OFFICIAL REPORT

OF THE

Visit of the Delegation of the International Federation of Master Cotton Spinners' and Manufacturers' Associations to

EGYPT

(October-November, 1912)

AND

Report by the Secretary on his subsequent tour in the

ANGLO-EGYPTIAN SUDAN

(November-December, 1912)

With a Preface to the latter by

HIS EXCELLENCY LIEUT.-GENERAL SIR F. REGINALD WINGATE, *G.C.V.O., K.C.B., K.C.M.G., D.S.O.*, etc.

Governor-General of the Sudan and Sirdar of the Egyptian Army

ALSO

COTTON GROWING IN EGYPT

A re-issue of the report by the Secretary on his visit to Egypt in 1911, with some Additions.

PREFACE.

In submitting the Official Report of the International Delegation's visit to Egypt, the International Committee desire to draw the special attention of the affiliated Associations and of their members to the resolution relating to the consumption of the various kinds of Egyptian cotton, which was unanimously adopted at the last of the meetings held in Cairo. A suitable enquiry form is being prepared by the International Committee, and will be forwarded in the autumn, along with the usual schedules for the annual census of cotton consumption, to all users of Egyptian cotton.

Although, owing to the Balkan War, many delegates who intended taking part in the Egyptian tour were prevented from doing so, yet it is most gratifying to the International Committee to be able to state that the Delegation was thoroughly representative of that section of the world's cotton spinning industry which uses Egyptian cotton.

Sir Charles W. Macara, President of the International Cotton Federation, whilst in Cairo, received a cordial invitation from His Excellency Lieut.-Gen. Sir F. Reginald Wingate, Governor-General of the Sudan, to visit Khartoum and the Sudanese cotton-growing districts, but owing to his many engagements in England Sir Charles, to his great regret, felt that he could not spare the time for so extended a tour. The International Committee, therefore, decided that the Secretary should proceed to the Sudan at the termination of the meetings of the International Delegation, and his interesting and exhaustive Report of the visit, to which Sir Reginald Wingate has contributed a most valuable preface, is included in this volume.

The International Committee take the opportunity of expressing their great satisfaction with the recent undertaking on the part of the British Government to afford facilities for the raising of a loan of £3,000,000 for the development of the Anglo-Egyptian Sudan, in which country the International Committee have taken so deep an interest.

As the first edition of the Secretary's Report on his visit to Egypt in 1911 is exhausted, the International Committee consider it advisable that this Report, along with some additions, should be re-issued herein.

This Official Report is issued under the auspices of the Committee of the International Federation of Master Cotton Spinners' and Manufacturers' Associations, but the Committee do not hold themselves responsible for the statements made or opinions expressed by individuals.

Manchester, March, 1913.

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Committee of the International Federation of Master Cotton Spinners' and Manufacturers' Associations.

SIR CHARLES W. MACARA, BART. (England, Sweden, Norway, and Denmark), PRESIDENT.
JOHN SYZ (Switzerland), VICE-PRESIDENT.
CASIMIR BERGER (France),
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ARTHUR KUFFLER (Austria).
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J. B. TATTERSALL (England).
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SENJIRO WATANABE (Japan).
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NICOLAS MOROSOFF (Russia).
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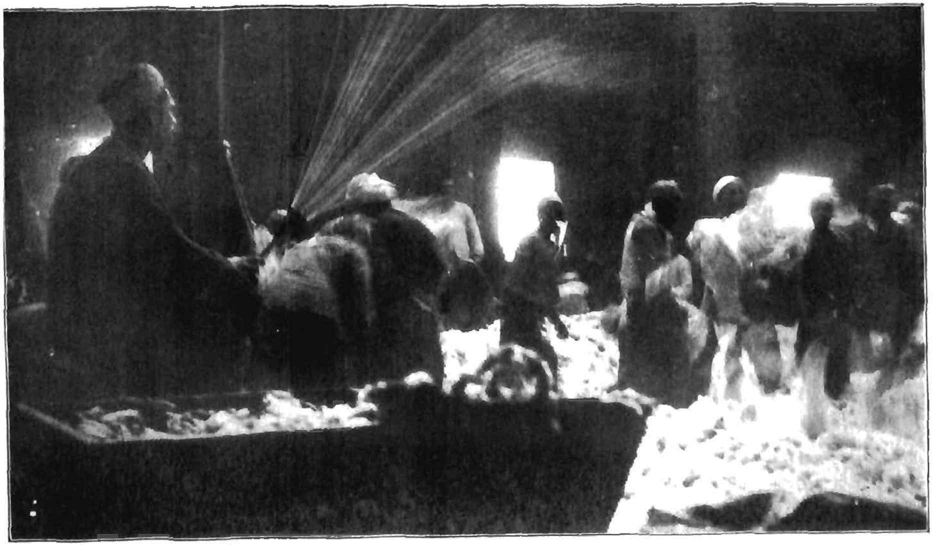
GERALD C. DUDGEON, Director-General of the Government *Department of Agriculture*, Cairo.

C. CHOREMI, of Messrs. Choremi, Benachi, & Co., representing the Alexandria General Produce Association, Alexandria.

ABDUL HAMID ABAZA BEY, Director of the Khedivial Agricultural Society, Cairo, Honorary Secretary.



Watering of Cotton at one of the largest Presses at Alexandria.

This photograph has not been touched up in any way.

List of Delegates of the International Cotton Federation.

Austria.

C. H. Beckmann, c/o J. B. Limburger, jun., Leipzig (Saxony).

Theodor Cichorius, Cichorius & Co., Kratzau.

André Gassner, sen., Baumwollspinnerei und Weberei, Neumarktl. Ed. Glanzmann & And. Gassner, Oberkrain.

Vladimir Pleska, Karl A. Tucek's Baumwollspinnerei, Horic, Bohemia

Dr. Josef Stern, A. Stern & Sohn, Vienna.

Max Stern, A. Stern & Sohn, Vienna.

Karl A. Tucek, Karl A. Tucek's Baumwollspinnerei, Horic, Bohemia.

Belgium.

Omer van Ham, Filature à Braine-le-Château.

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Joseph Neve, 11 rue de la Croix, Ghent.—Substitute Member for Belgium on the *International* Committee.

England.

P. B. Barlow, Barlow & Jones, Ltd., Bolton.

*John Charnock, Vernon Mills, Bolton.

*John Emery, Palmer Mill, Ltd., Stockport.

J. P. Garnett, David Smith, Garnett, & Co., 61, Brown Street, Manchester.

Francis Gregory, John Ashworth (1902), Ltd., Bolton.

*Joseph Hilton, Sudan Mill Company, Ltd., Oldham.

Ed. Hinmers, Baytree Mill Company, Ltd., Oldham.

Wm. Howarth, Fine Cotton Spinners' and Doublers' Association, Ltd., St. James' Square, Manchester.

Sir Charles W. Macara, Bart., The Bannerman Mills Company, Ltd., 33, York Street, Manchester, President of the International Cotton Federation and of the English Federation of Master Cotton Spinners' Associations.

Lees H. Marland, Atlas Mill Company, Ltd., Ashton-under-Lyne.

*S. Newton, Rock Spinning Company, Ltd., Ashton-under-Lyne.

*Official Delegates of the English Federation of Master Cotton Spinners' Associations.

JOHN SMETHURST, 15, Cross Street, Manchester, Secretary of the English Federation of Master Cotton Spinners' and Manufacturers' Associations.

J. B. TATTERSALL, Ash Grove, Royton, Member for England on the International Committee, Vice-President of the English Federation of Master Cotton Spinners' Associations, and President of the Oldham Master Cotton Spinners' Association.

F. V. TOMLINSON, Robt. H. Buckley & Sons, Ltd., 69, Royal Exchange, Manchester.

HAROLD WHITTAKER, Marlborough Mill, Ltd., Failsworth, Manchester.

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W. A. BALMFORTH, Official Reporter of the International Cotton Federation, 15, Cross Street, Manchester.

CHARLES DAVIDSON, Private Secretary to the President, 33, York Street, Manchester.

ARNO SCHMIDT, Secretary, International Cotton Federation, Manchester.

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CASIMIR BERGER, C. Berger & Cie., 80, rue d'Elbeuf, Rouen; Member for France on the International Committee and President of the Syndicat Général de l'Industrie Cotonnière Française.

Germany.

WILLY BEHR, Vigogne-Actien-Spinnerei Werdau, Laubnitz-Werdau (Saxony).

STEPHAN CLAUSS, E. I. Clauss Sucr., Plauen bei Chemnitz (Saxony).

JEAN HAUFFELE, Spinnerei Gebweiler, Gebweiler (Alsace).

KARL GMINDER, Ulrich Gminder, G.m.b.H., Reutlingen (Württemberg).

ROBERT GROSS, Held & Teufel, Rottweil (Württemberg).

ALFRED KAHLE, Sächsische Vigogne-Spinnerei, Werdau-Crimmitschau.

MORITZ SCHANZ, German Colonial-Economic Committee, 54, Weststrasse, Chemnitz.

L. STEINEGGER, Mittweida.

L. STEINEGGER, jun., Baumwollspinnerei Mittweida, Mittweida (Saxony), substitute member for Germany on the International Committee.

Holland.

B. W. TER KUILE, B. W. & H. ter Kuile, Enschede; Member for Holland on the International Committee.

NICO TER KUILE, Nico ter Kuile & Zonen, Enschede.

*Official Delegate of the Bolton Master Cotton Spinners' Association.

Italy.

G. Mylius, 32, via Montebello, Milan; Member for Italy on the International Committee and President of the Associazione Cotoniera Italiana.

Japan.

Toyozi Wada, Fujigasu Cotton Spinning Company, Osaka; Substitute Member for Japan on the International Committee.

N. Kuji, Fujigasu Spinning Company, Ltd., Osaka.

Portugal.

Jacinto Magalhaes, 36 rua da Saudade, Oporto, Member for Portugal on the International Committee.

L. F. Oliveira, 36 *rua* Passos Manoel, Oporto.

H. P. Faveira, 238 rua da Palma, Lisbon.

Switzerland.

Caspar Jenny, jun., F. & C. Jenny, Ziegelbrücke.

Viscount Kitchener of Khartoum. *Sir C. W. Macara, Bart.*

C. Berger. *H. E. Sirry Pasha.*

Garden Fête at the Zoological Gardens, Cairo.

Official Report of the Conferences.

The Delegates met in the large Hall of the Alexandria Town Hall on the morning of Wednesday, October 30th, 1912.

H. E. Sidky Pasha, Under-Secretary of State of the Ministry of the Interior, attended on behalf of the Egyptian Government. The Director-General of Agriculture and other Government Officials, as well as a number of distinguished personalities of Alexandria and Cairo, were also present.

The chair was taken by Mr. P. Ferrari, President of the Alexandria General Produce Association, who addressed the following words of welcome to the Delegates: In opening this Conference, my first duty is to extend a cordial welcome to the representatives of the International Federation of Master Cotton Spinners' and Manufacturers' Associations, over which Sir Charles W. Macara presides. The visit to Egypt of your powerful Federation is the best proof of the interest taken by the consumers in our valuable product. I have no doubt that good results will arise from your visit amongst us from the point of view of the bonds of confidence which ought always to exist between producers, spinners, and manufacturers, that is to say, between all those interested in cotton. You will hear, presently, from an eminent authority, Mr. Lawrence Balls, an address on one of the questions which justly claims the attention of all those who cultivate, purchase, and transform the fibre of our cotton plant, and we will afterwards discuss a few special questions stated on the agenda of this meeting. The Alexandria General Produce Association, of which I have the honour to be the President, has already had a fairly long existence. It was established 30 years ago on the initiative of the exporters, and it has played in this country, we can say it with pride, a beneficent rôle. It is in this metropolis of the cotton trade that it has its headquarters. Our Association is proud of being able to offer you the first welcome to Egypt. You will continue your educative journey, but you will be convinced from what you will see and observe everywhere that it is here that all ends, and that the history of Egyptian cotton is made here. Your visit will be a happy one for us, because it will permit us to become acquainted with you, and we hope it will afford you an opportunity to appreciate our efforts and our work.

Dr. Ruffer, Vice-President of the Municipality and a prominent member of the Egyptian Government Cotton Commission of 1910, after some hearty words of welcome, said: Not many months ago the Egyptian Government appointed a commission, of which I am a member, to study the parasitic diseases of cotton, and I hope this meeting will encourage the Government and the Association to put the study on a real scientific basis. The cotton worm, I believe, has done a great deal of harm to the plant in Egypt, but, personally, I decline to be despondent on the subject. When such a disease as

yellow fever can be stamped out by scientific methods, it is not too much to expect that very soon such a pest as the cotton worm will also be done away with. I would remind you that Alexandria was at one time not only the greatest trading station of the East, but also the greatest scientific town of the East. I am sorry to say it is so no longer, but there is no reason why it should not regain its former position. I should like to see established here in Alexandria an institute specially devoted to the study of useful plants, and especially of cotton, and I hope that by the time you come here again, at a date not far distant, such an institution will be in existence.

The SECRETARY of the Alexandria General Produce Association then read the following statement on the

PROGRESS OF THE EGYPTIAN COTTON TRADE AND INDUSTRY.

You will leave our city to-morrow, and in the course of your itinerary through Egypt you will inspect the cotton fields, the ginneries and presses, you will see the railway lines and the canals which carry the bags and bales of cotton in competition with the camels, our old-fashioned means of transport.

Egypt will interest you on account of its picturesqueness, and also on account of its progress in civilisation and modern industry. You will be astounded by the contrast between the chimneys of the factories, the noise of the machines, and the peasant, whose Pharaonic shadow stands out clearly on the banks of the canals, where he works with an indefatigable energy from morning to night the well for watering his fields. You will also observe with what supple spirit this peasant adapts himself to the new conditions, and how this admirable cultivator becomes a clever workman. The occupation of the greatest part of the population of Egypt—of the natives as well as of the foreigners—is either directly or indirectly connected with cotton. This is also the raw material which engages our attention, and we, who have the honour of welcoming you, so to say, on the threshold of Egypt, have also the pleasant duty of supplying you with some general indications on the different operations necessary for bringing the product of the cotton fields to the steamer, which in turn carries it to the various destinations, according to your instructions.

The first stage, the growing of the cotton, will be dealt with by eminent specialists on your arrival in Cairo. We shall deal with cotton from the point when it becomes merchandise. The handling of cotton at a ginnery, and the baling, were far from being as perfect as you will see these processes carried out when you pay your visits to the factories in the interior. Formerly the ginning was carried out in the most rudimentary way by means of wooden gins driven by hand. The pressing into bales was unknown, and the cotton arrived from the interior in ordinary bags, which were often in a very bad state, covered with mud and dirt. The roads of Minet-el-Bassal, the centre of our trade, where all the arrivals from the interior have for a long time been handled, were far from being in such a perfect condition as you will find them now.

Before commencing your journey, it will perhaps be interesting if I explain to you the stages through which the cotton passes before it can be delivered by the exporting houses to the consumers. This will render more comprehensible the work which is carried on in the factories which you will have the opportunity of visiting. It is due to improvements which have gradually taken place from year to year that the different stages of ginning and pressing have been brought to their present perfect condition, which is superior to any existing in other countries. Platts' gin, which is used in all the factories, has been employed for a great number of years, and even to-day it is recognised as the best for ginning Egyptian cotton, whose long and silky fibre requires special attention in the ginning process. Special experts, called "carpenters," are engaged in regulating each gin according to the length and quality of the fibre of the cotton to be ginned. This work of setting the gins requires great practice, and we may well maintain that it is a work of supreme importance. After the cotton has been ginned it is transported to the press, where it is pressed into hydraulic bales, in which form the cotton is sent to Alexandria. A few houses possess in the interior steam presses, which press bales ready for export.

The stranger who enters one of the ginning factories in Egypt is at once astonished to find so many workmen. We must say, however, that during the last few years the number of workpeople has been considerably reduced. Formerly the seed, after being separated from the fibre, used to be collected at the back of the gin. We had workmen whose special duty it was to carry it in baskets to the sieve. To-day we find that in most of the modern factories this work is carried out by mechanical conveyers. Besides, formerly the cotton, after it had been taken to the press, was put in box-presses, where eight or ten men used to press it with their feet in order to put as much weight of cotton in one bale as possible. This work also is being carried out, in the majority of the factories during the last few years, by mechanical piston presses.

Those who are not familiar with Egyptian ginning will ask, why one does not use for the feeding of the gins suction pipes instead of having an operative for each of the gins, who does nothing but feed the seed-cotton on the lattice table of the gins?

We can say that all the experiments towards this end have failed so far, owing to the large number of gins which are fitted up in each ginning factory, as the distribution of the seed-cotton would be very difficult. We know that in the United States the suction pipes are in use, but the manufacturers of these appliances have had to acknowledge that the existence of so large a number of gins in one building, as we have in Egypt, is an obstacle difficult to overcome.

You must not think, however, that no effort is made on our part to reduce the number of hands employed at the gins. Engineers who have made a study of this question have obtained very satisfactory results. They are able to reduce the number of hands to half, or, at all events, two-thirds.

Another cause of astonishment to the casual visitor is the box-
back of the gins and receive

the cotton from each gin in order to convey it to the press. At first sight it might appear that an endless conveyer would do quite well the work which at present is carried out by a pretty large number of men. It must, however, be remembered that very often the cotton as it comes from the gin takes fire owing to different causes. With the existing method it has been proved that the fire is generally confined to the cotton which is in the box-cart. With an endless conveyer the fire might easily be communicated to the presses, and then the risk would be very serious.

The cotton whilst passing through the gins becomes hot and loses some of its humidity. Moreover, the fibre loses its nice appearance and becomes gritty. It is therefore necessary to humidify it in order to give back its normal moisture, its elasticity, and its silky appearance.

We must confess that the work which is carried out in the most primitive way, is the carrying of the bales from the yard to the inside of the factories. The reasons why we have not yet been able to make experiments with the new means of transporters, such as are being used in connection with other merchandise in Europe, are that the sacks easily tear, that the cotton must not be scattered about, and, finally, it must be remembered that the arrivals at the factories during the season are enormous, and that consequently an obstruction frequently occurs which does not allow any systematic handling.

The foregoing will have given you an idea of the ginning process. The cotton, however, has to be subjected to a great number of manipulations for classifying purposes before it reaches the ginning machine. As you must know, the cotton crop is generally picked at various periods, the first picking being the best quality; the second and third are of an inferior kind. Important cultivators keep the pickings separate in the stores, and the putting of the cotton into bags is carried out under the supervision of the classifier of the buyer. This man must be able to separate each picking, that is to say, he must be careful not to mix in one sack the cotton from differing pickings. The cotton thus separated in the store of the seller is once again examined with great care in the factory. The classification in the factory is the final stage of separation of the qualities prior to ginning, which must be carried out separately for each of the classes. When the ginning is finished the cotton is sent to Alexandria, where it undergoes a final examination, and each firm selects from among its arrivals the qualities which correspond to the types sold by them abroad. Thus it is that the cotton is ready for pressing in the careful way which you have seen already.

The manner in which the seed for sowing purposes is selected is such an important subject that we must mention it here. It is indeed recognised that the good quality of a cotton, of no matter what district, depends upon the selection of the seed. Of course, the cultivator must also take great care of the method of cultivation. He must see that the pickings are undertaken at the proper time, and see that the cotton is picked clean.

Each merchant is, owing to his long experience, in a position to know those among his producers whose cotton offers the best guaran-

tee of producing a seed suitable for sowing purposes. Such cotton, after it has been carefully classified, only enters the factory for ginning purposes after a thorough cleaning of the gins and sieves; they must be absolutely cleared of the seeds left from the previous ginning. This work calls for great attention, as the minutest mixing is certain to have an unfavourable effect upon the good quality of the seed. In spite of the precautions brought to bear by the reliable houses upon the methodical selection of the seed-cotton, there arises a natural degeneration caused by each variety of cotton retaining its primary qualities only during a period of some 10 years. Of the causes of this degeneration Mr. Lawrence Balls will not fail to enlighten you.

We must add that the Government, with the co-operation of the firms referred to, makes praiseworthy efforts to improve the quality of the seed in order to put at the disposal of the cultivator the very purest seed that can be obtained.

ADDRESS BY THE PRESIDENT OF THE INTERNATIONAL COTTON FEDERATION.

Sir CHARLES W. MACARA, Bart., said: This International Delegation which has come to visit your wonderful country is representative of one of the most remarkable commercial movements the world has ever seen. The International Cotton Federation was founded in 1904 in a crisis brought about by the inadequate supply of the raw material, and since then my colleagues and I have been received by the Head of every State in which Congresses or Committee meetings have been held, as well as by many of the principal ministers of state. I think it is a very hopeful sign that the highest personages in the world are devoting their attention to the promotion of the peaceful pursuits of industry. I have been surprised by the amount of information on commercial subjects which is possessed by those who occupy the highest positions, and perhaps their knowledge is to some extent attributable to the fact that our reports are forwarded to them under the auspices of the British Foreign Office. That has given to our movement a prestige which no other commercial movement has ever had.

INTERNATIONAL INDUSTRY AND COMMERCE.

I now propose to deal with the consideration of international trading from the standpoint of practical experience. Many discussions are conducted by those who have not had opportunities for gaining the practical experience that my public work during the past 20 years has enabled me to acquire. This public work has necessitated the taking of a comprehensive view of the international industries which provide the main factors in the two essentials of existence, viz., food and clothing, and the two are inseparably bound up together.

When King Edward VII. and Queen Alexandra received and entertained the Committee of the International Cotton Federation at Windsor Castle in 1906, his Majesty, in referring to the establishment of the International Institute of Agriculture, expressed the hope that it would, when fully developed, be of service to the cotton and

kindred industries which were so dependent for their raw material upon the tillers of the soil. This hope is being realised.

INTERNATIONAL CO-OPERATION IN AGRICULTURE AND INDUSTRY.

It has been my privilege to be associated with the inauguration of two international organisations which have played an important part in bringing the nations of the world into friendly co-operation, the first being the International Federation of Master Cotton Spinners' and Manufacturers' Associations, initiated at Zurich in 1904, with its head-quarters in Manchester, and embracing, either in its membership or in co-operation with it, nearly all the countries where cotton is grown or manufactured; the other is the International Institute of Agriculture, which, on the recommendation of an American citizen, was initiated and promoted by the King of Italy, and has its head-quarters in Rome. In the International Institute of Agriculture no fewer than 49 States are co-operating. As president of the International Federation of Master Cotton Spinners' and Manufacturers' Associations I was appealed to in the initial stages of the International Institute of Agriculture to render whatever assistance was possible towards the promotion of this world-wide movement, an appeal which I at once responded to, recognising that it would be of immense service to all the textile industries of which cotton is the chief. I feel pleased that France, England, and Germany were among the first of the great nations to support, in the order named, the King of Italy's scheme to promote the welfare of the agriculture of the world. Since then these two international organisations have worked hand in hand, and each succeeding year emphasizes the view that they are destined, not only to promote the material welfare of the inhabitants of the globe, but by the dissemination of a vast amount of information regarding the conduct of the industries, which, as I have said before, provide the essentials of life, an educational work is being carried on which is demonstrating most forcibly the entire interdependence of the nations of the world. When the Committee of the International Cotton Federation was entertained by the British Government at the House of Commons in 1910, Sir Edward Grey, Secretary of State for Foreign Affairs, in commending the work of the International Cotton Federation, said that when the interdependence of the nations was fully realised the peace of the world will be assured. It is impossible to estimate the value of the wide distribution of the reports of the work of these international organisations, which has been done most extensively, the annual reports being published in the best known languages and circulated throughout the world. In all the countries in which Congresses, or meetings of the International Cotton Committee, have been held, the work has received the personal recognition of the heads of the States, and the cordial support of prominent statesmen.

In this connection I might say that another international movement which is rapidly assuming large dimensions has been established. I refer to the International Federation of Textile Workers, a movement that is equally demonstrating the interdependence of the nations.

THE CLOTHING OF NINE-TENTHS OF THE WORLD.

In a paper which was read at the seventh International Cotton

Congress held in Brussels in 1910, the magnitude of the possibilities of the cotton industry was brought out. This industry supplies nine-tenths of the clothing of the world's inhabitants, and it is estimated that out of a population of 1,500,000,000 only 500,000,000 are completely clothed, 750,000,000 are only partially clothed, and 250,000,000 are not clothed at all. Such figures show the vastness of this international industry and the possibilities of its development. It is obvious that this can only be effectively carried out by international enterprise, and the educational process which is being prosecuted is showing the growers of the raw material the immense possibilities of the development of their industry to meet the ever-increasing demand for cotton clothing. In addressing the cotton planters of the Southern States of America at the International Congress held in Atlanta, Georgia, in 1907, in order to counteract the view they took that the higher the price they could get for cotton the better their interests were served, I pointed out to them that the consumers of cotton goods were adversely affected by a great enhancement in the cost of their clothing, which had the further effect of reducing the consumption of cotton goods and the employment for the cotton mills of the world. I further pointed out to the planters that their best interests lay in the scientific cultivation of the soil, thus increasing the yield per acre, which would enable them to secure adequate remuneration and yet to sell cotton at a considerably lower price. This, together with better handling and marketing, which further reduces expenses, would ultimately tend to the prosperity of the growers, the manufacturers, the workers, and the users of cotton clothing. The mere enumeration of these considerations proves what can be accomplished by friendly discussion among the representatives of the nations, demonstrates the interdependence of the nations, and shows how each can contribute to the prosperity of all. In writing to me subsequently, President Roosevelt referred to the great awakening that was taking place in the United States as a result of two previous visits of a Lancashire Commission of cotton experts, and of the Conference with the cotton planters at Atlanta.

The Open Door.

Under normal conditions the demand for cotton productions is practically unlimited. During recent years the supply of raw cotton has been short of the world's requirements, and the price has consequently ruled high. Although England holds so commanding a position in the cotton trade of the world, yet her policy has always been to maintain the open door wherever her influence extends. All nations are thus placed on an equal footing with England in meeting the demand for these commodities. Among the principal aims of the International Cotton Federation are the development of the cultivation of cotton in all parts of the world where it can be grown successfully and on a commercial basis, compiling statistics regarding the industry, and establishing Courts of Arbitration to promote the smooth working of international trading. Panels have already been appointed in most of the countries included in the Federation. The International Institute of Agriculture encourages the more scientific cultivation of all crops, and also publishes reliable statistics regarding the crops of the world and their consumption.

The interests of all who cultivate the soil, as well as of all who manufacture raw materials into clothing, the distributors and consumers, have to be considered. For example, the cotton planter must get an adequate price to remunerate him for his labour and enterprise, but this does not necessarily mean a high price. Scientific methods of cultivation may enable the grower to sell his commodity at a moderate price, which will pay him for his increased production just as well as a high price did formerly. A moderate price of raw cotton enables the manufacturer of cotton goods to sell his productions also at a moderate price, and this in its turn results in a greater consumption of cotton clothing, which increases the employment for the cotton mills of the world.

THE VISIT TO EGYPT.

It is obvious that if the industries which provide the essentials for the human race are to be conducted with the breadth of vision necessary for their success, the nations of the world must work together for greater efficiency, and in doing this there need be no greater rivalry between nations than there is between individuals. Individual and national rivalry have always existed, and with nations, just as with individuals, it is those who display the greatest energy and resource who are the most successful. This delegation, representing the principal European nations and Japan, is visiting Egypt for the purpose of encouraging by its presence the work which is being carried on by the Khedive, the Egyptian Government, and by that able administrator, Lord Kitchener. Primarily, this work is in the interests of the Egyptians themselves, but all cotton-using countries will also benefit.

All other industries are supplementary or subsidiary to those which provide food and clothing, and upon the successful conduct of industry depends the provision for the defensive forces of the nations of the world.

INDUSTRIAL AND INTERNATIONAL RELATIONSHIPS.

From many years' experience in dealing with the relationship between capital and labour, I am firmly convinced that strong and efficient organisation on both sides is the best means for promoting mutual respect and for dealing successfully with industrial disputes. There is no doubt that where such organisation exists disputes are more likely to be settled harmoniously than where one side is weak and the other strong, or where both sides are imperfectly organised. I consider also that the intercourse which takes place between the representatives of capital and labour tends to a better realisation of the difficulties of each, and, above all, to bring home forcibly the fact that their interests are not antagonistic, but that they are identical, and that many difficulties can only be surmounted by co-operation. On the other hand, it becomes apparent as time goes on that industrial strife is against the interests of both capital and labour.

What applies to the conduct of industry applies equally to the relationship between the nations of the world. Here again practical experience is of the utmost value, and the working of the two international organisations with which I have been associated has proved conclusively that it is possible for the representatives of the

numerous nations of the world to meet together in friendly conference, discuss problems that concern the welfare of all, and that are impossible of solution except by the co-operation of all. The successful and harmonious work of these organisations shows that, notwithstanding the great increase of armaments, the peoples of the world are friends at heart.

International trade demonstrates the dependence of the nations upon one another. I may quote, as an example, the trade between England and Germany, which approaches, in round figures, £120,000,000 annually; that between England and France is about £80,000,000 annually. Then England uses about half the crop of cotton which is grown in Egypt, the other half being distributed amongst the other cotton-manufacturing countries of the world.

So far as finance is concerned, the interests of all countries are also closely interwoven, but these considerations, colossal as they are, would be far exceeded in dire consequences in other directions should there be other serious complications. Indeed, to anyone who fully realises the basis on which industry and commerce exist, it must be apparent that it would be impossible to emerge from war without irreparable loss, not only to combatants but to non-combatants. I fear, speaking generally, that statesmen and diplomatists have little opportunities for gauging the terrible effects war would have upon the ever-increasing intricacies connected with the carrying on of industry and commerce, and the absolute chaos that would be produced. It would be well if there were more intercourse between them and the leaders of industry and commerce, so that they might by this means realise more fully the vast issues that are involved, which would certainly tend to the exercise of greater care in the discussion of difficulties as they arise. In the carrying on of the international movements to which I have referred, all the nations have worked perfectly harmoniously. At these international gatherings it is impossible to detect racial jealousies or that the delegates belong to so many different nations. Indeed, the deliberations are animated throughout by a desire to deal with the industries as a whole, it being fully realised that each nation is simply carrying on its own part of international industry, and that all should combine in facing problems which can only be successfully dealt with by combination.

The Value of Round Table Conferences.

With such experiences I am at a loss to understand the constantly recurring jealousies and misunderstandings between nations, which I cannot help feeling are magnified by writers who do not realise the gravity of the issues with which they are dealing. Mischief is so often brought about by want of thought in dealing with industrial strife, which in a minor degree has the same disastrous results as would be brought about by war, that it is earnestly to be desired, for the welfare of humanity, greater care will be exercised in the future.

Having presided over numerous conferences that have taken place in connection with the disputes which have occurred in the cotton industry of England during the past 20 years, I can testify to the immense value of the round table conference, both in the settlement of disputes and the prevention of industrial strife, and I

feel certain that the adoption of a similar course, pursued assiduously in international disputes, would generally lead to a settlement and prevent recourse to war.

I do not share the Utopian views which are frequently expressed regarding disarmament, much as their realisation is to be desired. *Changes in the existing state of affairs, in my opinion, cannot* be brought about rapidly or without much patient educational work. As an advocate of the thorough organisation of capital and labour, I am also an advocate of thorough efficiency in the defensive forces of the nations. At the same time I firmly believe that eventually, with *the advance of science and the spread of civilisation, together with* international co-operation to promote greater efficiency in carrying on the world's work, ample employment will be found for all, which would tend to remove national jealousies, and thus help materially to ensure the peace of the world.

DETERIORATION OF COTTON VARIETIES.

Mr. W. LAWRENCE BALLS, M.A., the Botanist of the Department of Agriculture, Cairo, then gave a lecture, illustrated by limelight views, on the "Deterioration of Varieties of Egyptian Cotton." The following is an abstract of the lecture; the full text, together with a number of illustrations, will be found in Appendix I.

The deterioration of the Egyptian crop during the past decade has been twofold; firstly in yield, through environmental causes; secondly in quality, through constitutional causes. The simultaneous incidence of the two separate causes was a matter of chance. The quality is also affected by the same causes as the yield, though to a less extent.

Environmental deterioration is not deterioration of the variety proper. It belongs to the phenomena of fluctuation, and is not permanent; if the prejudicial factors of the environment are abolished, the variety returns to its original condition.

An exception to this may result when—as is the case with all present varieties—the plant population is mixed, since, under the new conditions of existence, those plants best suited to them will produce most seed, so that, when the prejudicial conditions are removed, the population will include a greater proportion of those plants than it originally contained.

Varietal deterioration has for long been regarded as inevitable, and the possible life of a variety has been designated at 10 to 20 years. The deterioration which has always been experienced, and which has given rise to this opinion, is due to explicable and preventable causes. These causes are:—

Original impurity of the introduced variety.

Further contamination by natural hybridisation.

The operation of natural selection and of the laws of chance on the mixed populations thus formed.

DAMP IN COTTON.

The Congress next discussed the question of damp in cotton. Mr. ARNO SCHMIDT, opening the discussion, said: At every

Congress we have had a discussion on damp in cotton, a subject which is constantly before the International Federation, the English Federation, and the Continental Federations. A Committee has been formed on the Continent to ascertain, in conjunction with the cotton merchants of Bremen, the quantity of moisture in American and in other cotton, and experiments are being made by scientists to find out what is the extent of natural moisture in cotton—a point which is at present unknown. On the Continent a definite maximum of damp (8½ per cent.) has become the recognised standard in the delivery of yarn, and quite recently a stipulation of this kind was made by a very large buyer of cotton yarn in England. It is therefore quite natural for the spinner, who is bound to deliver yarn which does not contain more than a certain percentage of moisture, to say to the sellers of cotton, "What can I count upon as the standard degree of moisture in the raw material?" That is natural, logical, and reasonable. Dr. Ruffer expressed the hope that an institute would be established in Alexandria where scientific investigations will be made, and I venture to suggest that one of the first aims should be to ascertain on a scientific basis the amount of moisture that the Egyptian cotton naturally holds. It is an advantage for each merchant to have his own testing plant, but in that case there will be no guarantee that the tests of the various merchants are made in a uniform way. I therefore suggest that the Alexandria General Produce Association should establish a testing house in this city, and that tests as regards the percentage of damp should be made by an impartial staff of most of the lots of cotton shipped by you. Furthermore, I am convinced that a solution of this vexed question of damp in cotton can be found if you, members of the Produce Association, appoint a committee to meet a special committee of the International Cotton Spinners' Federation with a view to arriving at a standard of moisture for Egyptian cotton. If we succeed in establishing a scheme of this sort it will be a great triumph for this Conference. I was pleased when a member of the Produce Association said to me: "I, personally, am very much in favour of making scientific tests on a uniform basis, because that would probably be the means of eliminating unfair competition. There are some people, I am sorry to say, who take an unfair advantage by adding too much water, and are therefore able to sell at a lower price." If that is a correct report of prevailing conditions I venture to think it would be in the interests of the merchants of Alexandria, as well as of the cotton spinners of the world, if scientific tests for damp were constantly made, and if you would rescind the rule that prohibits your members from selling cotton with a maximum degree of moisture.

Sir CHARLES MACARA: Mr. Schmidt has very admirably described the plans which we are wishful to carry out. I have taken a great deal of pains in dealing with this vexed question on numerous deputations to the Liverpool Cotton Association, and I think you will agree with me that it is an immense advantage to the industry that everything that can be done should be done to promote smooth trading and mutual confidence. At the last Conference we had with the Liverpool Cotton Association, after we had spent, I think, some

hours in discussion, I suggested that a small committee, composed of spinners and of members of the Liverpool Cotton Association, should investigate the matter together. If everything is right that ought to be a very good way of dealing with it. The Liverpool Cotton Association said they would give the matter their most serious consideration, and that they would report. For their report we are now waiting.

Mr. S. NEWTON (England): This is a very delicate question, and one which we cannot settle here to-day. It is one of very great importance to spinners of Egyptian cotton, and in my opinion ought to have immediate attention. If damp in cotton is to be recognised we ought to have a recognised standard of moisture. If there is not, unfair competition arises. Perhaps some equitable arrangement would be possible if the Egyptian merchants were to go into the matter with the International Committee, or with some other committee, upon which they might agree.

Mr. CASIMIR BERGER (France): Acting upon the hints thrown out at various International Congresses, the spinners of France have established a testing-house at Havre, and it has recently been opened. There, with the most approved scientific instruments, they are undertaking the testing of cotton as it arrives, and they hope to extend their operations more and more. We have just made in France various experiments with regard to Egyptian cotton, and we have found differences in various lots, and I may tell you that they vary in the amount of excess moisture from 4 to 7 per cent. I am pleased to see that a great deal of attention is being paid by Alexandria merchants to the grading and selection of cotton, and I think it would be to their interest if they were to join together in the establishment of a testing-house where the tests would be made scientifically in an entirely impartial way. The cost of such a house would not be at all great.

Mr. T. CICHORIUS (Austria): I have been asked to say a few words explanatory of the position of the Austrian spinners. They have testing-houses at their various establishments, and there they have found differences in damp in Egyptian cotton varying from five to six per cent. That is too much. And it hits the Austrian spinners exceptionally hard. They are obliged to buy cotton for the whole of a season, and when the cotton has been excessively damped, it becomes mildewed during the time it is lying in the warehouse, and the fibre loses its strength, so much so that cotton of good staple, which at the beginning of the season was used for fine counts, at the end of the season cannot be used for the purpose for which it was bought. Of course, the effect is an increase of the price of Egyptian yarns and a decrease in their consumption on account of their increased price, and the substitution of American for Egyptian yarns. That is the difficulty, and the Austrian spinners hope that by conferences some means will be found of solving it, a solution being in the interests of all concerned.

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Mr. B. W. TER KUILF (Holland): I am a consumer of many varieties of cotton, and I have made many tests. Indian cotton I have found averaging 7½ per cent. of water, Texas 8¼, Upland 9½, Egyptian from one firm 8 per cent., and from others more than 10 per cent., Chinese 12½. One firm in Egyptian cotton, you see, is next door to the "Chinee" man in excessive damp. I suggest that every spinner should buy a testing machine. Then he will very soon find out who is the best exporter. That is the best way to get at it, but I also support the establishment of a testing-house at Alexandria.

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ABAZA BEY: In Manchester I saw bales of cotton as well baled as Egyptian, and the man who had them told me that if they had not contained water they would have been spoiled.

Mr. WM. HOWARTH (England): I did not intend to take part in this debate, but I have been requested to do so. And I think it is desirable to point out one or two things, because it is obvious that this discussion is not aimed at the wind. It is aimed at a direct object. If we are not aiming to get somewhere the discussion might as well never have taken place. This morning we have been shown that of four great staples, cotton, silk, wool, and flax, cotton has ousted in a large measure the other three. It is obvious that the general system of marketing, spinning, and manufacturing cotton, and placing it at the disposal of the world, has, on the whole, been satisfactory. The channels have been built as the result of years of experience, and I think it would be very unwise to be dogmatic and lay down definite proposals for a change. It may be desirable, and I think it is, that we should get exact knowledge. The suggestion that there should be a testing-house established in Alexandria is, I think, a very good one, and one which the Alexandria Produce Association might adopt, but it is most undesirable that any of us should set up a standard of moisture. I am now expressing my personal opinion only. If one were set up we should have appeals to courts of arbitration, and quarrels extending to every part of the globe. I do not think anyone wants to introduce things of that kind. If each spinner were to adopt the sensible suggestion of our friend, Mr. Ter Kuile, and provide himself with a proper testing system he will be able to tell whether a fair proportion of damp is being exceeded by the firms sending cotton to him. If it is exceeded, and he continues to trade with the firm which is guilty of the excess, he has himself to blame.

The CHAIRMAN: I would like to add a few words to what has been said already. You spinners must not believe that the merchants of Alexandria, represented by the Alexandria General Produce Association, have treated the question of humidity with an air of indifference. I assure you that if the exact quantity of water lost in the ginning process and that added again had been established, you would find out that the spinner is still the gainer. You know that transactions in Egyptian cotton are always carried out in this way: You are in the habit of buying a certain kind of cotton, and if there is a cheaper kind in the market that will suit your purpose, you buy it from somebody else, but if your old supplier consents to make a reduction you come back to him. The business in Egyptian cotton during the last 47 years, during which I have been engaged here in the cotton trade, has always been a question of confidence on the part of those who buy and one of conscience on the part of those who sell the cotton, and the spinners who have followed on those lines will be able to tell you that there have been occasions when a certain lot of cotton has been very wet, but that this has not happened frequently, and, further, that the cotton was not purposely damped. Those spinners who have followed that principle have generally been satisfied. In conclusion, I wish to tell you that we shall study the question as soon as possible. What you have told us will have our careful attention, and if there is a possibility of coming to an understanding I believe my colleagues will make you some propositions.

Mr. HUGO LINDEMANN (Egypt): We merchants look upon water in cotton from two points of view—first, that the water does not spoil the quality of the cotton, and, second, that we do not make you pay for water as if it were cotton. As to the first point, I say that spinners have taught us to put water into cotton by the way in which they judge cotton; merchants know by experience that cotton which has had water added sells better than cotton which contains no water. We had experience of this the other day. Two lots of cotton of exactly the same quality were made up. One contained water and the other was dry, and the watered cotton sold better in the Liverpool market than the other, on account of its better appearance. As to the allegation about being charged for water at the price of cotton, you can protect yourselves by buying from really reliable firms who are not guilty of adding damp in excessive quantities.

Mr. DELTA (Egypt): You will allow me to add a few words on this question. We have heard with the greatest pleasure the explanation from the standpoint of the spinner, and we have also listened to Abdul Hamid Abaza Bey, who has taken the part of the cotton merchants. You have certain objections to our putting water in cotton. Firstly, you believe that the quantity of water which we put into the cotton spoils the quality, and, secondly, you do not wish to pay the price of cotton for water. As regards the first objection, you have heard already what care we bestow upon maintaining the quality, what labours we spend upon the selection of good seed, &c. You know now that it is as much in our interest as in yours to uphold the quality of the cotton. Do not think for one moment that if we take so much trouble from the very start of sowing the cotton until it comes to the quays of Alexandria, that we put excessive moisture in cotton and damage the quality. It is necessary to put some water into the cotton, but I maintain that, instead of spoiling the quality, it improves it. I assure you that the spinners have taught us to put water into cotton, because we have found out by experience that the cotton which we have delivered in an absolutely dry state has always been unfavourably judged. There are houses in Alexandria who have made the experiment of dividing one lot into two; in half the number of bales water has been put, and the other half has been kept quite dry. The former has been preferred to the latter. Cotton which has been pressed without being damped does not look as nice as cotton that has had some moisture added. I also wish to add that we only put water in the higher grades of cotton in order to preserve the length of fibre. In the low-class qualities no water is added, as the length of fibre is not so important. Moreover, the spinners have every facility for ascertaining the amount of moisture which they receive in the lots of cotton shipped by the various exporters of Alexandria, and they generally know which of the firms are in the habit of shipping cotton with an excess of water.

Sir CHARLES MACARA: We have had a most interesting and instructive discussion. The great thing is to arrive at a uniform system, and such a system we cannot get through each spinner making his own test. We do not know exactly how his tests are

made. Is it not possible to arrange a joint meeting of representatives of the Liverpool Cotton Exchange, the International Committee, and the Alexandria Exchange, to talk the matter over? Then if you can satisfy the spinners that the best is being done there is an end of it. Until something of that kind is done the spinners will have misgivings, and we want to remove them. The whole object is to make trading smooth. If the proposition of Mr. Newton could be carried out we might arrive at something which would satisfy all.

A NEW VEGETABLE FIBRE.

Mr. MORITZ SCHANZ (Germany): I would like to take advantage of this occasion by drawing the attention of the exporters of Alexandria to a new raw material for the textile industry, a vegetable silk, which very much resembles "Kapok," although it is quite different in its botanical classification. I am speaking of the plant called "Akon" in India, and which is called "Ushr" in Arabic. Until quite recently this fibre was used only for stuffing mattresses, cushions, and similar articles; it had never been spun. In the last few years a chemical process has been discovered in Saxony by which the vegetable silk can now be easily spun, and this industry has developed to a considerable extent. The East Indies have supplied up to the present about 40,000 bales of this material per annum, but this quantity is no longer sufficient. Fortunately, there are other countries where "Ushr" is to be found. This plant is to be met with in many African countries, especially in Upper Egypt and the Anglo-Egyptian Sudan, where large quantities grow in a wild state. I think, therefore, that "Ushr" should be well worth the attention of the Anglo-Egyptian Government and of the cotton exporters of Alexandria.

The Conference then adjourned.

MONDAY MORNING, 4th November.

RECEPTION BY VISCOUNT KITCHENER AT THE BRITISH AGENCY AT CAIRO.

In the morning the delegates drove to the British Agency, on the banks of the Nile, where they were received by Field-Marshal Viscount Kitchener of Khartoum, K.P., G.C.B., O.M., G.C.S.I., G.C.M.G., G.C.I.E., LL.D., &c., British-Agent and Consul-General.

After having a private conversation with Sir Charles Macara in his room, and after receiving the members of the Committee, Lord Kitchener led the way to the terrace, where the whole of the delegates were introduced to him. At the conclusion of this ceremony, Lord Kitchener, after offering a hearty welcome to his visitors, said:—

I hope your inspection of the cotton industry in its centre here will be profitable not only to yourselves but to Egypt also. Mr. Arno Schmidt, your secretary, last year gave us a very valuable report on his visit. In that report there were many

hints which have done a great deal to improve the work out here in regard to cotton cultivation. I am sure we all owe him a debt for the trouble he took in making that report. I hope your present visit will increase our knowledge. You have had opportunities of seeing the qualities of the fellah who cultivates the soil, and I think if he would pay a little more attention to the cotton when it is being picked and being stored, and would discriminate a little better in the seed which he uses, we should have more improvements. I have no doubt that will come. I think it will come perhaps through the small purchaser in Egypt, who goes round and buys in the various places where cotton is produced. If we can get the fellaheen to take their cotton to more general centres, and the small merchant to know better the quality of the cotton and to buy only the best, the fellah will know it is no use to produce an article which is inferior. That experience will teach him much better than we can tell him. The small merchant now buys up all he can, regardless of quality, but if we can get a better price for the good cotton, and encourage means of discriminating between good and bad, it will be good for the fellah; he will learn that it is worth his while to cultivate the best article.

As regards seed, Mr. Dudgeon (the Director-General of the Agricultural Department) is making experiments in new seed, and we should like your advice as to two new qualities of seed which we have got. I am sure if we know exactly what you want we shall be able to produce it. We have only got a very small quantity of the seed so far, and it will, I think, take five years, during which the greatest care will have to be paid in our Agricultural Department, to enable the seed to go out freely into the country, and to be of use to you. It is just as well to know at once that we are on the right lines. I hope some of you will give us an opinion as to whether these two products of our work for some time now in seed cultivation are really what you want. I hope you will give a better price. One of the great requirements of Egypt is a good price for cotton, and we look to you to keep it up. If we do all we can to produce the article which you require we ask you to keep it at a good price, so that our people shall be happy and anxious to produce the cotton which you require.

Sir CHARLES MACARA said: On behalf of my colleagues and myself I want to thank your Lordship most heartily for the reception

which you have accorded us to-day at a time when heavy responsibilities, arising from disturbed state of Eastern Europe, rest upon you. Since we arrived in Egypt we have had the most hospitable reception. The arrangements have been splendid. Everything has passed off without a hitch. Here we have seen exactly the opposite of what we saw in America in 1907, when we travelled 4,600 miles through the Southern States. We were distinctly disappointed to find that America, which we all thought was an up-to-date country, was very far behind-hand in agricultural methods. In Egypt we have been immensely struck by your methods, and by the possibilities that lie before you. And I can assure you that it is a matter of supreme interest to the cotton industry of the world that Egypt should extract from the soil as much cotton as possible. Egyptian cotton is used for the purpose of making the highest class of cotton fabrics, England taking half the crop and other nations the other half. This branch of the cotton industry is developing much more rapidly than any other branch, possibly because we now produce cotton fabrics which only an expert can differentiate from silk. For these fabrics the best of cotton is required, and where the quality is good there is no reason why the price should not be good also.

As for the cotton trade in general, we should like to see all possible steps taken to improve the cultivation of cotton. On experimental farms in America we saw land which had been producing half a bale an acre, with very little extra expense, under scientific cultivation producing three-quarters of a bale an acre. Our desire is to pay the planter a fair price, and at the same time to keep the cost of the raw material moderate. A moderate price encourages a larger consumption of cotton goods than is the case when the cost is excessively high, as it has been for the last few years. I do not think there is anything to which Your Lordship can devote your great abilities more important than the encouragement of the growth of cotton in Egypt. Cotton growing will largely benefit the people, and we are very anxious that the natives should have full remuneration and full encouragement to cultivate cotton and to improve its quality as much as they can. The object of the International Federation is to promote smooth relationships between those who carry on the growing of the raw material, and those who manufacture it. We want to create confidence, and I think there is nothing more likely to do that than that those who spin and manufacture should come into contact with those who grow the raw material. There are very great difficulties in the cultivation—we get to know that wherever we go—and there are also great difficulties connected with the manufacture. The more intercourse there is between those engaged in the industry the more likely we are to be successful. My motto always has been "Live and let live." We want all to do well. I assure you that our reception here to-day has given great satisfaction to my colleagues and myself, and we thank you heartily for receiving us.

LORD KITCHENER: I should like to refer to one other point—the question of drainage. We hear very often that the land in Egypt has generally deteriorated. That is not the case. The land is as good as it was, but in places it has become water-logged, and a

great many areas have gone out of cultivation or have very much reduced their acreage under cotton, owing to the water-logged state.

On that account the Government is taking up a very big scheme of drainage. That scheme has to be on a very large scale, otherwise it would be useless, and I have no doubt the effect of it will be to add a very much larger area to the land under cotton cultivation than there has been in the past. Work of that sort, of course, takes many years to accomplish: four or five years will elapse before the results will be apparent. If you come again in five years or so we hope we shall be able to show you a much bigger area under cultivation, and perhaps better produce than is now being cultivated. The amount we now turn out per feddan is about five cantars, a very good proportion. I do not think you will get it in any other country in the world. This year we shall have a bumper crop, I think. I don't think we have ever had as much cotton as we shall have this year. I do not know exactly what it will be, perhaps under 8,000,000 cantars, and if next year we go on increasing I suppose it will help you all in your manufactures. I am very glad to have seen you, and hope you will enjoy your visit to Egypt.

The deputation then withdrew.

RECEPTION BY THE MINISTER OF PUBLIC WORKS.

Later in the morning the members of the delegation were received by the Minister of Public Works, H. E. Ismail Sirry Pasha. After welcoming the Delegates, His Excellency said that every effort was being made to improve the quality and increase the quantity of Egyptian cotton. Any advice which spinners cared to give to the Government, he added, would be carefully considered.

Sir CHARLES MACARA, after thanking the Minister for his kind reception, said: I think our visit to Egypt is one of the most instructive we have ever made. We are very pleased to see the splendid efforts that are being made for extending the cotton crop in Egypt. Some time ago Egyptian cotton was of better quality than it is to-day, but we feel that it only requires the energy which is now being put into it to bring it back to what it was formerly. As the branch of the industry which uses Egyptian cotton is the one which is developing most rapidly it is of the utmost importance that we should have this class of cotton of good quality and in very considerably increased quantities. We hope by bringing the various nations of the world that are engaged in the manufacture of cotton into touch with the growers, that the growers will be encouraged to prosecute their industry with all the vigour possible. We would rather see cotton at a lower price than it has stood at during the last few years, but the quality of the raw material needed for these fine fabrics will always command a good price.

The delegation then withdrew.

MONDAY AFTERNOON, 4th November.

CONFERENCE AT THE EGYPTIAN UNIVERSITY.

The chair was taken by B. E. Sirry Pasha, Minister of Public Works, who said: It gives me great pleasure to receive you at this meeting on behalf of the Egyptian Government, and to extend to you the thanks of the agricultural community for your visit. The meeting of the producers and the consumers of any agricultural product must be for the benefit of both parties, and it is only by the exchange of opinions and ideas that the most efficient results can be obtained. I trust that at this conference you will be able to realise the work which the Egyptian Government is doing for the improvement of cotton and the great importance which the Government attaches to any opinions which may be expressed by the members of the Federation with regard to their requirements. Furnished with the information which you can supply our efforts towards the improvement of the industry in this country should be greatly assisted.

IMPROVEMENT IN QUALITY AND YIELD OF COTTON.

Mr. G. C. Dudgeon, Director-General of the Department of Agriculture, Cairo, read the following paper:—

SEED DISTRIBUTION.

Almost exactly two years ago I was charged with the formation of a Department of Agriculture in Egypt, and as soon as I had got together a staff sufficient to form the nucleus of the same, I selected what appeared to be the most important agricultural questions in the country and gave them particular attention.

The most prominent agricultural product being cotton, the best means of preventing the deterioration of the quality, and the decrease in the quantity per feddan (1) were among the first matters examined. Being fortunately possessed of exceptional experience in cotton growing in all the most important cotton-producing countries in the world, I was enabled to take up both these questions promptly, and to avoid the many pitfalls which anyone without these advantages might have stumbled into.

With a view to the improvement of quality, for instance, it was constantly urged that the primary, if not the only means, to attain this end was by the introduction of new varieties. Many of the advocates of this seem to have had no very clear idea of how to proceed, or what might be the result of relying entirely upon such means for improvement.

It is not a difficult matter, as I have no doubt Mr. Balls will tell you in his lecture upon plant breeding, to produce new varieties of cotton, but to obtain one which shall be suitable for cultivation in a large part of the country, and which at the same time shall meet the exact requirements of the spinning industry, is a work which necessitates a great amount of patient study and one which cannot be completed within a short time.

(1) Roughly = 1 acre.

Most of the advocates for the introduction of new cottons appear to have considered that a variety yielding longer, finer, and more silky lint was all that we required to satisfy the trade; but experience in other parts of the world, as well as in Egypt itself, has shown that the demand is small for cotton in which these qualities are developed beyond a certain limit. What we understand to be at present most necessary is a purification of the existing types of cotton, the quality of which has been steadily declining. It was to stem the tide of deterioration that the Department adopted its seed distribution project as the initial step in a scheme of cotton improvement.

Some of the causes of the deterioration may be referred to here as having an important bearing upon the scheme. There may be said to be at present in Egypt about seven or eight well-marked types of cotton, the plants of which are often found growing in adjoining fields, and the cotton from which is ginned in the same machines. Both these are causes of deterioration from the typical form; in the first case through hybridisation from approximation, and in the second through the mixing of the seed in the gins. Apart from these influences upon the purity of the seed, which it is hardly possible to entirely avoid, a system had grown up in Egypt whereby the smaller cultivators, especially, were being supplied with mixed and inferior seed by the small seed merchants, who were also money lenders, and upon whom the cultivators had become completely dependent.

This last is doubtless a strong fundamental cause of the deterioration of the quality. It was ascertained that the small cultivator obtained his seed on credit, but that the rate of interest charged by the seed merchant, from the time of sowing until he gathered his crop, brought up the price of the seed to a very high figure. As it was to the seed merchant's advantage, unless he had arranged to take a proportion of the cotton crop in lieu of payment, to supply the least expensive seed, the cultivator was usually the sufferer with respect to the quality.

It was also ascertained that the small cultivator could not afford to pay cash for his seed, and that unless credit was given by Government it would be impossible to remedy the state which existed.

Taking these facts into consideration the Department of Agriculture proposed that Government should take over the supply of seed to this class of grower, and that a distribution should be made to them upon credit; the cost of the seed, without interest, being recovered in the following November of each year.

Although the Department was only formed on January 1st, 1911, I urged that an attempt at such distribution should be made, if only upon a small scale, in that year, in order that we should be in a better position to bring the scheme into full working order in the spring of 1912. The Government thereupon consented that we should commence operations in one province in Lower Egypt, and placed at the disposal of the Department a sufficient credit with which to buy seed. By the time this matter had been arranged, most of the cultivators had provided themselves with seed for their requirements, but, in spite of this, the Department disposed of 1,530 ardebs in the one province of Sharqia. Everything worked

very satisfactorily, and the whole of the cost of this seed was recovered by the Department of Direct Taxes with the November tax instalment. The distribution in 1912 increased to 40,000 ardebs (1); and it is expected that for 1913 the demand will exceed twice that amount, as the Government seed distribution has become extremely popular, in spite of the attempts on the part of the small seed merchants and others to decry the efforts of the Department of Agriculture, even to the extent of adopting many under-hand devices.

It will be asked, no doubt, from what source the Department of Agriculture has obtained sufficient seed of good quality to supply the extensive demands which it has to meet, and in reply it must be admitted that, without the assistance of the largest and most reliable ginners in the country, the distribution could scarcely have reached the dimensions it has in so short a period. The thanks of the small cultivator are then largely due to the gentlemen who control the ginneries, and who, by their assistance, have enabled the cultivator to procure a good quality of seed at a fair price, in place of a bad quality at a high price.

Although this supply of seed makes for the improvement of the cotton grown by a large majority of the cultivators in Egypt, it is only a portion of the scheme of cotton improvement, the full details of which can scarcely be entered into here, but will be briefly sketched.

For some years the seed produced upon the State Domains lands has been regarded as some of the best and purest in the country. The distribution of the surplus seed grown on these lands has, until this year, been entirely entrusted to the Khedivial Agricultural Society, who supplied it to the most careful cultivators in the country at a fair price. It was endeavoured to make a stipulation when supplying such seed that the resultant seed crops should be obtained by the Society for redistribution, but the difficulties which were met with prevented this scheme being carried out.

A modified plan is being adopted now by the Department of Agriculture, whereby arrangements have been made with the most important and careful ginners in the country that 50 per cent. of the seed obtained from the first pickings of cotton bought by them from those cultivators who planted Domains seed shall be put at the option of the Department of Agriculture for redistribution. The cultivators who purchased the Domains seed from the Department were only permitted to do so on signing a contract by which they agreed that the officials of the Department might inspect their fields at any time, and by which they promised to notify to the Department the name of the merchant or ginner to whom they sold their cotton crop. It is hoped that in this way the improvement in the quality of cotton will be effected from the top, as well as from the bottom, in the manner previously referred to.

Other portions of the scheme are in connection with the production of pure and regular types of cottons by means of the Mendelian process of breeding at the Department's experiment farms, about which Mr. Balls will speak to you. It is proposed to submit those

(1) About 218,000 bushels.

varieties of cotton produced on the experiment farms which are suitable for growth in the country to the spinners for their approval, and to propagate the seed from the approved kinds until sufficient quantities are obtained to be grown upon the State Domains farms, when they will enter into the general scheme of seed distribution as follows :—

1*st Generation.*—Pure seed produced in the Agricultural Department experiment farms and transferred to Domains.

2*nd Generation.* Available from Domains for distribution to large cultivators and supervised by Department.

3*rd Generation.*—Available from large cultivators' fields for distribution to medium cultivators.

4*th Generation.*—Available from medium cultivators to be distributed on credit to smallest cultivators.

By this scheme it is hoped to drive out those types of cotton which have been so contaminated by mixture with Hindi plants and with other varieties that they have become scarcely recognisable, and to substitute annually pure seed from the Department's experiment farms through the channels indicated.

Demonstration Farms.

Having shown briefly the manner in which the quality of cotton is receiving the attention of the Egyptian Government with a view to maintaining its standard, I will now refer to the method by which the Department has striven to teach the cultivator how he can obtain a larger quantity per feddan than he does at present.

Circularising printed instructions among an agricultural population, 94 per cent. of whom are illiterate, is obviously unsatisfactory, unless special facilities are given for reading such instructions to assembled masses in mosques, &c. We have therefore had recourse to what we call demonstration farms as a primary means of instruction.

Among the demonstration farms conducted by the Department in 1911, 11 were laid out in different parts of Egypt specially as cotton farms, in order to show by comparison with neighbouring fields that, by the exercise of a little more care in cultivation and the employment of less heavy waterings, especially in insufficiently drained land, the crop could be greatly increased. In all the demonstration plots cultivated under the Department's direction, average land or that which had previously given unsatisfactory results was selected, and a contract was drawn up by the terms of which the Department had the full direction of all the operations on the land, guaranteed a crop equal at least to that of the neighbouring fields, and permitted the proprietor to obtain the full benefit of any increased yield. The cultivator on his part agreed to pay for and carry out all the ploughing, sowing, and irrigation operations according to the directions of the Inspectors of the Department. In all cases the results obtained by the Department were better than those of any of the neighbouring fields, and the cultivators in general were so pleased with the results that very large tracts of land were offered to the Department upon which to conduct similar farms in 1912. It was obviously impossible to comply with the many requests received,

but in 1912 44 demonstration farms have been under the direction of the Department upon similar terms, the results from which promise to be quite satisfactory. Owing to the small inspectorate staff at present employed and the manifold duties which have to be carried out by them in connection with the cotton worm campaign and seed distribution, it does not appear to be advantageous to increase the number of cotton demonstration farms further at present. The lessons which have been taught to the cultivators who have visited the Department's farms are chiefly those in connection with the advantages accruing from wide ridging and spacing, thinning of Hindi plants, light hoeing, and light watering. As an example of how little faith many had in our methods at the commencement, the proprietors of some of the lands told our inspectors that our wide sowings and infrequent waterings would be disastrous. In spite of this our yields were in some cases double and in all cases considerably larger than those obtained in previous years.

In conclusion, I may say that it is generally acknowledged that both with regard to the improvement of the quality by means of our seed distribution, and to the increase of the quantity by our demonstration farm methods, we have made an advance, and secured what is of such great importance for future operations— the confidence of the fellaheen.

COTTON INSECTS IN EGYPT.

Dr. LEWIS GOUGH, Entomologist of the Department of Agriculture, Cairo, then delivered the following paper :—

In most cotton-growing countries of the world, in addition to the cultivated varieties, wild species of cotton occur. These wild cottons are the original source of those cotton pests which, not being general feeders, attack cotton and Hibiscus.

In Egypt wild species of cotton do not appear to occur, or are extremely rare. Cotton has, however, certainly been cultivated for several centuries.

At the beginning of the last century cotton seems not to have been grown for fibre, and was re-introduced into Egypt about 1820 from India, and later on from America. It was, however, the opening of the Delta Barrage, in the fifties of the last century, which gave an impetus to cotton growing in Egypt, and the subsequent extension of irrigation has greatly increased the area under this crop.

Although cotton was introduced here, both from America and from India, no specific cotton pests appear to have been introduced from America.

Only two insects occur here, which appear to be restricted to the cotton plant and its allies. These are the Egyptian boll-worm (*Earias insulana*) and the hemipteron known as *Oxycarenus hyalinipennis*.

The boll-worm, *Earias insulana*, is found in India and wherever cotton grows wild or cultivated in Africa. It has not yet been recorded from America. A nearly related species, *Earias fabia*, occurs in India, together with *Earias insulana*, and is commoner there than our species, doing considerable damage to cotton.

Oxycarenus hyalinipennis seems to be restricted to cotton and Hibiscus, although in winter it is often found hibernating on other plants, such as maize. This insect is known in Algiers, East and West Africa, Congo, and the Sudan.

A nearly related species with the same habits occurs in India. Hemiptera of this genus are restricted to Africa, South Europe, Southern Asia, Ceylon, and New Caledonia.

The recent reintroduction of the cotton plant and the absence of wild species of cottons, probably account for the restricted list of specific cotton insects which are met with in Egypt. The sudden extension of cotton growing during the past 50 years has, however, caused a large number of omnivorous insects to adopt cotton as a food plant. Most of these insects are very widely distributed; some are actually cosmopolitan. To this list belong a Hawk moth (*Dilephila livornica*), the Egyptian cotton-worm (*Prodenia litura*), the smaller cotton-worm (*Laphygma exigua*), the American cotton boll-worm (*Chloridea obsoleta*), the silvery Y moths (*Plusia confusa* and *circumflexa*), the cut-worm (*Agrotis ypsilon*), the pink boll-worm (*Gelechia gossypiella*), and the cotton aphis (*Aphis sorghi*).

All these insects were probably well established in Egypt before the extension of cotton cultivation, and it is due to the sudden increase of area under the new crop that many of them have taken to cotton. The cotton-worm is a case in point. This insect is common in all the warmer countries of the world, except America. Where it occurs outside Egypt (for instance, in India) it never attacks cotton. Even in Egypt, where it is such an aggressively familiar pest on cotton, it seems to prefer clover or maize. In India its favourite food plants are castor and tobacco; it is not noticed on these plants in Egypt, as castor is not grown on a commercial scale, and tobacco cultivation is prohibited.

Dilephila livornica.—A hawk moth, occurring in Europe, Africa, Southern Asia, and Australia, has in Egypt taken to feeding on cotton and henna. It is more commonly known as a pest on vines, and is still unimportant as a cotton pest.

Laphygma exigua.—Occasionally feeds on cotton, but only does slight damage. It is almost cosmopolitan in range, but is not recorded from America.

The American cotton boll-worm is also cosmopolitan and omnivorous. Although its ravages cause considerable damage to cotton in America, it has not yet become a serious pest here. It is interesting to note that in America it prefers maize to cotton, just in the same way as our cotton worm does.

The silvery Y moths have been found feeding on cotton, but do very little damage; they are very widely distributed, *Plusia circumflexa* occurring in Europe, Northern and Southern Africa, and India, *Plusia confusa* being known in Northern and Southern Africa and India.

The cut-worms, *Agrotis ypsilon* and *Euxoa spinifera*, are cosmopolitan, feeding on the tender stems of young plants. Both cause considerable damage to cotton, as also to other crops, notably maize and cereals.

The pink boll-worm, *Gelechia gossypiella*, whose larvæ usually feed on the seeds inside the cotton pods, has been found here feeding

also on pomegranates. It is widely distributed, occurring in India, Egypt, Hawaii, &c., but has not been found in America.

Our cotton aphis is *Aphis sorghi*; it is probably not the species attacking cotton in America or India. It occurs also in the Sudan. Its food plants are cotton, maize, and millet.

It will be seen that our cotton insects are typically old world or cosmopolitan species. The omnivorous species probably existed in Egypt long before cotton was cultivated. The species feeding only on cotton and Hibiscus may have been introduced when cotton growing was first attempted.

In looking through the list, one is struck by the fact that no cotton-feeding species of *Dysdercus* has as yet invaded Egypt, although various species of cotton stainers occur in most other parts of Africa and India, as well as in the West Indies and America.

There is some danger that the Sudan boll-worm (*Diparopsis castanea*) may be introduced into this country, but the Egyptian Department of Agriculture is taking all precautions to prevent any extension of the list of destructive insects occurring here.

Sir CHARLES MACARA: I am sure we are greatly indebted to the gentlemen who have addressed us on these very important matters connected with the growing of cotton. Since we have been in Egypt we have added considerably to our knowledge of both the growing and handling of cotton in this country. Although we are all apt to think that our own branch of the industry has to confront exceptional difficulties, yet I think we must all agree that the difficulties of the growers are very great indeed. I am sure that the skilful way in which the problems are being handled, and the experiments which are being made, will have a very material effect in increasing the supply of the raw material. We have, as you know, done a great deal in trying to rouse the governments of various countries to energetic action in regard to the development of cotton cultivation in their respective colonies. Sometimes we have felt discouraged that we have not succeeded better, but we do not intend to relax our efforts. Some time ago Mr. Dixon, managing director of the Fine Cotton Spinners' Association, and I had a private interview in London with Sir Edward Grey, Secretary of State for Foreign Affairs, and I think I may be allowed to say that we had something to do with the establishment of the Department of Agriculture, of whose work you have heard to-day. I feel satisfied that the more heartily governments co-operate with representative men of industry and commerce the more likely are results of immense benefit to all concerned to be achieved.

Sir Charles concluded by moving a vote of thanks to the chairman and to the readers of the papers, and the proposition was carried with acclamation.

In connection with this meeting there was an exhibition of charts, scientific instruments, cotton samples, &c., a description of which will be found in Appendix I.

WEDNESDAY MORNING, 6th November.

RECEPTION BY H.H. THE KHEDIVE.

The Delegates drove to the Palace of Koubbeh, a few miles from Cairo, where they were received by the Khedive. After His Highness had cordially shaken hands with all his visitors,

Sir CHARLES MACARA briefly mentioned the principal aims of the International Cotton Federation, congratulated the Khedive and his people on the skilful way in which they had converted waste land into land admirably adapted for agricultural purposes, quoted the opinion of an eminent English scientist, Sir William Ramsay, to the effect that there is no limit to the possibilities of the scientific development of the soil, and said the Delegates were just as much impressed by the manner in which cotton was being handled in Egypt, as they were depressed by what they saw in this direction in America.

The KHEDIVE, in reply, said: It is a great pleasure to me to hear from you the appreciation you have of our country and our people. It is a great pleasure also to welcome you in our country, and to offer my best wishes that I shall see you again in Egypt. Personally, I am glad to meet you, and to hear what you have said, as I also am an agriculturist. It is a great honour for us Egyptians to have you here in Egypt. I am sure you will help us with suggestions, which are for the benefit of the country, and we will do all we can to carry them out.

Sir CHARLES MACARA: We feel that it is a good thing that manufacturers of cotton should come into contact with the growers of cotton.

The KHEDIVE: Yes, absolutely.

Sir CHARLES MACARA: The great object of the Federation is to promote mutual confidence. We are engaged not in a money-making scheme, but in a public-spirited movement, to develop great industries.

The KHEDIVE: That we appreciate. I thank you again for the trouble you have taken to come to see me. I have made a great effort to return to Egypt before your meetings here came to an end, and I am very pleased to have had the opportunity of receiving you.

The Khedive then spoke to the individual members of the International Delegation in English, French, and German.

The Delegation then withdrew.

WEDNESDAY AFTERNOON, 6th November.

LECTURE ON SEED BREEDING AT THE POLYTECHNICAL SCHOOL AT GIZA.

Chairman: H. E. SIRRY PASHA, Minister of Public Works.

Mr. W. LAWRENCE BALLS, the Botanist of the Agricultural Department, gave a lecture, illustrated by lantern slides, on seed breeding, of which the following is an abstract. The full lecture, together with some of the most important illustrations, will be found in Appendix I.

Historical.—A State supply of cotton seed was provided for Egypt by Mohammed Ali, the first of the Khedivial dynasty, in 1820. This system died out through various causes. In recent years the precautions taken by the ginners have been the only general systematic influence. These precautions can delay seed mixture, and so retard the deterioration of varieties, but cannot prevent it.

The reconstruction of a depreciated variety can only come by synthesis, viz., the introduction of a new variety, since the old one has been lost in its own depreciation.

The essential feature of the lecturer's scheme is that any variety, once isolated, shall never be lost.

The kind of seed required.—This is independent of the healthiness of the parent: thus, seed from December bolls is as good as seed from the first pickings, when pure strains are used. Contradictory opinions on this point are due to the mixed nature of commercial varieties, thus, late-maturing plants are commonest in the late pickings, and the use of first-picking seed checks the multiplication of late-maturing plants.

An immature seed will germinate badly, but the plant resulting will not be constitutionally altered, though it may be stunted.

Cases of disease being carried by seed are practically unknown in Egypt.

Two warnings.—(*a*) Many of the statements made in this lecture will seem to be opposed to practical experience. This is because we are speaking of "pure strain" or "pure line" seed, and of a scheme of pure strain supply, in which natural selection cannot operate, since all the plants are constitutionally identical.

(*b*) Most of us are accustomed to regard statements made by people who study plants and animals as being merely approximate. This is not necessarily the case, for organisms in pure strains are as definite in their behaviour and in their reaction to the conditions under which they exist as is a chemical compound. Agricultural botany is capable of precision equal to that of the physical sciences.

Pure Strains.—Pure strains of cotton were unknown until 1906, when some were isolated here, and by Mr. Leake in India.

Seed of a pure strain gives rise to plants, and these, again to other plants, which are all identical in constitution. Seed breeding would be simplest in a new and isolated land, into which we could introduce one strain only. Deterioration would be impossible

(except in the event of "mutation"); the crop would simply grow better in one place than in another. This last fact introduces a practical consideration.

If Egypt were cleared of every grain of cotton, and re-sown with pure-strain Yannovitch, the crop would be poor in Upper Egypt. This fluctuation necessitates special strains for special districts, and the mixture and crossing of these various kinds brings about all the trouble. This trouble is accentuated by the fact that the hybrids grow more strongly, produce more seed, and thus inevitably convert the pure strain into a welter of dissimilar individuals.

Types of Seed Supply.—(*a*) Pure strain; gives the most perfect uniformity of crop obtainable, since only the environment can affect it. Each pure strain must be kept separate, and fed outwards through seed stations, year after year, to drive the older and more contaminated seed into the crushing mills.

(*b*) Selection: choosing the best plants from the existing mixtures is likely to increase the proportion of hybrid plants, and hence of irregularity in the crop, since these hybrids are usually the biggest plants and bear the best and longest lint, on account of their hybrid constitution.

(*c*) Rejection; rogueing out all non-typical plants is in some respects better, provided that the type can be recognised at all.

(*d*) Cultivation of hybrids. A perfectly uniform crop can be raised from seed resulting from the crossing of two pure strains, with all the advantages of the powerful growth of the hybrid plants. The manipulative difficulties render this method agriculturally impracticable with cotton, though it is being adopted with maize.

Of these four methods the first has been chosen by the lecturer for the future seed supply of Egypt, and begun this year.

Pure Strain Seed Supply.

Pure strains once bred out are self-fertilised by covering the plants with nets. Seed from these is sown in cages of fine wire gauze, which exclude the bees carrying foreign pollen. The seed from these will go into giant cages of the same kind, covering several acres. Thus, a sufficient quantity of uncontaminated seed is obtained to plant several acres wide-sown, and since bees usually visit the margin of a plot first, the risk of contamination is relatively slight in such an area. This area will be situated on a seed farm, from which large cultivators will be supplied under condition of the return of the seed, and so the fellah.

Each year the small cages will be resown from the nets, the giant cages from the small ones, and the seed farm from the giant cages, thus retaining seed of the same guaranteed purity every year at each point.

Every strain held by the central laboratory will be kept alive as a matter of routine, if only with two or three plants, whether it is required in cultivation or not, so that a change in the demand can be met in a few years by the introduction of the newly-desired kind in place of some other one.

The kind of pure strains to grow.—We can either find our strains in the existing varieties, or make them by Mendelian breeding. Practically, however, there are no pure strains to find, and they have to be bred out from the natural hybrids instead of from artificial hybrids.

Thus we have three principal ways of obtaining pure strains:—

(*a*) Self-fertilise type plants of existing varieties until pure lines are obtained.

(*b*) Cross such pure lines together to obtain combinations of characters which are not easily found by the first method, *e.g.*, a brown super-Sakel.

(*c*) Experiment with inter-species crosses, as Egyptian with American Upland, to breed out pure strains with such agricultural advantages as the huge boll of Truitt. This has been done, and could be done on a commercial scale, but it necessitates very elaborate research.

The testing of these strains, however obtained, under field conditions, is the last, and in some ways the most delicate task of the breeder. The lecturer's method of "Observation Rows" and "Plant Curves" has simplified the matter considerably, and increased the speed, since testing can be made with mere handfuls of seed. The chief difficulty lies in the fact that in any one year some 20 such tests should be made for each variety under consideration, each of the 20 being carried out on a different site.

Conclusion.

The small laboratory, which will be visited after the lecture, represents only the thinnest part of the wedge of pure seed which it is proposed to drive into the cotton crop of Egypt.

The inception of the work has been delayed for four years beyond the lecturer's intentions, but the wedge has begun to move.

Those members of the International Cotton Federation who have grumbled to me in past years about the weakness, irregularity, and untrustworthiness of our crop may at last anticipate the appearance of an improvement within a few years' time, which improvement will be permanent and under perfect control.

After a hearty vote of thanks to Mr. Balls and the President, the meeting terminated.

FRIDAY EVENING, 8th November.

CONFERENCE IN THE EGYPTIAN UNIVERSITY.

Chairman: Sir CHARLES W. MACARA, *Bart.*

After a few introductory remarks by the CHAIRMAN, the following paper on the

MAINTENANCE OF THE SUPERIORITY OF EGYPTIAN COTTONS

was read by ABDUL HAMID ABAZA BEY, Director of the Khedivial Agricultural Society:—

ABAZA BEY said: Like some of the distinguished speakers who have preceded me, I think it is my duty to present to you a review of my work in Egypt during the past 18 years, and to this I propose adding a short account of the institution of which I have the honour to be the director. I do this the more willingly on account of the wish expressed by some members of this Congress. In his address, at the opening meeting of the Congress in Alexandria, Sir Charles Macara spoke of his 20 years' industrial experience, and Mr. Fenderl entertained us with his 47 years of commercial life in Egypt. I desire, therefore, to give you the results of my experience during an agricultural career of 18 years in Egypt. I propose discussing one of the most important questions; one that is equally of interest to the merchant, the manufacturer, and the farmer. In agriculture it is, as in any other calling, practice, aided by theory, which plays the important part, and constitutes the foundation of success. I think I am able to speak with some degree of certainty of Egyptian agricultural questions from a theoretical as well as from a practical standpoint. As a descendant of farmers, at my graduation at the Egyptian Government School of Agriculture, I was admitted to the service of the Khedivial Agricultural Society at its foundation, and I have been connected with it ever since. From the first this Society has devoted itself to the agricultural development of Egypt. No one can overlook the service it has rendered to the country. It has created experimental farms, chemical laboratories, entomological and botanical sections, and has established agencies in all the capitals of the Provinces. The most difficult task for the Society was to persuade the farmers to give up their traditional methods of farming, and adopt the new methods of modern agriculture. Our official reports show that from 1905, besides issuing circulars and reviews published in Arabic, French, and English, more than 200 meetings were held annually in the large centres of the country, where lectures and addresses on agricultural subjects were delivered.

Abaza Bey then dealt at some length with the various branches of the work which the Khedivial Agricultural Society had successfully undertaken in the past, and quoted some sympathetic remarks made by Lord Cromer and Mr. A. H. Dixon, managing director of the Fine Cotton Spinners' Association, Ltd., Manchester, regarding that work. Abaza Bey continued: I have sketched the work accomplished in the past, and, satisfied by your presence amongst us, of the great interest you all take in this

country, I assure you that our Society will continue the work from an agricultural and commercial standpoint. The purchase of a new farm for experiments near Cairo, the erection and installation of sumptuous and large laboratories, stables, stores, and villas for the dwelling of our large scientific staff, these are a guarantee for the extension of our work in the future. "It is for every man to do his best, and God will give him success," says a well-known Arabian proverb. The two questions that I intended to deal with are cotton planting and the mixing that occurs on the plantations. As I have recently returned from a trip in America and Europe, my numerous occupations, and the preparations taken for this Congress, have made it impossible for me to deal with the two questions at the same time. Besides, these two subjects are too long to be dealt with at one sitting. In regard to the first question, it would be a pleasure to me to publish in the near future, in detail, all that concerns the cultivation of cotton in Egypt, for insertion in your general report. Meanwhile I refer you to the Book of Agriculture published by the Department of Public Instruction of the Egyptian Government, Vol. II., which contains a complete study of cotton planting by Mr. G. P. Foaden, my predecessor. Mr. Foaden had a most brilliant agricultural career of over 20 years in Egypt, and continues to be the greatest authority on all questions dealing with agriculture in this country. The report of Mr. Arno Schmidt on this question also contains much information that Egyptians themselves would be glad to have widely disseminated.

MIXING COTTON.

I will only deal at present with the question of mixing cotton, which seems to me specially important to the industrialist and cultivator at the same time. The evil exists. Everybody feels it. But I know of no remedy for it, and I have never heard of efforts to study it. Before discussing these two points I would have liked to have obtained from you clear and precise information as to the nature of this evil of which you complain so bitterly. You tell us in general terms that our cotton varieties lose their superiority, without telling us clearly and exactly what is your complaint. The superiority of our cotton is for us a vital question, and it is to our interest to maintain it so that we shall not be swamped by the enormous production of countries of larger area. We know that it is for you and for your fellow manufacturers that we produce this raw material, and we will be very happy to know your desires on this subject—I would even say to receive your instructions—which we will follow scrupulously in the hope that you will buy our cottons at higher prices, to cover the expense of cultivation, which constantly increases, and to compensate us for the efforts we are making. This question has been already dealt with by Lord Kitchener and by His Excellency the Minister of Public Works, at the official receptions held in your honour; and in their speeches you had the assurance that the Government and the people will be very happy to give to your suggestions every consideration. We know that the question of price depends on different factors, among which there is that of the production of cotton in other countries; but we do not doubt that it is in your power to use your influence largely in our interest, by larger demand

for our cotton, and by giving it the preference over other varieties. Moreover, your reports of previous congresses show me that we are not the first producers who have solicited an increase in price for their cotton. Our case, however, differs from that of other countries. In fact, Sir Charles Macara, in his reply to the American producers at the Congress held in Atlanta in 1907, remarked justly that, instead of asking for an increase in price, they could enormously increase their income by giving better care to cultivation, and by using better methods for increasing the output of their crops. Such a reply could not be made to us. You have expressed your satisfaction with the care and the cleanliness given in pressing cotton while visiting our press houses at Alexandria; you have admired the efforts made by the Aboukir Land Company in the transformation of a large salt lake into cultivated lands, with dwellings and villas scattered here and there, and crossed by railways. You have appreciated the energy with which draining, reclamation of soil, and land levelling are being carried on on the State Domains which you visited at Sakha, where you have seen, on the same piece of land, three pairs of steam ploughs, and 150 teams of oxen doing the levelling of a piece of land which is not more than a few centimetres higher than the neighbouring land. If all this, and the speeches of Lord Kitchener and His Excellency the Minister of Public Works have been sufficient to convince you *that no efforts are being spared by the farmers of this country for the* improvement of the quality and the increase of the production, nothing would more amply reward the efforts of our cultivators, and encourage them to continue in this road of progress, than an increase in prices. It is possible that 30 dollars per kantar may be injurious to the cotton industry, but it is also certain that the actual price of 17 to 18 dollars is injurious to the agricultural industry in a country where the average price of good land is £150 to £200, and where the annual rent per feddan is £15 to £20. I regret that in the year in which we wanted to act on the advice given in the very interesting report of Mr. Arno Schmidt, the year when Mr. Hutton, chairman of the British Cotton Growing Association, came to acquaint us with the varieties most required for the cotton industry, in that very same year the prices of cotton decreased enormously. I would like to believe that it is we who have misunderstood, and so as to avoid any misunderstanding in the future, we would be much obliged to you, if before your departure you will leave us a clear and precise answer to this question, and to the one concerning the proportionate demand of the different varieties of cotton. In my anxiety to solve this question of price I visited the home of the cotton industry, but could not gather any information. While visiting Liverpool and Manchester last September I vainly sought to find out exactly what there was to complain of in our cotton.

DETERIORATION IN QUALITY.

No one could tell me, and yet everybody assured me that our cotton deteriorated. Mr. Dixon himself, the managing director of the Fine Cotton Spinners' Association, declared that he could not tell exactly what it was; but observed the gradual deterioration of our cotton by the larger percentage

of waste in the factories. It is well known that Mr. Dixon is the greatest authority in the world on high-grade cotton questions, using in the factories of the Association over which he presides about 80,000 bales of Egyptian cotton every year. However, he is the only one who, although he did not answer my question directly, helped me to solve the problem by relating to me the circumstances which are said to have led to the invention of the comb which is to-day the basis of all high-grade cotton spinning. The invention of this comb is, it seems, due to a husband who, in watching his wife combing her hair, found that a number of hairs remained in the comb after the operation. This husband applied the principle to the cotton fibres, and invented the actual combs used in the factories. Having secured from Mr. Dixon permission to visit one of their numerous factories, I studied this comb minutely, as well as its effects on the cotton fibres. I noticed that while the fibres of suitable length were easily combed the shorter fibres fell and formed most of the cotton waste. Such loss is not, however, total, for this waste is sold to another factory manufacturing cloths of a lower grade, and this, in turn would sell its waste to a third, and so on. At the end of this visit I could understand the reasons of the deterioration of which they complained so much. If the idea I formed is correct, it would be only the mixing of cotton varieties which is the cause of this waste, and consequently the cause of this deterioration observed by the manufacturers. But if my idea is wrong, I will be very glad to have it corrected.

Taking it for granted that the admixture of various cotton varieties takes place, that crossings occur among the varieties, and that the admixture of various qualities of the same variety are the main cause of the deterioration of cotton, I intend to deal with the matter under these heads: (1) What are the causes of the mixing? (2) What should be done to prevent it? The mixing occurs on the plantation, either naturally or artificially. I mean by plantation, the fields with all their dependencies, or, in other words, the places where cotton is treated from its sowing to its ginning. As to the mixing which occurs either in the ginning houses or at the seed merchants, this has been already dealt with in a previous lecture. Let us see first how nature causes this mixing. This is often due to a crossing, performed either by bees or other insects, and, at times, by the wind in the case of two contiguous plants. As to the artificial mixing it may occur in the following ways: (*a*) The desire of the farmer to sow on the same property two or three different varieties so as to guarantee for himself the advantage of high prices of at least one of those varieties; it also occurs by sowing the various seeds which have been stored together in the same store, or in picking, or while storing the cotton, or during its bagging. It is during these various operations that the farmers, even the most careful among them, involuntarily mix the seed. (*b*) The unscrupulous work of the small purchaser who buys various small lots of cotton of different qualities and qualities, and who mixes them together, either to hide the bad lots he buys, or with the desire to avoid work and trouble in keeping the varieties separate. The small buyer, who is often met with at the crossings of roads not far from the market place, should not be forgotten. At the

entrance of a village or a small town he has spread a few rags as a store, on which are thrown different small lots that he buys, without even weighing them, no matter what the quality or the variety may be. At the end of the day this buyer may have enough to fill four or five sacks, and it is by the hundreds of such men that the ginning houses are kept busy.

THE REMEDY.

Let us now look at the practical side of these practices and propose the remedy. I am sure that all of you have been convinced that this matter is of the highest importance to the prosperity of Egypt and the progress of the cotton industry in general, and I believe I could make an effective appeal to farmers, merchants, and to the Government to unite in the fight against the evil of cotton mixing. The part of the farmer being rather a matter of purely internal order, I would prefer to discuss the question with my fellow countrymen in detail in one or more lectures similar to that I have had the pleasure to deliver on this and other questions in the past. What makes the task difficult is the migration of large landowners from the agricultural centres to the large cities, a movement which for the last 20 years has been increasing, to the disadvantage of agriculture. This movement is an obstacle to the laws that could be enacted. In fact, instead of giving our advice to a landowner cultivating an area of 1,000 feddans, for instance, it is to the hundreds of small farmers who rent this property in small lots that we should have to give this advice. We have always insisted that care should be given in selecting seeds for sowing and resowing, in destroying plants strange to the variety planted, particularly when the plants are still young, and in requiring the tenants of a property to plant the same variety in one part of the property, just as if the landowner cultivated it himself, and particularly insisting upon cleanliness in picking, &c. We will make the farmers of the same locality understand that it is to their interest to choose the same and best variety for planting; we will try to have this question discussed at the meetings of the Provincial Councils; and we will try to arouse in them an active interest in this question. We will carry on in the principal centres various experiments to determine the variety most suitable to a district. I have begun with the proprietors, and now I deal with the much more important question of the merchants. I will take the liberty of discussing at length this part of my study, for I think that it depends particularly upon the merchants to maintain and even greatly to improve Egyptian cotton. I hope I shall be able to convince them of the value of my proposition, for as soon as we understand each other I will have more faith in them than in the farmers to have my propositions carried out, because they are more educated people and more *au courant* with the world's events, and aware of the competition that is becoming unbearable. They will understand easily that united action is the best to fight against the difficulties that arise; indeed, it is the only way to triumph. Landowners or merchants working separately could not continue to prosper unless the industry they are in connection with be flourishing. Those who have attended the opening of this Congress at Alexandria

will remember the manner in which I defended the reputation of the Egyptian cotton against the question of humidity, which seemed to Mr. Lindemann, one of the largest merchants, an argument in favour of merchants. As a matter of fact, I believe that in the cotton industry there are only two main factors—the producer and the consumer. The work of the producer ends with the production and the delivery to the merchants. All other details belong to the other branch, *i.e.*, that of consumption. It is for you to instruct the merchants of the way in which you want the cotton before it is delivered to you. I believe that you have more power to have such measures adopted than we have. It is not that we mean to refuse you our support, but I am sure we cannot be held responsible except as producers, as in any case the merchant is the agent of the consumer. Before going into details of the practice of merchants in regard to mixing and the deterioration of cotton, I would like to call attention to a fact which I hope will not allow any discussion. To demand intelligent work from an employé he must be encouraged by good pay, and rewarded occasionally. The employé works for his chief, and the farmer for the consumer; in other words, the farmer will not give the crop all the care required by the consumer or advised by the authorities except when he finds the selling price not only meets the expense of cultivation and leaves a reward for his efforts, but when, in addition to that, he is given something more for having offered a better product than his neighbours have offered. It is therefore necessary to give high prices to the farmer so as to enable him to improve cotton varieties, and a premium for the best lots offered for sale in the market. This is the way to encourage the most hard-working among them.

PRICES IN 1862.

It is a well-known fact that it was due to the high prices that prevailed in Egypt in 1862 during the Civil War in the United States that cotton cultivation took a prominent place in Egypt, and became the main crop of the country. History repeats itself, and it is only after a year of high prices that the area planted in cotton increases, and that the cultivator seeks the advice of the Khedivial Agricultural Society to secure new information on the latest experiments carried out by the Society, and to be supplied with seed and fertilisers. It is sufficient that the price goes down for a year to discourage the farmer and to make him careless. Being myself a landowner and a descendant of landowners, I wish to tell you in the name of all the farmers of our country that we give you unlimited power to make such regulations as you judge useful for the production of cotton of the variety and quality you desire, and we promise to obey these regulations, provided that you give us higher prices. It is really the genuine way to get the farmer to do his best. This being adopted as a principle, let us go back to the study of what really is going on between merchants and farmers. Let us speak first of the large merchant who usually in Egypt combines the business of the merchant and the ginner. Bound early in the season by contract with spinners to furnish a certain number of bales, his only care is to secure the quantity of cotton necessary for his ginning house, and for this reason some buy the cotton they need, regardless

of the quality, and all compete severely and without harmony. Contrary to the practice in America about half the Egyptian crop is sold before picking, and even some times before sowing. The other half of the crop is sold, it is true, after picking; but 50 per cent. of this last half is sold in the interior to small dealers acting on their initiative for speculation, the others working for larger merchants. In both cases it is to the large merchant that these lots purchased by small dealers come. He pays a price lower than the market price for such mixed lots. It seems from the above that it is only a quarter or a third of the total crop which is bought by the merchants in a regular way, that is, after seeing the sample and examining the lot. The farmers who sell their crop before it is picked and those who patronise small dealers are very numerous. Not one among them cares the least about the quality he produces, but, on the contrary, their main interest is to increase the quantity by any means.

Unfortunately, it is the foreign plant and particularly the hybrids which have the most vigorous growth. The farmer, anxious to increase the quantity, keeps those bad plants. I have been through the fields of small farmers and seen Hindi plants which I requested them to have removed. "Why take so much trouble?" they would answer. "We have sold already our next crop, or the town merchant will buy the crop anyhow at a high price." This reasoning is right to some extent, for, in fact, the merchant buys the crop at a price relatively high, but he makes up the difference in the weight, for in calculating the price he does not care about the consequences of such proceedings, which tend to injure the reputation of the quality of Egyptian cotton. The merchants pay to the farmers for the first picking a price much higher than that paid for the second picking, and even some among them refuse to purchase second and third pickings. This makes the cultivator delay his first picking often until a good deal of cotton falls on the ground, so as to be able to make in one picking what ought to be made in two. The dishonest farmer finds himself forced to mix these pickings together to have them pass as a first picking. It is true that in such cases when the merchant discovers the wrong the price is lowered for safeguarding his personal interests. The result of such a combination becomes a plot arranged by the merchant and the producer against the spinners and the reputation of the Egyptian cotton crop. This ought to receive most careful attention. To remedy these conditions, I suggest the following: (1) When a merchant makes a contract with a farmer for buying his crop he ought to introduce into the contract a clause of this kind: "Though the price has been fixed, let us say, at 50 P.T. per kantar higher than the market price, this margin remains the same for the cotton of middle quality; for better quality an addition of 25 P.T. is made, while for inferior quality a decrease of 25 P.T. is liable." A system of arbitration similar to the one in force at Liverpool would be inaugurated in the capital of each province and a Court of Appeal at Alexandria. Such a clause must be clear and precise and written in every contract in large type. In this manner the farmer will understand that the price depends upon the quality of his crop. Measures should be taken in the wording of a model-contract in order that the merchant could not take advantage of such clauses to injure the interest of the farmers. It

should be stipulated, for instance, that in case of disagreement a sample in three parts will be sealed and one be given to the seller, the other to the buyer, the third to the committee of arbitration, without in any way delaying the delivery of cotton or its payment; but only to keep for future settlement the sum of 25 P.T. per kantar, which will either constitute a reward or penalty for the farmer. (2) The merchant would have to stop his relations with the small dealers and buy direct from the farmer according to samples. In this connection I am glad to pay public tribute to one of the numerous great achievements that Lord Kitchener has accomplished in Egypt. I mean the halakas of cotton, which creation has for its object the safeguarding of the interest of the illiterate fellah from the unscrupulous and greedy merchant. These halakas are public markets in the centre of cotton districts, where farmers carry their cotton to be sold under the supervision of the Government agents. Thus the farmer is enabled to sell his cotton after it is examined by the merchants, to the mutual advantage of both. I earnestly hope the merchants, as proof of good faith, will encourage this project, and help the farmers to sell their crop in the halakas. (3) The merchant ought to encourage the farmers to keep separate the cotton of each of the three pickings by buying all of them, or finding someone to buy what he does not need, and before buying the first picking he ought to ascertain that the second and third pickings are still on the trees, or in the store. He could also try not to attract the attention of the farmer to the great difference of price in the different pickings.

APPEAL TO THE GOVERNMENT.

Before closing I must make appeal for the support of the Government, whose co-operation is necessary to get an ideal result in Egypt. Always mindful of mixing as the main cause of the deterioration of Egyptian cotton, I believe the support of the Egyptian Government is indispensable to :—

(1) Forbid transactions made by the small dealers of whom I have spoken and make it unlawful to sell except in halakas, unless the merchant ginner buys the crop of large farmers direct, *i.e.*, without any agent. This would be a similar application of the principle of the law making obligatory the transport of animals to slaughter-houses.

(2) Forbid the planting of more than one variety of cotton, if not in the district or village, at least in the one property.

(3) Require for the sale of seeds a special permit similar to the "roksa," or license, imposed on the merchants of fertilisers and liquors, &c. These measures would result in keeping out of business the class of merchants who in all the markets of the country and in the village sell bad seed without taking into consideration what the seed will produce, and will give the Government the right of inspection and supervision of the sale of seeds.

(4) Find the means to give rewards for the best lots of cotton of a village sold in the halakas. This reward could be given by the Central Government, or by the Provincial Council, either in money, medals, or even a simple certificate that would encourage the farmers, the expense of which could be borne by the merchants.

(5) Popularise the general principles of modern agriculture. It is high time that the Egyptian should understand that he is not born a perfect farmer. Recent discoveries, the competition of other countries, the study of fighting the various pests, all these have made of agriculture a most interesting science abounding in problems not yet solved.

This is not a new idea, and I am not asking for Egypt what is not found elsewhere, such as in America, in England, in Japan, and in almost all the countries of Europe, which depend on agriculture much less than Egypt does. This is a study in which I have taken the deepest interest, particularly during my last trip; and on which I propose to present to Lord Kitchener a full, detailed report, which I am quite certain will have his attention. I conclude with the hope that the Government, the merchants, and farmers will co-operate with perfect harmony in a question of such vital importance in Egypt. I am sure you will take part in this co-operative movement and encourage it for the mutual benefit of all concerned. I hope, and all the Egyptians with me—you will pardon me if I repeat myself—that you will increase the demand for Egyptian cotton *and maintain the prices high enough to encourage the farmers, for* they know that you, as spinners and manufacturers, preside over the destinies of cotton.

The CHAIRMAN: I am sure you will agree with me that we have listened to a most admirable paper, and that Abaza Bey has gained a thorough grasp of the subject during the 17 years he has been taking a prominent part in trying to improve the agriculture of Egypt, and especially the growing of cotton. We have seen *sufficient during our stay in Egypt to convince us that growers have* to face very great difficulties indeed, perhaps much greater than we had previously known. From that standpoint I think these International Congresses are doing a very great deal of good. We are also trying to deal with the smooth working of the distribution of the products of our spindles and looms, and to promote harmony among the nations of the world by inter-trading. There is nothing to my mind that will promote the welfare of everyone connected with this great international industry, which stands second to none as regards the clothing of the people of the world, than that all who are engaged in it should have complete confidence in each other. We want the planter to have fair remuneration for his labour. It would be a calamity if the price of cotton became so low that the grower would *not be encouraged to go on growing, but I do not agree with Abaza* Bey here, that a high price must necessarily be in the interest of the grower. What we want is to have a price that will pay him, and that will pay the spinner, and that will not handicap in any way the consumers, who, you must bear in mind, represent a large portion of the poorest people in the world. If we, by bad marketing, or by people coming between the grower and the spinner, or by gambling operations, add to the cost of the raw material, it is against the interest of everyone connected with the trade. That is what we want to deal with drastically. I have been engaged in this exceedingly hard fight a great many years now, and I am glad to see that the President-Elect of the United States has shown, in his election cam-

paign, that he is determined to deal with persons who exploit the grower, the spinner, and the manufacturer. I may quote the opinion of a well-known multi-millionaire of my acquaintance who says that the day of the multi-millionaire is over, and that the people of the world will not tolerate many more of them. The legitimate middleman we must always have—he is a necessity. The people we want to get at are the people who have no interest in growing, spinning, or manufacturing cotton, people who simply gamble. The problem is very difficult, but by patience and perseverance we may eventually overcome it. Before I sit down I will ask the Secretary to read a resolution which was passed by the International Committee.

Mr. ARNO SCHMIDT: The resolution is as follows:—

"The Committee of the International Federation of Master Cotton Spinners' and Manufacturers' Associations will undertake to circularise its members in the countries of the world in which Egyptian cotton is used with the object of obtaining statistical returns of the quantities of each kind consumed, and, if possible, an expression of opinion as to the types most likely to be of service in the future. The Committee desires to urge upon the Egyptian Government department concerned and upon the cotton growers of the country, that the strength and the uniformity of fibre of the old type of Afifi should be recognised as two fundamental conditions in any kinds of cotton that are to be raised."

After discussion, this resolution was unanimously adopted by the meeting.

The CHAIRMAN: I should like Mr. Howarth, whose firm uses 80,000 bales of Egyptian cotton per annum, and who himself manages a section of the firm with 450,000 spindles, to give us the benefit of his experience.

Mr. WM. HOWARTH (*England*) said: After the many kindnesses that we have received at the hands of the Government of this country and its people it would ill become me if I failed to answer the call of our Chairman to give you the benefit of what little experience I may have had in the cotton trade. I am not an old man, yet I have been in touch with the cotton trade in a practical way for 32 years, so I think I can claim to have some knowledge of its working and of the classes of cotton which are necessary for Lancashire and for other users of Egyptian cotton. One gathers from the paper of Abaza Bey that he had not been able to discover what are the deficiencies in the quality of Egyptian cotton of which the Lancashire trade so bitterly complains, and yet I think he himself has told us what those complaints rest upon. Mr. Dixon told him of an extra amount of wastage in the cotton, and I can tell him that users of the old standard cottons agree there has been a loss of strength noticeable by spinners who use those qualities. I am not going to suggest the reason for the loss of strength and the extra wastage. I think Mr. Dudgeon, Mr. Balls, and Dr. Gough have shown us in their pictures and in their lectures how in the cultivation of cotton these weaknesses may develop, and Abaza Bey has shown us how these weaknesses are often advanced deliberately by the farmers themselves. We have all admired the work of the agricultural scientists, and we have had ample demonstration that the

Egyptian cultivator is a practical farmer, and knows his job. And when we get practical industry and applied science running hand in hand, and working in conjunction, we can rest assured that the object which we seek to attain, the securing of a better staple and less wastage, will be attained. Running all through Abaza Bey's paper was the one predominant note that the price should be increased. We do not fix the price of cotton. It is the demand that the world makes for our goods that fixes the price. There is one way in which year in and year out the farmer can get a premium on his cotton, and that is by avoiding the mixtures. Abaza Bey has pointed out—I am quoting him fairly—that the farmer, knowing that he has sold his crop, oftentimes puts into his delivery of what should be first pickings, cotton which rightly belongs to the second picking. Thus he takes advantage of the merchant for one season, he lowers the quality of his high-grade goods, and the seed will be of an inferior type. The year following, the merchant and the spinners know what to expect from farmers who act in this way. The farmer would be well advised to abide by his contract honestly when once he has made it. It needs to be thoroughly understood that the manufacturing of Egyptian cotton is a highly-specialised trade, both in the machines and in the goods that are made. When the machinery is put into a mill calculations are made as to what type of cotton is going to be used there, and often the range that the machinery is fixed for is very limited. You cannot turn inch and a half and one inch staple into the same machinery. A few concerns have adaptable machines which can spin a fairly wide range of staple, but there are limits even to that. And when a mill is fitted up for its type of work, it is fixed definitely for at least 20 years. You will understand that its owners want a regular running quality of cotton all the year through. That specialisation also refers to the finished products. It is subdivided in many ways, and if you vary the cotton, even if it is of similar length staple, you may alter entirely the character of your production. The demand for your cotton depends absolutely upon the users of your cotton meeting the needs and touching the fancies of the consumer. If we get a class of goods running, made from a certain class of cotton, and without our knowledge the cotton is varied, our goods are varied too, they take dye in a different fashion, the finish of the goods is altered, and we get into trouble. Our demand is cut off and it reacts upon you in a severe fashion the following year. The main thing we have to aim at is a regular running standard of cotton, giving a regular strength, year in and year out, and free from mixtures. In that way I guarantee you will get the full price that your commodity is entitled to in the world's markets, and we shall have less trouble than we have had in years past. It seems to me that when we have complained as to the quality of the cotton, Egypt has promptly thought we were complaining of the type of cotton and has immediately set out to produce a new type. That is not what we need. Occasionally, of course, we do need a new type of cotton because we want to touch the fancy of the world in a different way, but whenever a new cotton is introduced it should be introduced quietly and tentatively. We want to get a market for it

before it is thrown in immense quantities on the world. At this moment there is an idea that what is wanted is long staple growths *only*, but the fact is, there is a greater demand for the medium-length staples than for the extra superfine staples, which cannot be utilised except by a proportion of the spindles. What we speak of when we talk of deterioration of qualities is deterioration of all qualities. We want you to produce the best of each type; not to produce new types. If you produce immense quantities of a commodity that is not freely used naturally you will depreciate the value. Its intrinsic worth may be greatly in excess of the worth of another cotton running with it, but at the same time the actual price you will get in the world's markets will be less, because there is an infinitely less number who can use it and an infinitely less number of purposes to which it can be applied. That is one of the principal facts that Abaza Bey and his colleagues should take note of. So far as we are concerned, we will give them all the advice we can as to the character of the cotton we need. We will assist them in every way possible and encourage the application of common-sense business methods from the planting of the cotton to its delivery in Alexandria. I may say, perhaps, that what we want is a considerable weight of cotton which can be used in medium-priced goods. What farmers should realise is that they cannot produce cottons all over Egypt which will secure the same price. I have a friend near me who uses an immense weight of Upper Egypt cotton, but when the price gets over a certain figure his trade is cut in half. American cotton is switched into use and takes the place of Ashmouni in all districts where his yarns are delivered. You say you must produce certain qualities only to be sold at a given price. If you are aiming at an even price for every quality you will never attain your end.

MOUSTAPHA EFF. ABDEL MEGID (Egypt), one of the inspectors of the Khedivial Agricultural Society, asked if nothing could be done to encourage the sale of the cotton direct to the consumer, and the fixing of the price to be given to the native in the local market.

Mr. T. CICHORIUS (Austria): There is hardly anything to add to the excellent speech of Mr. Howarth, but from the Austrian point of view I want to confirm what he said from the English point of view. Afifi cotton has degenerated so much of late that the Austrians have not found the spinning of it remunerative. What we require is cotton of good length and good strength which does not produce much waste. If the cotton is improved the planter will get better prices. Certainly, of late years the price of Egyptian cotton has not been low considering the falling off in the quality. Indeed, the falling off has been so great that the price should have been considerably lower than it has been. When spinners come to Egypt the farmers here have a natural pride in showing their best qualities, but it is not the best qualities which we require in anything like large quantities. What we want in large quantities is a good medium quality.

Mr. J. CHARNOCK (England): I have been very much interested in the paper read by Abaza Bey. We all agree after what we have seen that there is a great desire all over Egypt for an improvement

in the quality of Egyptian cotton, and that much energy and determination are being shown to promote that end. The fruits of these labours will be seen in the future. It is equally true that in the past the quality has deteriorated very much. Last year the quality was not good at all. Perhaps the cotton grown in Upper Egypt had not so much deteriorated as that of Lower Egypt, but at the same time there was great deterioration in both kinds. I may say that the firm I represent is the greatest user of Upper Egyptian cotton in the world. I think I was the first in Lancashire to use that class of cotton. I am using more Upper Egyptian cotton than I ever used before, but last year I rejected a very considerable quantity of it, at least 2,000 bales, because the quality was so poor. It is asked why you cannot get the same price for the cotton of Upper Egypt as for that of Lower Egypt in the same grades. The reason is that it is not so good, nor so strong. I make yarns which compete with yarns made from American cotton, and when Upper Egyptian cotton is at a reasonable price I can compete. But the price must not get too high. The merchant who has been accustomed to paying 20s. a piece or 30s. a piece will go on paying that amount, but if you put 2d. or 3d. a piece more on he will not pay it. He will suggest something being taken out of the cloth rather than pay an advance. Abaza Bey says we should pay more money, and that is an excellent idea for him. But for the poor spinner I do not know that it is very practical. For years good cotton never touched 6d. per lb., and latterly we have been paying 9d., 10d., 11d., and 1s. for it, and my friend suggests more. I think the prices we are paying ought to be enough to encourage these gentlemen to grow cotton. I am afraid the price of land has something to do with the advance you are seeking. If you put up the price it is quite certain that some spinners will use American instead of Egyptian cotton. Referring to a remark which Mr. Howarth made as to high prices, I want to say that if you grow too much of a higher class of cotton, inevitably the price must come down. If you give me Sakellaridis at the same price as second pickings of Lower Egyptian I could not use it. My machinery would not deal with it. The staple is too long for me. If you grow higher grades of cotton and leave out of consideration those who use the lower grades of cotton, our commodity will be very scarce, it is true, but the better grades will have to come down in price. From my point of view I want something which will compete with American cotton at a fair price. I am sure that there would be a market for all the lower grades of cotton you could grow in Egypt, whereas if you produce all the higher grades you will hardly have any market at all.

Mr. CASPAR JENNY (jun.) (Switzerland): We have heard that the Egyptian planters want a higher price, but that the spinner cannot go beyond a certain limit. If the planter wants a higher price he must find some means of obtaining cheaper money. It is evidently because of the high price of his land that he makes these continual demands for a higher price for cotton. As to the suggestion that spinners should work for an amalgamation and purchase direct from the growers, that I think we are hardly prepared for yet. The prices at

Alexandria will be properly regulated, I think, by the great competition among the Alexandria merchants. I should like to add one remark about the new class of cotton which it has been the practice to introduce almost every year. These new kinds of cotton involve great outlays on new machinery, and that, of course, cannot be for the advantage of the industry. A good class of cotton running from year to year is what the spinning industry wants.

Mr. S. Clauss (Germany): Speaking for German spinners, I entirely support what Mr. Howarth and Mr. Charnock have said. I want to complain about the large amount of mixing which takes place, especially in the first picking, with the intention of getting a higher price, and to confirm what has been said of the disadvantages resulting from the introduction of new types. Continental spinners often buy for long periods ahead certain types of cotton to which they have been accustomed, but when deliveries come the exporters make the excuse that the type of cotton has not come up well this season, and the buyer will have to be satisfied with something else. Of course, that cannot be an advantage to the spinning industry, and ought not to exist. Spinners ought to be able to rely on getting the same type of cotton from year to year. I also wish to protest against the amount of water which is put into cotton, partly in the fields, partly in the gins, and partly in the presses, a process which leads to a large amount of waste. The quality of cotton frequently becomes inferior owing to its having been ginned too early. If it is ginned before it is quite matured it begins to curl, and that is another drawback in the spinning. Another point is that the German spinners desire to have a regular staple. They do not wish to have a few long fibres, and some short ones. Their aim is to get a uniform staple. I should like to add, that I heartily approve of the idea of a joint committee of the International Federation and the Alexandria General Produce Association to confer over these matters.

Mr. S. Newton (England): One question I should like to ask Abaza Bey, if he will not think it impertinent. I have been given to understand, since I came to Egypt, that the small farmers who take their land from the landowners, are obliged to sell back their cotton to the landowner. Is that so, or is it not? If so, has the small farmer any control over the price? I have also been told that after they have sold their cotton to the landowners, if there is a surplus left at the end of the season, they divide that surplus with the landowner. Again, if it is not impertinent, I should like to know if that is so.

Abaza Bey: As we are here for free discussion hardly any question can be called impertinent. No landowner can control the price that the cultivator gets for his cotton, except it be in the case of a landowner who helps his tenants to sell their small quantities of cotton, knowing that dealing with large quantities of cotton, he can help them to a better price than they can get. If the tenant says to the landowner, "Please get away. Here is your rent, or the security for it," then the landowner will never interfere. The Egyptian farmer is very cute and will not be misled by the landowner or by anybody else. When he disposes of his crop, any money

that comes from the crop is for him and for him alone. The landowner takes just what is due to him and the balance is left for the cultivator.

Mr. F. A. TOMLINSON (England): I should like to emphasize our complaint of the deterioration in the quality of the cotton. I admit that Sakellaridis and Joannovitch have maintained their strength and quality for a large number of years, and ought to be encouraged, but the cotton that seems to be capable of being cultivated to the most advantage, both to growers and spinners, is Nubari. Let that take the place of Afifi, which there is no advantage in prolonging. You will find, if you make enquiries, that last season every merchant had large quantities of Afifi left over, whereas every pound of Nubari cotton was sold. I wish to emphasize the fact that we do not want any more new growths. We have Sakellaridis, Joannovitch, Nubari, Upper, Abassi, and Voltos. Keep up the quality of these and do not encourage any new growths, or at anyrate do not inflict new growths upon the spinners until you have proved that they are of commercial advantage both to you and to them. Of course, the cultivator always wants a high price. I have been in the trade sufficiently long to have bought a great many thousands of bales at half the price of to-day. We have had Egyptian at 4d. and 4½d. It bothers a good many of us to know why you are complaining to-day when the price is 100 per cent. more. Another point. I am told there is a new way of buying Egyptian cotton which is largely prevalent, called "buying on call." I wonder if a spinner thinks when he is doing that, that every pound he buys on call he is selling short. It is a most dangerous practice, especially when you remember that at no one time can you command a heavy stock of Egyptian cotton. That is the way in which a corner in Egyptian cotton may arise, and is the only way to give Abaza Bey the shilling a pound he wants, and, in fact, it may raise the price to any point the successful speculator may desire.

ABAZA BEY: Although some of you say you do not fix the prices, we have heard from you, and still hear from you, that you are willing to give good prices if the quality is good. That seems to show that you have something to do with prices. I think it is my duty as a grower to say that I want good prices. You point out to me that the price is already much higher than it was. I will tell you why. In former years the price of land in Egypt was not as high as it is now, and the expense of growing cotton was not as high as it is now. Everything has changed in Egypt. A price that was satisfactory ten years ago cannot be satisfactory now. You say there is a limit. We do not ask for 30, 40, or 50 dollars, but 17 dollars is not sufficient to make the growers do what you want, and give the best attention to his land.

Mr. TOMLINSON: I should like to ask Abaza Bey if it is really for the good of the cultivators that they should get these very high prices? Two or three years ago, I know, cotton went up to very high prices owing to the short crop. Then there was a land boom, and I am told that put the value of land up two, three, or four times its original price. Does Abaza Bey wish us to go on paying more money for cotton so that the price of land can continue to go up?

Is that what we are working for? Always to put money into the pockets of the landowner? Is it not time something was done to keep rents down?

ABAZA BEY: I agree with you. I am not asking for very high prices. Let us have a moderate price, a good price. Let us meet half way; say the prices that have been prevailing for some years, during which we have been doing good work and you have been doing good work.

Mr. TOMLINSON: I am not wishful to make this into a personal discussion, but it seems to me that on a basis of 6d. per pound for American futures, in normal times good prices would be: 1s. for Sakellaridis, 11d. Joannovitch, 10d. Nubari, 8d. to 9d. Upper, 10½d. Abassi and Voltos. I am not taking Afifi into account, as it has become so irregular in quality and price, that it would no longer have a standard value, but for the influence of the speculator and "contracts." You would make a good deal of money at these prices, even taking into account extra rents, increased cost of labour, and everything. I think that is the limit to which the English spinner can go.

ABAZA BEY: Is that the limit?

Mr. TOMLINSON: That is the limit.

ABAZA BEY: If they do not think that limit is sufficient they had better grow maize or wheat?

Mr. TOMLINSON: Yes.

The CHAIRMAN: I am sure we must all be impressed by the practical tone of the discussion this evening. I have no doubt it will be productive of a very great amount of good. I am prepared to admit with Abaza Bey that there has been considerable increase in the cost of production. At the same time there has been a considerable advance in scientific methods of cultivation.

VOTES OF THANKS.

Sir CHARLES continued:—

We have now come to the end of our Egyptian Conferences. In all the important work undertaken by the International Cotton Federation it is doubtful whether there has been anything of a higher educational value than our visit to this country. We have had the experience of visiting the ancient glories of Egypt, and we have been immensely impressed at the same time by the evidence we have had of the skill and energy with which agriculture is conducted to-day in every part of the Delta. The object of our Federation is to bring the various sections of the industry into touch with each other. Cotton growing, of course, is the basis of our industry, and it is well that spinners and manufacturers, who know so well the difficulties which they have to face in the conduct of their own business, should have opportunities of forming an opinion of the difficulties which the growers of the raw material have to overcome.

Many things have contributed to the success of the visit which is now drawing to a close. First, I would mention the

gracious reception which was accorded to every member of the Congress by His Highness the Khedive, himself an ardent agriculturist. The fact that he is so deeply interested in farming pursuits is, of course, of vast importance and of great benefit to Egypt. Then we had the good fortune to be received by Lord Kitchener, who was equally gracious in receiving and shaking hands with all the delegates. Lord Kitchener has had 20 years' experience of Egypt, and we all feel that if it is possible for him to continue to devote his great abilities to the development of the country, and to the improvement of the conditions of the fellaheen, in whose lot he takes special interest, all the nations of the world will share in the benefit. I would further refer to the kindness which we have met with from His Excellency Sirry Pasha, the Minister of Public Works, who has also charge of the Department of Agriculture, and I would further refer with gratitude to the assistance we have had from Sidky Pasha, the able Under-Secretary of the Ministry of the Interior, who acted as President of the Reception Committee, who was with us at Alexandria, and who has done so much for us in Cairo. Everywhere we have met with kindness and hospitality, which we shall never forget. Our most cordial thanks are due also to:—

H. E. IBADI PASHA, Governor of Alexandria and President of the Municipality, who placed a room in the Alexandria Town Hall at our disposal and entertained the Delegates and ladies at Nouzah.

Mr. P. FENDERL, the President of the Alexandria General Produce Association, who made the arrangements for us to visit the cotton presses in Alexandria, and who, on behalf of his Association, entertained us to a banquet at San Stefano.

Mr. PERCY CARVER, Chairman of the Société de Pressage, Alexandria, and to Mr. ANTON MILLS, General Manager, for their kindness in granting us permission to visit the cotton presses in Alexandria, and for conducting us on the occasion of the visit.

THE ABOUKIR ESTATE COMPANY, LTD., and staff, especially Mr. DE CLAY, the sub-manager, who showed us over the interesting estate, and entertained us to tea.

Mr. P. W. CARVER, M. HUGO LINDEMANN, Mr. C. J. CHOREMI, and Mr. A. T. KITSOEFF, who entertained the party at the ginneries at Kafr-el-Zayat. Mr. Choremi also acted on the Egyptian Reception Committee.

H. E. MOHEB PASHA, Governor of the Province of Gharbieh, who organised a magnificent reception at Tantah.

Mr. R. STORRS (Oriental Secretary to Lord Kitchener), whose valued co-operation has been much appreciated.

H. E. BIRCH PASHA, who gave us permission to visit the Sakha Estate of the State Domains, and in this connection also

Mr. H. C. JEFFERYS, AUDEBEAU BEY, and WOODS BEY, Agricultural Experts of the State Domains, who explained the various branches of the work carried on on the Sakha Estate.

H. E. MOHAMED BEY ABDEL NEBY, at Mehalla Kebir, who showed us his cotton and silk weaving plant. The looms have remained substantially unaltered from the earliest times.

H. E. RASMY BEY, Sub-Governor of Gharbieh.

H. E. HAMDY BEY, Commandant of the Police at Gharbieh.

H. E. MAHOMET BEY BABLY, Mehalla Kebir, who entertained the party to tea.

H. E. AMIN BEY WASIF, Governor of the Province of Gizeh, who made the arrangements for our visit at Sakkarah, and entertained the party to tea on board the steamer.

Mr. B. PEARSON, Inspector of the Egyptian State Railways, for the admirable railway arrangements made for the Delta tour, and for his personal attention.

Mr. H. W. TITE, General Manager of the Compagnie Internationale des Wagons lits, whose excellent arrangements contributed so much to the comfort of the Delegation during the Delta tour.

Mr. G. C. DUDGEON, Director-General of the Department of Agriculture, who also is a member of the Egyptian Reception Committee.

Mr. W. LAWRENCE BALLS, M.A., the Botanist of the Department of Agriculture, for his two most instructive lectures.

Dr. LEWIS GOUGH, for his lecture on "Cotton Insect Pests."

CAPTAIN FLOWER, the Director of the Zoological Gardens.

Mr. P. R. BOXWELL, Inspector of the Delta Barrage, for his attention and courtesy on the occasion of the visit to the Barrage.

The CHIEF COMMISSIONER OF POLICE, Cairo, and to his Officers and Men, for their admirable arrangements throughout the tour.

H. E. IBRAHIM PASHA MURAD, for entertaining the Delegates and ladies to luncheon on his estate at Deir, and for showing his model plantation.

The Authorities of the Egyptian University, and of the Ecole Polytechnique for placing rooms at our disposal for the meetings in Cairo.

Finally, I must refer in the warmest terms to the untiring labours of Abdul Hamed Abaza Bey, Honorary Secretary of the Egyptian Reception Committee. Sidky Pasha told me at Alexandria that to Abaza Bey had been entrusted the carrying out of the arrangements of the Congress. They have been perfectly successful, and they are a fine tribute to Abaza Bey's splendid organising powers. We cannot thank him too highly.

I may add that the International Committee have already recorded their high appreciation of Abaza Bey's ability and energy, and in order that it shall have permanent form they have directed that the terms of the resolution shall be inscribed on vellum and presented to him.

To all who have contributed in any way to the wonderful success of the visit of the International Delegation of Cotton Spinners we desire to express our heartfelt thanks.

Mr. BERGER (France) seconded the motion, which was passed with acclamation.

This concluded the proceedings of the Conferences.

VISITS, DELTA TOUR, RECEPTIONS, Etc.

Visits, Delta Tour, etc.

MONDAY, 28th October, 1912.

The Delegates visited Pompey's Pillar, a striking monument made of granite, which stands in the outskirts of Alexandria. The shaft is about 70 feet high, and is fluted; the capital is ornamented with palm leaves. The magnificent tomb of the Roman period at Kôm-el-Shogafa, near Pompey's Pillar, was likewise inspected. A visit to the Catacombs terminated the morning's drive.

In the afternoon a visit to the Museum was undertaken.

TUESDAY, 29th October.

A visit was paid in the morning to the Alexandria Cotton Market. There, "on the flags" in the burning sunlight, and also in the shade, the delegates entered into conversation with the cotton exporters and their agents, who answered, very frankly, the innumerable questions which were addressed to them. The delegates were told that in the Nile delta there are many centres at which the cotton is collected from the native cultivators, who probably number over a million, some of them producing not as much as half a bale. It was interesting to learn that the first great impetus was given to cotton growing in the country by the high prices which cotton commanded after the outbreak of the American Civil War. At that time the area of land under cotton in Egypt was largely extended, and has gone on increasing on a profitable basis ever since.

From the date on which they first entered upon cotton cultivation on a large scale, the Egyptians have properly baled their produce, and the delegates had opportunities in several warehouses of seeing highly-efficient cotton presses at work. First, the cotton, loosely baled as it comes from the country, is spread out in huge heaps by groups of lithe and sinewy Arabs, who chatter and sing very gaily over their work. In some cases, while the cotton is undergoing this process, it is openly damped from a huge syringe which holds about a quart of water, the excuse for this addition being that it presses better when not absolutely innocent of added moisture. At other presses, which seemed to work perfectly, there was no sign of the addition of water. The powerful machines turn out bales of about 700lbs. each at the rate, when in full work, of sixty an hour, the total weight dealt with by one press in an hour being, therefore, over 40,000lbs.

In the evening the delegates and ladies were entertained at a banquet at San Stefano, a seaside suburb of Alexandria, by the Alexandria General Produce Association. Mr. P. Fenderl, President of the Association, cordially welcomed the Delegates and ladies.

H. E. SIDKY PASHA, Under-Secretary to the Ministry of the Interior of Egypt, said: I am very pleased to be with you this evening, and, in my position as President of the Reception Committee, to have this first opportunity of extending to you a welcome, as much in the name of the Government of H.H. the Khedive as in the name of all the cultivators of Egypt. We, in this country, ardently desire to maintain more intimate relationships with the great centres of commerce and industry, and I am happy to think that this desire has greatly developed in the course of recent years on the part of all those interested in the cotton industry. We had learned with pleasure—from the accounts given of the meetings held by the Committee of the Federation at Berlin in the autumn of last year—that the International Cotton Committee had decided that a delegation of some of its members would visit Egypt. We are indebted to the Committee for this decision, and we thank you especially, ladies and gentlemen, for having come in such great numbers to represent amongst us your Federation, which, of course, was already well known to us by the aims of common interest which it pursues, and by the great work which it has already carried through towards the attainment of this object. Following the example of all the nations interested in agriculture, the Egyptians appreciate the efforts made by you during recent years, and admire the zeal, energy, and indefatigable activity with which your President, Sir Charles Macara, continues to increase the growth of your corporation and the expansion of an industry so necessary to the welfare of the nations. As has been stated already on a former occasion, we know that beyond your work, and besides the immediate object that you pursue, namely, the prosperity of the cotton industry, you contribute powerfully towards the accomplishment of a still higher task. I mean the diffusion amongst the nations of the sentiment of their interdependence and reciprocal solidarity in the interests of their common prosperity. No task is higher and more fruitful. That is why it seems to me that, although gathered together for the first time, we are already old friends. We are still the more your friends, because there is behind us a long period of relationships of mutual benefit. It is fortunate for Egypt that the industry which constitutes the greatness of the county of Lancashire cannot exist without our cotton, and you will therefore permit us to add that it is equally fortunate for Lancashire to have found in the Egyptian cotton a raw material which responds so well to the requirements of your industry. We have learned that Lancashire mills employ in certain cases American cotton in substitution of our cotton, and—in spite of the satisfaction that we experience in seeing that the demand for Egyptian cotton increases considerably in the various European countries, whose delegates we are pleased to see here and to welcome this evening—we express the wish that this substitution may become less and less prevalent. We hope there will no longer be any justification for this practice when we have brought our cotton cultivation up to the necessary degree of perfection, and when we shall be able to supply you with qualities of cotton worthy of the fertility of our soil and of the activity of our peasants. Towards the attainment of this aim we are working

daily with a perseverance, of which you will have the opportunity of observing the first results during your visit in the interior of the country.

All Egypt to-day welcomes your arrival, and unites in the most fervent wish that this exchange of opinions between producers and consumers, which is anticipated by your visit, may have for both parties the most beneficial results.

I say purposely *all Egypt* welcomes your arrival, because, contrary to other countries, we are here all either agriculturists or interested more or less in agriculture. Officials or bankers, solicitors or doctors, merchants or industrials, all recognise that the products of the field form the source of their resources. We would have preferred—especially considering the favourable circumstance that this year's crop has been earlier than usual—that you might have arrived a month sooner. A month ago you would have been able to have formed a better opinion of the great fertility and productive power of our soil, because you would have seen on your journey thousands of fields covered with a snowy carpet. You have, however, the advantage that the lower temperature of November will make your studies easier. I should have been very pleased to have accompanied you myself during the whole of your tour in Egypt, and I very much regret that my official duties prevent me from absenting myself for any length of time from Cairo. We have, however, requested Abdul Hamid Bey Abaza, the active and devoted Director of the Khedivial Agricultural Society, to accompany you during the whole of your stay in Egypt. I have only therefore to wish that the work of the Congress will terminate to our mutual benefit, and that on both sides we may retain the happiest remembrances of the visit, and I am convinced that this will be the result. I raise my glass to the happiness and prosperity of the nations represented by you, of the respected heads of these nations, of your President, and of you all, ladies and gentlemen, whom we feel honoured to welcome to-day.

Dr. RUFFER, Vice-President of the Municipality, in a brief speech, said the International Cotton Association was unique in its character, composed, as it was, of men of various nationalities, united together for the good of all. "It would be presumptuous on my part," he added, "to speak of the great good which will accrue to Egypt from your presence and from the exchange of ideas which will follow from it, but I would like to say that Alexandria is proud that the delegates have chosen the town as one of their places of meeting."

Sir CHARLES MACARA, in reply, after a reference to the splendid hospitality which the delegates were enjoying, said: "We have been in many places in America and Europe, but this is the first time we have met on the continent of Africa. I assure you that our visit to the Alexandria Cotton Market to-day was exceedingly instructive, and will be, I venture to say, of mutual benefit. A few years ago it fell to my lot to lead a larger delegation than this to the United States, and at the meetings there I was able to allude to the packing of Egyptian cotton as an example which the American growers should follow. It was a revelation to us that a nation, which was

supposed to be the most up to date in the world, should be so far behind Egypt in both the cultivation and the packing of cotton. Since that visit, as President Roosevelt wrote to me some time afterwards, there has been a great awakening in the United States both as regards the cultivation and the storage of cotton.

"To get into touch with those upon whom we are dependent for our raw material, to develop the cultivation of cotton in existing fields, and to try to promote the growth of the plant in any part of the world where it can be grown as a commercial success, are among the objects of our International Federation. In the position in which we are placed we are bound to take broad views, and we are glad to know that the extent of land suitable for cotton cultivation is practically unlimited.

"Apart altogether from the benefits to the industry, the meeting of the nationalities once a year at a Congress, and the more frequent meetings of the Committee, are exceedingly helpful. The harmony which has prevailed at all our meetings has been perfectly wonderful, and I cannot help feeling that if practical men of the world, who are responsible for the conduct of the great industries which supply the food and the clothing of the human race, were brought into closer contact with statesmen, many international difficulties, which now lead to great trouble, might be amicably settled. In the industrial world, at anyrate, of which I speak with intimate knowledge, when both sides are well organised, I put great faith in round-table conferences. They settle disputes satisfactorily nine times out of ten."

A delightful evening was afterwards closed informally.

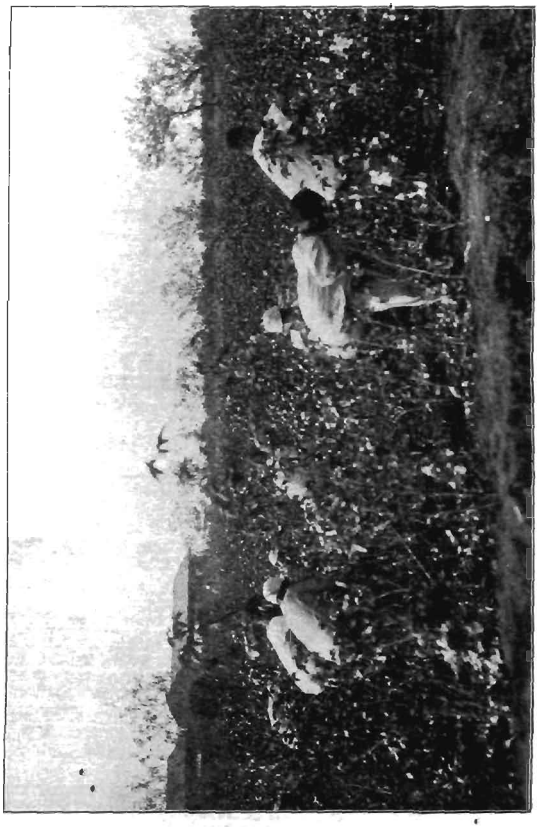
WEDNESDAY, 30th October.

On behalf of the Municipality, H. E. ABADI PASHA, Governor of Alexandria and President of the Municipality, entertained the delegates and ladies to a garden party at the beautiful Botanical Gardens at Nouzha. A number of Alexandria notables were present.

THURSDAY, 31st October.

The delegates and ladies spent the morning in rambling on the shores of Aboukir Bay, which is about eight miles from Alexandria.

In the afternoon they went by train to Maamourra, and spent several hours on the vast farms of the Aboukir Estate Company. A quarter of a century ago this estate, on which a million pounds had been spent, was in an apparently hopeless condition, and did not support a single human being. To-day it is a handsome dividend-paying concern, 20,000 of its 30,000 feddans have been sold, and it supports a population of over 25,000. It grows vast quantities of cotton, maize, wheat, clover, and other products, in a soil which extensive irrigation works have made wonderfully fruitful. The party were conveyed for miles on trolleys running on tramway lines, and saw in many fields the gathering in of the third picking



Picking Cotton on the Aboukir Estate.

of the cotton crop. The delegates were hospitably entertained at tea by the Company, in a marquee near the principal residence on the estate.

A detailed description of the Aboukir Company, prepared by Mr. R. Lang Anderson, will be found in Appendix I.

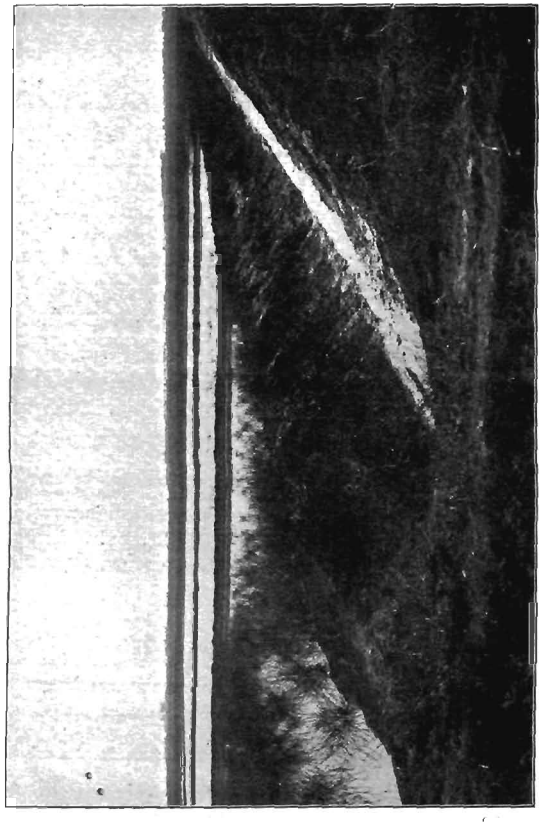
A paper by Prof. John A. Todd, on "The Agricultural Drainage of the Egyptian Delta," is also included in Appendix I.

FRIDAY, 1st November.

The delegates left Alexandria early in the morning by a special train de luxe for Kafr-el-Zayat, a journey of about one hour and a half. This is the most important ginning centre of Egypt. The delegates were shown through several of the large ginning factories, in one of which as many as 180 gins were at work removing the seed from the cotton and preparing it for transport to the presses at Alexandria. The delegates who had had the experience of the ginneries of America were loud in praise of the spacious buildings, which were vastly superior to those in America. The apparent waste of labour was generally commented upon. Here, again, the artificial method of damping the cotton before pressing the bales was criticised by the spinners. The bales are hydraulically pressed at Kafr-el-Zayat, and then forwarded by rail to Alexandria, where they are finally pressed for export. This is the practice followed by all the ginneries, except that in one of those establishments which was visited at Kafr-el-Zayat a comparatively small number of bales were pressed for export, but even there the bales were first hydraulically pressed, and 24 hours later were pressed by steam to the shape of the usual export bale. The spinners were unable to understand why it should be necessary to press the bales twice, and if technical reasons should necessitate the two processes, why this could not be done generally at Kafr-el-Zayat instead of forwarding a bulky bale to Alexandria, which necessarily costs more freight, and must entail additional expenses for carriage, insurance, &c. The explanation offered by the merchants was, that the cotton has to be carefully examined at Alexandria, and the mixings can only be made there, as they have no graders at Kafr-el-Zayat.

From Kafr-el-Zayat the delegates journeyed by train to Tantah, where HIS EXCELLENCY MOHEB PASHA, the distinguished Governor of the Province, and his principal officials received the party. The day being the Mohometan Sunday, work was suspended, and the streets of the town were crowded with the swarthy-faced, picturesquely-attired residents, who gazed with much interest, not altogether unmixed with amusement, at their European visitors. The streets were kept clear by a brisk body of native policemen, and between the serried ranks the delegates drove first to the principal mosque of the town, which they were permitted to inspect with slippered feet.

From the mosques the delegates proceeded to inspect one of the cotton markets which have recently been established all over Lower Egypt on the initiation of Lord Kitchener. The object of these markets is to inform the small producers of cotton of the latest prices for the various qualities, and to ensure that all bales are weighed correctly.



Washing of Land on the State Domain, at Sakha.

Later the delegates were shown through a large and well-appointed Technical School, just on the point of completion; an orphanage on a big scale, quite worthy to stand alongside any European institution carrying on similar work; and they were entertained at tea in the spacious Municipal Gardens, where the honours were done by H. E. Moheb Pasha, to whose enterprise and energy the remarkable growth of the town of Tantah is largely due. The cordial thanks of the delegates were conveyed to His Excellency in the Municipal Gardens by Sir Charles Macara, and were gracefully acknowledged.

SATURDAY, 2nd November.

The night was passed in the train in a siding at Mehallet Roh, and the following morning the delegates travelled to Sakha, where they alighted in order to drive through the huge State Domain. There they saw a repetition of the vast agricultural enterprises they had witnessed at Aboukir: thousands of acres of highly cultivated land, growing cotton, maize, wheat, sugar, and other crops on land ingeniously watered by artificial canals. Everywhere there was evidence of excellent management, and the most up-to-date appliances. Among other things, a trio of steam ploughs caused a general stoppage, and elicited very congratulatory remarks. The delegates learned that the estate, heavily burdened with debt, was taken over by the Government 35 years ago, and that in another year all the burdens will have been cleared away.

From Sakha the train took the delegates to Mehalla Kebir, where H. E. Mohamed Bey Abdel Neby showed his cotton and silk weaving plant. The looms of this factory have remained substantially unaltered from the earliest times. In the evening H. E. Mahomet Bey Bably, a local notable at Mehalla Kebir, entertained the party to tea.

In the evening the special train left for Cairo, and the headquarters, Shepheard's Hotel, was reached at 10 p.m.

SUNDAY, 3rd November.

The party visited in the morning the famous Museum of Egyptian Antiquities at Cairo, and drove to Mena House, where lunch was served. In the afternoon visits were paid to the famous Pyramids and Sphinx at Gizeh. Some of the party visited the temple of the Sphinx, some inspected the interior of the Pyramids, and others climbed to the top.

TUESDAY, 5th November.

The party travelled, in a steamer kindly supplied by the Egyptian Government, up the Nile to Bedreshein, where donkeys were provided, and a ride of about two hours through magnificent tropical scenery to Sakkarah followed. On the way the ruins of Memphis, once the capital of Egypt, were inspected. Sakkarah is principally noted for its famous step-pyramid. The return journey was commenced in the afternoon, and the party were kindly entertained to tea on the steamer by H. E. Amin Bey Wasif, Governor of Gizeh.

THURSDAY, 7th November.

In the morning the delegates were conveyed in a steamer placed at their disposal by the Egyptian Government to the Delta barrage, a few miles nearer the Mediterranean than Cairo. The Nile, which formerly entered the sea through seven mouths, has now but two, the Damatta and the Rosetta branches. Just below the point where they diverge the barrage is built across both branches. Its object is to hold up the level of the water in the Nile so as to allow it to enter three great canals which commence at this point. The canals provide water for and allow of navigation to almost all parts of the Delta.

The barrage was one of the great experiments of Mohammed Aly. The plans were prepared in 1835 by Mougel Bey, and the work, which occupied 20 years, cost £800,000. When completed it was found that the foundations would not hold, owing to the shifting nature of the soil, and they remained a costly failure until 1885. Then strengthening operations were begun by Sir Colin Scott Moncrieff, and these, completed in 1890 at a further cost £400,000, have been entirely successful, the level of the water having been raised as required ever since.

The delegates were shown over the works by Mr. Boxwell, the resident engineer, and they also had opportunities of visiting the house in which are stored models of the great engineering feat which has been accomplished.

In the afternoon the delegates drove to the magnificent Zoological Gardens of Cairo, where H. E. Sirry Pasha, Minister of Public Works, entertained the party to tea. A special honour was shown to the delegation by the visit paid by Viscount Kitchener of Khartoum, who had a long conversation with Sir Charles Macara and a number of prominent members of the delegation. Several Ministers of the Egyptian Government were also present. The party was received at the entrance of the Gardens by Captain Flower, the Director of the Zoological Gardens.

FRIDAY, 8th November.

The delegates journeyed by train to Toukh, where they were very hospitably entertained on the estate of H. E. Ibrahim Pasha Mourad. His Excellency is one of the most famous and one of the largest farmers in Egypt. On his estate of 13,000 acres he employs 20,000 very happy and very prosperous-looking workmen, and he grows huge quantities of cotton and maize, besides supplying the Egyptian and other markets with about 300,000 fowls annually. Though over 70 years of age, he still occupies all his time in the management of his farms. An elaborate luncheon in the Egyptian style, consisting of about 20 courses, was served in a specially erected marquee, where the party were joined by all the notabilities of the district. Opportunities were also given for visiting the orange groves, where fruit in great abundance was just on the point of ripening.

Before leaving the estate, Sir Charles Macara, standing in the courtyard, surrounded by the delegates, the local notables, and a

huge crowd of natives, said: We have been magnificently entertained by one of the largest and one of the most up-to-date cultivators in Egypt, a man of whom Lord Kitchener said yesterday, "He is an example to the whole country, and I hope many will follow his lead." We are deeply impressed by what we have seen to-day of what can be done by a man who devotes the whole of his life to his enterprises. I am glad to see he has five sons coming on, and they will, I hope, tread in their father's footsteps. Though I am not an expert cultivator, I know enough about agriculture to recognise how well the land through which we have passed to-day is handled, and it is quite clear from the appearance of the people that they have someone looking after them who takes a great interest in their welfare. That, I believe, is the secret of success. We must look after the people, and do well for them. My colleagues and myself will long remember this day, and we all wish you every success in your work.

H. E. IBRAHAM PASHA MOURAD, in reply, speaking in Arabic, said: I thank you for having accepted the invitation to come to visit my farm, and I thank the ladies especially. Their presence has crowned the day with flowers. Your presence will be an encouragement to me and to my sons to continue our work, which is to do our best for agriculture and for humanity, by providing, so far as we can, food and clothing. All the notables of our district have been glad to meet you, and we return you our best thanks for your visit.

Later the delegates returned to Cairo.

The International Committee take this opportunity of expressing their entire satisfaction with the travelling and other arrangements in Egypt, which were undertaken by Thomas Cook & Son, of Cairo, and Manchester.

COTTON GROWING

IN THE

ANGLO-EGYPTIAN SUDAN

Report by

ARNO SCHMIDT,

Secretary of the International Federation of Master Cotton Spinners' and Manufacturers' Associations

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With a Preface by

HIS EXCELLENCY LIEUT.-GENERAL SIR F. REGINALD WINGATE,

G.C.V.O., K.C.B., K.C.M.G., D.S.O., Etc.

Governor-General of the Sudan, and Sirdar of the Egyptian Army.

PREFACE.

The vital importance to the cotton mills of Lancashire of maintaining the supply of raw material is widely recognised, and the problem of developing existing cotton fields and opening up new areas for the production of that commodity has occupied the attention of all those interested in one of the principal industries of the British Empire.

Attention was first drawn to the Sudan as a promising field for the cultivation of cotton by Sir William Mather, who combines with a thorough experience of the requirements of the trade a local knowledge obtained by actually visiting the Sudan and studying the conditions on the spot.

As a result of his whole-hearted and disinterested efforts, the British Cotton Growing Association was interested in the proposition, and, early last year, sent a deputation to the Sudan to examine the question, under the direction of Mr. J. Arthur Hutton, the distinguished chairman of the British Cotton Growing Association. The detailed and exhaustive report of this deputation still further stimulated public interest in the matter, and the conclusions arrived at left little doubt regarding the potentialities of the Sudan as a cotton-producing country.

In June, 1912, it was decided by the Committee of the International Federation of Master Cotton Spinners' and Manufacturers' Associations that a deputation of the countries included in the Federation should visit Egypt in order to observe the conditions under which the Egyptian cotton crop is produced. As a result of this decision, an International Congress was held at Cairo in November last, and the whole question was very thoroughly and exhaustively examined under the direction and chairmanship of Sir Charles Macara.

The greatest interest was also evinced in the Sudan cotton proposition, and, although Sir C. Macara and the members of the Congress were unfortunately unable to visit the Sudan personally, the Secretary of the Federation, Mr. Arno Schmidt, was deputed to visit the Sudan and report on the cotton-growing possibilities of that country.

Mr. Arno Schmidt has written an extremely valuable and interesting account of the results of his visit, and has asked me to write a preface to his report, a request with which I readily comply.

Although I must not be held to endorse all Mr. Schmidt's statements, or all the conclusions which he founds on the information collected during his tour, I have no hesitation in commending his report to anyone interested in the cotton industry, whether in the Sudan or elsewhere.

To officials, on whom devolves the task of developing the undoubted potentialities of the Sudan, it is of the greatest value to have the assistance of the impressions formed by a trained and independent observer of wide experience in other countries, while the influential position which Mr. Schmidt holds, as Secretary to the *International Federation of Master Cotton Spinners' and Manufacturers' Associations*, secures that the claims of the Sudan to be considered a sound business proposition as a cotton-producing country will be fully advertised, both in England and in the other countries represented in the Federation, and cannot but conduce to the benefit of all concerned in increasing the world's supply of cotton.

There are one or two points which may perhaps be noted as supplementary to Mr. Schmidt's full and interesting report.

The first, and perhaps the most important, is that the Sudan from time immemorial has been a cotton-producing country. Centuries ago, the trade in cotton between the ancient kingdom of Sennar and Abyssinia was extensive, and the Sudan was noted throughout Africa for its cotton manufacture. In more recent times, under the rule of the Khalifa, taxes were largely paid by the Blue Nile districts in the shape of locally-manufactured cotton goods. It is not surprising, therefore, that not only in the Tokar district of Red Sea Province does the native still take readily to cotton cultivation, which was carried on there intermittently even during the period of anarchy under the Mahdi and Khalifa, but that in the Gezira also, where a good rainfall invariably results in an output of considerable quantities of cotton, he devotes himself to its cultivation willingly.

These inherited traditions and the natural aptitude of the native to grow cotton are assets of great significance in estimating the feasibility of the larger schemes to which Mr. Schmidt refers.

Among those who have had long experience in the country there has never been any doubt as to the future of the Gezira and other

parts of the country as a field for cotton growing, and, for that reason, it is refreshing to find that these views are now accepted and emphasized by experts.

Another matter to which Mr. Schmidt alludes in connection with the question of the labour supply is the migration of people from outlying districts to Tokar during the cotton season. This movement is by no means an isolated phenomenon, but is characteristic of a general tendency, which must be taken into account in calculating the population available for the development of the Gezira project during its initial stages. In the Sudan, as in other Oriental countries, the execution of any such scheme as that for the irrigation of the Gezira, is certain to set up a drift of people living in other districts upon what used to be called "the margin of cultivation," since the native is already accustomed to move from place to place as his interests dictate.

There must, therefore, be added to the resident population now living within the limits of the proposed scheme a considerable factor from outside. This point is easily realised when it is remembered that within 100 miles of the centre of the area to be irrigated there is a population of over 120,000 people living in the three towns of Khartoum, Khartoum North, and Omdurman.

It is not improbable, either, as time goes on, that a portion of the large nomadic population will change their habit of life and become sedentary, thus providing another source of labour supply. In these circumstances, I do not think there need be any fear as to the sufficiency of population, but I am glad to see that Mr. Schmidt advises caution and a gradual advance, accompanied by educational experiments.

Although Mr. Schmidt's report is entirely concerned with the question of cotton production, it will not be amiss to remind its readers that any stimulus applied to cotton cultivation will strengthen other forms of production and lead to fresh openings for industrial activity, some of which, by their close association with the production of cotton, will re-act on that industry to its benefit.

For instance, the Sudan is a great pastoral country, with inexhaustible supplies of live stock, which are only now beginning to be exported. There is no need to expatiate on the inter-dependence of agriculture and the raising of cattle and sheep. The possession of flocks and herds will be of invaluable assistance in the development of the Gezira and other cotton areas.

Grain and oil seeds are already staple exports, and the conditions of their production are so closely knit with that of cotton that these crops must inevitably respond to the same impetus and advance with equal strides.

Last, but not least, is a fact of primary importance, viz., the admirable strategic position of the Sudan as regards markets for its produce. Although Mr. Schmidt rightly draws attention to this point, it is one upon which I should like to lay stress. Port Sudan lies half-way between Europe and India, within a few miles of one of the greatest of the world's highways of commerce. It is contiguous to the markets of the Arabian coast, and in close proximity to those of the Near East, while already first-rate steamship lines connect it with the ports of the East Coast of Africa, India, and the Far East. The northern frontier of the Sudan is co-terminus with Egypt with its population of 12 millions. The railway to El Obeid leads to the threshold of vast territories in the interior, while the White Nile and the Sobat enable commerce to be exchanged at Gambela with some of the richest territories of Abyssinia.

The publication of this report is peculiarly opportune, in view of the recent announcement of the Prime Minister of the United Kingdom as to the financial guarantees for the development of cotton cultivation in the Sudan, and it must be a matter of great satisfaction to all those who have devoted their time and energies to initiating and furthering this proposition to find that the sympathetic interest they have displayed in this country has helped to lay the foundation of an industry which will one day prove of universal benefit to the cotton world.

I trust that Mr. Schmidt's report will receive the attention which it fully deserves, not only from its intrinsic value as an unbiased statement of the case as regards the actual potential position of cotton growing in the Sudan, but also because the country as a whole cannot but benefit from intelligent and sympathetic criticism directed to the development of its manifold resources.

REGINALD WINGATE,
Lieutenant-General, Governor-General of the Sudan.

Khartoum, February 8th, 1913.

Cotton Growing in the Anglo-Egyptian Sudan

Report by Mr. ARNO SCHMIDT, Secretary of the International Federation of Master Cotton Spinners' and Manufacturers' Associations.

Introduction. Following the International Congress, held under the auspices of the International Federation of Master Cotton Spinners' and Manufacturers' Associations in Egypt, the Committee decided, at a meeting held at Cairo on November 6th, 1912, that I should pay a visit to the cotton-growing districts of the Anglo-Egyptian Sudan, specially with a view to ascertaining what the possibilities of that country are as regards the production of cotton.

I propose to give first an outline of the general conditions obtaining in the Anglo-Egyptian Sudan, and then to describe what I saw during my journey of inspection.

Geographical Notes. The Anglo-Egyptian Sudan extends from the 22° to the 5° northern latitude. The boundaries are: On the north, Egypt; on the east, the Red Sea, Eritrea, and Abyssinia; on the south, Uganda and the Belgian Congo; on the west, the French Sudan. The whole of the course of the White Nile and almost the entire Blue Nile are within the boundaries of the Anglo-Egyptian Sudan. Khartoum is the seat of the Government. The city of Khartoum has about 20,000 inhabitants, whilst Khartoum North has almost 40,000, and the neighbouring Omdurman 50,000. Wadi Halfa, on the Egyptian frontier, is the most northern town. Other towns of importance are Abu Hamed, Berber, Dongola, Wad Medani, Sennar (all along the Nile), El Obeid (the present terminus of the railway), Kodok, Mongalla, Gondokoro in the extreme south of the country, Kassala on the boundary of Eritrea, Port Sudan and Suakin on the Red Sea, and Tokar, about 50 miles south of Suakin.

The rivers and districts which are of importance as regards cotton growing are the Blue Nile, from which the water is supplied for the Gezira district; the Nile proper, for the cotton plantations northwards of Khartoum; the river Baraka, which waters the Tokar district; and the river Gash, whose floods are of the greatest utility to the Kassala district. The width of the river Nile at Khartoum is 1,700ft.

The area of the Anglo-Egyptian Sudan is about 1 million square miles. North Sudan has very little rainfall indeed, the climate there being almost identical with that of the south of Egypt. As we go further south the rainfall increases, and

south of the Gezira we have as much as 23in. of rainfall during the year. The accompanying map indicates the rainfall. Along the Red Sea the rainfall is considerable, and the atmosphere is consequently damp, whilst Khartoum, the Gezira, and the Berber districts possess mostly a very dry atmosphere.

The country is divided into the following provinces: Halfa, Dongola, Berber, Red Sea Province, Kassala, Khartoum, Blue Nile Province, White Nile Province, Sennar, Kordofan, Upper Nile Province (formerly called Fashoda), Mongolla, and Bahr El Ghazal.

The population was estimated last year to be 3,000,000, but an exact census has never been taken. Before the outbreak of Mahdism the country was supposed to have had 10 million inhabitants, but this figure is probably somewhat exaggerated.

Owing to the comparative prosperity and security which the country has enjoyed during the last few years, there is no doubt the

Children at Tokar.

population is increasing very rapidly. It must also be borne in mind that as the water from the Blue Nile is not allowed to be utilised from March 1st to July 15th, so as not to interfere with the Egyptian water supply, there is that period of the year in which no crops can be grown in the Sudan, and that these months must be used for the preparation of the fields for the coming crop. This is different from the case in Egypt, where crops are grown all the year through, and where, in consequence, the labour requirements are much greater.

Some people maintain that the population of the Sudan would not be sufficient to work cotton plantations on a large scale. From my own observations, and from the statements of high officials who are constantly travelling through the Sudan, I know that there is an abundant number of boys and girls between the ages of 12 and 14 to be found in every village, and consequently

time (that is, when Sir Wm. Garstin's scheme will at its earliest come into operation) the population of the Sudan will have increased very considerably. There is no doubt that the present generation is very robust, and that owing to the hardships suffered during those terrible years of the Khalifa's rule only the fittest have survived.

History; and Financial Relations between Egypt and the Sudan.

Prof. John A. Todd, in his book on "Political Economy for Egyptian Students," under this heading, says:—

"Since its first conquest for Egypt in the reign of Mohammed Aly (1820) the Sudan has been a source of little profit and great anxiety to Egypt. Only within the last few years has there been any diminution in the outlay such as might give some hope of ultimate financial independence.

The motives which first led Mohammed Aly to send his sons Ismail and Ibrahim to conquer the Sudan are variously stated. It was certain that the country possessed a considerable caravan trade which Mohammed Aly desired to get into his own hands, as he had already done with many of the industries of Egypt. It was also believed that the country contained gold. On the other hand, the reports of the anarchy and misrule which prevailed in the country, and the desire to introduce civilisation on the upper reaches of the Nile, may well have weighed with him, for Mohammed Aly had broad views of the future of Egypt, and realised, probably as well as it has ever been realised since, the common interest of all the territories which lay in the valley of the Nile. It is probable that he had also in view the possibilities of the Sudan as a recruiting ground for his new armies.

The campaign, in spite of the horrible death of Ismail, was successful in its first object. The building of Khartoum was begun in 1823, and the whole country came under the rule of Egypt. That rule, however, was little more than nominal, and the chief result of the opening up of the country was the development of the slave trade. This became so bad that in 1838 Mohammed Aly, moved by the reports of Bowring and others, paid a flying visit to the Sudan, but without any very practical results. Said Pasha also visited the country in 1857, but was so disgusted with the state of the country that he was only with difficulty dissuaded from abandoning it altogether. The reforms which he instituted were soon forgotten.

The area originally conquered was added to from time to time. In 1866 the Khedive Ismail succeeded in obtaining a grant from the Porte of Massowah and Suakin. In 1869 he sent Sir Samuel Baker on an expedition, which was practically one of conquest as well as discovery, to the sources of the Nile, resulting in the annexation of the Equatorial province. It was not until 1874, however, that Ismail made any serious attempt to remedy the abuses which had made the Egyptian Government of the Sudan utterly profitless alike to both countries.

In 1876 Ismail found himself involved in a war with Abyssinia over a question of disputed boundaries between that country and the Sudan, which cost Egypt considerably over £1,000,000 sterling.

In 1877 General Gordon, who had previously been Governor of the Equatorial province, was appointed Governor-General of the Sudan, and during his three years of office he not only practically stopped the slave trade, but succeeded for the first time in its history since 1820 in making the revenue of the country meet its expenditure and even yield a small surplus. On his withdrawal, however, in 1880 the country quickly relapsed into its old state. By 1882 the outbreak of Mahdism had reached such threatening proportions that the Government of Egypt was compelled to take steps to defend its hold on the country. The ill-fated expedition of Hicks Pasha from Khartoum in 1883 was the first of a series which not only cost Egypt large sums of money, but soon proved her inability to hold the Sudan against the revolt. The rout of another army under Baker Pasha near Tokar left them no alternative but to abandon the Sudan. How that was done is a matter of history: the actual cost of the campaign to Egypt was over £2,000,000 sterling.

From 1885 to 1898 the cost of the Sudan to Egypt was mainly in the first place defensive, and then preparation for the final reconquest, which was completed in 1898. The total cost of the re-conquest was nearly £2,500,000, of which Great Britain paid £750,000, while of the balance nearly £1,250,000 was represented by works of permanent value, especially railways and telegraphs. Since 1899 the drain on the Egyptian finances has not materially lessened until of recent years, but the application of the money has been very different, and likely to lead to much more satisfactory results. The following table gives an idea of the total amount of the expenditure since 1899:—

Year.	Annual Subsidy.			Special Expenditure.
	Civil.	Military.	Total.	
	£E.	£E.	£E.	£E.
1899	—	—	422,068	—
1900	134,317	282,862	417,179	—
1901	194,545	222,634	417,179	121,352
1902	267,173	122,548	389,721	142,832
1903	196,063	193,658	389,721	129,110
1904	193,850	185,913	379,763	621,863
1905	193,006	186,757	379,763	750,213
1906	253,006	126,757	379,763	698,640
1907	253,006	126,757	379,763	921,598
1908	253,006*	126,757	379,763	637,768
1909	208,000	127,000	335,000	645,200
1910	198,000	127,000	325,000	518,866
1911	188,000	172,000	360,000	132,510
1912	163,000	172,000	335,000	
1913	85,000	172,000	257,000	

£E. (Egyptian pound) = £1. 0s. 6d. sterling.
* Including £.E45,600 of interest repaid.

Against the amount of the annual subsidy, however, there are certain items of profit or gain to Egypt from the Sudan.

In the first place no customs dues are levied upon goods passing into the Sudan from Egypt, so that the customs revenue from such goods already paid on their entry into Egypt goes to the Egyptian Government. The probable amount is stated for the year 1908 as £87,500.

Egypt supplies the whole of the silver coinage used in the Sudan, and from this she derives a seigniorage which is estimated at an average of £.E.35,000 per annum.

The Government of the Sudan has taken over certain services which were formerly paid for by the Egyptian Government, viz., the administration of the province of Suakin and the maintenance of schools at Suakin and Wady Halfa. This is said to be equivalent to a relief of £25,000 per annum.

In addition to the items above mentioned, there is a considerable advantage to Egypt derived from its trade with the Sudan. Of this the only item which is measurable is the profit of the railway, post-office, and telegraph services. These have been estimated as follows for the year 1908 :—

Railways—Total traffic estimated at £.E.66,700, less cost of administration, 60 per cent.	£26,680
Posts and Telegraphs—Total traffic estimated at £.E.12,500, less cost of administration, 92 per cent. ..	1,000
	£27,680

These figures are probably higher by now.

But, above all these considerations, the main recompense to Egypt in the possession of the Sudan is of a negative character. Since 1898 Egypt has been relieved of the dread of invasion from the Sudan, and of the consequent cost of the maintenance of a large army on the Sudan frontier. Further, the water supply of Egypt is secured from all danger of attack at the source. For these reasons alone the payments made by Egypt to the Sudan have been money well spent, though it is hoped that, as the development of the country proceeds, the improved finances of the Sudan may make it possible to treat these payments really as advances and to repay them."

Great Britain holds the Anglo-Egyptian Sudan in partnership with Egypt, but so far Great Britain has not contributed any funds towards the development of this country, beyond paying towards the wars against the Mahdi, and these financial contributions and the loss of British blood on the battle-fields were necessary as a vindication of the British prestige in Africa. Considering the heavy financial assistance given by Egypt, I venture to express the opinion that the time has now come when Great Britain should do her share in the development of the cotton-growing area of the Sudan by providing irrigation works and railway connections between the cotton districts and Port Sudan. Unless Great Britain comes forward with funds towards the development of the country there will be stagnation and retrogression, because it is evident that Egypt requires all her money for the development of additional cotton land. I have heard it stated by responsible residents in the Sudan that unless

British capital is invested under British Government guarantee, Great Britain will hardly have a moral claim to her position in the Sudan.* From the proceedings published recently of the Egyptian Legislative Council, it is evident that the contributions to Egypt are to be curtailed from year to year. It is true that the Sudan is to receive, according to the latest decision, the amount collected by the Egyptian custom-house on goods entering Egypt at Port Said and Alexandria destined for the Sudan (about £85,000). It is obvious that it will be to the advantage of the Sudan Government to have the total customs' receipts at their disposal, because they offer a very advantageous form of guarantee for any loan which the Government may wish to raise.

The Note by the Financial Adviser on the Egyptian Budget of 1913 contains, with regard to the Sudan Subvention, the following paragraph, which may be of interest :—

"The Sudan has hitherto figured in the Budget for the amount of two subventions, one for civil, the other for military expenditure.

"The amount of the subvention for civil purposes in the Budget of 1912 was £.E.163,000, having been gradually reduced to that figure from the amount of £.E.253,000, at which it stood in 1908. For 1913 it has been found possible entirely to do away with the subvention. On the other hand, the Egyptian customs will no longer take the duties on goods imported through Egypt into the Sudan. These duties are estimated at present at £.E.85,000, so that there is a real gain in 1913 to the Egyptian revenue by this arrangement of some £.E.78,000.

"The military subvention represents a portion of the cost of the Egyptian Army, and has only figured as Sudan subvention in order to bring out the fact that a part of Egyptian military expenditure is really chargeable to the Sudan. It has been recognised, however, that this method of accounting is complicated, and is subject to misapprehension. It has therefore been decided to place, from 1913 onwards, the whole of Egyptian military expenditure under the proper head, and to show the subvention no longer. This arrangement is a mere change in accounting, and is not intended to obscure the fact that a part of the expenditure is chargeable to the Sudan, of which due account will continue to be taken.

"It must be understood generally that the financial obligations of the Sudan to Egypt will not be altered in any respect by any of the above-mentioned changes."

According to the existing methods of keeping accounts in the Sudan, one may say that the Sudan is almost self-supporting, as the receipts for 1911 amounted to £.E.1,304,900, whilst the expenditure was £.E.1,347,900, leaving a deficit of only £.E.43,000.

The following table of the amounts realised from the main sources of revenue in 1911, as compared with the actual receipts of the four previous years, shows the extent of development which has taken place :—

*This report was written before the Prime Minister promised to a Deputation, (January 23rd, 1913) that the British Government would shortly introduce a Bill with the object of guaranteeing a loan of £3,000,000, to be raised by the Sudan Government.

Classification.	Receipts.				
	1907	1908	1909	1910	1911
	£E.	£E.	£E.	£E.	£E.
(*a*) Provinces :—					
Land Tax :—					
(*a*) Taxed land	59,510	55,857	61,632	58,283	62,900
(*b*) Ushur	49,071	42,977	60,759	77,854	79,000
Date tax	16,659	18,986	18,512	19,284	19,460
Animal tax	27,228	28,003	36,325	51,663	59,580
Tribute from nomad tribes	19,074	19,192	19,338	21,814	23,750
Royalties	39,634	40,798	47,698	51,152	51,450
Timber and firewood	26,160	29,754	28,036	30,931	29,760
Miscellaneous	51,974	57,589	62,466	63,105	70,000
Total	289,310	293,156	334,766	374,066	395,900
(*b*) Departments and Services :—					
Customs	87,749	69,893	64,347	70,132	98,600
Steamers	126,711	126,857	130,806	147,252	154,000
Post and telegraphs	45,023	47,295	46,833	52,726	59,000
Railways	303,823	323,476	336,726	391,301	442,000
Agriculture and forests	7,699	3,436	3,047	3,042	3,300
Legal	19,983	8,437	9,531	7,756	9,100
General central services	17,341	21,655	22,688	19,571	21,500
Other depts. and services	25,991	30,628	33,564	39,027	47,500
Total	923,630	924,833	982,302	1,104,873	1,230,900
(*c*) Local Provincial Services	52,343	54,510	60,297	66,134	74,000
Grand Total	975,973	979,343	1,042,599	1,171,007	1,304,900

The land tax is a sure index of the state of agriculture, and the following table indicates strikingly the growth that has taken place in this direction :—

Year.	Land Tax.		
	Taxed Land.	Ushur.	Total.
	£E.	£E.	£E.
1899	22,000	—	22,000
1900	23,100	19,600	42,700
1901	28,300	22,400	50,700
1902	33,700	10,800	44,500
1903	37,800	29,300	67,100
1904	46,200	31,100	77,300
1905	49,000	30,400	79,400
1906	55,500	50,800	106,300
1907	59,500	49,100	108,600
1908	55,800	43,000	98,800
1909	61,600	60,800	122,400
1910	58,300	77,800	136,100
1911	62,900	79,000	141,900

It must be pointed out that the revenue derived from the land tax, viz., from land irrigable by artificial means or by the rise of the rivers, on which a land tax is imposed, and from land irrigable by the rainfall, on which a tax equivalent to 10 per cent. of the value of the crops assessed is levied (the latter tax is called "Ushur") is the largest on record in both cases for 1911.

The following is an approximate statement of the areas of land cultivated during 1911, as compared with the previous year, showing the method of irrigation employed:—

	1910	1911
1. Irrigable by artificial means:—	Feddans.	Feddans.
(*a*) From the river	105,734	102,967
(*b*) From wells or storage tanks	10,280	10,267
2. Irrigable by natural agency:—		
(*a*) By flood or rise of river	122,268	129,526
(*b*) By rain	1,724,870	1,458,560

There is every prospect of further improving the system of land taxation, especially in regard to Ushur.

Royalties to the amount of 15 per cent. ad valorem are levied on gum and ivory exported, and to the amount of 20 per cent. ad valorem on ostrich feathers.

There is an *Export duty* on all goods exported of 1 per cent., which merely covers the statistical expenses.

The *Import duties* are exactly the same as in Egypt, viz., 8 per cent. ad valorem on practically everything except tobacco; fuel, oil, building materials, and cattle pay only 4 per cent.

One hears it frequently stated that the Sudan Government intends to introduce an income-tax in order that those firms and persons who do not pay any other direct taxes should be made to contribute towards the upkeep of the State.

Railways. The Sudan Government Railway has 1,500 miles of open line, and the traffic generally is increasing, both in passengers and goods. I learn from the accounts of the Railway Department that an annual profit is already being made. Travelling on the main lines is quite as comfortable as in England, although the fares are somewhat high. The Railway Department is one of the Government Departments which will at once feel the benefit from the works of development that are bound to be undertaken in the near future in the Sudan. This benefit will gradually be felt over the whole country.

Nile Navigation. The Sudan Government owns steamers on the Bahr-el-Ghazel, Bahr-el-Gebel, and on the Blue and White Niles.

Trade. An extract from the Report of the Finance Administration on the condition of the Sudan for the first nine months of 1911 says, with regard to trade: "The general situation of trade and the advance which has been

made since the last report on this subject are fairly well indicated by the value of the external commerce of the country, which, including specie, has increased this year by no less than 42 per cent., or £.E.980,778, namely, from £.E.2,299,771 to £.E.3,280,549. If trade maintains the same rate during the last quarter of this year as in the same period of 1910, the value of the external trade of the country for the complete year should be well over £.E.4,000,000, as compared with £.E.3,113,561 last year. There have been exported this year, taking round figures, 3,600 tons more cotton (lint and seed), 22,000 more sheep, 13,000 more cattle, 86,000 more skins, 780 tons more sesame, 770 tons more dates, 220 tons more ground-nuts, 2,300 tons more dom nuts, and 870 tons more gum. The export of gum was 13,929 tons, and of cotton (lint and seed) 12,300 tons."

The following table, showing the values of external trade of the Sudan, will be of interest :—

GENERAL STATEMENT OF VALUES OF THE EXTERNAL TRADE OF THE SUDAN DURING THE YEARS 1907—1908—1909—1910—1911.

Years.	IMPORTS.		Merchandise in Transit "Inwards"	EXPORTS	RE-EXPORTS	Merchandise in Transit "Outwards"	Specie Movements
	Public	Government					
	£E.	£E.	£E.	£E.	£E.	£E.	£E.
1911	1,508,974	764,975	22,723	1,376,958	74,894	31,002	357,705
1910	1,223,915	727,511	16,092	977,621	57,958	30,336	126,128
1909	1,119,072	656,885	6,913	673,902	60,941	23,709	44,158
1908	1,183,054	709,744	3,623	515,938	37,079	29,285	60,172
1907	916,243	687,894	10,281	449,329	49,015	22,242	102,361

The principal exports are gum, cotton, maize, cattle, ivory, hides, dates, sesame, senna, and gold.

The total importation of cotton fabrics during 1911 was 4,369,542 kg., representing the value of £.E.580,697. The major portion of these had been imported viâ Egypt, viz., £282,050. Great Britain had exported direct £191,427 sterling (a large portion of cotton goods imported viâ Egypt are of British origin), India £60,161, Italy £44,533, Eritrea £1,396, United States £394, Belgium £127, Germany £99, France £54, Austria £27, other countries £429.

The following figures, which are taken from the third quarterly statement of 1912 of the Customs Department about the foreign trade of the Sudan, show a less favourable situation :—

The total value of imports from July 1st to September 30th, 1912, amounted to £.E.458,671, as compared with £.E.477,232 in the third quarter of 1911. There is thus a decline in imports of £.E.18,561, or slightly less than 4 per cent. The imports during the three first quarters of the year amounted in value to £.E.1,480,611, as compared with £.E.1,709,193 during the same period of 1911, a decline of £.E.219,582, or about 12·8 per cent.

The exports also show a decline from 1911. During the third quarter of the present year they are valued at £.E.214,503, while

in the third quarter of 1911 they amounted to £.E.292,069. There is, therefore, this year a decrease of £.E.77,566, or nearly 26·6 per cent. The total exports from January 1st to September 30th, 1912, amounted to £.E.1,116,285, while the exports during the corresponding period of 1911 amounted to £.E.1,202,840. This shows a decrease of £.E.86,555, or about 7·2 per cent.

In spite of this general decrease, however, the "Sudan Times" states that the trade of the country is not on the decline. A careful perusal of the report enables one to trace the decrease to its proper causes, and the fact is revealed that, whereas the exports of certain Sudan products have decreased during the present year, others have increased, notably gum, the exports of which in 1912 thus far exceed those of 1911 by about 32 per cent. The articles which have suffered a decrease are those which have been directly affected by the comparative scarcity of rain. These are cotton and dura principally. Cattle exports have also decreased owing to the outbreak of cattle diseases at one time or another in various parts of the country. The causes of the decrease are therefore only temporary and do not indicate any tendency downwards in the commercial development of the country.

As for the imports, the big drop of over £.E.200,000 should give no cause for alarm. Two items alone account for it, i.e., timber and manufactured iron and steel. There was a good deal of construction work done last year, mostly by the Government, and hardly anything done this year, and this accounts for the important decrease in these two items. Cotton fabric imports, however, show a great fall likewise. But those who are acquainted with trade conditions in the Sudan know how intimately connected with each other are the dura crop and the Manchester goods trade, so that it is not a matter of surprise for them to find that the latter has decreased owing to the failure of the former.

Central Economic Board.

The Sudan Government constituted in 1906 the Central Economic Board, whose head-quarters are at Khartoum. The functions of the body are merely consultative. It considers, investigates, and reports upon questions relating to economic and commercial products and development, which may be referred by the Government generally or initiated by individual members. The Board has no executive authority. The Secretary, in addition to his immediate duties under the Board, acts as commercial intelligence officer of the Government. Any information of interest and importance in its bearing on the economic and commercial development of the country should be forwarded to him. Interesting monthly and annual reports are published by the Economic Board.

The present Board consists of :—

President :

Colonel E. E. Bernard, C.M.G., *Financial Secretary.*

Members:

Lieutenant-Colonel P. R. Phipps	*Civil Secretary.*
Major E. B. Wilkinson	*Director, Agriculture and Forests.*
Mr. J. Currie	*Director of Education.*
Mr. P. M. Tottenham	*Inspector-General, Sudan Irrigation Service.*
Major W. Hayes Sadler	*Director of Customs.*
Captain E. C. Midwinter, C.B., C.M.G., D.S.O.	*General Manager, Sudan Government Railways.*
Dr. A. Balfour	*Director, Wellcome Tropical Research Laboratories.*

Additional Member:

Dr. W. Beam	*Research Chemist, do.*

Secretary, Mr. H. P. Hewins.

This Board has proved to be of invaluable service in the development of the Sudan. Cotton production is one of the subjects which interests this body.

Department of Agriculture and Forests.

This Department, under the able directorship of Major E. B. Wilkinson, attends primarily to the cultivation of cotton. According to the Director's Report for 1911, the Department suffers greatly from being under-staffed. The agricultural development has been very extensive during the last six years, and as a direct result of the expansion of the railway system new and extensive areas of great fertility have been tapped. The quantity of produce that can be grown in the near future in these newly-opened-up districts is enormous, but the inhabitants there require education in order to enable them to get the best value out of their land. This education can only be imparted by means of a larger staff of experts in each particular district. If the Government intends to work some additional farms in the Gezira, it will be absolutely necessary to engage a number of agricultural experts who possess an extensive experience in handling natives.

Cotton Ordinance.

Great praise is due to the Department of Agriculture and to the various Governors of the respective cotton-growing Provinces who have elaborated the Sudan Cotton Ordinance of 1912, of which a full copy is given in Appendix II. This Ordinance regulates the importation of cotton seed; the supply of cotton seed by the Director of Agriculture; it provides for special licenses for ginning factories, and enables the Government Inspectors to visit the ginning factories; it insists upon the clean picking of cotton, the separation of cotton seed of different qualities, and gives special powers to the Governors of the Provinces to establish such regulations as may be requisite according to special local conditions. The Act also provides for the fencing of machinery, protection against fire, notice of accidents. If similar Acts were in existence in Egypt, India, and some of the African Colonies, we would hear less of the deterioration of quality and the other evils resulting from the mixing of seed in the ginneries.

Wellcome Tropical Research Laboratories.

These form part of the famous Gordon Memorial College, and their functions, besides the study of tropical hygiene, are the study of plant diseases and investigations in connection with agricultural products or operations, and consequently this institution assists the cotton-growing industry of the Sudan.

I may here mention that in paying a visit to the Gordon College I was highly pleased to see the skill with which the natives were working in the machine shop that has been provided by the generosity of Sir William Mather. It is most creditable to these native youths that they have been able to make in this machine shop the iron railing which extends in front of the Gordon College. I shall speak, later on, of the work carried out in connection with cotton under the Director of Education of the Sudan Government, Mr. James Currie, who is also the Principal of the Gordon Memorial College.

Transfer of Land to Europeans.

Owing to some extent to some sharp practices which had been adopted in former years by a number of Greeks to obtain land from the natives at prices considerably below the actual value, the Government of the Sudan has been forced to issue a law according to which a native cannot transfer his land to Europeans without the consent of the Governor.

Another very important reason for the adoption of this policy was that in the absence of land settlements it was impossible to be certain as to whom the land actually belonged, and it became necessary to forbid sales altogether without the sanction of the Governor, in order to prevent internal troubles and endless law-suits.

As I thought it is possible that some readers of this Report might consider the advisability of establishing a cotton plantation in the Sudan, I enquired from the legal Secretary of the Sudan Government, Mr. E. Bonham Carter, whether the Government would object to such an undertaking, and his reply is as follows :—

> "With regard to the purchase of land from natives by Europeans, the consent of the Governor would be influenced by the locality of the land proposed to be purchased, and the proposals of the purchaser as to development. The Government would regard with favour a well-considered proposal for bringing land under perennial irrigation."

In view of what one hears generally in the Sudan, that the Government wish the Sudan to be reserved for the Sudanese, I am enabled to say on the highest authority that the Government would not object to the establishment of further European cotton-growing companies, provided no advantage is taken of the natives, and that certain stipulations of the Government as to the amount of profit were fulfilled. Company promoters or syndicates intending to make large profits, perhaps with the help of Chinese labour, are certainly not wanted in the Sudan. On the other hand, if a company that would be satisfied with a modest return on its capital, and

would give guarantees of fair treatment to the native, were to approach the Government, I feel sure that satisfactory terms could be arranged.

COTTON CULTIVATION.

The cotton-growing districts of the Anglo-Egyptian Sudan are best dealt with in the following divisions:-

I.—Flood Irrigation.

Tokar, with a cultivated area of about 50,000 feddans, watered by the flood of the Khor Baraka. *Kassala*, with a cultivated area of 4,000 feddans, watered by the flood of the river Gash.

II.—The Gezira.

The Tayiba Test Farm, at present irrigated by pumps. The final schemes provide perennial irrigation by means of a barrage and canals.

III.—Pump Irrigation.

North of Khartoum, principal places, Zeidab, Fadlab, Darmali in the Berber Province, and several plantations in the neighbourhood of North Khartoum, viz., Kadro, Sagai, &c.

IV.—Rain-grown Cotton.

South of the Gezira, Singa, Renk, Mellut, and Kodok; some rain-grown cotton is raised in the Gezira.

I.—FLOOD IRRIGATION.

Tokar District.

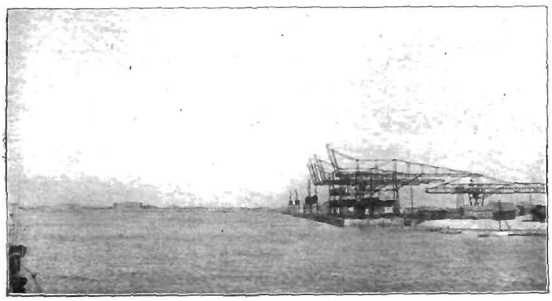
I travelled viâ Suez per Khedivial Mail Line to Port Sudan, a voyage which took about 65 hours. Port Sudan can boast of an up-to-date harbour, with electric cranes, six electric capstans, two coal berths, four coal transporters, which can deal with 300 tons of coal per hour. The quays have at present a length of 2,000ft., and the depth of water alongside is 30ft. at low water. Five large ships can be berthed at one time. A dockyard has been built and also a slipway. The entrance to the Port is over 1,000ft. wide, and the depth of the approach varies from 40ft. to 70ft. The quays, streets, and workshops are lighted by electricity. Port Sudan was opened by H.H. the Khedive as recently as 1909, and its streets and buildings are of quite a modern type. All the houses are built of a kind of coral, which is quarried in the plain to the west of the town. The whole of Port Sudan stands on a flat coral reef about 10ft. above sea-level, and as there is no soil deposit on the reef, great difficulty is being experienced in making gardens round the houses, the soil having to be brought in from long distances. A few shrubs are grown in this manner, and their green leaves form a bright contrast to the red roofs, covered with Marseilles tiles. Port Sudan is the only harbour on the Sudanese coast where vessels of any size can enter easily. Port Sudan is connected by rail with the main line, which was opened in 1906; the distance from Port Sudan to Atbara is 486 km. It is true this railway passes through a desert, from which little traffic can be expected, but the advantages of the port to the whole country are evident.

A recent Consular report states that the trade of the Sudan is now becoming a factor of some importance, and worth the attention of those interested in the development of this part of the African continent.

With the exception of cattle and dura passing to Egypt through Halfa by the Nile route and goods entering Suakin, about two-thirds of the imports and exports are through Port Sudan.

The value of imports viâ this port only has increased from £.E.642,661 in 1909 to £.E.1,356,457 in 1911. This includes imports for Government departments, the proportion being Government cargo 46 per cent., public 54 per cent.

Tokar is generally reached by camel from Suakin, a distance of 54 miles, but as camel-riding is very tiring to one unaccustomed to it, the Sirdar kindly placed at my disposal a steamer, which took me to Trinkitat, a very small port, at which only sailing vessels (called



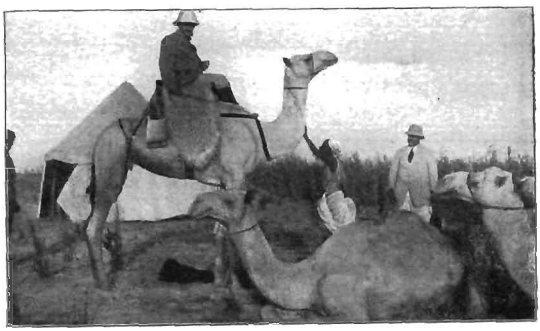
Port Sudan.

sambuks) can enter. The distance from here to Tokar is only 18 miles.

The Cotton Growing District of Tokar

is situated between 18·15° and 18·30° latitude. Its water supply comes from Abyssinia, Eritrea, and part from the Kassala Province. The principal river is the Khor Baraka. "Khor" means a river bed, which is dry during certain seasons; "Baraka" means blessing. The river reaches the sea only during flood times, when, unfortunately, a great deal of water runs annually to waste, and although efforts are made by means of temporary guiding banks to stop this waste, the want of adequate funds hitherto has always prevented the Government from undertaking permanent works to confine the waters. The rainfall is about 6in. in the year, and this takes place towards the end of October, November, and beginning of December. The rain which falls during June in Abyssinia and Eritrea runs down the mountains, and carries with it a very large amount of silt and vegetable matter. The river Baraka is in flood from about July until September.

The maximum flow is more or less between the 15th July and the 15th August. When there is a late flush in the flood, second sowings are frequently necessary, as the first sowings are generally washed out in such cases. It has been ascertained that the silt deposit on the lower points of the delta, around Tokar, is in places 40ft. deep. These floods carry the crop to the rainy season, which, as stated above, may begin towards the end of October. The only additional moisture which the plants receive is from the heavy dews, which set in about the middle of September. The air generally is humid. Throughout the winter months there are many cloudy days. The Khor Baraka has a habit of flowing into different districts from year to year, and this alteration of its course is an enormous drawback, as the cultivators, not knowing whether the flood will come on their land, seldom prepare it



The Secretary on his Tour of Inspection.

in advance for cultivation. As the farmers are never sure whether the flood will reach certain lands, they are careless, and refrain from preparing for the flood, *i.e.*, they do not weed or hoe the ground. It has been proved by the Inspector of Agriculture on the Government farm at Tokar that hoeing or fassing, as it is generally called in Egypt and the Sudan, prior to the flood, gives increased yields. The uncertainty of the river reaching the land makes the cultivation an element of chance. Attempts in a small way at directing the flood into certain courses have been fairly successful. There has been elaborated a flood-controlling scheme, whereby an area of at least 70,000 or even 80,000 feddans will be flooded sufficiently every year.

Sand Storms. From the middle of June to the 12th September, which is the period for preparing and sowing the cotton, sand storms (called haboobs) hinder the work. These sand storms are at times terrific, clouds of sand

darken the sky, and the wind drives the sand into every nook and crevice.

A few weeds allowed to grow may often be the cause of the formation of a sandhill during these storms. The fine sand is driven like snow, settles at any obstacle, and gradually a sandbank is formed, where before the storm there was only a weed. Any unevenness in the surface is, of course, a great drawback at the time of the flood, if the water does not cover it.

Land Taxes. The land in the Tokar district is owned by the Government, which hires it out on a yearly tenancy, the native paying in lieu of rent the following land taxes :—

	Strangers	Residents, natives of the district.
On first-class land.....	80 piastres.	60 piastres per feddan.
On second-class land ...	60 ,,	50 ,, ,,
On third-class land	40 ,,	30 ,, ,,

Plus 1 piastre for school tax and 1 piastre for watchmen.

The Area under Cultivation. This depends entirely on the extent of the flood. The following is a table taken from a Government publication :—

Years.	Total area cultivated	Area Cotton	Area other crops	Total area taxed	Revenue per feddan	Total Revenue	Cotton crop Kantars*
					m/m	£E.	
1891–1892	8,749	2,507	6,242	—	—	—	—
1892–1893	10,000	709	9,291	—	—	—	—
1893–1894	150	Nil	150	—	—	—	—
1894–1895	2,000	100?	1,900?	—	—	—	—
1895–1896	6,000	?	?	—	—	—	—
1896–1897	9,000	427	8,573	—	—	—	—
1897–1898	2,897	?	?	—	—	—	—
1898–1899	4,000	?	?	—	—	—	—
1899–1900	1,994	?	?	—	—	—	—
1900–1901	19,068	2,259	16,809	—	—	2,349	—
1901–1902	13,269	1,030	12,239	—	—	702	—
1902–1903	14,610	2,867	11,743	—	—	2,077	—
1903–1904	18,456	7,425	11,031	15,432	156	2,408	—
1904–1905	39,671	15,046	24,625	27,302	213	5,833	47,435
1905–1906	33,492	8,230	25,262	20,505	257	5,284	42,156
1906–1907	36,332	17,707	18,625	32,080	261	8,397	65,956
1907–1908	50,647	22,225	28,422	37,574	284	10,657	90,032
1908–1909	28,292	21,095	7,197	15,971	303	4,843	52,992
1909–1910	45,324	35,324	10,000	28,166	411	11,589	98,625
1910–1911	53,568	47,010	6,558	44,156	420	18,547	155,180
1911–1912	43,923	43,143	780	30,661	495	14,905	112,000

* These are ordinary kantars of about 100lbs. seed cotton, giving about one-third of lint. It is a pity that Tokar people persist in speaking of small kantars whilst all over Egypt, at Zeidab and Tayiba, large kantars of 315lbs. seed cotton are understood when speaking of seed cotton.

This table shows that the taxation, and consequently the cultivation, have considerably increased. The year 1911-12 was a year of very small flood, during which a great deal of the flood water has run to waste.

In fixing the land taxes, the Government may be said to be guided by the Mosaic law in that one-tenth of the crop should be paid to the Government, and the figures given for the three classes of land represent more or less that proportion.

As the land belongs to the Government, it is in the power of the officials to take away or reduce after the year's lease any holding which is not properly cultivated. This is a powerful weapon in the hands of the officials, who have strict instructions to mete out as fair treatment as possible; it certainly is an incitement to the native to work. Cotton is the recognised staple crop of the district, and I have been shown a field on which cotton for 14 consecutive years has been grown successfully. This was possible only in consequence of the heavy silt deposits brought down by the Baraka.

Seed. Only Afifi cotton is grown by the natives in the Red Sea Province, and the seed is supplied to them yearly by the Government, which so far obtains a fresh supply every year from the Alexandria merchants. It will undoubtedly prove to be an advantage to use in future selected seed from the Government farm at Tokar, as this will have become acclimatised. A Government seed farm is very much needed at Tokar.

Preparation of the Soil. During recent years, since the Government has interested itself in the cultivation of cotton, some of the natives have began to hoe the land before sowing, but most of them do not loosen the soil at all. During 1912 a small area was ploughed for the first time, and the experiments carried out by the Department of Agriculture at their experimental farm at Tokar have proved conclusively that the preparation of the soil is most profitable. One can, of course, understand that a native tenant will be averse to spending money on this work when he is uncertain whether the flood will pass over his land or not. For the same reason the Government officials cannot force him to undertake the work. The statement in a recent Government report that there is a distinct advance noticeable among the cultivators towards improved methods of cultivation is undoubtedly reassuring. The report says that sowing is now carried on more regularly, and thinning out is attempted by several of them, but the cleaning of the ground is still largely neglected.

Sowing. As soon as the surface of the soil after the flood becomes dry enough, *i.e.*, during August/September, sowing operations begin. The implement used is something like a long dibber (called in Arabic "Seluka"). See page 56. This dibber lifts up a large clod of the surface and makes a hole in the damp soil in which the seed is dropped. The Government officials recommend that five to six seeds should be put in each hole, but the general practice is that more seeds are used. The distance in planting seems to me very wide indeed. Generally, the sowing seems to be done in a haphazard way. Perhaps on an average the distance is 1 m. from plant to plant, but in many fields the distance is considerably greater. The rows in which the seed

is sown are not straight. All the seed is sown on the flat. Hoeing is only done for the purpose of weeding; where land is clear of weeds no loosening of the soil is carried out. The Government officials strongly recommend hoeing, as during the dry weather pretty large cracks come into the soil and cause evaporation.

Picking. Picking commences at the end of December, and continues until May. Every field is picked over weekly, and no distinction is made as regards first, second, and third pickings, as is done in Egypt. Each field is picked over every third or fourth day, as otherwise a great deal of the cotton falls to the ground owing to heavy winds. The strength of the Tokar cotton deteriorates as the period of picking advances: the early months' pickings are the best, whilst the cotton picked in May is very weak. The pickers are mostly women and children and casual labourers, such as pilgrims from the West Coast and the centre of Africa, who are on their way to Mecca. There are at all times of the year a great many of these pilgrims to be found, and without them there would certainly be a scarcity of labour in the district. It may be mentioned here that some of these pilgrims come from as far as Kano and Sokoto, and take from five to six years for their return journey. Time is no object to them, and they frequently stop for a year or so in the neighbourhood of Tokar. The pickers are generally paid by share. In the beginning of the season they receive one-eighth, towards the end one-sixth, and this proportion is gradually increased until at the very end the tenant must pay one-half the quantity picked in lieu of wages. The Government Farm pays its pickers about 3 piastres for a daily quantity of about 40lbs. The Government insists upon clean picking, even in the fields of the natives, and a special staff of watchmen is kept to see that the regulation as regards cotton picking, as contained in the Cotton Ordinance, is enforced.

Quality and Yield. The average yield of cotton per feddan is very small, viz., about 400lbs. seed-cotton giving about 31·5 per cent. of lint. The quality is very strong indeed, and the colour of the cotton is likewise satisfactory. Owing to the unsatisfactory method of cultivation, the yield is small and the staple is somewhat irregular. That the yield can be increased has been proved by a Greek farmer, who had last year an average crop of 700lbs. seed-cotton per feddan. This was entirely due to slightly better cultivation than the natives adopted; even on this plantation, no ploughing or preparing of the land prior to the flood was undertaken.

A Government Report on the Tokar season, 1911-12, states: The quality on the whole was better than last year, as the seed was very good, and great care had been exercised in the picking. The mixing of various grades in the ginning lowered the price, but some lots sold better than F.G.F. contract, whilst prices are consistently superior to those of Upper Egypt and F.G.F. spot. Messrs. Wolstenholme & Holland have valued samples at 10¾d. per lb., when Egyptian F.G.F. was 10¼d.

There are stringent orders given as to the cleaning out of ***hindi,*** and I detected very few pure hindi, but a good many crosses.

Classing. All the cotton of the district must pass into the Government cotton market at Tokar, where a Government classifier grades the arrivals into four different classes. Special attention is paid in the grading to uniformity and to cleanliness. All the cotton, after it has been duly graded, is sold by auction. The buyers are mostly local merchants who are often agents of larger firms in Suakin. For the last two seasons several representatives of Alexandria houses were present at these auction sales. I was told in Alexandria that these, in order not to run up prices unduly against each other, *came* to an arrangement that on certain days one would buy *and the others retrain from bidding. No cotton is allowed* to leave the cotton market until it is branded with the grade and the bales duly sealed. According to the new Cotton Ordinance, no mixing of the different grades is allowed, the intention being to establish a reputation for Tokar cotton. As, however, several Alexandria firms buy the cotton on the spot and have it ginned, partly in Egypt and partly in Suakin, it is evident that the good intentions of the Sudan Government are frustrated by their action. The owner of the ginnery at Suakin told me repeatedly that the Alexandria houses insist upon mixing the grades. The cotton ordinance will have, however, that advantage that each class must be *ginned separately, and therefore the seed of the first-grade cotton,* which must be kept apart, should be useful for sowing purposes. *No cotton is allowed to leave the Sudan in an unginned condition,* except by land to Abyssinia and Eritrea, and it may be worth considering whether the Government ought not to compel the ginner to *bale* each grade separately; perhaps by that time the direct shipments of Tokar cotton to England will have increased. The difference in price obtained by some growers for the various grades impressed the natives, and inclined them to more careful cultivation, and especially to clean picking and to keeping different pickings apart. The *innovation of having a grader at these local cotton markets* is for that reason alone worth a great deal of money, and I cannot help but hold up the example of Tokar to Egypt, and especially to India, where these cotton markets have been in existence for a long time. The Cotton Ordinance of the Sudan is another instrument which will have a powerful influence in establishing a good reputation for the Sudanese cotton, although cotton merchants and ginners will probably find fault with it.

Transport. The whole of the cotton crop, amounting to some 7,000 tons, is transported from the market at Tokar to Trinkitat, thence by "sambuks" (sailing boats) to Suakin. The normal cost of this transport, including the double handling involved, amounts to at least £.E.1 per ton, and in the height of the cotton season, when there may be a scarcity of camels, this amount is probably considerably higher. It must, of course, be apparent that this enormous cost of transport is a very serious *handicap to the development of the cotton-growing area of Tokar.*

There cannot be the least doubt that railway communication from Suakin to Tokar is of primary necessity. The above estimate of transport expenses of cotton to Suakin has been taken from the Note on Tokar, published by the Government in 1913, and if one considers that the area of cultivation may be increased shortly, this outlay may reach the figure of £10,000 per annum. I have discussed the question of constructing this railway with Captain E. C. Midwinter, the General Manager of the Sudan Government Railways, and he estimates that the 50 miles of railway between Suakin and Tokar would cost at the rate of £3,000 per mile, if entirely new material were employed. This would bring the total cost to £150,000. It is, however, customary to construct railways, especially if they are to serve only periodical requirements, of second-hand rails. This was done, for instance, on the line from Khartoum to El Obeid. The cost of constructing the Tokar-Suakin line with second-hand material would certainly not be more than £2,000 per mile, but probably less. It is true that a considerable amount of bridging will be necessary. Wash-outs, which occur frequently after heavy rains, would temporarily make it impossible to use the line. This is the case at present on the line between Suakin and Port Sudan, but these wash-outs would occur before the period of the cotton crop. In view of the enormous traffic of pilgrims and of the quantity of food and other merchandise which the constantly-increasing town of Tokar and surroundings require, it is pretty certain that the railway would have important additional receipts besides cotton, but even cotton alone would pay 5 per cent. interest on the capital outlay of an entirely new railway line. It is quite safe to assume that the deterioration and cost of working would be paid through the passenger traffic. The "sambuk" traffic from Trinkitat to Suakin is most unsatisfactory, as at the time of the cotton season high seas are usual in the Red Sea, and the cotton frequently becomes wet. The journey usually takes 1½ to 2 days.

Insect Pests. White ants are doing a great deal of harm to the cotton crop by attacking the stems, and so far no insecticide seems to have been discovered for their destruction. The only remedy is supposed to be continual cultivation. Boll-worm is present to a small degree, but so far cotton worms have not been found.

Division of the Land. The whole cotton-growing land has been divided out into sections of 160 feddans; large poles indicate these demarcations. So far, 606 squares of 160 feddans each have been measured out, and these represent almost entirely cultivable land.

Cost of Cotton Farming. The cost of cotton farming at Tokar may be said to be £.E.1 per acre for manual work and 82 piastres for Government land tax on the best land, equalling altogether 182 piastres. The crop, which, under present methods of native cultivation, can be expected, is 1½ kantars of cotton, and this represents a net value to the farmer of about 500 piastres per acre.

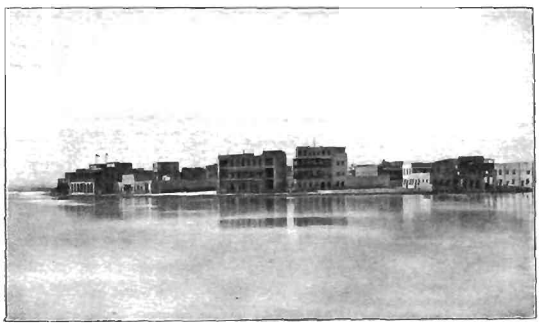
I was told by several of the best cultivators whom the Mamour,

the Egyptian officer in charge of local affairs, called in, that 7 kantars per acre seed-cotton are easily raised under present conditions by careful cultivators, and that the cost of labour did not exceed 100 piastres.

There is no ginnery at Tokar; all the cotton is transported, as described, to Suakin.

Ginnery at Suakin.

The ginnery at Suakin has 50 Platts gins and an engine of 350 h.p. The factory seemed big enough, yet it did not make on me the impression that it was well kept, although at the time of my visit the machines were just being refitted, and for this reason everything was untidy. I have heard many complaints that the fibre of the Tokar cotton is frequently damaged in the ginning, and it is for this reason that several Alexandria houses have the cotton ginned



Suakin.

in Egypt. The daily wages paid are 5 piastres to girls at the gin, 7 piastres to general labourers, and 1 piastre per bale for carrying it into the ginnery, 8 to 9 piastres for men working at the press; 12 hours constitute a working day. There is attached to the ginnery a very old-fashioned box press, which does not press the bales to the density of the Egyptian bale, and I was told that the shipping companies have increased for this year their rate of freight on these bulky bales.

From a gentleman who was present last year during the ginning operations, I heard that about 5 syringes full of water are emptied on each box cart of ginned cotton before baling. The owner of the gin said that only 1 per cent. of water is added, and the mechanic told me that 2 syringes are emptied on each box cart. It must be remembered that the atmosphere of Suakin is extremely humid, and as the ginnery is situated close to the sea shore the atmosphere of the ginnery must naturally be damp. The owner charges 12 piastres per kantar for ginning and

13 piastres per bale for baling. I tried to persuade the owner of the gin to remove his factory to Tokar. He recognised the unnecessary cost which at present the cotton must bear, and that sooner or later the business will be taken away from him, as a ginning factory at Tokar would offer enormous advantages. The owner of the gin stated that his reason for not transferring his factory to Tokar is the scarcity of water there. I am, however, informed by an engineer that there is no reason why the press and ginnery should not be worked by oil engines. The water which is available at Tokar from wells is somewhat salty, but would be good enough for the oil engines.*

General Notes.

The great majority of the inhabitants of Tokar are of a migratory nature. As already stated, many are pilgrims. Owing to the comparatively high wages paid in Tokar, there is a regular influx of workpeople. The Arab landowner considers it beneath his dignity to do manual work. The Tokar district has been in a settled condition for a longer period than the rest of the Sudan.

It is said that in the cotton market at Tokar as many as 20 different native languages are spoken. The wages during the season have been known to go up to 15 piastres for the sowers; women and children generally receive 3 piastres. An effort was made to fix the maximum wages at 7 piastres per day, but on account of the demand they were increased. An ordinary field labourer, who attends to the weeding, receives from 4 to 5 piastres per day. As in Egypt, the cotton sticks must be pulled up and burnt before the new crop is put into the soil. In the Tokar district the latest time for this work is the end of June.

The Government charges ½ piastre per kantar for weighing. One millième (one thousandth part of £.E.1) was charged last season per kantar for grading. This year it has been raised to 2 millièmes per kantar, as two Government classifiers have been appointed.

The town of Tokar is quite modern. It has broad streets, and the houses, although mostly built of mud bricks, are certainly an improvement on the rough huts made of shrubs, palm leaves, &c., which one sees generally in the Sudan; only one small portion of the town is built of rough huts. During the summer season Tokar has only 10,000 inhabitants, but during the period of sowing there will be 15,000 in the town. During the picking season, I was told, as many as 20,000 people are busily engaged in and around Tokar. The influx consists mostly of natives from the surrounding mountains and from the interior of the Sudan, who are attracted by the high wages.

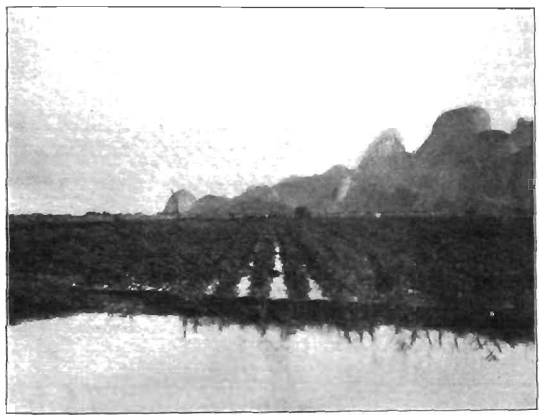
The possibilities of cotton growing in the Tokar district depend, in the first place, on the construction of permanent channels for the Khor Baraka. The cost of the scheme is estimated at £80,000, whilst the revenue resulting from additional land brought under

* During my journey I drew the attention of various firms to the excellent prospects for the working of a ginnery at Tokar, and I am pleased to say that the Sudan Plantation Syndicate, Ltd., has since decided to establish a modern ginnery and press at Tokar, and that this firm has already received the necessary licence from the Government.

cultivation and from more regular cultivation of existing land has been estimated by Government officials as likely to produce £10,000 per annum. The expenditure of £80,000 on this work would be amply justified, and would prove highly remunerative. In the second place, the development of the cotton-growing industry in the Tokar district depends to a great extent upon the construction of the railway between Suakin and Tokar, about which I have already written.

Kassala District.

This is situated near the Eritrean frontier, and the journey to and from the nearest railway station takes about one month. I was therefore unable to visit the place, and must content myself with reporting what I have heard from persons acquainted with the conditions of this province, and with quoting from Government Reports.



Kassala Cotton.

The conditions are undoubtedly similar to those at Tokar. Instead of the river Baraka we have in Kassala the river Gash, which floods the country between July 7th and September 15th. Unfortunately, the rains coincide with the flood. There are three kinds of irrigation. Up stream of Kassala town a weir is run across the Gash and a canal taken off. In this vicinity three types of irrigation have been tried. The first corresponds to ordinary "sagia" irrigation (water wheel), small feeder canals being taken off the main canal, which supply water whenever required during the flood. Land so irrigated is termed "nili." The second and third are types of basin irrigation, but differ in that the land receives a soaking of 7 to 10 days, is then emptied, and sown, receives further flush irrigation according to the state of the crops and the length of the

floods. In the third type the basin is kept full from 25 to 30 days, is then emptied, and receives no further watering. These basins range from 20 to 100 feddans in area. Under the name of Debeloweit another basin is known. Down stream of Kassala a canal is taken off the Gash to fill a large bottle-shaped basin. This must be emptied between the end of August and September 3rd, and is provided with an escape regulator for that purpose.

July, August, and the first half of September are comparatively cool; from then to November the temperature is high. October is generally a very hot month.

Cotton does best on land which has received one long flooding, say, 25 to 30 days. Afifi has given the highest yield of the various cottons tried, but Abassi cotton was more favourably reported upon by the Alexandria merchants. Owing to the neighbourhood of the Italian colony of Eritrea, seed which was of an American kind was obtained by the natives from the Società Cotonniera di Agordat, but this turned out to be of a shorter staple than the Egyptian kinds.

Some of the cotton raised in the district is exported viâ Eritrea, but the bulk is sent viâ Port Sudan. Altogether the cotton crop may be estimated at about 4,000 kantars, but, judging from the reports of Government officials who have been stationed there, a possibility of very great extension exists, as there are 120,000 acres of suitable land. This, however, cannot take place until Kassala is linked up by railway with other centres of population. As far as I could ascertain, the Government favour the construction of the railway line to Kassala in preference to that of Suakin to Tokar. If I may venture to express an opinion, I think that the Tokar line is needed more, and, whilst the cultivation in the Kassala Province is still a doubtful item, we know positively that Tokar produces a good cotton in fairly large quantities. Moreover, the construction of the Tokar line would require much less capital, and I think would prove to be a remunerative investment from the start, whilst the Kassala line would no doubt in the future pay, but the first years would see only a small return on the money. It was mentioned to me that the railway might be taken from Suakin viâ Tokar to Kassala, but this would undoubtedly necessitate the construction of tunnels, and so far the Sudan Railway does not pass through any tunnels.

Ushr.

Ushr (*Calotropes procera*), or Sodom's Apple, grows wild in very large quantities on the outskirts of the desert between Trinkitat and Tokar. There are also 8,000 to 9,000 feddans of land near Kassala where this plant grows profusely. The natives have so far used the stem for making ropes, and the fibre which the plant produces has been used in Europe for the purpose of stuffing cushions, mattresses, &c., but latterly there has been invented in Saxony a process which renders possible the spinning of this fibre, and during the last season as many as 40,000 bales of this flint have been imported from India into Germany. As this plant does not seem to grow as freely in India as in the Anglo-Egyptian Sudan, it might be worth investigating whether it could not be cultivated, or whether it would pay to collect the fruit from the wild plants and export it. I have seen many plants on which

here were ripe and unripe bolls together; some were in flower and some bolls had withered away. I was told that there would be a great difficulty in collecting the fibre, as the stems contain a milky substance which flows out as soon as they are broken, and this substance is extremely poisonous. Another disadvantage is that the fine fibres fly about when the plants are touched, and easily injure the eyes of the pickers. The fibre is very light in weight.

The natives are said to use small portions of the milky substance for adding to a certain kind of beer they brew. The wood of the Ushr plant gives the best charcoal, and even to this day it is used by some nomadic tribes for obtaining a light by rubbing two sticks together and igniting them by friction.

Ushr Plant.

II.—THE GEZIRA.

General Remarks.

Gezira means "island," but in the case the land which is situated between the White and Blue Niles south of Khartoum is understood, although it does not form a perfect island. In travelling from Khartoum through the Gezira plain, one is struck with the apparently absolute flatness of the country. On the horizon one sees mirages constantly, which, I was informed, are possible only on exceedingly flat stretches of land; lakes and trees will appear on the horizon, and when one approaches them one finds they have been nothing but an optical illusion. The Gezira plain contains about millions acres of land, and the soil is of a very fine dust-like silt. Some people believe in the theory that this soil has been formed by the excretions of white ants many thousands of years ago. Thorough investigations on the part of the Irrigation Department have proved that a scheme which would provide a Barrage at Sennar and a canal almost parallel to the Blue Nile, would supply sufficient water for the

irrigation of the entire Gezira plain. As will be seen from the map, the topographical features of the Gezira are exceedingly favourable for irrigation. The land falls gradually from the Blue Nile towards the White Nile; the slope is almost imperceptible to the eye, and therefore the expenditure for levelling the ground, which is one of the most serious items in practically all irrigated plantations, would be non-existent or infinitesimal.

The climate of the Gezira near Khartoum is almost rainless, the occasional heavy storms being too uncertain to permit of cultivation, but the rainfall increases steadily as we go south. Regular cultivation commences about 30 miles south of Khartoum, and reaches its maximum development near Wad Medani. Very dry grass and bush become prominent features, passing to comparatively dense forest near Wad Medani, where the area cultivated in rain-crops is

Mirage in the Gezira.

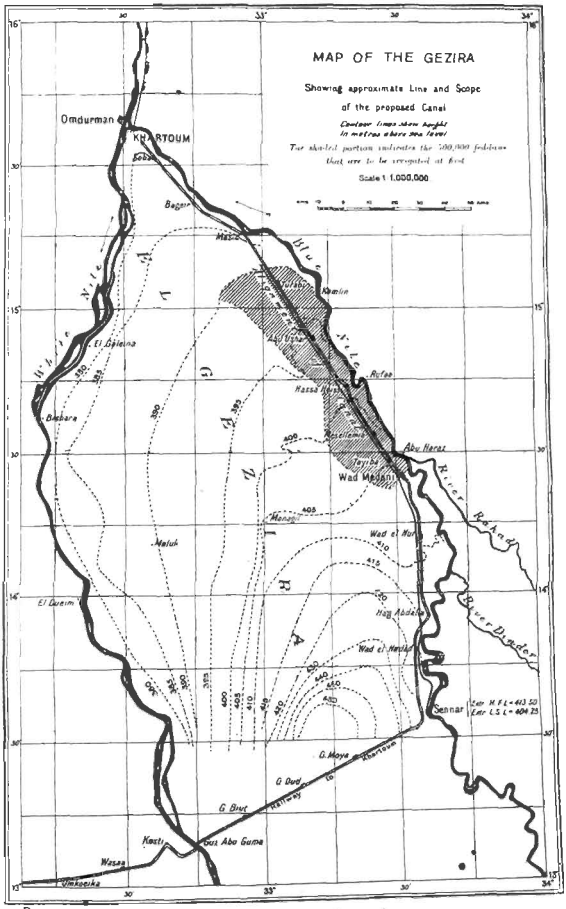
The appearance of water on the horizon is an optical illusion: it is merely the heated atmosphere in the sunlight. This photograph also shows the level character of the Gezira plain.

considerable. These crops consist almost wholly of sorghum (millet), but patches of cotton of stunted growth may be seen here and there. The sorghum crop seems to be a favourite amongst the natives so far, and in good, rainy seasons the yield is very fair. Before one reaches Tayiba one notices a few scattered fields grown with cotton. They look most discouraging, as the crop cannot be more than 20lbs. per acre. All the more is one struck by the appearance of the fields of the natives within a few yards, at Tayiba, which receive the water from the pumping station. One cannot help but be astounded at the miracle produced by its steady supply.

The population is densest and the villages most numerous as we approach Wad Medani.

Gezira Irrigation Scheme.

Sir Wm. Garstin's project consists in establishing a barrage at Sennar, and cutting a canal from there almost parallel with the Blue Nile to about 30 miles south of Khartoum, which would feed smaller canals branching off in the direction of the White Nile.



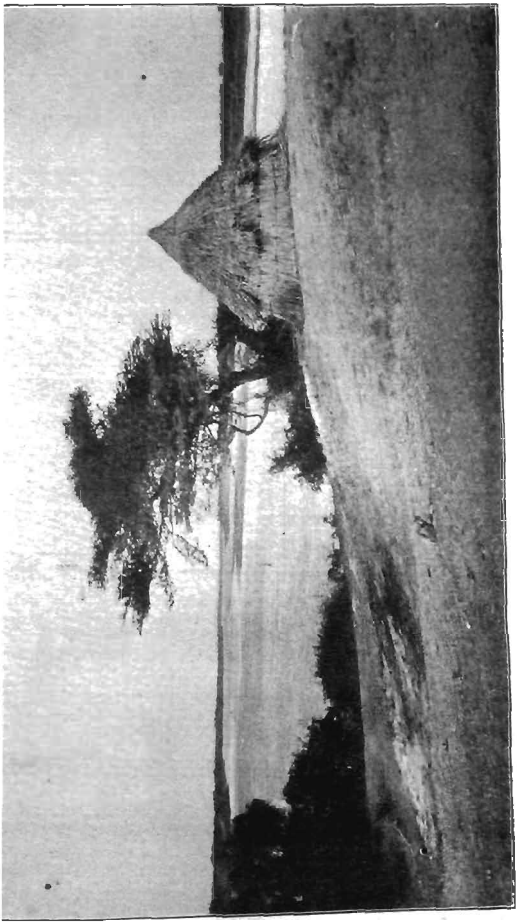
The cost of construction of the Barrage at Sennar has been estimated at	£1,250,000
The cost of construction of the main canal at	1,000,000
The cost of the construction of distributing canals at...	1,750,000
	£4,000,000

These calculations are based on irrigating at first an area of 500,000 acres. This proposed area is marked on the map in shaded lines. For an additional 500,000 acres a sum of about £2,000,000 would be required, so that £6,000,000 would be necessary for irrigating 1,000,000 acres. The return which may be expected from the working of such a scheme is perhaps more difficult to estimate than the construction of the work. The following are some remarks on

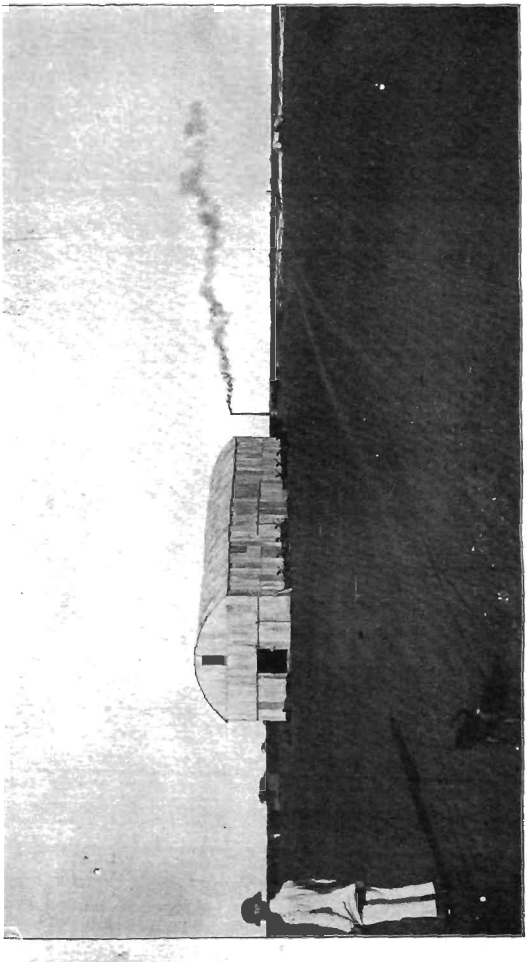
Village in the Gezira.

this point taken from a Government publication of April, 1908, dealing with the Gezira scheme: "It is worth noting that in places where the cultivators of the Sudan are familiar with irrigation they have frequently expressed their willingness to pay one-third of any crops realised on their lands for the supply of water (from a pumping station or otherwise) necessary to mature these crops, and the realisation of any such land in the form of taxation and water-rate should give a handsome return on the capital invested, apart from the indirect benefit to the country as a whole."

Tayiba Farm. The best evidence of the quality of the soil is the fact that under present conditions when rain is at all normal good crops are raised, but in order to prove the fertility of the soil and the adaptability of the Sudanese to become good cotton growers, the Government decided to first start a test-farm at Tayiba. This farm was begun in 1911; the water for irrigating the land has, of course, to be lifted by means of



A view of the Blue Nile from the Tayiba Pumping Station.



The Store at Tayba, with the Pumping Station in the background.

a pumping station. In 1911, 545⅝ feddans were under cultivation, whilst in 1912 1,914 feddans were under cultivation and have received water.

Landownership. It is very unfortunate that the land in the Gezira belongs to the natives, and not to the Government, the boundaries going in zig-zag fashion, whilst for irrigating purposes all the land must be divided into regular squares. The Government had to rent the land necessary for working the Tayiba farm.

At present, land in the Gezira is sold at 20 piastres (4s. 2d.) per acre, whilst when the water is obtainable the value of that same land may be anything from £10 to £15 per acre and more. This surely is a case for the just application of an unearned increment tax; in fact, the whole of the construction of the Barrage and canal might be paid for out of these unearned increments.

Management of Farm. The Sudan Plantations Syndicate, Ltd., was asked by the Sudan Government to take charge of the management of this farm, and personally I think the Government must be congratulated upon this very wise step, as this company has highly-experienced agricultural experts, who are not only well versed in the technical affairs of a cotton plantation, but also understand the handling of the native — a difficult matter for any newcomer to the country.

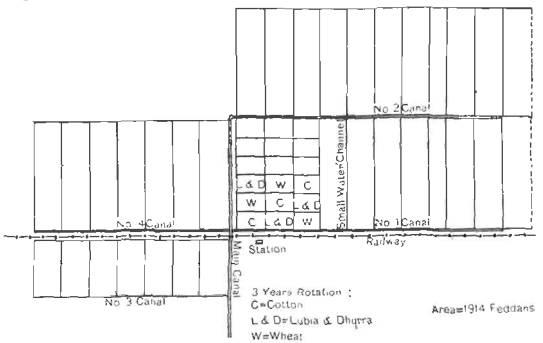
In the agreement with the Sudan Plantations Syndicate, Ltd., it is distinctly stated that the farm must not be worked as an experimental farm alone, but mainly as a test station, that is to say, the land must be given out to natives, who must work it in the same manner as it will be worked when the great Gezira scheme is in operation. Each native has about 30 acres. They are on a yearly tenancy, and each tenant has on his holding his hut, which is generally constructed of shrubs, reeds, and palm leaves.

The Sudan Plantations Syndicate has to reserve one-tenth of the total area for experiments which it undertakes on behalf of the Government.

Pumping Station. As the level of the Nile from the surface of the land varies from 52ft., at high water, to 71ft., at low water, it is natural that the cost of pumping is a very expensive item, and it was understood at the very commencement that this test station could not be a remunerative undertaking. The water-lift when I inspected the pumping station was 56ft.; it is the highest water-lift along the Nile in the Sudan. The output of the pumps is 27·5 cbm. per minute = ·46 cbm. per second. Tandem compound engines by R. Wolf, Bukau-Magdeburg, with superheated steam locomobiles, are used, and the engineer told me that they work excellently and economically. The pumps are made by Willans & Robinson, Rugby.

The prime cost of the pumping station was about £18,000. The fuel used is Cardiff Crown briquettes, which cost 340 P.T. per ton free Tayiba Station. The consumption is about 1½ tons per 12 hours' run, including lighting up. The water horse-power (w.h.p.), i.e., lift of 1 cbm. of water 1ft. high per minute, is 123 when the lift

is 71ft. The indicated horse-power for each of the three engines is 200. Revolutions of the engine are 180 to 186, revolutions of pump 750. The wages paid for running the pumping station are £70 per month. The cost of the fuel has lately increased, owing to the discontinuance of the steamship company which used to send steamers regularly up the Blue Nile. Fuel has now to be sent per rail. The system of irrigation is explained in the accompanying diagram.



Plan of the Tayiba Test Farm.

Method of Cultivation.

The land is ploughed twice and ridged during May and June. A few days before the 15th July planting begins, and 7 to 10 seeds are put into each hole. The spacing is 60 cm. to 70 cm. on the ridges and 90 cm. from plant to plant on the ridges. Irrigation commences about 15th July. Weeding is done about 14 days after first watering. The second watering, as it falls within the rain period, is given 25 to 30 days after the first. The other waterings are given as required, about every 15th or 16th day. The land is hoed three times, sometimes by hand and sometimes by cattle-drawn implements commonly known as "cultivators." The thinning-out takes place after the second watering. Two plants are left in each hole, and during this operation "hindi" plants are carefully extracted. The bulk of the picking takes place in December. The earliest picking for Afifi has been November 4th. This cotton had been planted on July 15th.

The rotations adopted are: Cotton; wheat; dura (sorghum); and leguminous crops (lubia beans), &c.

Of each crop 10 acres are grown. Cotton was planted on 250 feddans during the first year, which means that 25 tenants had each 10 feddans under cotton. The average crop was 5·32 kantars ginned cotton. The highest yield from a 10-feddan plot was 7·87 kantars. The first year's experiments were made on the basis

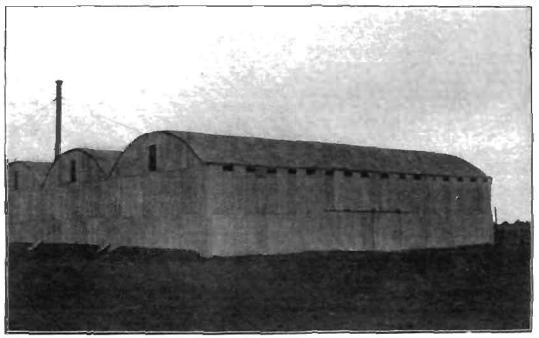
of a three-years' rotation; in the second year experiments with 90 feddans are being made on a two-years' rotation, that is cotton and leguminous crops alternately.

Afifi yields slightly better than Nubari. Liverpool merchants consider the Tayiba Afifi as fully good, staple good length, and very strong. On July 31st, 1912, the cotton was valued at 11¼d.

Nubari.—Liverpool merchants consider it fully good, staple long and very strong, valued July 31st at 11¼d.

The price of fully good fair Egyptian on the same date was 10¾d.

Dr. Beam, of the Wellcome Tropical Research Laboratory at Khartoum, has made extensive physical and chemical analyses of the soil of the Gezira, and these show that it is eminently suited to the cultivation of cotton. The fertility of the soil on account of its



Ginnery and Store of the Sudan Plantations Syndicate, Ltd., at Wad Medani.

varying composition, and its undulating surface is not so great near the river, but two miles from the river the land begins to become uniform and excellent for cotton; near the river slight undulations in the surface are found.

Ginning. The cotton grown at Tayiba is ginned at Wad Medani, which is about 8 miles further south, where the Sudan Plantations Syndicate, Ltd., has recently erected an up-to-date ginnery and press. This ginnery has three bays, one of which is fitted with 10 Platts' roller gins and two saw gins (Platts'). The latter are intended to gin the rain-grown cotton from the south. I am sure the managing director will see to it that there is no mixing of the seed, a process which brings such evils in its train. The other bays are intended for extension and storage. Transport of cotton from Tayiba to Wad Medani is undertaken by rail. At Wad Medani a good deal of rain-

grown cotton from the south will be ginned. The engine and boiler of the ginnery are by Roby & Co., Ltd., Lincoln, whilst the hydraulic machinery and press are supplied by John Shaw and Sons, Salford. The bales pressed will be 400lb. weight. There is another ginnery at Wad Medani, containing eight gins. Wad Medani is the capital of the Province, has 30,000 inhabitants, and, in view of the forthcoming developments of the Gezira, has a great future.

There have been no insect pests, except slight attacks of white ants, but these will disappear with continued cultivation.

Subsoil Water. In view of the difficulty which Egypt is having on account of the high subsoil water, it is interesting to note that even with high water in the Nile the level of the subsoil water in the Gezira is 41ft. from the surface.

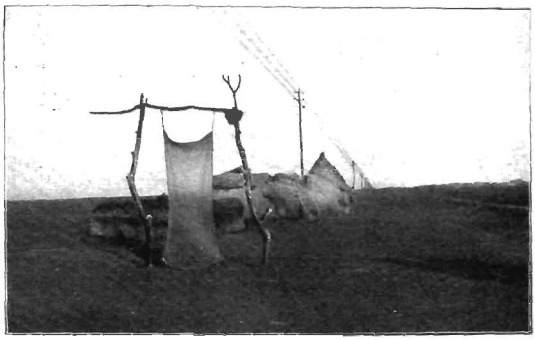
Drainage. There are no field drains provided on the Tayiba Farm, as it is maintained that there is no necessity for them owing to the deep level of subsoil water, but it is certain that drainage will become necessary when a larger area is brought under cultivation, as the health of the population depends so much on the absence of stagnant water, this being always the breeding place for mosquitoes. The difficulty and sickness experienced at Zeidab in its earlier years, owing to the absence of drains, afford ample proof of the necessity of providing them in the Gezira. What is the good of enriching the native and of teaching him to find a pleasure in work when at the same time his health is neglected? The health of the worker should be the first consideration. If he is not in a sound condition he is unable to perform his work, and malaria fever is one of the most depressing sicknesses, which generally lasts for a long number of years, and frequently ends fatally. On account of the rainfall alone, drains ought to be laid.

Implements. The implements used are the native plough and the American ridging plough (Planet Junior), which is specially adaptable for this pliable soil.

The land necessary for working the Tayiba farm has been rented by the Government from the natives, and the Government sub-lets the land in plots of 30 acres.

Tenancy. The tenants must obey the instructions of the Inspector, who is an experienced agriculturist of the Sudan Plantations Syndicate. In cases where there is disobedience the advances on the crop are withheld. The tenants are entirely free agents as regards the disposal of their produce, after having paid their rents. The rent of the first year was £2; in the second year new tenants had to pay £2. 10s. per acre. Copies of the tenants' agreements will be found in Appendix II. Whilst the natives first ridiculed the idea of sending water to a higher level than the Nile, they have now fully recognised the advantages of pump irrigation, and are clamouring to be allowed to come in as tenants. When the land was given out for the second year's trial the natives from all over the Gezira came, offering to deposit money, gold, bracelets, and all kinds of jewellery in their anxiety to obtain land.

The Government has shown great wisdom in entrusting the management to a firm which has not only a trained staff of agriculturists, but was also able to induce trained farmers to come from Zeidab, where the company has a large plantation, to Tayiba. These original Zeidab natives have taught a small number of the inhabitants of the Gezira the proper way of growing cotton. I was told that it was on the suggestion of Lord Kitchener, when he visited the Gezira last year, that some natives who had no experience at all in cotton growing were sandwiched in between some old tenants from the Zeidab Estate, and it is wonderful to see how these novices at cotton growing have, through the influence of their neighbours,



A Homestead on the Tayiba Test Farm.

(Each of the tenants places in front of his hut a bag, in which he stores the cotton as he picks it.)

cultivated their own fields as well as if they had been used to cotton growing all their lives.

I was specially impressed with the clean condition of the fields, and, what is of great importance, with the fact that the cotton plants branch out from the very bottom, and bear bolls from the bottom to the top. In some fields the bolls were so heavy that the plants were weighed down. There was no need to draw during the second year upon Zeidab farmers.

Wages. The day wages paid are ½ P.T. for a child, 2 P.T. for a woman, and 3 P.T. to 4 P.T. for a man. The day is reckoned from sunrise to sunset.

Comparison Between Egyptian and American Cotton.

The following is a comparison of the cost of growing American and Egyptian cotton on tenants' system :—

Cost of growing 1 feddan of cotton producing 5 kantars of cotton :—

American—	£.E.mms.
Rent	2·500
Two ploughings	·400
Ridging	·150
Making Tugnets (banks)	·100
Three hoeings	·950
Sowing	·060
Thinning	·050
Twelve waterings	·600
Seed	·070
Picking 5 kantars at P.T. 25	1·250
Five sacks	·300
Cutting cotton stalks at P.T. 10	·100
Total cost of cultivation of 5 kantars American cotton	£.E.6·530

Egyptian—	£.E.mms.
Rent	2·500
Two ploughings	·400
Ridging	·150
Tugnets	·100
Three hoeings	·950
Sowing	·060
Thinning	·050
Fifteen waterings	·750
Seed	·150
Picking	1·250
Sacks	·300
Cleaning	·150
Total cost of cultivation of 5 kantars Egyptian cotton	£.E.6·810

If one takes the average price of Egyptian at 10d. and that of American at 6¾d. it will be at once seen that there is an enormous difference in favour of Egyptian cotton growing, and there ought to be no question as to which crop is to be grown. The demand for Egyptian cotton is enormously increasing, so that Egypt need not be afraid that the Sudan will cause any material competition.

Conclusions.

The result at which one must necessarily arrive after the two years' working of the test farm—where, it must be remembered, no garden experiments have been carried on, but where everything has been done on a large scale on tenants' system, by which only the success or non-success can be judged—is that the Tayiba farm has been a complete success, and has undoubtedly surpassed even the most optimistic expectations, as, from all appearances when I visited the farm, this

year's cotton crop will on the average be larger than last year's. On all my tours of inspection I have never seen, either in Egypt, America, or India, a model plantation that is equal to the Tayiba farm.

Nevertheless, to be satisfied with the test of 2,000 acres would to my mind be too hazardous, and I think that the safest way for ascertaining the suitability of producing cotton over the entire area of the Gezira would be in the first instance to enlarge the Tayiba farm to an area of 10,000 or 20,000 acres, and to establish two, or even three, additional farms along the Blue Nile at equal distances, these farms to be each supplied with a separate pumping station.

I was informed that an estate of 10,000 acres would become remunerative. The management expenses for a 10,000-acre estate would be little more than for a 2,000-acre estate. The capital required for an estate of 10,000 acres would be, according to calculations of the Irrigation Department, £10 per feddan, and the working capital necessary would be about £5 per feddan, altogether £150,000. The object of these farms would be :—

(1) To ascertain whether the land *all over* the 500,000-acre area of the Gezira is quite suitable for cotton growing.

(2) To educate the inhabitants of the Gezira in cotton growing, and this is perhaps of greater importance, because little doubt exists in the minds of experts as to the answer to No. 1.

(3) To ascertain through actual experience the cost of excavating the channels in various parts of the Gezira, and thus enable the Irrigation Department to make correct calculations as to the exact cost of the great scheme.

(4) To await an increase in population. Large numbers of boys and girls of the ages of 12 to 14 years are to be met in the villages, and in a few years they will be cultivators, with their own homes and families. There are now undoubtedly sufficient people in the Gezira to work these four farms, but by the time these farms have proved whether it will be desirable to go on with the scheme or not, that is, in about four to six years, there will be a much larger population from which to choose prospective tenants for the 500,000 acres.

It must be remembered that all the irrigation channels which would be on these test-estates would come in for use when the Barrage and the large canal will be constructed, and as regards pumping installations there is no doubt that they could be easily employed afterwards on the east bank of the Blue Nile, where there are further prospects of extending cotton growing in years to come.

The following particulars, which were supplied to me by Messrs. Sulzer & Co., Winterthur, Switzerland, who are well known for their excellent pumping installations, may be of interest :—

A pumping installation for a 10,000-feddan area ready fitted up would cost £50,000.

This would include all pumps, buildings, foundations, discharge and suction pipes, and contingencies.

These pumps (two) would lift 7 cbm. per second. If only 6 cbm. per second are required, the cost would be reduced by £4,000. The current working expenses for a 7 cbm. plant, for fuel, engineer, assistant, native workmen, depreciation, would be about £10,000 per annum; for a 6 cbm. plant, £8,700 per annum.

The total capital expenditure for an estate of 12,500 feddans, with the water output of 7 cbm. per second, according to information received by an agricultural expert in the Sudan, would be as follows:—

		£.E.
Main canal	Irrigation Works	20,000
Canalisation		
Bridges and regulators		
Levelling and clearing—Development		5,000
Pump installation		80,000
Buildings		10,000
		£.E. 115,000

This figure is somewhat below the estimate of the Irrigation Department.

With a 6 cbm. output of water the cost would be reduced by £5,000.

The price of crude oil for a Diesel engine at Port Sudan is £2. 10s. This should not bring the cost to more than £4 per ton in the Gezira. Oil consumption is 200 gr. per horse-power per hour; coal minimum, 600 gr. per horse-power per hour. As the price of coal is £3. 18s., the cost of oil fuel is therefore at least half the cost of coal. It must be remembered that Diesel engines require a good deal of lubricating oil, but, on the other hand, there is no loss in lighting up and shutting down. It is also hoped that oil will be pumped shortly in the neighbourhood of Suez.

III.—PUMP IRRIGATION.

In Khartoum I had various conferences with H. E. Lieutenant-General Sir Reginald Wingate, the Governor-General; Sir Rudolf Baron von Slatin Pasha, the Inspector-General of the Sudan; Mr. P. M. Tottenham, Inspector-General of the Irrigation Department; Mr. E. Bonham Carter, Legal Secretary; Judge H. St. G. Peacock; Mr. J. Currie, Director of the Education Department; Dr. A. Balfour and Dr. W. Beam, of the Wellcome Tropical Research Laboratories; Mr. H. P. Hewins, Secretary of the Central Economic Board; and I was in daily touch with Major E. B. Wilkinson Pasha, Director of Agriculture and Forests. I also had interviews with the Governor of the Red Sea Province, Mr. Graham C. Kerr, and E. C. Midwinter Bey, General Manager of the Railways Department, and I am pleased to state that all these officials recognise the importance of the cotton crop to the further development of the Sudan. Mr. George G. MacDonald, Inspector of Agriculture, showed me over the Tokar plantations. I am indebted to all these gentlemen for a great deal of the information contained in this Report.

Ginning

There is a small ginning factory, containing eight gins, belonging to the Gordon College, Khartoum. I heard several complaints as to the unsatisfactory way in which the gins work. The strongest complaint, however, was that these gins are not sufficient to cope with the amount of cotton coming in during the season, and that the bales pressed are of an unusually small size, which seems to be detrimental to the sale. I was told that some bales from the previous season were still lying unsold at Liverpool on account of this method of packing. I persuaded Mr. Currie, the principal of Gordon College, to purchase an up-to-date press, and when I left Khartoum he had already applied for tenders for the usual type of press employed in the Sudan (Shaw's). Although the Khartoum College is not supposed to enter into competition with commercial firms, still it must be admitted that an advantage will result to ginners from the fact that some natives will be trained to work these hydraulic presses, and these will be able to take positions in existing ginneries. Moreover, the demand must be met by some institution if private enterprise does not come forward.

Khartoum North Research Farm.

Gordon College took this farm over from the Agricultural Department in June, 1912. Its area is 230 acres, which are used for experimental work, but there are 200 more feddans belonging to natives, who obtain their water supply from the pumps of the experimental farm, and these 200 feddans also serve for observation purposes.

The objects of the farm are purely educational, the purpose being to instruct the farmers in Khartoum, Berber, and also the Blue Nile Province. The research farm sells the water to the natives at cost price, but they must in exchange conform to instructions laid down by the manager, Mr. E. R. Sawer, who has had practical experience in Natal and Rhodesia. The natives have shown themselves exceedingly anxious to avail themselves of the offer, and it is interesting to note how intensely interested they have become in the experimental work. Some are applying for disc ploughs and iron implements, and are conducting experiments even on their own land.

Irrigation.

The water is supplied by means of a high-speed 10in. pump. New machines and floating pumps, with 80 h.p. engine and double 12in. pump for extension of the supply of water to the natives, will be installed shortly.

The irrigation system consists of elevated "gadwals," with infiltration drains, supplemented by usual drainage; *the minimum depth of drains is 2 metres.* An exceedingly useful experiment in view of recent developments in Egypt!

Rotations.

Cotton and wheat are planted alternately, each being followed by Lubia (bean) as green manure and feeding crop, the latter being a leguminous plant. The natives have three revenue crops and one manure crop in two years, *as the lubia is being ploughed into the soil.* The usual experiments as regards distance in planting, time of sowing, volume of water,

effect of fertilisers, cultivating (hoeing), green and stable manures, are carried on.

There is a laboratory in connection with the farm. A botanist, Mr. Massie, is in charge of it. Plant selection and hybridisation, plant physiology, and soil studies are being carried on. The farm is situated opposite Omdurman, close to the Nile.

Farms Visited North of Khartoum.

Together with Major E. B. Wilkinson, the Director of Agriculture, I paid a visit to the Sagai Plantation, which belongs to Mr. Capato & Zubeir Pasha. There are 250 feddans under cotton, whilst the total estate is 2,600 feddans, only 700 of which are canalised. I also visited Capato's farm at Cadaro, which has

Cotton Plantation in neighbourhood of North Khartoum.

500 feddans, of which 100 are under Afifi and Abbassi. Several small farms are situated along the banks of the Nile. Those which I saw did not strike me as being well kept. The plants had formed a good deal of wood, and this evidently to the detriment of the bolls, which appeared only at the top. It seemed to me as if too much water had been applied. The cultivation and general conditions do not differ much from those which are described in the following pages in connection with the Zeidab Plantation of the Sudan Plantation Syndicate, Ltd.

ZEIDAB COTTON PLANTATION.

Zeidab is situated 181 miles north of Khartoum and 25 miles south of Atbara; it is in the Berber Province. A concession of 10,000 feddans was granted in 1904 to Mr. Leigh Hunt, an American, for perennial irrigation. Mr. Hunt endeavoured to cultivate a small tract by direct labour, but, as is usually the case when this method is adopted in cotton planting, failure resulted. The Sudan Plantation Syndicate, Ltd., took the concession over in 1907, when about

1,000 feddans had been brought under cultivation. There are now under cultivation :—

2,800	feddans	under	cotton.
2,700	,,	,,	wheat.
1,500	,,	,,	maize, followed by lubia.
1,100	,,	,,	berseem.
8,100	feddans.		

The land is hired out to tenants, of which there are 310, each holding about 30 feddans, and about 10 feddans each are cultivated in cotton, wheat, and leguminous crops.

The annual rent for cotton land charged to the natives varies from 412 P.T. to 512 P.T., according to the quality of the land; for wheat it is 258 P.T.; for leguminous crops 154 P.T. per plot of 10 feddans, including water supply.

The Syndicate also rents water to about 140 tenants adjoining the estate, for which a charge of 250 P.T. is made. In the Appendix will be found copies of the agreements with both kinds of tenants.

Irrigation. The rainfall is only about 5in., consequently artificial irrigation is necessary. The main canal is 5 m. wide in the bed, 8 m. at the level of the land, and has a depth of 1½ m. The distributing canals are 2 m. in the bed, 4 m. at level of land. The subsidiary canals ("gadwals") are ½ m. in the bed, 1½ m. at level of land, from which smaller canals are taken off to irrigate plots of 10 feddans. Subsidiary canals irrigate 70 feddans.

Pumping Station. There are two installations. The first has two 30in. Gwinn centrifugal pumps, driven by two engines of 300 h.p., made by Allen's, Bedford, each pump delivering 5,500 cbm. per hour (1½ cbm. per second). The other installation comprises two 30in. Sulzer pumps, turbine-driven by two 300 h.p. engines of Sulzers'. These pumps deliver 5,600 cbm. per hour each. The maximum water-lift is about 8 m., and the minimum about 1½ m. For fuel, wood is used. The cost of both installations is £42,000, the cost of canalisation about £17,000, with a yearly up-keep of £600.

Climate of Zeidab in comparison with the Gezira. During November, December, January, and part of February/March, the temperature in the Gezira is about 10° warmer than at Zeidab. From June 15th to end of September Zeidab is about 10° to 15° hotter than the Gezira, whilst in the Gezira in April, May, and half June the temperature is 10° higher. North of the Shabluka Cataract, about 18 miles north of Khartoum, the whole district is liable during November, December, and January to sudden spells of cold weather at night, the temperature being at times as low as 45° Fah. This is exceptional, but 55° Fah. is of frequent occurrence. These exceptionally cold snaps are injurious to cotton, especially so if the weather throughout the day has been very warm, as a dew deposit

takes place during the night, which seems to cause a sticky substance to appear on the leaf, called in the Sudan "Asal," and scientifically known as "Aphis gossyphii." The leaves after such a dew become rusty and drop off. The same happens to the young flowers, and a continuance of the cold weather prevents the bolls from opening. These cold snaps occurred only in two years out of six years, and the Sudan Plantation Syndicate has decided, until such time as it is ascertained whether the cycle of cold years will continue, not to extend cotton cultivation on this plantation. I could see that during this last season a few cold nights had affected the plants slightly in the manner described. I was unable to obtain any scientific explanation of this sweating of the cotton plants, but investigations have for some time back been carried out by Mr. H. H. King, Government Entomologist at the Wellcome Research Laboratories.

Perhaps the view expressed as regards the suitability of the district north of Khartoum for cotton growing is somewhat pessimistic. Zeidab has been the only serious experiment so far. I hope that experience and scientific research work will make cotton cultivation north of Khartoum lucrative.

Kinds of Cotton Grown. The bulk of the cotton grown at Zeidab is Nubari and Afifi, about half of each, but there are besides about 200 feddans Sakellaridis, and 70 feddans Voltos. The other varieties are Asili, Ashmouni Nyassaland, Allan's improved, Griffiths (the latter two American kinds on a small scale, in fact, only 70 feddans altogether are under American cotton). The yields over the whole estate during the last six years were 3 kantars, 3½ kantars, 3 kantars, 4 kantars, 1 kantar, and 2¼ kantars, the 1 kantar yield being in the cold year followed by boll-worm.

Ashmouni pays best on poor land. On good land Sakellaridis and Voltos are remunerative. Ashmouni branches better, and carries more bolls. Voltos ripens three to four weeks earlier. The general experience so far has been that when cotton was a bad, wheat proved to be an excellent crop. Owing to the climatic conditions it will be necessary to find some variety which is more rapidly maturing. Sowing cannot take place earlier than May, as the hot weather in September and October would open the bolls prematurely. There is a lack of humidity in the air during the month of October, causing the moisture in the plants to evaporate heavily when the bolls are being formed. From the beginning of May to the beginning of October the wind is generally from the south, and brings with it a good deal of humidity, but from October 1st onward the temperature is very dry, the wind being from the north.

Cultivation. As stated before, the whole of the land is let to tenants in blocks of about 30 acres. Cotton is sown in May, American cotton in the middle of June, and it is ready for picking in February. Wheat is sown in November, and is ready for harvesting by the end of March. Maize is sown early in May, and takes until August to ripen. Leguminous crops, like berseem and lubia, are sown in October, and are cut at the beginning of March.

The preparing of the fields for cotton is carried on as follows: the land is ploughed twice and ridged by means of the Planet Junior *ridging machine. The holes for the reception of the seeds are made* 70 cm. apart, and 90 cm. is the distance from ridge to ridge. Five to eight seeds are placed in each hole. The first watering is given immediately after sowing, and the second watering about 20 days after the first; the third about 15 days later. The field is then hoed, and immediately after hoeing the plants are thinned out to two in a hole; sometimes three are left. Every 15 days after that the fields are irrigated. At least two hoeings are required, but more are given if the land is baked and weedy. These hoeings must be made before the cotton is too big. As in Egypt, the fass or a kind of Dutch hoe is used.

Picking. American cotton begins to get ripe early in November, whilst the Egyptian varieties are not ready before the beginning of December. There are never any definite pickings, as in Egypt. The first lot is generally not as good as the second. The fields are picked as the cotton becomes ripe, otherwise the bolls begin to shed. Clean picking is insisted upon by the management. Pickers distinguish easily between any "hindi" that might have been left in by chance in the process of thinning out, and leave it in the fields. The pickers spread the picked cotton on a mat and expose it to the sun in order that any insects may escape. The wages for picking are 30 P.T. to 40 P.T. per kantar of 315lbs. to 340lbs. The tenants bring the cotton to the store after they have collected a few bags of about 315lbs. each. The cotton is then graded by a competent classifier, and the Syndicate buys it from the natives at Alexandria prices, less transport and ginning expenses.

Telegrams giving Alexandria prices are posted daily at the ginning factory on the estate. The tenant is obliged to pay his rent before he is allowed to sell his cotton to any other firm.

Other Crops. *Wheat* is sown in November and harvested in March and April. The average yield per feddan is about 333lbs. of a value of 125 P.T. to 128 P.T. at Zeidab. The estate has a Clayton & Shuttleworth threshing machine. Chopped straw is sold to the army, and represents a value of 70 P.T. per acre. The tenants generally sell their wheat to the company, but keep the maize for food, consequently the rent for land on which maize has been grown is collected in cash.

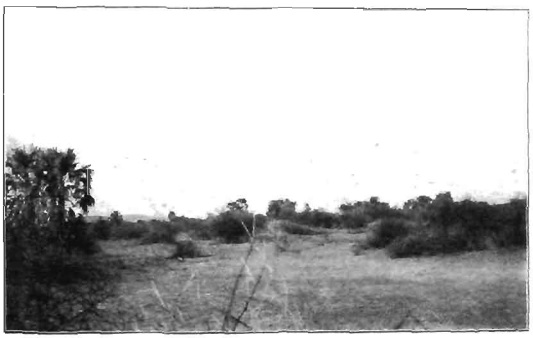
There are two periods for planting *maize*, April/May, and October/November. The yield is from 2 to 5 ardebs of 333½lbs. The average price of maize in the Sudan is about £1 Stg. per 400lbs.

Berseem is sown end of October/November in hods filled with water. It gives two good cuttings; the third is indifferent. The second cutting is threshed out for seed purposes; it gives ¾ ardeb. The value of seed in the Sudan is about £2 per ardeb; in Egypt £3 per ardeb. Transport and other expenses come to about 10s. Berseem and chopped straw are used extensively for sheep, cattle, and camels.

Cotton Fields as Pasture.

March and April being severe months in the desert, the sheep, camel, and donkey herds of the Arabs are driven to the cotton fields, and there they eat the leaves and young stems of the cotton plant. For this pasture the nomadic tribes pay 150 P.T. per acre. All sticks are pulled up and burnt in the ground. Through the grazing of the herds the fields receive some manure. No other manuring is done, except by means of leguminous crops, such as beans and berseem. The lubia crop is ploughed in every third year as a green manure.

Lubia grows exceedingly well, and is eaten off in the fields by cattle, each animal being tethered. It is said that one feddan of lubia gives to the soil about 50lbs. nitrogen through its roots, and as the cattle eat it off in the fields a certain amount of manure is gained in this way. An entire crop of lubia ploughed in should give



Typical country in the neighbourhood of the Zeidab Cotton Plantation.
(The picture shows the difficulties connected with the clearing and levelling which had to be overcome before commencing cultivation.)

about 300lbs. of nitrogen. Ploughing in should be done with a disc plough or an Oliver plough.

Ginning.

The ginning factory at Zeidab consists of 10 Macarthy Platt gins, one Scarto gin, a sieve for seed, a 280-ton hydraulic press of John Shaw and Sons, Salford. One gin has a capacity of 70lbs. to 80lbs. per hour. The press can turn out 20 bales of 400lbs. per day. The ginnery is mostly engaged on cotton produced at Zeidab, but small quantities raised on surrounding estates are also ginned.

Cost of Cultivation of Cotton.

The cost of cultivating cotton is estimated to be £15 to £20 per 10 acres up to the time of picking. This includes the tenant's own labour, his living expenses and outside help which he uses at times of sowing, hoeing, and picking.

Labour.

The Syndicate does not complain of any scarcity of labour. When the rains have been very heavy in the desert an occasional scarcity of labour is felt, because many natives withdraw to the desert, which at that time enables them to find a living there. All the seed for the various crops is supplied by the Sudan Plantations Syndicate at cost price. The tenants must obey the reasonable orders of the officials of the

Insect Trap.

These are frequently erected in Egypt and the Sudan. The insects are attracted by a sweet smelling composition inside the cage. Once inside they cannot possibly escape. The maker is Geo. Nicod. Georgiades, 4, rue Machmoud Pasha el Falaki, Alexandria.

company. The European management consists of one manager and four inspectors, each of these having about 2,000 acres to look after. The land was fairly undulating and overgrown with shrubs and palms when it was first reclaimed, necessitating levelling, which costs as much as £10 per acre in some places; the average cost may be taken as £5 per acre. As the land is rarely perfectly levelled, there is always

a difficulty in irrigating, and a great deal of the attention of the inspectors is taken up with its direction. Every one of the tenants is visited by an inspector at least once a day, and a careful account is kept of his daily work. As the land on the Gezira is already level, there would be no necessity for keeping so many inspectors on an estate of equal size. On the Gezira a European inspector would be able to look after 4,000/5,000 acres. The Syndicate has paid during the last year its first dividend of 12½ per cent., but, as the heavy expenditure of levelling is now finished, there is every reason to believe that the company will continue to pay a dividend. The plantation is situated about five miles from the railway station, on the opposite side of the river. A steam tug and two 25-ton barges are connecting the plantation with the railway.

The transport per ton of 22 kantars of lint, which may be taken as the yield of 6 feddans, is £.E.8·32 to Liverpool, including selling charges.

The Syndicate debits the tenants 20 P.T. per kantar for ginning and transporting cotton to the railway station. 3·2 tons of seed cotton produce 2·2 tons of seed and 1 ton of lint: the freight and selling charges on this quantity of cotton seed are £6·20, making altogether £14·52 for transport of lint and seed to Europe, which is the product of 6 feddans.

Cotton Insects.

Insect traps, such as are reproduced in the illustration, are erected. Boll-worm has appeared only once in six years. There is a cotton stainer to be found in the fields, but when the cotton is opened out in the sun it disappears. There has never been any cotton worm in the district. The cotton flea sometimes touches the leaves.

Other estates in the neighbourhood are Fadlab Estate, Darmali Estate, Menani Estate, but no cotton is grown on them.

My cordial thanks are due to Mr. D. P. MacGillivray, Managing Director of the Sudan Plantations Syndicate, Ltd.; to Messrs. Macintyre and H. Wright, inspectors of the same company, who supplied me with information regarding the Tayiba and Zeidab Estates.

IV.—RAIN-GROWN COTTON.

Some rain-grown cotton from the Sudan is considered slightly better in quality than Middling American, but, unfortunately, the picking until now has been carried out in a very careless fashion. As is done in Asia Minor, the cotton bolls are taken from the plants, and the separation of the boll and lint is carried out at leisure at home. No doubt the recently-adopted Cotton Ordinance will stop this primitive method, which naturally causes the cotton to be dirty and mixed up with leaves. The Department of Agriculture must undoubtedly engage a larger staff if it wishes to cope with the requirements in this rain-grown cotton district, which is situated south of Sennar, namely, at Renk, Mellut, and Kedok, and the southern portion of Kassala Province. A seed farm, with a properly-regulated seed supply, should be taken

Natives using the "Seluka." Sowing Cotton at Singa, Sennar Province.
(Rain-grown Cotton.)

n hand by the Government. The method of cultivation is very primitive. So far about 1,000 tons of this kind of cotton are grown, but the possibilities of extension are said to be very great. I do not think that any important increase in the output will take place for some years to come, as the population in these parts is not very dense. In any case nothing but American kinds should be grown here.

ARNO SCHMIDT, Secretary.

Manchester, 5th January, 1913.

THE DEVELOPMENT OF THE SUDAN.

BRITISH GOVERNMENT REQUESTED TO GUARANTEE A LOAN OF £3,000,000.

A Deputation of the British Cotton Growing Association waited upon the Right Hon. H. H. Asquith, Prime Minister, in London, on January 23rd, 1913, for the purpose of requesting the British Government to guarantee a loan of £3,000,000 for the development of the Sudan. The Prime Minister was accompanied by the Right Hon. Sir Edward Grey, Bart., K.G., Secretary of State for Foreign Affairs, the Right Hon. D. Lloyd George, Chancellor of the Exchequer, and the Right Hon. Sydney Buxton, President of the Board of Trade. The Deputation was introduced by the Earl of Derby, G.C.V.O., C.B., President of the Association, and the other speakers were the Duke of Marlborough, K.G., and Sir Charles W. Macara, Bart., Vice-Presidents, Mr. J. Arthur Hutton, Chairman of the Council of the Association, and Mr. A. H. Gill, M.P., one of the members of the Council, representing the operatives in the cotton industry. The speeches were businesslike and impressive, and they have had a large circulation. Sir Charles Macara, who dealt with the subject from an international standpoint, said :—

The position I have occupied in the cotton industry during the last 20 years, both nationally and internationally, has necessitated a careful study of all the problems that have to be faced in carrying on this great industry, which plays such an important part in clothing the people of the world. Since the British Cotton Growing Association was inaugurated I have taken a very deep interest in the work it has carried on, and although it has been quite impossible for me to share in carrying on its every-day work I have never lost an opportunity of advocating its claims, and have done what I could to secure financial support from the members of the Federation of Master Cotton Spinners' Associations, of which I am the president. The British Cotton Growing Association has appealed to me in a variety of ways, perhaps none more forcibly than its having given an object-lesson to the world of friendly co-operation between the representatives of capital and labour in promoting a movement for the benefit of the industry, upon the success of which both are equally dependent. I have on many occasions referred to this with pride in addressing meetings of business men in numerous parts of the world. Moreover, in connection with the work of the International Cotton Federation, one of the aims of which is to develop the existing cotton fields and to open up new cotton fields in any part of the world where this can be done successfully, the work of the British Cotton Growing Association has always had a prominent place in the annual reports, which have been printed in the best-known languages and circulated throughout the world. In this connection it has been a source of much satisfaction to me in meeting Ministers of State in the countries I have visited to hear from them the great assistance they have received in developing cotton growing in the colonies of these countries from the experience they have gained by perusing the reports of the International Cotton Federation.

THE PROBLEM TO BE SOLVED.

Any narrow views that I may at one time have entertained have been completely dispelled by the experience I have gained in visiting the principal countries that share with England the carrying on of the cotton industry of the world, and I have come to the conclusion that it matters little where cotton is grown, but the great problem that has to be solved is that there should be sufficient cotton to meet the rapidly-developing requirements brought about by the march of civilisation and the increase of population. It must be remembered that still a large proportion of the people of the world are only partially clothed or not clothed at all. The price of the raw material for carrying on the cotton industry is a most important factor, and when I state, what I have frequently stated before, that an increase of 2½d. per pound on the world's cotton crop means £100,000,000, it will be seen that this is a serious factor in the prosperity of the industry, as it reduces the consumption of cotton clothing, which is the clothing of the poorest people of the world, and by so doing it is obvious that the employment of the mills is also reduced. The position to-day is that cotton, through anticipated scarcity of supply, is over 2d. a pound above what it was 12 months ago. It must also be remembered that scientific cultivation is a great factor in increasing the yield and so reducing the price at which the planter can sell his cotton and retain a satisfactory profit. It was decided by the Committee of the International Cotton Federation in June last that a delegation representing the countries included in the Federation should visit Egypt in November to study the conditions under which the Egyptian crop is grown, handled, and marketed, and the developments that are going on. This delegation was on the same lines as the one which visited the cotton-growing States of America in 1907. The report of the delegation to Egypt will be issued very shortly, but I may say that all the delegates were immensely impressed with the splendid agricultural methods which are in vogue in Egypt, and the magnificent resource that is displayed by the Khedivial and the British agricultural societies by taking advantage of scientific methods and also in reclaiming land, this work being carried on under the direction of Lord Kitchener, who, I may say, is enthusiastic about the possibilities. My colleagues and I were immensely impressed with what is going on, and are convinced that an early and considerable increase in the supply of Egyptian cotton is practically assured.

THE MAGNITUDE OF THE COTTON TRADE.

In addition to meeting Lord Kitchener and his staff and some large agriculturists, I also met in Cairo, Sir Reginald Wingate, the Sirdar, and had a most cordial invitation from him to visit the Sudan, which unfortunately I was unable to accept. It was arranged, however, that the Secretary of the International Cotton Federation should go to the Sudan, and his report is now being printed and will be issued shortly; it will amplify and endorse everything that the Chairman of the British Cotton Growing Association has said. Indeed, I have the utmost confidence, with such men as Lord Kitchener, Sir Reginald Wingate, and others, that the development

of cotton growing in Egypt and the Sudan will solve more rapidly the problem of increasing the supply of cotton than could be done in some of the other parts of the world where new cotton fields are being developed, and at the same time will be of immense benefit to these countries. I hope that a broad view will be taken by the British Government of the proposition that has been placed before them to-day. It must never be overlooked that although other countries are developing their cotton industry, England has developed much more rapidly than any of them, and that practically all the countries of the world are customers of England for cotton goods, that England's cotton industry depends for about three-quarters of its employment on export trade, that cotton goods represent about one-third of the total exports of manufactures, that the cotton which can be produced in Egypt and the Sudan is of the utmost importance to England, as she consumes more of this class of cotton for her fine manufactures than all the other countries of the world combined. I would like to mention that the British cotton industry provides directly the livelihood for millions of people and indirectly for millions more. In conclusion, I would like to emphasize that Egypt has spent enormous sums in the development of the Sudan, and the time has certainly come when England must materially assist in this direction. I hope that all these matters will receive the serious consideration that they certainly deserve.

THE PRIME MINISTER'S REPLY TO THE DEPUTATION.

The Right Hon. H. H. Asquith, Prime Minister, said: I am very glad, and so are my colleagues, to have had the opportunity of meeting this very representative deputation and listening to the case which has been so tersely and so forcibly laid before us by the speakers. We have long—when I say "we" I mean His Majesty's Government—had under consideration the very important question upon which you speak with such special opportunities of knowledge and of authority. When I was last year, in the early part of June, at Malta for another purpose, I had an opportunity of several conversations with Lord Kitchener, and he laid before me these facts and considerations which you have presented to-day, because you are well aware he has from the first been a most ardent as well as a most powerful advocate and supporter of the scheme. All these facts have been considered by the Government, and we have certainly come to the conclusion, particularly as regards the wedge of territory, Gezira, that the prospects of utilisation (of what I may call the economic utilisation) as a place for cotton growing are probably at least as great as those of any other unexploited plot of similar size in the world. It is a matter of interest not only to England or to Great Britain, but to the whole of the great Empire, that we should multiply our sources of supply of raw cotton and enlarge the area from which it is grown.

Being, as we are, so largely interested not only in the cotton industry here, but in the development of the Sudan itself (in which we have now acted as trustees during a considerable number of years, as Mr. Hutton has said, with very striking results in the economic progress of the country) we approach the consideration of such a plan as you have laid before us with sympathy and the utmost prepossession in its favour. We have given careful consideration to the matter, and I am glad to be able to inform you, I am sure you will be glad to hear it, that it is the intention of the Government at the earliest possible part of next session to introduce a Bill—I have the draft of it here—which will authorise the Treasury to guarantee the payment of interest on a loan to be raised by the Government of the Sudan to the extent of £3,000,000.

A number of purposes are enumerated in the schedule, which, without committing myself at this moment to the precise details, I think you will find carry out most, at anyrate, of the suggestions you have made here to-day. We are satisfied that the British Government in giving that guarantee will not be imposing on the British taxpayer what is likely to be a serious or even an appreciable burden. We believe that all parties in the House of Commons will join in giving rapid passage to a measure in which the best interests of the Empire are concerned. I have very great pleasure in having seen you here to-day.

The Earl of Derby expressed the warm thanks of the deputation to the Prime Minister. "I do not think there was one of us," he said, "who expected so prompt a reply as you have been able to give to us. This Association is entirely non-political, but although my politics may differ from those of some in this room, I can say that each of us will do his best to make this measure a non-contentious one in every respect, convinced, as we are, that it will be of great benefit not only to Egypt, but to the whole Empire."

OPENING OF THE BRITISH PARLIAMENT.

MARCH 10, 1913.

EXTRACT FROM THE KING'S SPEECH.

"You will be asked to authorise a guarantee from the Imperial Exchequer of a loan by the Government of the Sudan for ensuring the prosperity of that territory and the development therein of the industry of cotton growing."

In the debate which followed the reading of the King's Speech, the Right Hon. H. H. Asquith, Prime Minister, in referring to the Bill to guarantee the loan, said: "I may say, as to the Sudan loan, that the maximum amount we propose to ask is £3,000,000 in instalments, and I believe that the resources of the Sudan and the prospects of its development are such as to afford ample security."

COTTON GROWING

IN

EGYPT*

Report by Mr. Arno Schmidt, Secretary of the International Federation of Master Cotton Spinners' and Manufacturers' Associations, on his visit to Egypt in 1911.

(As the first edition of this Report is exhausted, the International Committee consider it advisable that it should be included, along with some additions, in this volume.)

* *Lord Kitchener, when he received the delegates of the International Cotton Federation on November 4th, 1912, spoke of this report in his address as follows:—*

"Mr. Arno Schmidt, your Secretary, last year gave us a very valuable Report on his visit. In that Report there were many hints which have done a great deal to improve the work out here in regard to cotton cultivation. I am sure we all owe him a debt for the trouble he took in making that Report."

Preface to the First Edition.

Although doubtful as to whether so complete a report as that of Mr. Arno Schmidt on Egyptian Cotton Growing requires a preface, yet I gladly acquiesce in his request, if only to add my small testimony to the value of his excellent work. After a careful perusal of the report I can strongly recommend all users of Egyptian cotton to study it, for not only does it contain a large number of simple but instructive facts bearing upon the growth of cotton and the possibilities of the country, which in themselves are of vast interest, but it has the additional advantage of being, to the best of my belief, wonderfully correct. To those of us who have had many opportunities of studying the question on the spot it confirms largely any impressions we may have formed, and to others who have not had the same opportunities it is a very well compiled statement of facts which cannot fail to be of value. If only for the possibilities that it puts forward of further reclamation of land, and consequent increase of acreage of land under cotton, it will be welcome reading, but to me the greatest value in the report lies in the assurance that the new Agricultural Department under Mr. G. C. Dudgeon is seriously working to enlarge the crop and maintain, or rather improve, the quality; above all, that Lord Kitchener himself is taking a large personal interest in the matter, is in itself an assurance that real work will be done and permanently good results achieved. The paragraphs dealing with Assili cotton are full of interest, and should it be possible in the near future to substitute this growth for Afifi much will have been done not only to increase the production per acre but also to improve the general standard of quality.

Mr. Schmidt points out that in the cotton spinning industry long staple American cotton has been largely substituted for Egyptian cotton, and has been found to meet the requirements of certain trades: still, although this is correct as regards the last few years, yet it must not be forgotten that the American production of long staple cotton is dwindling every year, largely owing to the ravages of the boll weevil, which is much more dangerous to long staple cotton than to the shorter staple varieties, as the former is

three to four weeks longer in reaching maturity. The result of this has been that the American farmer has to a large extent substituted short staple for long staple cotton, and consequently a high premium is being paid for the latter. All things considered, I think that it will be evident to all Egyptian cultivators that it is more imperative than ever to maintain a high standard of quality.

I will not refer to the many points of interest touched upon, such as the primitive handling of cotton at the gins, &c., but leave the reader to study the varied headings for himself, merely contenting myself with offering to Mr. Schmidt my sincere congratulations upon having compiled a well-thought-out and instructive report, which cannot fail to be welcome to all who are engaged in the Egyptian cotton trade, whether as growers, merchants, or spinners, and particularly to those who have the welfare of Egypt at heart. The action of the Committee of the International Federation of Master Cotton Spinners' and Manufacturers' Associations in deciding to send the Secretary to Egypt is justified to the fullest extent by the excellence of the report which he has prepared.

A. H. DIXON, *Managing Director*,
The Fine Cotton Spinners' and Doublers' Association, Ltd.

St. James's Square, Manchester, 27th February, 1912.

COTTON GROWING IN EGYPT.

Report by Mr. Arno Schmidt, Secretary of the International Federation of Master Cotton Spinners' and Manufacturers' Associations, on his Visit to Egypt.

Introduction. The principal purpose of my visit, as decided upon by the International Cotton Committee at its meeting in Berlin, on the 11th October, 1911, was to prepare an itinerary for a tour of investigation by members of the International Cotton Federation: full details of the preliminary programme for this tour will be published later. The main object of the present report is to direct the attention of the members of this delegation and others to some of the conditions under which cotton in Egypt is cultivated and marketed.

I was aided in my work of collecting material by many Government officials to whom my visit had kindly been notified by the British Foreign Office. I had the pleasure and honour of having three interviews with Field-Marshal Viscount Kitchener of Khartoum, the Consul-General of Great Britain in Egypt. Owing to the short duration of my stay this report is merely a collection of information obtained; only in a few cases have I ventured to make suggestions as to improvements, and this after consultation with experts.

My information has been derived from personal interviews with the leading cotton experts in the country, and, as far as time would allow, from a careful inspection of some of the cotton fields, gins, and presses.

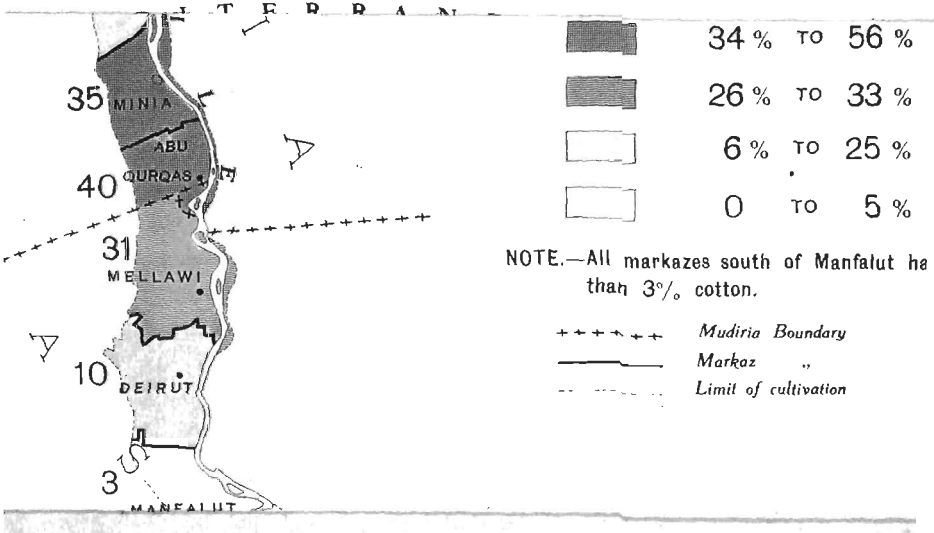
To those who desire to make a closer study of the questions at issue the publications noted at the end of Appendix III. are recommended; some of these have been used in the preparation of this report.

Geographical. Egypt occupies the north-eastern part of the African Continent and the Peninsula of Sinai in Asia, but, generally speaking, the part situated in the Nile Valley is termed Egypt. Whilst the Egyptian Khedivate covers about 900,000 square kilometres, Egypt proper has only about 30,000 square kilometres. Of these 22,300 are cultivated, viz., 9,000 square kilometres in Upper Egypt and 13,300 square kilometres in Lower Egypt.

The importance of Egypt is due to the regular and abundant water supply from the Nile and to its geographical position, being the connecting link of all roads between the East and West. The part south of Cairo is called Upper Egypt, and that north of Cairo Lower Egypt.

There is very little rainfall in the country, and therefore crops are almost entirely dependent on irrigation.

All the year through there is a north wind, which is of considerable economic advantage, as it enables the many thousands of


35
MINIA
ABU
QURQAS
40
31
MELLAWI
10
DEIRUT
3
MANFALUT
34 % TO 56 %
26 % TO 33 %
6 % TO 25 %
0 TO 5 %
NOTE.—All markazes south of Manfalut ha
than 3% cotton.
Mudiria Boundary
Markaz ,,
Limit of cultivation

picturesque sailing vessels to go up the river, even against the strong current during the flood.

The surface of the land is almost a plain, and where this is not the case naturally it is made so artificially in order to facilitate irrigation.

Soil. Although the whole of the Nile Valley has been formed by deposits of the River Nile during many thousands of years, yet the soil is not uniform in character. The soils in the northern part of the delta and all other low-lying lands in Egypt are liable to become impregnated with common salt—sodium chloride—and for this reason such tracts must be well washed with fresh water before they are fit for cultivation. Without cultivation and irrigation the salt rises to the surface by capillary attraction.

Egypt's sole source of income might be said to be agriculture, cotton, of course, being the principal export; but wheat, maize, barley, rice, beans, lentils, ground nuts, sugar, onions, tomatoes, dates, berseem (clover), are also largely cultivated. (See statistics of areas under different crops.—*Annuaire Statistique*, 1911, p. 260.)

Population. The population is growing rapidly; roughly speaking, there are two people for every feddan, and the increase is not due to immigration or to any marked increase of industrial population in the cities, but is due to the natural increase of the agricultural classes. I am told that the percentage of infantile mortality is about 60 per cent.

The following table may be of interest —

Provinces.	1897		1907
LOWER EGYPT (EXCLUDING TOWNS).			
Kalioubia	371,602	..	434,784
Sharkia	748,972	..	886,346
Dakahlia	780,480	..	912,428
Menufia	864,206	..	971,016
Gharbia	1,297,656	..	1,484,814
Behera	656,419	..	814,037
	4,719,335	..	5,503,425
UPPER EGYPT.			
Ghiza	401,234	..	460,080
Beni Suef	312,115	..	372,412
Minia	550,971	..	662,144
Assiout	782,720	..	907,582
Girga	688,011	..	797,940
Kena	711,457	..	780,849
Assouan	208,704	..	232,813
Fayum	371,006	..	441,583
	4,026,218	..	4,655,403
All Egypt	9,717,228	..	11,287,359

The total population according to the last census was, in 1907, 11,287,359, of whom 5,667,074 were males. In 1880 (1882) the population was practically only half the number, viz., 6,516,040 (6,831,131).

The density of population is 939 per square mile (considering only the inhabited area of the country), whilst the most densely-populated European country, viz., Belgium, can boast of only 588·1 per square mile.

Labour. The population is mainly agricultural. The people live a most frugal life, and considering the climatic conditions may be said to be hard working. In dealing with populations living in tropical or semi-tropical climates, the European is apt to forget that continuous work is almost impossible, and when we hear of a 16-hours working day in this or that tropical climate it is understood by employer and operative that the work is carried on intermittently, the operatives absenting themselves from their work at frequent intervals.

Schools. Education amongst the great mass of the people is practically non-existent: only about 60 per 1,000 over all, or 85 per 1,000 of the native *male* population, were returned in 1907 as able to read and write. A large number of schools and colleges have been established of late.

The People. In Europe we have been given to understand that the "fellah" (a term now used generally for the small cultivator in Egypt, whilst really the word means the race originated by the old Egyptian agricultural classes) is of an extremely conservative mind, but evidently a change has come about. Farmers in any country have a conservative mind, and Lord Kitchener told me that he did not think the fellaheen were any more conservative than the English farmer. This is borne out by the fact that they are using in ever-growing quantities artificial manures, for the introduction of which the Khedivial Agricultural Society has done so much.

As it is against the Mohammedan religion to charge interest on money, the fellah does not give his savings to a bank, but buries them for safe keeping.

The possession of land is an instinctive craving in the fellah, and as soon as he has saved sufficient money he invests it in agricultural land and cattle (mostly buffalo cows, goats, and camels).

A great many different races may be found in the agricultural classes, for instance, Copts (the successors of the old Egyptian Christians), Circassians, Turks, Arabs, &c.

I was favourably impressed by the sturdy physical development of the men in the country. Unfortunately, the people have not much regard to their health; a visitor to Egypt is struck with the number of blind persons and of people with defective eyes; but this need not surprise anyone who sees how the flies are allowed to remain on and about the eyes of infants and children. No child under 13 years of age is allowed to work in a factory. The Law No. 14 of 1909 dated July 4th, 1909, regulates the employment of children in cotton-ginning factories.

Wages. In some cases the labourer is paid partly in cash and partly by the landlord giving him an allotment of about 2 to 2½ acres of medium land; for every child he will get an additional half acre. The labourers are under restriction as to

the cultivation of this allotment; for these allotments they pay only a reduced rent, supposed to be equal to the land tax. Under those conditions a labourer will receive about 6s. per month wages; where no allotment is given he receives about 30s. per month.

The Weights and Measurements used in Egypt are:—

1 Ardeb = 198 Litres = { 43·58 gallons / 5·45 bushels } = 2·7 kantars (of cotton seed).
1 Feddan = 4,200·8 square metres = 1·038 acres = ·42 hectares.
1 Kassabah = 3·55 metres = 3·88 yards.
1 Oke = 1·25 kilos = 2·75lbs. (English).
1 Kantar { 100 rotls / 36 okes } = 44·93 Kilogr. 99·05lbs. (English).
1 acre for all practical purposes = 1 feddan; the exact equivalents are: ·936 feddan, or ·40467 hectares.
1 Egyptian £ = £ sterling 1. 0s. 6¾d. = Frs. 25·92.
1 £ sterling = 97½ P.T. (Piastre Tarif).
1 £ E. = 100 piastres = 1,000 millièmes.
1 piastre = 2·46d. = 25·9 centimes = 10 millièmes.
1 millième = ·246d. = 2·59 centimes.
1,000 millièmes = 1 £ E. = £1. 0s. 6¾d. = Frs. 25·92.

Land Values.

As is generally known there was an enormous wave of speculation in land, which came to a head in the crisis of 1907. In 1898 certain estates were valued officially at £E402,000, one year later at £E625,000, and in 1905 at £E1,300,000. Good cotton land in Lower Egypt, which 10 years ago might have been bought at £E80 costs to-day quite £150. The price of land in Upper Egypt has risen from £E50 to about £E80. The causes for these stupendous increases are mainly to be found in the improvement actually caused or anticipated through irrigation and drainage works, and the high price of cotton and other products of the soil.

I was told that one might take £E120 to £160 as the average cost per acre in the best cotton-growing districts; as an extreme case it may be cited that £300 per acre was asked for agricultural land (for market gardening) a few miles out of Cairo; this same land is rented at present at the rate of £21 per annum. Newly reclaimed land is of course cheaper. At Aboukir the average rental is £5 per feddan; there is some land that lets at £2 and other at £8, according to the number of years it has been under cultivation. The landlord who insists on a two, or especially on a three years' rotation, must necessarily let his land at a lower rate than the landlord who allows his tenant to impoverish the soil by planting cotton year after year. In connection with the profits resulting out of the bye-products it may be of interest to refer to the paragraph dealing with the Aboukir Estate on page 159. It is evident that the small farmer with 8 to 12 feddans and less holding is able to obtain a number of bye-products from the land, such as eggs, milk, poultry, vegetables, which it would be almost impossible for the large farmer to realise.

Ownership of Land.

According to an official publication, out of a total of 1,392,000 landowners in Egypt in 1910, 1,247,000 owned less than 5 feddans each, and the average size of the holdings of the latter was 1·10 feddans. Of

these 782,639, or 56 per cent. of the whole landowners in the country owned less than 1 feddan, with an average of only ·46 feddans. How is it possible to grow crops under such conditions of standard qualities suitable for export? At the Aboukir Co. the average holding of a family, consisting of five including children, is 8 feddans.

AREA AND LANDOWNERS* IN 1910.

COMPILED BY THE DEPARTMENT OF DIRECT TAXES.
MINISTRY OF FINANCE.

EXTENT OF HOLDING.	TOTAL OF AREA.		TOTAL OF LANDOWNERS.	
	Feddans.	Percentage.	Landowners.	Percentage.
Up to 1 feddan	364,290	6·67	*782,639	56·22
From 1 to 5 feddans ..	1,005,322	18·40	464,442	33·37
From 5 to 10 feddans ..	530,231	9·70	76,139	5·47
From 10 to 20 feddans ..	507,050	9·28	36,707	2·64
From 20 to 30 feddans ..	247,439	5·02	11,233	·81
From 30 to 50 feddans ..	323,883	5·93	8,390	·60
From 50 feddans	2,458,574	45·00	12,414	·89
Total	5,463,789	100·00	1,391,964	100·00

* Of the 1,246,081 proprietors owning less than 5 feddans, 360,000 do not grow cotton.

The Land Taxes.—The following figures of the revenue under this heading may be of interest :—

	Total feddans cultivated.	Revenue.	Average rate of tax per feddan. £E.
1881	4,714,406 ..	4,880,518 ..	1·035
1890	4,941,488 ..	5,118,142 ..	1·036
1900	5,486,700 ..	4,379,290 ..	·798
1910	5,657,000 ..	5,118,887 ..	·904

The greater part of the cultivated area in the country belongs to private owners, and as will be seen from the table previously given there are 1,359,927 landowners possessing 20 acres or less. Several Princes are amongst the large landowners. Large estates are the State Domains and the Daira Sanieh (the latter now broken up), which had been given as security to the European banks for loans raised by the late Ismail Pasha. The State Domains are managed by an English, Egyptian, and French Administrator, the managing director being Birch Pasha, an Englishman who has held with success various positions of the highest importance in the country and has furthered especially the agriculture of Egypt; he is one of the best-known Englishmen throughout Egypt, and his advice is generally accepted by natives as well as by foreigners. During the coming year the whole of the loan raised on the Domains will be paid back, leaving the State with a property of well over £E5,000,000 value.

It was only in 1900 that these Domains showed a surplus on the year's work for the first time.

The estates managed by the Daira Sanieh Administration were handed over to a private syndicate in 1898; the loan was finally cleared off in 1905, leaving a reversion to the Government of about £E3,200,000.

Prof. J. A. Todd describes the Egyptian Banking System in his book, "Political Economy for Egyptian Students," as follows:—

The Egyptian Banking System.

The Egyptian banks may be divided into three classes: (1) The ordinary or deposit banks; (2) the Agricultural Bank: and (3) the other land banks, such as the Credit Foncier.

The functions of the deposit or ordinary banks are to receive money from their customers on deposit or current accounts, and to use these funds, along with their own capital, in legitimate banking business, discounting, &c., but not in lending

Store of a Bank in Beni-Suef.

(*The Banks make advances on all kinds of produce. The bales in the illustration contain cotton, the heaps on the left and in the centre are oil seeds.*)

directly on the security of land. That is a kind of business which no deposit bank should touch, because securities over land are proverbially difficult to realise quickly, and a deposit bank may require to realise a large portion of its securities at any time to meet sudden demands by its customers.

The position of the Agricultural Bank is entirely peculiar. It was established in 1902 under the auspices of the Government and the National Bank to take over a special class of financial work which had already been carried on since 1895 on experimental lines, first by the Government and then by the National Bank after its foundation in 1898. Its funds are derived from its own capital, which now amounts to £10,310,000, raised partly under Government guarantee,

and are lent out on two classes of loans to the fellaheen: (*a*) Short loans not exceeding £E20 for not more than 15 months, to enable them to buy seed, &c.: (*b*) longer loans for periods not exceeding 20½ years, and limited to £E500, to enable the fellaheen to buy stock, erect buildings, or make improvements on their farms. The rate of interest is now 8 per cent. It is not the business of the Agricultural Bank to lend money to the fellaheen to enable them to make speculative purchases of land, but it is to be feared that during the recent boom many of the fellaheen were buying land to an extent so far beyond their actual resources, either of purchase or cultivation, as to be really little better than speculative purchases.

The Governor of the National Bank of Egypt is President of the Board of Directors of the Agricultural Bank, and the Government Commissioners on the National Bank are entitled to attend the meetings of the directors, to examine the books of the bank at any time, and to report any breach of the statutes to the Government.

The bank has the assistance of the Government's sarrafs in the provinces in collecting the interest and principal of its loans. For this the sarafs receive ½ per cent. on the sums collected, while the bank pays to the Government the cost of any extra staff specially required for the work.

The land banks proper, however, may quite safely embark in land mortgage business, because the source of their funds is different from that of the deposit banks. It consists of their own capital and funds received from debenture holders, none of which can be called up except at stated times. Thus the bank may safely invest these funds in more or less permanent securities without fear of having to realise in a hurry in order to meet some unexpected call. There are many of these banks in Egypt which have drawn large sums of capital from Europe, but as a considerable part of the money is placed on loans repayable over long periods, it is obvious that they can only continue the business on a large scale as long as fresh supplies of capital continue to come from Europe.

There is nothing in the Egyptian banking system corresponding to the position occupied by the Bank of England in London as the bankers' bank. The National Bank of Egypt holds the Government balances on certain conditions, and has the exclusive right of issuing bank notes, but there is no central reserve system, each bank keeping whatever reserve it thinks fit. There is no clearing house, but the use of the notes of the National Bank, and the fact that most of the principal banks keep accounts with each other, to some extent serve the same purpose.

Professor Todd says, in the same book:—

History of Cotton in Egypt.

The modern history of cotton in Egypt dates from 1820, when a French engineer, called Jumel, who had recognised the possibilities of improving the cotton crop in Egypt, succeeded in interesting Mohammed Aly in the subject. The new Jumel cotton, as it was afterwards called,* was a tree cotton which Jumel had found growing for ornamental purposes in a Cairo garden, and the cultivation on a large scale was soon shown to be a commercial success. The results encouraged

* The French Spinners still call Egyptian cotton "Coton Jumel."

Mohammed Aly in further experiments, and he began to import foreign seed, principally Sea Island and Brazilian. The result has been the gradual development of a cotton which is distinctly Egyptian, and which, through many different varieties, possesses the characteristics which have given it a special value.

Its importance as a part of the world's supply was first established during the Civil War in America in 1864, when the price of Egyptian cotton rose to an unprecedented level. The subsequent relapse to something like the old prices contributed largely to Ismail's early financial difficulties. In 1894 the price fell below seven dollars per kantar.

Of recent years the improvement in the processes of production of cotton fabrics and the increased demand for the finer cotton goods has given a special value to the Egyptian cotton. The introduction of the process of mercerising, enabling cotton goods to attain a quality and

Leveling the Surface of the Field.

finish almost like silk, gave a fresh impetus to the demand, and in 1906–7 prices rose to a level unheard of since the war. The general depression which fell upon all the markets of the world after the American crisis of 1907 had its effect on the demand for these fine cotton goods, and the price of Egyptian cotton fell heavily. In 1909–10 again, owing, in the first place, to an expected shortage of the American crop, and then to the sudden failure of the Egyptian crop to come up to the expected yield, the price of Egyptian cotton again jumped to the highest figure on record.

A renewed demand for Egyptian was also caused by the increased desire for luxury of the well-to-do classes all over the world, as Egyptian cotton serves to make the finest kind of textiles.

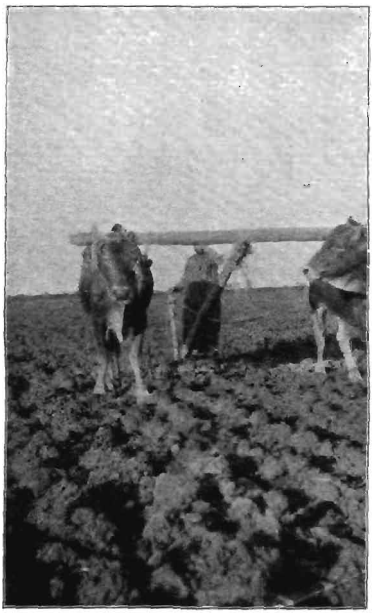
Agriculture.

It seems necessary to explain that one distinguishes the crops in Egypt between winter, summer, and Nile crops, *i.e.*, crops of which the seed is sown in winter,

summer, or directly after the flood. Cotton is of course the most important crop of the country.

Methods of Cotton Cultivation and Preparation of Soil.

Large estates are using steam ploughs, but the small cultivator prepares the ground in autumn by means of the primitive Egyptian plough, drawn by a pair of oxen. I have seen as many as 12 ploughs in one field at one and the same time. The plough is made entirely of wood; only the front part of the beam which goes into the soil is shod with iron.



Ploughing in Egypt.

The plough does not cut deep into the soil, but simply scratches it; the fellah will generally plough his field four times, sometimes oftener, each ploughing being done at right angles to the previous one. When making ridges for cotton, the beam edge of the plough which goes into the soil has to be covered with sacking, &c., as the ordinary plough does not throw up the soil. There is in use a ridging plough, called "battana."

After the ridges have been made in this primitive manner, a number of men shape them properly by means of a "fass," an instru-

ment in the shape of a Dutch hoe; these men also attend to the breaking up of clods (*see illustration*). It is estimated that the cost of one pair of bullocks and the labour is about 4s. per day; the extent of their work is about 2½ feddans.

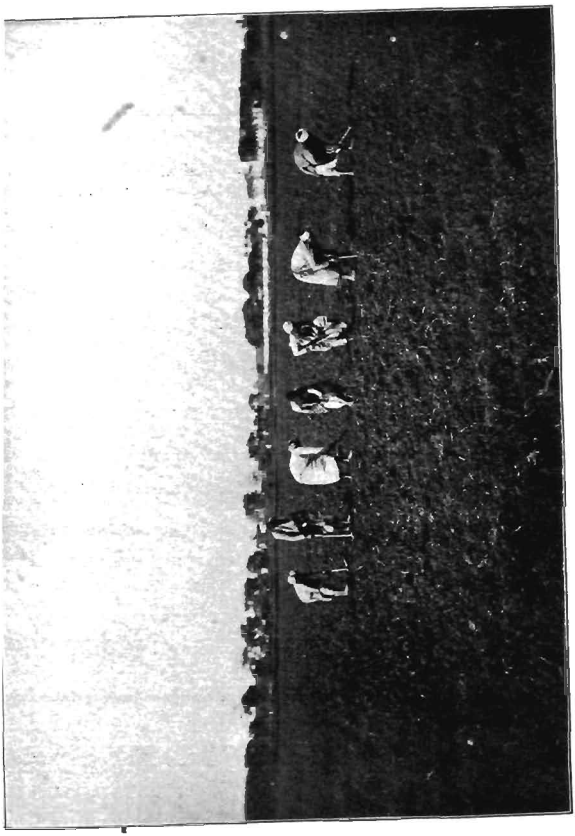
The native plough does not enter the soil deeper than 5in. to 6in.; cotton which has a deep tap-root, 2 yards and even more in length, requires the soil well loosened. It is generally considered advisable to let the land lie fallow after ploughing for about one month. The soil before planting cotton should be quite dry, though a watering is given immediately afterwards. (*See paragraph dealing with Rotation of Crops*).

Planting. I have already referred to the proper irrigation of the cotton field. Mr. George P. Foaden, B.Sc., formerly Secretary-General of the Khedivial Agricultural Society, says in his Notes on Egyptian Agriculture. "It is very rare in Egypt to find even as great a distance as 35in. between the rows, while on average land, producing 500lbs. of cotton, or even 750lbs., 30in. or even less may be looked upon as an average." In America we have seen that the distance from ridge to ridge is about 3ft. 6in. The Department of Agriculture is doing its utmost to get the fellaheen to adopt larger distances from ridge to ridge and plant to plant. As regards the latter a great deal of variety exists in Egypt. I have seen plants less than 10in. apart in Upper Egypt, but as a rule one may say 15in. is adhered to. This close planting is also assisting in the breeding of insects, which prefer shady places, and under thick foliage they are not easily found by the children seeking the eggs. Mr. Foaden estimates the number of cotton-seed holes per feddan as 13,000. In each hole from 10 to 20 seeds are put, and as the soil is often not fine but in clods, the fellaheen frequently put a bean along with the cotton seed. The bean being of stronger growth removes any clod which may be resting over the cotton seed. The seed holes are made, not on the top of the ridge, but about 3in. from the top on the sunny side of the ridge.

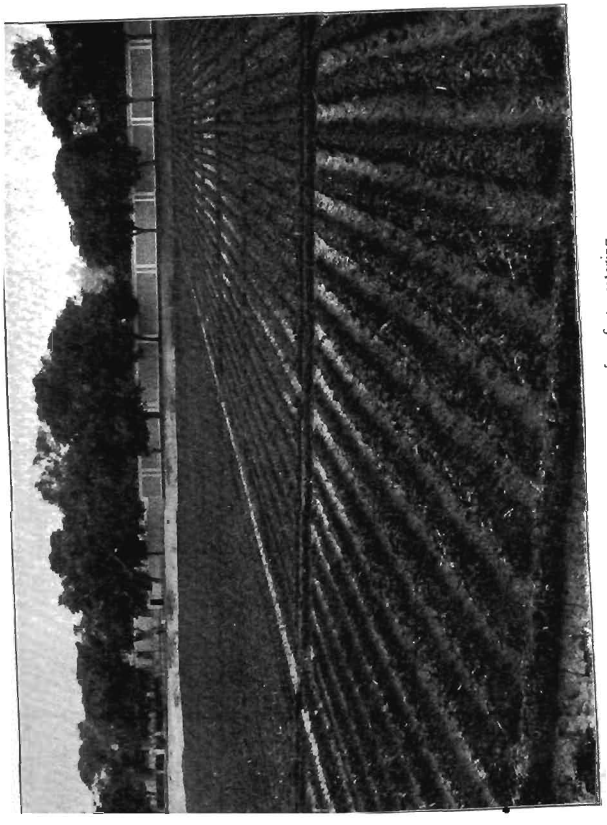
It is very important to notice that everywhere in Egypt two plants are grown in each hole, therefore the total number of plants is about 26,000 per feddan; in America and India only one plant is left.

The time of planting is generally March, in the north even April. Egypt knows no killing frosts, but there is frequently cold windy weather in early spring. The Department of Agriculture and all agricultural organisations make strong propaganda for early planting, as then the cotton does not suffer so much from the ravages of insects, which come in large numbers, generally in August, when early-planted cotton is almost ripe.

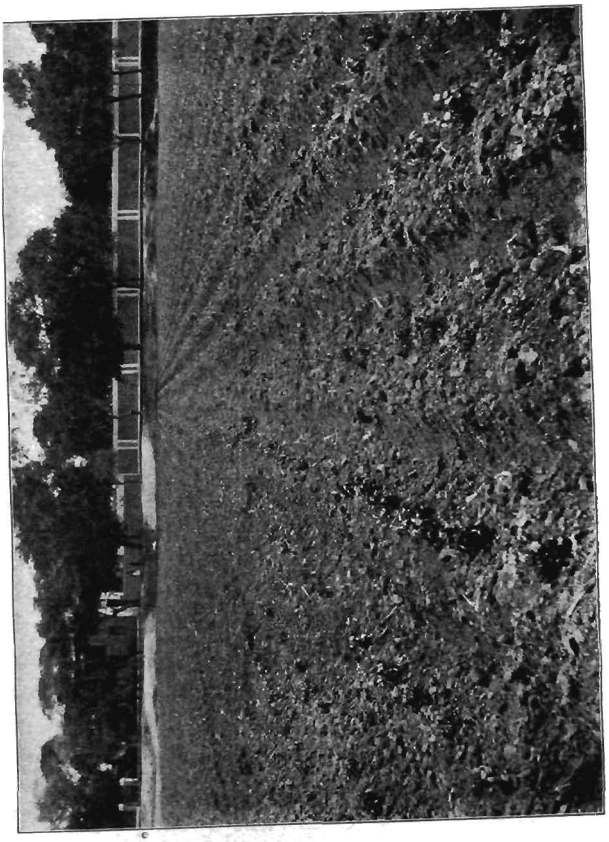
A watering is given to the field as soon as the seed is in the holes. Where seeds fail to come up, new seed, which has been soaked in water to accelerate germination, is put in. When the young plants are fairly well established, *i.e.*, in 16 to 20 days, a hoeing is given to clean the field of weeds and break up the clods. Three or four men will hoe an acre per day; sometimes a second hoeing is given within 35 days of planting, then another watering, but before the second watering the plants are thinned out; two plants, the strongest, are left. Too frequent watering prevents the plant from branching out at the bottom. The third watering is given about the end of May, generally followed by hoeing. Waterings are from now given more freely:



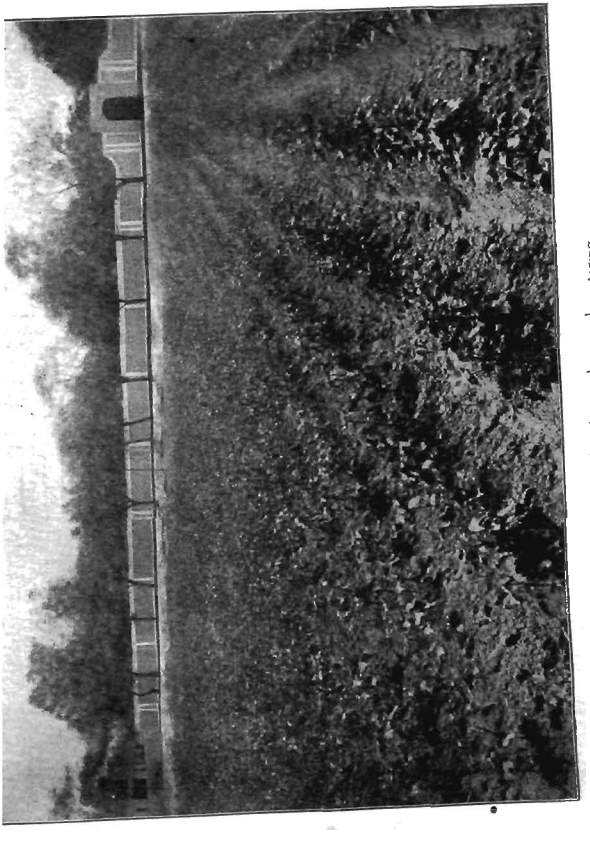
Preparing Land for Cotton.



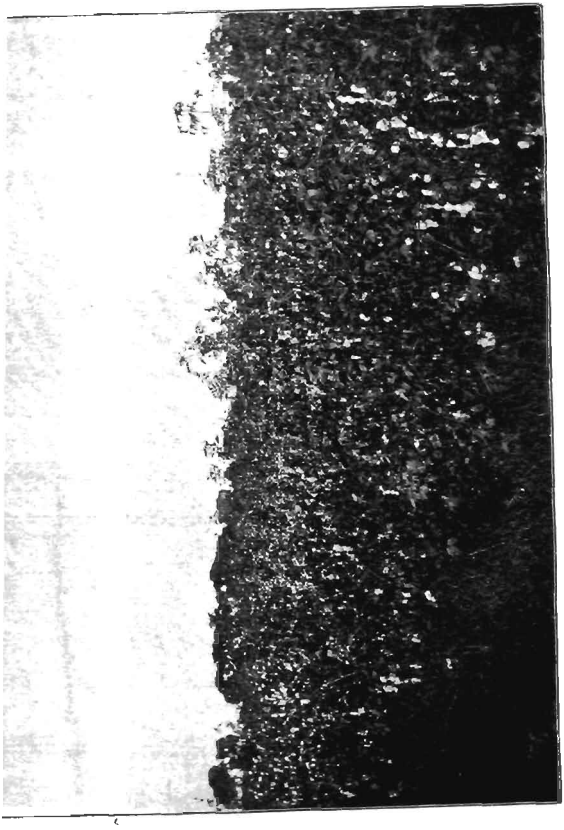
Land sown with Cotton after first watering.



Cotton ready for thinning out.



Cotton after thinning and second watering.



Ripe Cotton.

during June, July, or August, the cotton gets a watering every 14 days or as often as the water rotations will allow. (*See remarks under Irrigation.*)

Mr. Foaden says that each watering requires about 350 tons of water per acre, and as cotton receives 9 or 10 waterings, an acre of cotton receives a total of 3,150 to 3,500 tons of water, being equivalent to a rainfall of 31in. to 35in.

Manuring. Owing to the more intensive cultivation of the soil since the introduction of perennial irrigation, and also owing largely to the fact that there is at present very little Nile mud deposited on the land, whilst formerly at flood time, when basin irrigation was in general use, there was every year the restorative power added to the soil by the Nile mud, the question of adding manure becomes more and more acute. The heaps of manure which one sees at every village are a proof of the value which the native puts on it; every cultivator in Egypt acknowledges the value of manure as far as the cotton crop is concerned. The opinion is still held that stable manure is the proper dung for the cotton crop in Egypt; artificial manures have only proved a success on very poor soil. The mixture recommended by Mr. Foaden is 10 to 15 tons stable manure, 150lbs. or 200lbs. soluble nitrogenous manure, and two-thirds nitrate of soda and one-third sulphate of ammonia. Comparatively speaking, few cultivators are using chemical manures for the cotton crop.

It is estimated that 10 to 15 tons of stable manure are used per feddan in Egypt; this is applied broadcast before ploughing. Leguminous forage crops, such as clover (berseem) form an excellent preparation for a good cotton crop, and may be considered a manure.

In fact, green manuring is practised very extensively in Egypt. Mr. G. P. Foaden says in the "Text-book of Egyptian Agriculture":—

"Crops are not grown except in the case of lupins with this as the primary object, but the ploughing in of berseem (clover) before cotton, which is so common, is a system of green manuring which is attended with most excellent results. At the time it is ploughed in there is a considerable amount of stem and young leaves on the plant, though the amount of organic matter thus added to the soil is not so great as when mustard, buckwheat, lupins, and other crops are grown primarily for this purpose in Europe. The frequency with which it is practised in Egypt, however, compensates for this, and it is impossible to over-estimate the importance of the effect which it has had on Egyptian soils. In the first place, the mechanical condition of the soils has been improved, and when vegetable matter is thus incorporated in our heavy clay soils it opens them up, making them more light and porous. For the improvement of light sandy soils, no better system is known than that of growing berseem, which not only greatly enriches them in nitrogen, in which they are generally deficient, but also by the addition of vegetable matter renders them more absorptive and retentive and greatly enhances their value. In Egypt there is a great want of organic matter, and were it not for the system of indirect green manuring practised by the ploughing in of berseem, it is difficult to see how the fertility of our soils could have been maintained."

I have often been told that "berseem" is the salvation of Egyptian agriculture, and the Colonial Cotton Growing Associations will do well to experiment with this Egyptian clover. Mr. G. S. Henderson, the present Deputy-Director of Agriculture in Sind (India), who a few years ago was employed by the Aboukir Estate Company in Egypt, has introduced successfully "berseem" into Sind, and its cultivation is now also being taken up by other provinces in India.

According to Mr. Frank Hughes, F.C.S., of the Survey Department, who as chemist of the Khedivial Agricultural Society has executed a number of manuring trials in different localities, the usual practice among cultivators in Egypt appears to be to apply as far as possible the manure produced on the farm to the land destined for cotton. Where ordinary manure is insufficient it is frequently supplemented by the soil and dust from the sites of ancient villages (of which there are a great number). The manure tests carried out by Mr. Hughes have not shown any marked increase by the use of artificial manures; sometimes even a negative result in comparison with the experimental plot that was not manured. He expressed the opinion that probably good cotton soils do not require any manure, whilst poor soils should certainly receive a good dressing of stable manure. The stable manure of the country is poor in organic substance. Whenever the last crop of "berseem" is cut, the fellah allows the sheep or cattle on it, mainly for the purpose of obtaining the manure.

Picking Cotton.

During the latter part of August, cotton picking commences as far as Upper Egypt is concerned, where only Ashmouni cotton is grown. In September the first picking begins in the Delta, *i.e.*, in Lower Egypt.

The picking is carried out by children, boys and girls, and also old people, who put the cotton gathered into the folds of their loose smock. The pickers can certainly not carry in this way as much cotton as the pickers in America with their trailing sacks over their backs. I have watched these children separating carefully fibres from leaves, &c.; where the latter will not readily become detached and fall off, they put the cotton into their mouth and blow the leaf or part of stalk away, a process which they perform very quickly. To every lot of 10 or 12 children there is an overseer, and I have seen some of them using their lashes amongst the children who had left cotton on the plants. The average quantity picked per day by one child is about 30lbs.; picking cannot be carried out in the morning owing to heavy dews, and night falls at 5 p.m.

At the side of the field a long piece of canvas is stretched out and the cotton of each picker is weighed and put into the farmers' long bags seen in the illustration on page 160, and carried away on the backs of the camels.

The wages earned by each picker are from 5d. a day upwards.

The cotton from each picking is kept carefully apart. There are generally three pickings, in some places only two, but in others even four. After each picking the field is watered. The first picking is of the best quality, more even than the others, and generally begins in September. The second takes place in October, and the last may be as late as December.

YPTIAN COTTON AND OF THE AREAS PL

Statistical Department.)

itch.		Ashmouni.			Noubari.		
).	+, or − 1911.	1910.	1911.	+, or − 1911.	1910.	1911.	+
ms.	Feddans.	Feddans.	Feddans.	Feddans.	Feddans.	Feddans.	Fe
89	+ 1,580	—	70	+ 70	9,845	12,379	+
67	+ 1,876	—	50	+ 50	2,769	5,532	+
22	+ 22,203	—	1	+ 1	95	1,746	+
53	+ 15,776	—	112	+ 112	42,055	44,797	+
73	+ 29	—	—	—	2,376	7,236	+
51	− 82	318	91	− 227	36,754	40,296	+
55	+ 41,646	318	324	+ 6	93,894	112,616	+ 1
12	+ 12	29,966	41,897	+ 11,931	9	267	+
10	+ 10	70	486	+ 416	—	—	
	—	66,849	78,843	+ 11,994	92	—	−
	—	80,527	73,063	− 7,464	—	3	+
81	− 22	46	800	+ 754	100	3	−
43	+ 33	6,483	14,447	+ 7,964	2,959	2,603	−
	—	1,698	1,914	+ 216	—	—	
71	+ 265	106,533	118,069	+ 11,536	—	—	
17	+ 298	292,172	329,519	+ 37,347	3,169	2,876	−
72	+ 41,944	292,490	329,843	+ 37,353	97,054	115,492	+

ANTED IN 1910 & 1911.

	Sakellaridis.			Other varieties.			
or − 911.	1910.	1911.	+, or − 1911.	1910.	1911.	+, or − 1911.	
ddans.	Feddans.	Feddans.	Feddans.	Feddans.	Feddans.	Feddans.	
2,534	?	8,579	+ 8,579	399	3,973	+ 3,574	I.
2,763	?	16,292	+ 16,292	210	1,940	+ 1,730	II.
1,651	?	9,358	− 9,358	—	280	+ 280	III.
2,742	?	44,806	+ 44,806	4,522	6,481	+ 1,959	IV.
1,860	?	4,897	+ 4,897	—	83	+ 83	V.
4,172	?	35,523	+ 35,523	4,854	2,837	− 2,017	VI.
8,722	?	119,455	+ 119,455	9,985	15,591	+ 5,609	
258	?	—	—	428	19	− 409	VII.
—	?	—	—	—	128	+ 128	VIII.
92	?	—	—	56	10	− 46	IX.
3	?	—	—	—	287	+ 287	X.
97	?	—	—	—	32	+ 32	XI.
356	?	132	+ 132	—	—	—	XII.
—	?	37	+ 37	—	—	—	XIII.
—	?	12	+ 12	—	165	+ 165	XIV
284	?	181	+ 181	484	641	+ 157	
8,438	?	119,636	+ 119,636	10,469	16,235	+ 5,766	

The seed for sowing purposes is taken from the first picking only.

Before the last picking clover is frequently sown amongst the cotton, and as soon as the crop is finished the sticks and roots must be pulled out (according to Government decree not later than 31st December). After this the land is usually levelled for the water to reach evenly all parts of the clover.

Kinds of Cotton. The kinds of cotton grown are shown in the accompanying list.

Afifi is the "bread and cheese" quality of Egypt. The name Afifi has been derived from a village in the province Galiubia, where it was first grown in the early eighties. The fibre is brown, glossy, and strong; its staple varies from 1¾ to 1½ inches. All authorities are agreed as to its deterioration in quality and yield. The following figures as to yield per feddan over several years were given to me by a large farmer:—

	Kantars.	Kotles.
1898—1903 (6 years)	6 ..	14
1904 1908 (4 years)	4 ..	62
1909, exceptionally bad year throughout	3 ..	24
1910, no damage by cotton worm ..	4 ..	77
1911, probably	4 ..	50

(*See also Table on page* 171.)

Great attention has lately been directed to a new variety, **"Assili"** (meaning in Arabic "Thoroughbred"), which has been raised by Messrs. J. Planta & Co., as it is held by such authorities as Birch Pasha, Abaza Bey, and others, that it may possibly be destined to take the place of Afifi in the near future. I had a long conversation with Messrs. J. Planta & Co., who evidently deserve the highest credit for the scientific and practical manner in which they have striven to keep the "Assili" cotton free from admixtures. I was told by them that the spinning quality of this cotton has been satisfactorily proved. The yield per acre is said to have been as high as 11 kantars per feddan, and the ginning out-turn is at least 110 (*see explanation regarding ginning out-turn*), but I have convinced myself from lists shown to me by Messrs. J. Planta & Co. that some lots have shown as much as 115·5; the lowest out of about 30 lots was 108. Even this last return is considerably better than Afifi ever was. The following are expert opinions from impartial sources on "Assili":—

"The cotton has a finer touch and appearance, very superior to ordinary Afifi and more regular in staple than Domains Afifi (which is known as best type of Afifi)." "A very strong cotton." "No question of its being much superior to Domains Afifi. Anticipate a ready demand for Assili at higher prices than Afifi."

Messrs. J. Planta & Co. report to me as follows as regards this cotton: "It is now six years since Assili was discovered in a field of Mitafifi cotton as a new natural hybrid distinguishing itself from Mitafifi by its large bolls and its superior lustre. Our representative, Mr. L. Berla, undertook under his strict supervision the sowing and cultivation through first-class farmers, and in this manner he has been able to keep the variety pure. During this season 5,000 bales will be grown, and if the cultivation continues within normal conditions, there will be enough seed in two years to plant with Assili the acreage which at present is under Afifi in the whole of Egypt.

The plant is similar in appearance to Afifi, except that it has larger bolls. The yield per feddan (4.200 sq. m.) has been in favourable fields from 5 to 8 kantars lint, and in medium soils from 3 to 5 kantars, except where the cotton worm, boll worm, or atmospheric influences have been detrimental. The ginning yield is at least 6 per cent. higher than Afifi and Nubari, and 10 per cent. higher than Janovitch and Saklarides. The fibre of Assili distinguishes itself favourably from Afifi by its length and fineness, its strength and regularity; its colour is also uniformly brownish; there is no mixture of the Hindi (short white cotton), which for several years has been increasing in Afifi. It seems almost certain that Assili will in the near future replace Afifi, which is from year to year degenerating more and more."

In order to control the sale of Assili for the coming season Messrs. Planta & Co. sell this seed only on the condition that all cotton raised from it must be sold to them. At present the price of Assili seed is 300 piastres per sack of 270lbs., as against the current market price of about 85 P.T. for ordinary seed for crushing. (The Government sells Afifi seed to the small planter at 105 piastres.)

Abassi is the only white Egyptian cotton which was originated some 20 years ago; its fibre is finer than Afifi. The second and third pickings are said to be much inferior to the first.

Ashmouni is the old cotton of Egypt; whilst formerly it was grown all over Lower Egypt, its cultivation is now almost entirely confined to Upper Egypt, where the plants ripen earlier than in the north. The fibre is from 1in. to 1⅛in. long and has not the same lustre as Afifi. Efforts are being made to improve the ginning out-turn of this cotton. It is this cotton which is very largely used for mixing with Afifi, and for this purpose it is sent to Upper Egypt for ginning. The result is not only an inferior "Afifi," but the admixture of Ashmouni seed with Afifi for sowing purposes (*see also page 179*).

Janovitch is a selected Afifi; its cultivation dates back to 1897, and it is now already well mixed with the short-staple cotton "*Hindi*." Janovitch is perhaps the most glossy and fine cotton which Egypt produces; it has fully 1⅛in. staple, and is not quite as brown in colour as Afifi.

Nubari closely resembles Afifi, but is of distinctly superior quality.

Sakellarides is a recent variety of long staple cotton, similar to Janovitch, but superior in some respects, and equal to Sea Island for certain purposes. I was told at two ginneries that cultivators like this cotton very much even if they get only the price of best Afifi for it, as it will give a yield of 7 kantars in soil which gives only 5 under Afifi. The area sown was very large in 1911—119,636 feddans.

Voltos is a similar kind of cotton, only a few years old, and is very pure— a grade of Abassi.

The Nile and the Irrigation Systems.

I am indebted for a great deal of information on this head to an article by W. C. Mackenzie, D.Sc., entitled, "The Nile in Relation to Egyptian Agriculture." (Year Book of the Khedivial Agricultural Society, 1905, p. 233.)

The White and Blue Nile join close to Khartoum and form what is known as the Egyptian Nile. From Khartoum to the Mediterranean it is 3,000 klm. in length, but receives

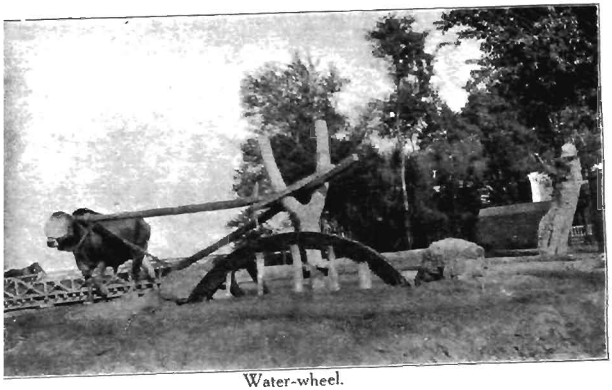
only one tributary, the Atbara. The Blue Nile and the Atbara have their sources in the mountains of Abyssinia. The White Nile rises in the large lakes of Central Africa. Whilst the Blue Nile and the Atbara are in flood from August to November, flowing quickly and carrying with them the soil from the Abyssinian highlands, where owing to the heavy fall the water does not soak into the soil, the White Nile has its flood time in the early summer. It flows slowly through marshes, deposits there the mud it may bear away from its sources, filters through the marshes, and carries away with it large amounts of vegetable matter, *e.g.*, particles of roots of grasses from the marshland. On the other hand, the Blue Nile and the Atbara are full of silt and mud. It is the deposit of this silt which in the course of many thousand years has formed the Nile Delta.

Egypt, being almost a rainless country, is dependent for its water supply upon the Nile.

Up to 1882 the country was supplied with its water by means of the system known as Basin irrigation. The country was divided up by banks into large plots varying from 500 to 50,000 acres: these were flooded by the Nile at the usual flood times, and the silt year after year deposited itself in these basins; the amount of such deposit has been estimated to be about 1 ton per acre, equal to a layer of one millimetre in thickness. In other words, it would take 1,000 years to raise the level of the basins one metre. The filling of the basins begins about the 10th to 15th August, and ends about the 20th or 25th September. Early in October the water from the basins is discharged. Where the soil depends entirely upon the flood for its supply of water, it is not possible to grow summer crops, such as cotton, sugar cane, &c.

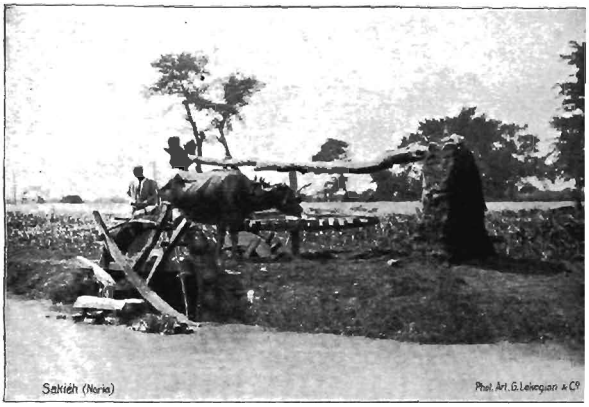
This system of basin irrigation has been to a large extent replaced by the modern system known as perennial irrigation. Canals were cut from the Nile to supply a larger area, and these canals supply water for irrigation all the year round; but it was soon found that these canals began to silt up, and they had to be cleared after each flood. With the view of keeping a constant supply of water in the Delta canals at a higher level, thus saving the annual clearing of the silted canals, the Cairo Barrage—a kind of enormous sluice or weir (*see illustration*)—was constructed at the branching of the Nile into its two main channels 12 miles below Cairo, its object being to hold up the level of the water in the Nile after the floods and enable the water to be turned into the canals at a higher level. The result has been that the levels of the canals were gradually raised, and the farmer has now in many cases no need to lift the water from the canals, but simply waters his fields by free flow irrigation. In other cases the difference between the level of the canal is not so great as before, and the farmer's task of lifting the water into his field is rendered much lighter. Various appliances of which illustrations are given, are used for this purpose.

Lower Egypt has no basin irrigation at all; during the flood time the numerous canals take the water directly from the Nile, but in summer, when the supply is limited, the whole of the water is arrested at the Cairo Delta Barrage and distributed by three great main canals to their respective irrigation areas. Each main canal is supplying smaller canals, which again are sub-divided, until the water runs in



Water-wheel.

Water-wheel.

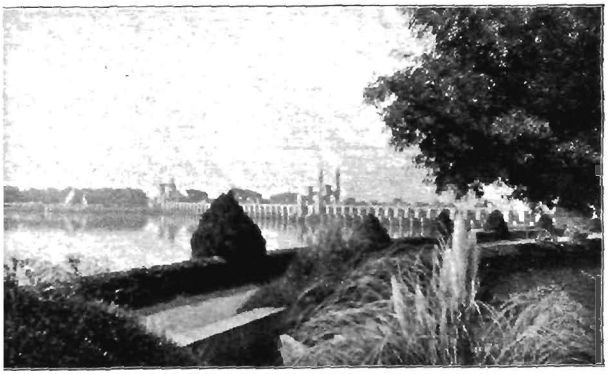


Water-wheel.

Shadouf.

numberless arteries all over the Delta. During eight months (September to April) the water is abundant, whilst from May to August the water is dealt out in "rotations," according to which canals or sections of canals receive water for a certain number of days and no water during so many more days. The extent of the restrictions depends on various circumstances: the extreme is six days water and 18 days none.

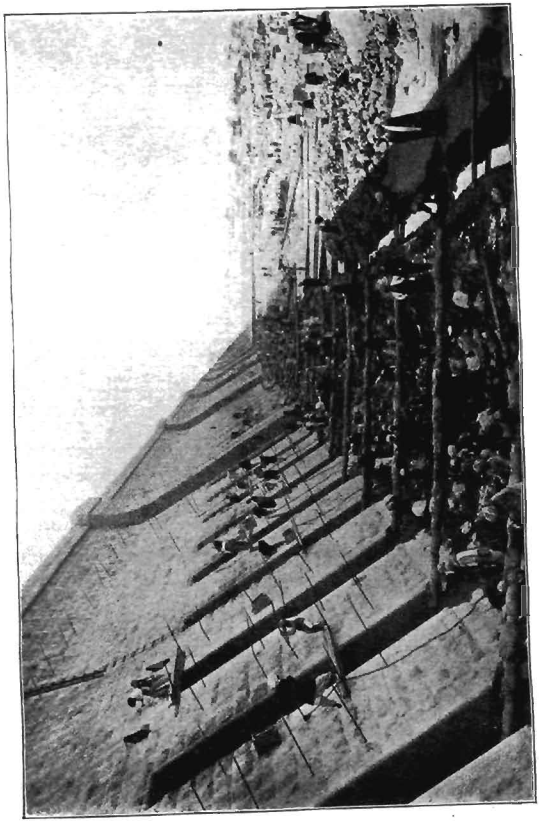
In order to guarantee a sufficient supply of water in the Nile during the summer before the flood came, a huge storage reservoir was constructed at Assuan, and a Barrage at Assiut. This has rendered possible the conversion of the basins of Upper Egypt into perennially irrigated land. The Dam at Assuan, which together with the first Nile Cataract forms this reservoir, was constructed by John Aird and Co. It has a height of 160 metres, and a length of 2,000 metres: there



Delta Barrage, near Cairo.

are 140 sluices below, each 14 metres square, and 40 upper sluices of 7½ metres square. The bottom sluices allow the silted water to pass when the river is in flood. The dam is at present* being raised by 6 metres in order to allow of sufficient additional water being collected for a further 1,500,000 feddans in the north of the Delta, which at present lie unreclaimed. When the flood ceases the sluices in the Assuan Dam are closed. This is generally about the 1st December, and it takes 100 days to fill the huge reservoir. Towards the beginning of May the water in the Nile becomes too low to feed the extensive network of canals, and from that time the water from the Dam at Assuan is used, the contents of which, amounting to 1,000,000,000 cubic metres, are necessary for supplying about half a million feddans in Upper Egypt with water. The cost of the Assuan

* The work has been completed in December, 1912.



Assuan Dam heightening, excavation from Set 16. Looking west.

Dam and the Assiut Barrage was £E3,439,864 and the additional 6 metres height will cost £500,000, whilst the work necessary to protect the antiquities at the island of Philæ will cost £1,000,000.

Mr. R. Lang Anderson, managing director of the Aboukir Land Company, in the articles he has contributed to the excellent Text Book of Agriculture, issued by the Ministry of Education, says, with regard to the Assuan Dam: "There are now 886,900 feddans in Upper Egypt cultivated during summer in sugar cane, cotton, and durah (maize), and when the Nile Reservoir at Assuan has been heightened the area receiving perennial irrigation will be greatly increased and the basin system will practically disappear. Instead of completely abolishing the basin system it would be more judicious from an agricultural point of view to so divide the basins into two,

The Assuan Dam after completion.

that summer cultivation could be confined to one half in alternate years, whilst the other half could be flooded, as is now done, but in alternate years. In this way all the land would have a thorough renovation with rich Nile mud every second year, and the noted fertility of Upper Egypt would be maintained."

Drainage. Where there is irrigation there ought to be an adequate drainage; drainage channels permit the filtering through of fresh water to remove noxious salt, they dry the land and leave it in sounder condition to feed vegetation, and they prevent the subsoil water from being raised too high: in short, a thorough system of drainage would prevent water-logging. As everything tends to point to this water-logging as being the cause of deterioration, the Government will, I feel sure, devote increased attention to the drainage of the country.

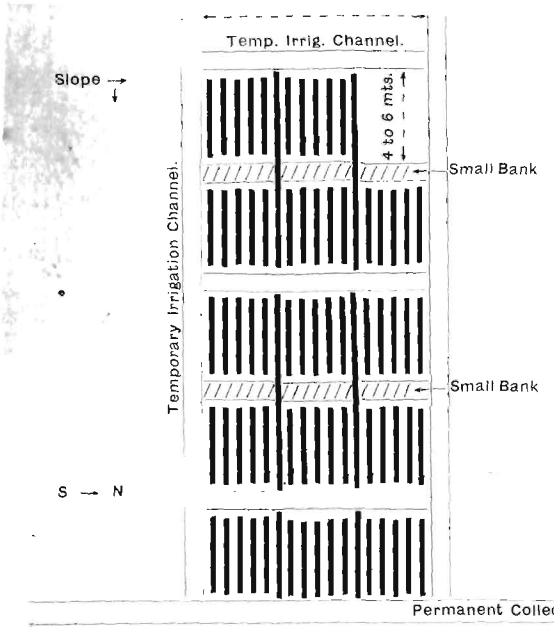
In Upper Egypt the drainage has been natural, the water percolating the subsoil and eventually returning back into the Nile.

Where the fields are more distant from the river, as in Lower Egypt, a large number of drains has had to be made; these have come into existence only during the last 25 years, and are not too numerous. I have seen canals as well as drains, specially the latter, which have been allowed to get overgrown with weeds, and this naturally reduces their efficiency. I was told in the Ministry of Public Works, under which the Irrigation Department is, that until

One of the Government Water Supply Canals near Korashia.
(Notice the large quantity of weeds.)

recently there was not sufficient money at their disposal to keep all the drains clear, but surely the expenditure under this heading must be a remunerative one.

In this connection it will be interesting to consider the following plan, which was drawn for me by Mr. H. C. Jeffrys, of the Sakha State Domains, and shows the proper method of field irrigation and drainage.



Notes.

The black parts are the ridges; they are 75 to 80 c/m. apart from each other.

Plants on ridge ·35 to ·40m. apart.

Ridges always run from east to west, in order that the plants get the benefit of the full sun.

When sowing, about 20 seeds are put in each hole; the two best plants are left.

Watering :—

First—just before planting.

Second—30 to 50 days later.

Third—25 to 35 days after the second.

Other waterings at intervals of about 20 to 30 days.

Water Rotations generally in Sakha :—

6 days water, 12 days without water, so that each field receives water on the 18th day.

Rotations begin in May (about 15th), according to level of Nile.

Land Reclamation.

Mr. R. Lang Anderson, who was the first to undertake the work of reclaiming land in Egypt, has contributed a detailed article under this heading for the "Text-book of Egyptian Agriculture" (pages 178-211). As the only method of extending the cotton area is by means of land reclamation I give a few extracts from this interesting article :—

"Although Egypt has been cultivated for countless centuries, and one might even record its agricultural history in millenarian periods, there yet remains a large area to be reclaimed. The great salt lakes bordering the sea coast, Lakes Mareotis 70,000, Edku 60,000, Borollos 180,000, and Memzaleh 49,000 feddans, with their marginal swamped lands, contain probably 1,000,000 feddans, whilst in almost every province in Egypt there is land which from difficulties of water supply or drainage, irregularity of surface, supineness or poverty of owners, has never been properly cultivated, or if cultivated in former ages has been allowed to revert. Remains of 'basin' banks and of ruined towns indicate more extensive cultivation of the northern delta than actually exists to-day."

"Reclamation will go on until Egypt reaches its final limits. This extension must cease with reclamation of the seaboard lakes and waste lands of the interior, in all probably not exceeding 1,500,000 feddans, an addition of say 24 per cent. to the present cultivated area."

"Reclamation of land necessitates the following operations : First, irrigation ; second, drainage ; third, levelling ; fourth, cropping ; fifth, village building. The manner and extent of these various operations depend on the locality and nature of the land taken in hand."

The method of land reclamation adopted by the Aboukir Co., the Sakha Domains Farm, and doubtless at other places, I may describe from what I have seen at Sakha and Aboukir as follows :—

The land is levelled by steam levellers (as at Sakha) or by means of a large wooden scoop and boards drawn by horses (see illustration p. 137). Where it is a question of converting a lake into a fruitful plain, the first operation is, of course, the pumping of the water from the lake. The land is then divided into small plots, a drainage canal is constructed on three sides and the irrigation canal on the fourth side of the plot. The land is filled up with water daily ; some water evaporates, but most of it filters through to the drains. In this way the land is thoroughly washed of the salt ; as much as 15 per cent. of salt is sometimes found in the drain water, and even when the sweetening process has considerably advanced the percentage of salt is as high as 2 to 3 per cent.

The process of washing the soil, in which salt is present in small quantities, is to flood it repeatedly and thus wash it ; this method is called "colmatage," but it is said to be inefficient in the case of reclamation of foul soil.

A pumping station to lift the water from the small drains into the Government drain, from where it passes into the Nile, or direct into the sea, must be constructed. At Sakha the pumping station is capable of raising daily the water covering 4,000 to 5,000

feddans. The engines of this pumping station are Diesel oil engines, which give perfect satisfaction; they can, of course, be started at any moment. The cost of washing stale land is about £10 per acre; if a large area is worked, this expenditure is more than recouped by the first year's crop.

A field that had been treated in the above manner the previous year gave during the past season a crop of 5 kantars of cotton, whilst the adjoining field, that had not been washed because it was thought to have less salt in the soil, only gave half a kantar of the same kind of cotton. I saw the two fields when the cotton crop was being picked, and could not help but notice the enormous difference in their appearance; whilst one field was white with cotton, the other had barely any white bolls and the plants looked very poor indeed. Everyone who wanders over reclaimed stretches of land must feel as though he were beholding a miracle, such is the effect.

LAND RECLAMATION.

The centre ditch acts as the drain into which the water percolates.

How the value of land improves through washing and draining was also demonstrated to me during my visit to the Aboukir Estate. Of the original area of 30,000 feddans there have been sold about 19,000 for £568,000, and there now remain to the company 11,000 feddans. The present value of the 30,000 feddans has been estimated to be £3,000,000. This self-same land before reclamation was begun did not support one single human being; to-day it could support a population of 12,000. Within one year of the first water being applied, some of the land is let at as much as £5 per acre, some of it at less, but £5 is the average rental over the whole of this well-managed estate.

The average holding of a family, consisting of five people, is 8 feddans, half of which is put under cotton. (But under the best conditions 2 feddans, or even one, will support a fellah and his family in comparative comfort.)

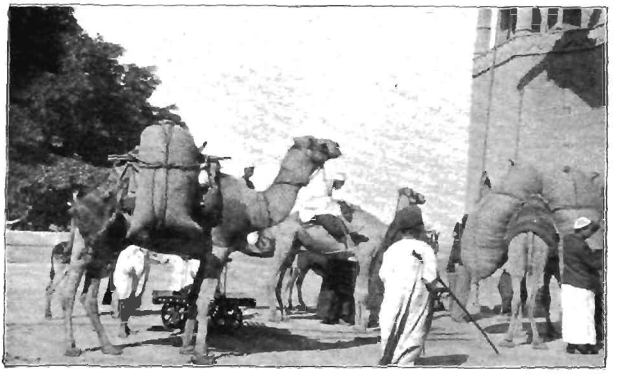
The regulation of the water supply is in the hands of the management, which is entirely European. The company itself does not farm any land, but lets it out to tenants in small lots of say 8 acres at an average price of £5 per acre. The contract between the company and tenant is printed in Appendix III. The tenant by the terms of his contract is obliged to hand over the cotton, which is sold by the company for his account; the crops from the remaining portion of the field (say 4 feddans) belong to the tenant. Generally two buffalo cows are kept by each tenant; they give good milk, which brings in about £30 a year. The tenant also makes a profit on the sale of eggs and vegetables, which he can readily dispose of, being close to Alexandria. I saw from the books that the tenants delivered during last year £13,260 worth of cotton, whilst their rents amounted to only £10,961.

It is a rule on the estate that the land which is intended to grow cotton must be ploughed by March and sowing completed by 15th April. Before the last picking takes place the tenant sows generally berseem amongst the cotton: after the third picking the cotton sticks are pulled out and the ground flattened. Berseem is sold as fodder for horses, and sells at Aboukir at about £2 per cutting per feddan; three to five cuttings are obtained from one field. Maize is sown in July, and if preceded by berseem the latter must be last cut, not later than June 15th.

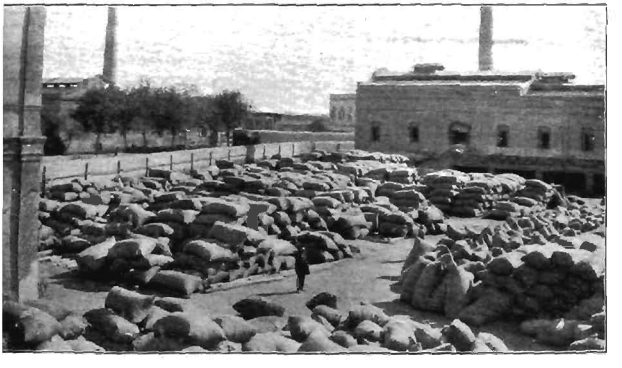
Ginning.

I visited six ginneries, including the most up-to-date factories. From entering the factories until leaving them I was very much astonished at the unnecessary waste of labour and wages. In comparing the arrangements of an Egyptian ginnery with an American one, one cannot but be impressed with the antiquated methods in use. Yet these ginning factories are in the large majority of cases owned by old-established and wealthy European firms. When I pointed out the useless increase in the cost of production of Egyptian cotton, I was told that reforms such as suction pipes as the means of transporting cotton had frequently been considered, but never any definite action taken, as it was feared the long staple cotton might suffer in the carrying by suction pipes. I replied that the spinner uses these pipes when the cotton comes to the mill, and he would not do so if he found any damage to the staple. Another argument in favour of the antiquated method was that wages in Egypt are much cheaper than in America. Quite so; but if the cost of production can be reduced, it ought to be done in the interests of the industry, and wages in Egypt have considerably advanced and will still further be raised, especially when schooling becomes more general, and the vast amount of child labour ceases. The cost of living has already gone up, and wages are not going to be on the same low level.

There are about 3,000 to 4,000 gins in Egypt, belonging to about 140 factories; the gin in common use is the Macarthy roller gin, made by Platt Bros., Oldham. The Associated Cotton Ginners of Egypt, which firm has recently been formed by some of the most prominent houses in Lower Egypt, own some 1,200 gins, or about one-third of the whole. The shareholders of the ginneries are in most cases the large cotton shippers in Alexandria.



Transport of Cotton Bales to the Ginning Factory.



The Yard of a Ginning Factory.

The ginning factory stands in a large yard, often six acres in size; during November-December these yards are filled with cotton bales. The bales are unprotected, and are exposed to the weather; but as rain seldom falls, this is not a great disadvantage. Although there is frequently a heavy dew the sun soon dries it up. The shoonah or store proper is in many cases some 30 yards away from the ginnery. There the long

The antiquated method of carrying cotton bales from the yard of the Ginnery into the Factory.

bales as they come from the cultivator are opened and roughly examined; only one class of cotton is kept in the store room at one time. After examination the cotton is put on a large canvas sheet, and a man taking the four corners in his hands, carries the cotton, weighing about 200lbs. across on his back; cotton, of course, drops off, and although someone follows and picks up the fallen cotton there must be some loss, and certainly dirt gets into the cotton. To prevent the latter a piece of canvas is stretched out from store to factory. In some cases

the cotton bales are brought directly into the ginnery; a man carries one bale with great difficulty up the incline to the ginnery, which is always somewhat high (see illustration). The carrying of these bales, owing to their ungainly shape, is a most difficult piece of work, requiring great physical strength. The bales weigh as much as 400lbs., but the weight-carrying ability of the Egyptian porters is phenomenal. Such antiquated methods would not be tolerated in Lancashire, on the Continent, nor in the U.S.A. The price paid for carrying one bale from the yard into the ginnery is quite a considerable item.

Behind each gin there is a box for the seed cotton. This box has to be constantly filled by special men. In one ginnery only had they an automatic feeder. When the cotton is ginned it drops into a box and a huge box cart running on rails is then brought along and the ginned cotton is loaded into it by about *eight* men and taken to the press. To anyone who has seen an American ginnery this seems a shocking waste of labour. Why should not suction pipes deliver the seed cotton to each gin from the store and from each gin to the press? A suction pipe for transmitting the ginned cotton from the gin to the press is a simple contrivance costing comparatively little. Such pipes should also be used for conveying the seed cotton from the store to the ginnery.

Ginning factories during the season, when there is a large crop, work day and night; they begin running in August and finish in January. When I visited the ginneries they were working only 15 hours per day. The following notice (*verbatim*) was posted up at Messrs. Choremi, Benachi & Co., Beni-Suef:—

> "Working hours: 15; in full season day and night work by changing every 12 hours the workmen. Age children 14 years."

On the State Domains in Korashia the labour in connection with ginning is contracted out. A contractor supplies the necessary hands and receives 3½d. per kantar of cotton ginned, the Domains finding only the gins, driving power, coal, and the engineer.

Seed for sowing purposes is selected at the ginnery from the first pickings of cotton only.

The price of seed fluctuates considerably: when I enquired it was about 83 piastres for one ardeb, *i.e.*, about 17s. per 270lbs.

Remembering that the American farmers said at Atlanta in 1907 that the cotton improves by keeping it unginned for about three to four weeks (they maintained that it becomes more ripe and mellow), I made enquiries whether this method was also followed in Egypt, and was told on several occasions that this would injure Egyptian cotton; only one man spoke of its advantages. Evidently the ginners might experiment in this direction.

Ginning Out-turn.

A kantar of seed cotton is equal to 315lbs.; this weight was taken as a basis, because 315lbs. used to give 100lbs. of ginned cotton. All ginning out-turns of Egyptian cottons are on the basis of 315lbs. seed cotton. If one speaks of a certain quality giving 96 as ginning out-turn, it means 96lbs. of lint for every 315lbs. of seed cotton. The ginning

out-turn is, of course, of the greatest importance to the farmer, as it largely influences the price at which he can sell his cotton.

The following may be taken as the present average ginning out-turns :—

Afifi, 102—103	Linters, called "Scarto" in Egypt are not included as fibre.
Abassi, 102—103	
Janovitch, 98·5—99	
Sakellaridis, 98·5—99, in some places 105	
Voltos, 105—107	
Assili, 110	
Ashmouni, 100	

Watering Cotton.

When the ginned cotton arrives in the pressing room, all the cotton is scattered over the floor, which is constructed like a sieve : the cotton is thrown up in the air by about ten men, an overlooker giving the word of command. This process shakes the dust to a certain extent out of the cotton. After about two minutes' shaking the men stand still and the cotton is watered in the following way. I noticed one, or in some cases two men, each provided with a garden syringe about 2in. in diameter and almost 2ft. long, emptying, sometimes twice, sometimes once, the syringes over the cotton from a fixed water tank. No secret is made of this artificial damping of cotton. With the exception of the factories on the Domain estates, I was told all the ginneries water the cotton, and certainly I have seen it done quite openly in the largest concerns in Egypt. I was informed that one ginnery has an ingenious system of sprinklers attached to the box cart which collects the cotton from the gins ; as this cart passes the gins, water is sprinkled over the cotton as soon as it falls from the gin. The cotton is shaken twice and watered twice, then it goes into the press. If suction pipes were used the 10 men would not be needed, as the dust is then blown away automatically.

I had considerable arguments with the owners of gins as regards this watering. First I was told it is an absolute necessity, because if it were not done the spinners would constantly complain as to inferior quality. I admitted that the cotton "pulls" better when somewhat moist, but maintained that the spinner would prefer to damp his own cotton if he wanted it to "pull" well, than to pay somebody else about 6s. per bale at the least. Another gin owner said watering improves the quality, but I cannot see that a fibre separated from its nourishing point, the seed, can be improved by water, but if it is improved, why should not the spinner do this watering himself and save the money ? Another reason stated was that the cotton would not press to the required density if it were not watered. I asked two men of practical experience in pressing, and they told me that the damping was not required for the sake of pressing the bales.

I may mention here that the ginner, or shipper, when he buys the cotton from the grower, deducts regularly 1 per cent. of the weight for damp and samples ; but in buying from the Domain Estates no such deduction is allowed. I am not aware that the spinner receives any such allowance from the Alexandria shipper as a regular condition,

although the latter has put more damp into the cotton which he bought, subject to the allowance.

I was told that cotton is sometimes artificially damped by the fellah, and that the ginner has to let the cotton lie for several days before he can gin it. In such cases the ginner fixes the allowance, which, I was told by a manager of a large gin, the native generally accepts without question.

Whilst pointing out to the spinners the artificial damping in the process of pressing, I feel it my duty to mention that I am convinced the ginners (respectively the cotton shippers, who are in most cases identical with the ginners) continue this method solely in the belief that the cotton is benefited by it, and not in order to obtain any unfair advantage. It seems to me a trade usage which has become thoroughly recognised, the wisdom of which, however, from the spinner's point of view at all events, seems open to discussion. When the spinners' delegation visits Egypt this would certainly be an interesting subject for consideration.

Pressing. Generally speaking, Egyptian cotton is baled three times. First when the cotton comes from the field the grower puts it in sacks of about 400lbs. After ginning it is made up in hydraulically-pressed bales of about 700—800lbs. For this purpose box presses are used; two or three boxes are on a turning disc; whilst one bale is being pressed the other two are being filled. Only a few of the presses I inspected had the usual system of piston pressing whilst filling the boxes with cotton; in most cases as many as six men kept stamping the cotton down with their feet in the box. When the box was full they drew themselves up on ropes suspended over each box. Here again waste of labour!

After being hydraulically pressed the bale is usually sent to Alexandria, where it is opened again, examined, watered, and pressed, this time by steam, to the well-known excellent shape. In isolated cases the ginneries in the country have besides the hydraulic press a steam press. Strange to say, even there all bales are first pressed by the hydraulic press and covered with canvas and hoops, and on the very next day they are opened again and finally pressed by steam. I enquired at the two gins where hydraulic and steam presses are kept, for the reason of this apparently unnecessary first pressing; in one case I was frankly told that the hydraulic press serves for the equal division of the moisture; in the other factory, no reason was given, except that it was the custom. Why the hydraulically-pressed bale is covered with canvas and hoops and stitches when it is to be opened again in 12 hours I cannot understand.

This twice pressing seems, at all events, a waste of labour: no satisfactory argument has been put forward to convince me of its necessity. The very firm that gins and presses the bale in the first instance has ample opportunity of inspecting the cotton, and it is in most cases the same firm in Alexandria that sells the cotton to Europe.

On steam-pressed bales there is a saving of 8½d. per bale over hydraulically-pressed bales in carriage by rail from Kafr-el-Zayat, the principal ginning centre, to Alexandria.

The cost of ginning is generally 7 piastres (1s. 6d.) per kantar, but it is only in rare cases that the fellah gets his cotton ginned on his own account. It is the custom for the ginner, who is really synonymous with the Alexandria shipper, to buy the cotton. He has agents in all the districts; at the beginning of the season small lots of cotton are bought from each district in order to ascertain the quality and ginning out-turn. Classifications are made, and the agents are instructed to buy accordingly. These agents are responsible as to damage or loss resulting from damp, false packing, or difference in quality.

The gins are fed by children of 13 or 14 years of age, who receive three piastres (7½d.) per day of 16 hours—but it must not be thought that they work continuously during that time. Overseers, who in some cases make use of a lash, are present in strong numbers. The season is, of course, short, and the work done at great pressure.

The men who throw up the cotton for the purpose of cleaning and watering it receive 5, 6, and 7 piastres a day.

The cost of ginning and hydraulically pressing is 63 piastres for a bale of 7 kantars. Steam pressing costs 25 piastres, consequently 88 piastres, or 17s. 6d., is the cost of the ginning and baling as delivered to the spinner, in addition to which there is the canvas. The hoops are included in the cost of the ginning, the canvas belongs to the shipper.

The small farmer often sells to a broker, who after having bought various lots goes to the bank, hands the cotton over, and receives an advance. Owing to the considerable fluctuations in the price of cotton, about 30 per cent. in recent months, the banks have become very careful. There are also some fellaheen who, owing to the low price of cotton, the failure of one of the Egyptian banks, and the present general financial uneasiness of the country, do not trust the banks. The result is that many fellaheen have sold only a portion of their cotton crop to pay the most pressing debts and taxes, and are keeping back the balance of the crop until next year. In some of the villages I saw cotton stored by some of the farmers, and I heard the opinion several times expressed that this season's crop would not be entirely marketed this year; but no doubt the recent rise in the price has altered this.

On my return visit to Egypt from India I was told that the banks had compelled many of their clients who owed them money to balance their accounts owing to the somewhat uneasy feeling caused through the failure of one bank and through the financial difficulties of a few large houses. As a result we have an important increase in the arrivals of cotton in Alexandria, as is shown in the accompanying charts.

Alexandria Cotton Market.

The cotton merchants or shippers in Alexandria possess a powerful organisation—"The Alexandria General Produce Association"—the members of which are bound by strict regulations. I was, for instance, told that a German spinner made the condition in his, rather important, purchases, that the cotton must not contain more than 8½ per cent. of moisture. The members no doubt foresaw in this

stipulation the opening of a critical question, and at once agreed unanimously not to sell under any conditions with a limitation of the percentage of moisture.

The cotton market proper of Alexandria is situated in the **Minet-el-Bassal** quarter. Each exporter has a small office there, and from 11-30 a.m. to 1-30 p.m. the courtyard of the cotton market is filled with men in a wonderful variety of dresses and colours. Very little English is spoken: French and Italian seem to be the predominant languages, and German is also heard. People of different races throng the courtyard of the cotton market, talking in strange Oriental tongues. Many of them carry a kind of rosary in their hands and fill up their spare time by repeating prayers.

Odd lots of cotton are offered on samples for sale in the small offices of the export houses. The expert valuer is separated by a rail from the brokers or farmers who bring the samples. The Banks also sell to the shippers in Alexandria the cotton on which they have made advances. The State Domains sell their cotton in Alexandria by auction sales.

Copies of Contracts between Ginner and Farmer will be found in Appendix III.

There is no uniform contract note in existence for spot cotton transactions: these are regulated by usages which vary very much.

Delivery must be taken within two days from date of purchase, failing this, storage at 5d. per bale per month is charged. The rate of insurance debited to small farmers is $\frac{3}{8}$ per cent. per month.

The system of purchasing necessitates a good deal of sampling. The first sample is that which is shown in the office to the expert; on this the price is provisionally fixed, then the buyer sends an expert to the store to select samples at random, and on these the price is definitely fixed. After the market has closed the shipper sends again to the store for the purpose of marking the bales bought, and on this occasion again he takes samples. When the mark has been put on the bales, the seller draws on the buyer for the approximate amount. As already referred to, most of the cotton (I was told 85 per cent.) is re-opened, examined, partially freed from dust, watered, and pressed by steam into the neat packages to which every spinner is accustomed.

In the cotton market at Alexandria other kinds of produce are also sold, especially cotton seed, in which a large business is done.

There are three large press establishments in Alexandria—Société Générale de Pressage et de Depôt, Presse Libre Egyptienne, Société de Presse Allemande—all of which possess up-to-date presses and large stores that have recently been fitted with sprinklers. Shippers have shares in this or that press by which they have the bales pressed and stored until shipment. No ginned cotton is kept up-country, it is forwarded at once to Alexandria, and thus the "arrivals" as published by the General Produce Association are a pretty good guide for gauging the possible size of the crop, although this year it is anticipated that a considerable quantity of cotton will be kept back by each fellah, if he can possibly afford to do so.

The Egyptian organisations looking after the cotton crop are the following :--

Department of Agriculture.

In my interviews with Lord Kitchener he was kind enough to describe to me the work which the Agricultural Department is carrying on, and with which he is acquainted to the smallest detail. The Director of the Department of Agriculture is Mr. G. C. Dudgeon. Whilst the Department of Agriculture will devote its attention to all kinds of agricultural products, Mr. Dudgeon fully recognises that it must give preference to cotton cultivation. In this respect the Department undertakes generally the carrying out of the recommendations of the Egyptian Cotton Commission. The Department of Agriculture attends to :--

(1) Distribution of seed, as described on p. 173.

(2) Rectification of mistakes made by the farmers in the cultivation, and the teaching of improved methods by :--

(a) Issue of circulars. A recent circular, No. 17, entitled "The Reconnaissance before the Battle," has been compiled at the Department under the instructions of Lord Kitchener, and was explained by him in Arabic to a deputation of some 200 fellaheen who had waited upon him at the British Legation to discuss the condition of the cotton crop. The circular is given in the Appendix, as it describes excellently the proper method of cultivating cotton. The circular is purposely drafted in plain language so that it may be readily understood by the fellaheen.

(b) Establishment of demonstration farms, where proper planting and all the agricultural work is shown. In the first year 16 of these, in various parts, were established, but the Director-General of the Department hopes to have 200 by next year.

Mr. Gerald C. Dudgeon has exhibited practical organisation power in arranging these farms. The manner in which these demonstration farms are established is the following: A large landowner is asked to cede a small portion of his land to the Department. The latter guarantees to him an equal financial return on that land to that which he gets from his surrounding land. The Government Inspector has absolute control over the land, and instructs the labourers of the landlord in the manner in which he desires the work carried out. In every case so far these demonstration plots have earned much more money, and have acted as a great stimulus to the farmers in the surrounding districts to copy the methods of cultivation used by the Government Inspector.

(3) Study of cotton breeding and research work in general.

The Department has now the services of a highly qualified botanist, Mr. W. Lawrence Balls, M.A., to whose work frequent reference is made in this report.

(4) The Department also acts as advisory council to the various other Departments of the Government which are connected with cotton, such as the Statistical Department, Survey Department, &c.

I am convinced that the work undertaken is most useful and practical. Its importance is recognised, and it is anticipated that it will within a few years be created into a separate Ministerial Department. At present the Department of Agriculture is attached temporarily to the Ministry of Public Works.

I may recall here the fact that the Department of Agriculture in Egypt was established shortly after the Seventh International Cotton Congress held in Brussels in 1910, when in consequence of a highly interesting paper, read by Mr. A. H. Dixon, managing director of the Fine Cotton Spinners' and Doublers' Association, Ltd., the following resolution was unanimously adopted :—

"In view of the gradual and steady decline in the quality and of the production per feddan from the cotton fields of Egypt, and specially bearing in mind the unforeseen disaster to last year's crop, this Congress wishes to respectfully urge upon the Egyptian Government the desirability of their forming a thoroughly well-equipped agricultural department, with the object—

(1) *Of obtaining detailed statistics of areas sown, yield and quality produced from as many different localities as possible, and promoting the publication of this information throughout the various districts in Egypt.*

(2) *Of investigating the different factors which affect the cotton crop and forwarding the results of these investigations throughout the country.*

(3) *Of making proper provisions to enforce any recommendations or suggestions being correctly carried out."*

This resolution was forwarded to the various Ministries in Egypt, and a deputation waited upon the Right Hon. Sir Edward Grey, Bart., Secretary of State for Foreign Affairs, in London, for the purpose of impressing upon the British Government the necessity of establishing such a Department in Egypt.

Khedivial Agricultural Society.

The Society was founded under the patronage of the Government in the year 1898 ; its President is H.M. Prince Hussein Pasha Kamil, the uncle of the present Khedive : the Director-General is McMurdo Pasha.

The aims and objects of the Society are set forth in paragraph 1 of the Statutes as follows :—

The objects of the Society are to aid the development and improvement of Agriculture in Egypt by the following means :—

(*a*) By the selection and distribution of seed of good quality.

(*b*) By the introduction of suitable new varieties of seeds, plants, and trees.

(*c*) By conducting manurial and other experiments likely to prove of practical utility to the cultivator.

(*d*) By the purchase and distribution of manures which have been found profitable for the various crops.

(*e*) By endeavouring to improve the existing races of cattle and other farm animals in Egypt.

(*f*) By seeking to improve existing farm implements and machinery, and by introducing any improved machinery likely to prove of advantage to Agriculture generally.

(*g*) By practical and scientific enquiry into the various insect and fungoid pests to which Egyptian crops are liable, and to endeavour to find practical remedies for the same.

(*h*) By publishing from time to time seasonable leaflets dealing with matters of Agricultural interest; as well as an Annual Report detailing the work of the Society, and containing the results of investigations conducted by the Society and others.

(*i*) By the organisation of an Annual Agricultural Show at Cairo and local shows in the various Moudiriehs as far as possible.

(*j*) By co-operation with similar Societies and Agricultural Departments in other countries to endeavour to obtain information on all matters relating to Agriculture which may prove of benefit to the country generally.

(*k*) By adopting any other means which may be considered necessary from time to time in the general interests of the Society.

The Society undertakes the work which is generally carried on by a Ministry or Department of Agriculture: it organises agricultural shows, causes scientific agricultural researches to be made, sells at a moderate profit well-selected seed and manures, raises cattle and investigates cattle diseases; it has branches in the most important districts, which enable it to come into touch with every development in agriculture. The Society possesses extensive show grounds, and has a large staff of clerks and inspectors, as well as a veterinary surgeon, chemist, entomologist, and botanist. Its sphere of influence does not clash with the newly-created Government Department of Agriculture; there is ample scope for both these institutions, and a harmonious understanding exists between them. On the Executive Committee of the Khedivial Agricultural Society all the Government Ministries and Departments which are in any way connected with cotton are represented. The subscription for members is only £1 per annum, but the Government subsidises the institution. The Khedivial Agricultural Society used to publish at the commencement of its existence a Journal containing highly interesting articles, especially on cotton, written by the staff. During the last few years it has published these articles in a Year Book, which contains the latest developments regarding the scientific aspect of agricultural products of Egypt, cotton, of course, taking the most prominent place. I do not know of any agricultural society in any other country which exercises so much influence amongst the farmers as does the Khedivial Agricultural Society in Egypt.

Cairo Scientific Society.

Another organisation for the fostering of the scientific side of Agriculture in Cairo is the *Cairo Scientific Society* at Giza (Mudiria), which consists mostly of English members of the various Government Departments, such as Survey, Irrigation, Agriculture, Education, &c. Papers on suitable topics are read every fortnight and published in the Cairo Scientific Journal. Anyone desirous of keeping himself conversant with new movements in Egyptian Cotton matters should subscribe to the Journal; the subscription is about 15s. per year.

There is in Cairo a *Khedivial School of Agriculture*, which is under the Technical Education department of the Ministry of Education. Its course covers four years, and the policy of the Director-General of the Department (Mr. Sidney H. Wells) is to develop a system of primary Agricultural schools throughout the country, the present school being raised to form a centre of higher education in Agricultural affairs for the whole country.

Importance of Maintaining High Grades of Cotton.

As Egyptian cotton has, until a few years ago, been almost exclusively used for the very finest cotton goods (it is for this reason that it has commanded a high price), it is of the utmost importance that the high grade be maintained. Every spinner knows that, owing to the failure of the Egyptian crop and the consequent high prices, it has been found possible to substitute largely the best kinds of American cotton for Egyptian cotton, and I am told by manufacturers that some of these substituted cloths are even preferred to the original cloths made of Egyptian cotton.

The following statement of the comparative cost of production of 50's yarn, made of Egyptian and American cotton, gives the actual experience of a Lancashire spinner who is now turning out American and Egyptian yarns side by side, whilst formerly he produced only yarn of Egyptian cotton. These particulars I obtained at a lecture given at the Cairo Scientific Society:—

Yarns.	Raw Cotton.				Cost after Carding.*	Selling Price of Yarn.	Gross Profit per lb. of Yarn.
	Class or Grade.	Price.	Basis Price.	Points on.			
			F. G. F. Brown.				
Egyptian 50's	Good Brown	10·50	9·75	·75	12·20	14·75	2·55
			American Middling.				
American 50's	American long staple.	8·75	6·50	2·25	10·17	14·00	3·83
Differences-American		-1·75	-3·25	+1·50	-2·03	- ·75	+1·28

* Adding 16 per cent. It takes 6lbs. of raw cotton to make 5lbs. of yarn.

The manner in which the yield per acre has fallen off is seen from the following table.

Average Yields of Cotton per Acre.

In the United States of America we can look upon 250lbs. lint as a good average crop, in India upon 90lbs. to 100lbs. and in Egypt the total averages for all kinds of cotton during the years 1895 to 1909 have been :

AREA PLANTED UNDER COTTON, WITH YIELD.
COTTON SEASON FROM 1895-6 TO 1911-12.

Cotton Seasons.	Area planted under Cotton.*	Total Yield.**	Yield per Feddan.	Quantity Exported.***
	Feddans.	Cantars.	Cantars.	Cantars.
1895—1896	977,735	5,256,128	5·27	5,225,206
1896—1897	1,050,749	5,879,479	5·60	5,761,982
1897—1898	1,128,151	6,543,628	5·80	6,415,402
1898—1899	1,121,261	5,588,816	4·98	5,626,671
1899—1900	1,153,307	6,509,645	5·64	6,496,233
1900—1901	1,230,319	5,435,488	4·42	5,401,009
1901—1902	1,249,884	6,369,911	5·10	6,526,783
1902—1903	1,275,677	5,838,790	4·58	5,860,751
1903—1904	1,332,510	6,508,947	4·88	6,144,551
1904—1905	1,436,709	6,515,570	4·59	6,576,127
1905—1906	1,566,602	5,939,883	3·80	6,041,197
1906—1907	1,506,291	6,949,383	4·61	6,977,918
1907—1908	1,693,224	7,234,669	4·71	6,912,813
1908—1909	1,640,415	6,751,133	4·12	6,814,286
1909—1910	1,597,055	5,000,772	3·24	5,046,207
1910—1911	1,642,610	7,573,537	4·70	7,477,483
1911—1912	1,711,228	7,424,208	4·34	7,364,752
1912—1913	1,721,798	?	?	?

* According to statements by the Village Tax gatherers (Sarrafs).
** According to information published by the Alexandria Produce Association. (September 1st to August 31st.)
*** According to the Custom House Statistics. (September 1st to August 31st.)

The question is of great economic importance because the loss of one cantar per feddan represents a loss of 1½ million cantars for the whole country, which, according to average prices, means a loss of about £6,000,000 to Egypt.

But whilst in the U.S.A. and India the yield per acre is steadily increasing, we find a continued falling off in the Egyptian yield, which is a very serious matter, although these figures perhaps convey at first glance an exaggerated impression; for it must be remembered that owing to the high price of cotton of late years, all available land, some of it too bad to produce anything like a good cotton crop, has been used for cotton. Formerly only first-class soil was requisitioned for growing cotton. The figures are therefore not a sure index as to the falling off in the fertility of Egypt. There remains, however, no doubt that the fertility has decreased, as the records from farms where cotton has been grown for the last 20 years show likewise a decided falling off in yield.

The "bread-and-butter" quality of Egypt is unquestionably "Mit Afifi" cotton, and undoubtedly this has not only deteriorated

in quality, but the yield per feddan has also been less. The latter is borne out by the following :—

COMPARATIVE STATEMENT OF AVERAGE YIELD PER FEDDAN IN LBS. OF MIT-AFIFI, FROM 1890 TO 1909, ON FOUR LARGE ESTATES.†

	Estate 1	2	3	4
1890	390	532	335	452
1891	361	578	577	447
1892	372	647	578	354
1893	351	543	599	470
1894	345	597	582	526
1895	291	645	578	414
1896	296	646	542	487
1897	261	791	540	559
1898	315	747	470	386
1899	412	829	634	473
1900	315	–	340	461
1901		660	365	363
1902	440		612	301
1903	578	699	352	357
1904	412	–	607	115
1905	364	–	428	316
1906	547	504	705	197
1907	594	443	715	321
1908	–	555	550	270
1909	304	244	426	288

† From figures supplied to the Cotton Commission.

This deterioration and reduction in yield are two very serious points, for if the quality of Afifi should fall to the level of American Middling, as seems possible, there will be a very serious reduction in the financial returns to the farmer and the country as a whole. It has been estimated that the reduced income to Egypt through the falling off in quality would be £6,000,000 to £8,000,000 annually, and if we also take into consideration the falling off in the yield per acre, we arrive easily at a reduction in the value of the Egyptian cotton crop of £10,000,000 per annum. The possibility of this happening would be, I consider, ample justification for a Government incurring the expenditure necessary for the provision of means to avert the disaster. Especially would this be the case when, as in this instance, the investment would be highly productive. Cotton is the staple product of Egypt, which can at any time be converted into ready cash, and the native uses it principally for paying his rent and the land tax.

Causes for Deterioration.

Various theories have been advanced, most of which were laid before the Cotton Commission in 1909-10 appointed to investigate these matters. They may be summarised as follows :—

(1) Careless seed selection.

(2) Over-cropping, the customary rotation having been reduced from three years to two, and it is said that the

plants are set in rows much closer together than formerly, while the number of plants in a row has also been increased.

(3) Insect pests, especially the cotton worm and the boll worm.

(4) Water-logging of the soil, due either to the raising of the level of the water in the canals, especially after the arrival of the flood, or to infiltration of water from the canals, and excessive irrigation in autumn.

The Cotton Commission published its report, making 26 recommendations and nominating a committee to see to these being carried out. Unfortunately the Committee has never met, but Lord Kitchener promised me that he intended to appoint a permanent cotton committee which would take up the whole matter.* The actual evidence laid before the Commission has not been published. The effect of the sitting of this Commission has certainly been a general awakening to the critical nature of the position, and every Government Department is now using its best efforts to find out the real causes of the evils. As a result of Lord Kitchener's keen interest in and detailed knowledge of cotton questions, every Department has still further concentrated its energies in the work, and I can quite understand, from the interviews I had with him, that his quick grasp of the points at issue will stimulate the enthusiasm of every Government official.

I will now endeavour to submit a few of the theories that have been advanced as to the probable causes of deterioration in quality and of decrease in yield :—

Distribution of Seed.

Mixing of seed has been going on constantly, as has been proved before the Cotton Commission, and from various lots of seed which I saw at the ginneries I have picked out quite a lot of "Hindi" or so-called Indian seed. If this seed is not carefully picked out from the seed to be used for planting purposes, it reduces next season the quality of the cotton, causes great waste in the spinning, and naturally accounts for a fall in the price of the cotton. At a ginnery of the Associated Cotton Ginners of Egypt I was told that up to the time of my visit they had ginned about 5,300 kantars Afifi this season : this ought to have given about 4,000 ardebs (sacks of 270lbs. each) of seed for sowing purposes, but owing to the extensive presence of Hindi seed, they were only able to keep 440 sacks for sowing purposes : the remainder had to be crushed for cotton-seed oil and cakes. In this ginnery the selection of seed from the seed cotton of the first picking is carried on carefully, but one can easily realise that damage will be done by those ginneries where there is not such scrupulous care taken. Hindi seed is easily distinguished by its smooth surface and a comparatively long fork at the point. Even when it comes up in the field it is at once recognised by the sturdy growth and by two red marks on the small leaves, later on by the pure white flowers and

* A Committee to investigate the Cotton worm only has since been appointed.

the oblong bolls which open in four or five divisions, whilst Afifi bolls have only three. As Hindi has a great number of seed kernels in each boll it will be understood that a few plants only in each field will cause a great deterioration when sown in the following year. I was repeatedly told that the only estate where pure Afifi seed can now be had is at the Domains Farms; there the selection of the seed has for years been carried on in the field, and as they have their own ginneries they can to a greater extent see that the seed which is kept for sowing purposes is reasonably pure. The Hindi seed is found especially in the Afifi and Janovitch cotton, and it is partly due to its presence that Afifi has fallen off so much.

The Department of Agriculture is taking up the distribution of seed amongst the small farmers, who up to now have been frequently buying sweepings from ginneries, often through money-lenders. The Department obtains good seed from those ginneries where the greatest care is exercised. These ginneries are assisting the Department as much as possible. The seed is sold to the small farmers in quantities not exceeding 3 ardebs, and its cost is collected, after the crop is reaped, by the Sarrafs or Collectors of the land tax. In this way the farmer escapes the money-lender. The Department does not make any profit on the transaction. The larger farmers have until recently been supplied on similar terms by the Khedivial Agricultural Society, which obtains the seed from the State Domains. The Department of Agriculture will in future also attend to the seed requirements of the larger farmers. There are signs that this system of seed distribution will not act to the satisfaction of the Government, and I take the liberty to suggest that *the State should make the sale of cotton seed a licensed trade*. This, I am told on high authority, would be quite feasible. Such a system would at once give the State the power to control the sellers of seed; this is at present impossible. Such a measure would be no hardship to the well-conducted concerns, but only to those who are in the habit of disposing of inferior seed. Only by licensing the sale of seed can the Government insist on the picking out of Hindi seed and on the separation of various kinds of seed. I shall be very glad if the spinners will express their opinions on this subject on the occasion of their forthcoming visit to Egypt.

Evidently the impure seed used for sowing purposes has had an adverse influence on the quality and the yield per acre.

Rotation of Crops.

It is the experience everywhere that if the same crop is raised year after year, the soil becomes impoverished. Different plants require different food from the soil, and although a certain amount of that food can be restored by means of manures, experience has shown that it will pay the farmer best to have a variation of crops. In Egypt it has been found best to adopt the following diversification :—

(1) Good cotton land—Lower Egypt.

	Winter.		Summer.
1st year	Berseem and wheat		Maize
	Fallow		Cotton
2nd year	Fallow		Cotton
	Berseem and wheat		Maize

This is common in Menufia and Qaluiba.

(2) Poor cotton land—Lower Egypt.

	Winter.		Summer.
1st year	Berseem	....	Cotton
2nd year	Berseem	....	Maize
3rd year	Barley	....	Rice or fallow

This rotation obtains in S. Gharbia, N. Daqahlia, Behera, and parts of Sharkia. The berseem is sown between the cotton plants before the last picking, and in order to hasten the germination of the berseem seed the field is flooded.

A further advantage of a three-years' rotation is that the insects die off before the same crop is grown again in the same soil. As cotton requires a great deal of plant food, it generally follows berseem, or is sown on land that has lain fallow.

Careful landowners, in order to prevent the soil from getting impoverished, let the land out only on the condition that a three years' rotation is adhered to.

Distance in Planting. Compared with the custom in vogue in the United States it is evident that in Egypt in most cases the plants are too close. The ridges are 60 cm. apart, and the plants about 40 cm. from each other. The Agricultural Department is carrying on at present several experiments in various districts for the purpose of demonstrating the folly of close planting. At the time of my visit the final results were not obtainable, but I was told by Mr. W. Cartwright, who is superintending some of the experiments, that they had obtained as much as 8 kantars on 1 feddan, whilst the neighbouring land had not produced 5 kantars. Mr. Cartwright had his cotton planted 3ft. apart, and the ridges were also 3ft. from each other.

Insect Pests. The two principal insects which do large damage to the cotton crop of Egypt are the *Cotton Worm* and the *Boll Worm*.

By Khedivial decree all leaves on which eggs of the Cotton Worm (Prodenia litoralis) are found must at once be picked and burnt. Children and men from 9 to 25 years of age may be requisitioned by the Government for that purpose at the rate of pay ruling in the district. If the owner of an infected field does not attend to the picking of the eggs, the Government authorities have the work carried out for him and charge him with the cost; he is also liable to imprisonment. The Director of Agriculture is proposing that not only shall such delinquents be punished by imprisonment, but also by hard labour: this to consist in picking the infected leaves in other people's cotton-fields.

The first few generations of the Cotton Worm are found in spring in the berseem (clover), but when the cotton plant begins to get sappy the worm comes over to it. The cotton worm does the largest amount of damage to cotton during June, July, and August, when at least three generations are hatched. One moth will lay about 200 eggs on the back of the leaf, and in from two to five days the worm is hatched; it feeds on the bottom segment of the leaf, and as the upper tissue soon dries up and turns brown, the infested leaf can easily be discovered. As the hatching of the egg is quick, it is very necessary that immediate and energetic steps be taken for their destruction. It has been estimated that in some years the damage done by the Cotton Worm has amounted to one million pounds sterling. As the Cotton Worm originates in the berseem, Lord Kitchener is anxious to find out whether there is a poison in existence that would check the worm in the berseem, without, however, doing harm to the cattle that feed on the berseem. I shall be glad to hear from any of my readers who may know of a remedy for this pest.

The worst enemy to the cotton crop is the *Boll Worm*, which must not be confused with the American Boll-Weevil. The Boll Worm (Earias insulana) does more harm in some years than in others: the loss from this ravage in a bad year has been estimated by Mr. F. C. Willcocks, the Entomologist of the Khedival Agricultural Society, at from £1,500,000 to £2,000,000. The eggs are laid by the moth on various parts of the cotton plant, but preference is given to the bolls and terminal buds; each female lays a single egg on a boll, generally in one of the grooves near the apex. A female may produce as many as 200 eggs; it only deposits these on the Malvaceæ, such as cotton, bamia, and til (a kind of hemp). It is the custom in Egypt to have each cotton-field fenced in by a row of these hemp plants, which protect the field from winds and give a useful raw material. In summer the egg is hatched in three to four days, and shortly after the worm escapes from the egg it proceeds to bore a hole into the boll. Earlier in the cotton season it attacks the terminal bud, and after destroying it bores down to the stem below, which causes the death of the growing point. The dark or black colour of the dead portions of the plant indicate the presence of the Boll Worm. Later in the season the Boll Worms attack the square (set of leaves which surround the flower and boll), and after having destroyed several flowers they proceed to the ripening bolls: these they pierce and then they make their way to the soft juicy seeds, the contents of which they eat. Besides destroying the seed, the worm, in eating its way into the boll, severs much of the fibre, which becomes stained with a yellowish-brown colour and matter, together with the excrement of the invader. The presence of a young Boll Worm can be detected by a small quantity of yellow excrement, which is frequently found at its small entrance hole. The young bolls which have been attacked die as a rule and dry up without opening; well-developed or medium bolls, when attacked, split prematurely. Much of the cotton thus damaged, being matted together and dead fibre, is picked and mixed with good cotton, and thus reduces the value of the crop. As the worm is frequently carried from one season to another by hibernating in the soil or in the

roots or on some stray branches, a Khedivial decree has been put into force, according to which all sticks and roots of the cotton plant, bamia, and til must be removed from the field by December 31st of each year. Fines and imprisonment follow where this has not been done, and the work is carried out by the Government at the expense of the owner.

A well-planned organisation of inspectors and assistants has been engaged for the purpose of combating these pests, and of seeing that the Khedivial decree is efficiently carried out.

In 1910 the Egyptian Government spent £E. 20,300 on the work of checking the Cotton Worm, and a further sum of £E. 1,600. During last summer a credit of £E. 21,450 was allotted to this work.

Egypt has very little wood, and consequently it has been the custom of the fellaheen to burn the cotton sticks at their homes. Formerly it was the custom to cut the sticks off the roots in the field, but now the roots must be pulled up: the latter send out young shoots in winter which give the worm sufficient food to carry it through that season. The cotton sticks are carried to the village on camels' backs. Owing to the scarcity of fuel the natives use some of the manure of the buffaloes and camels for it. They mix it with dirt and straw, and dry it in the sun. This of course takes from the soil a great amount of food.

On one farm I was told that this year the damage done by Boll Worm was:—

3 to 5·5 per cent. before the first picking.

5 to 8·2 per cent. before the second picking.

11 to 20 per cent. before the third picking.

In Appendix III. will be found the description of the work undertaken in the last season as regards the combating of the Cotton and Boll Worm.

Water Logging of Soil.* It is alleged by some that owing to the ample supply of water throughout the whole year at a higher water level than before 1904, when the construction of the Assuan Dam was completed, the level of the subsoil water has been raised throughout the country. Others believe that the subsoil water has been raised through over-abundant watering of the fields. The theory has gained ground that the roots of the cotton plant, which at times reach over 2 yards into the soil, become immersed in stagnant and probably salt water, with the result that the plant suffers. The damage is perhaps rather due to the sudden raising of the level in autumn, consequent upon the arrival of the flood; it is thought that the root of the cotton plant stops growing downwards when it reaches the subsoil water, *i.e.*, it accommodates itself to the depth of available soil. When suddenly the root of the plant is immersed in the subsoil water by the raising of the water table it must have a disastrous effect. During the

* See "The Prospects of the Egyptian Cotton Crop," and subsequent papers by W. Lawrence Balls, also reports by Audebeau Bey and H. T. Ferrar referred to in list of publications.

sitting of the Cotton Commission this theory was not generally accepted, although experiments carried on during the last season at Korashia on the State Domains have proved its justification.

It was suggested to the Cotton Commission that the "Water rotations" or system of restricting the supply of water in the canals should be continued until after the arrival of the flood. Sir William Wilcocks, one of the pioneers of the present irrigation system in Egypt, with whom I had a conversation on this matter, expressed himself as follows:—

"Feeling my way through the Irrigation Reports of the last 10 years and all the interesting publications connected with the question of sub-soil water and deterioration of the cotton crop, it has struck me that probably one of the main causes for the drop in the yield of cotton since 1904 is the fact that the date for the first irrigation of the lands to be put under durra (maize) has been put forward one month. I remember well in the early nineties we used to look upon the dryness of July as one of the main assets of the cotton crop in its struggle with the cotton worm. I myself have seen in Merkaz Zifeh hundreds of thousands of worms lying dead or dying in the cotton fields in July with the ground like iron beneath them and the sky like brass above them. A damp July gives an impetus to the cotton worm which nothing can resist, while at the same time the pouring of the water over the ground is helping to raise the spring bud, and further soften the cotton plant. It would have been possible to use the water stored in the Assuan Reservoir so as to give a plentiful supply in May, June, and July to the poor lands in the North and permit of them being very freely put under rice and velassund. Instead of this, at the request of the agricultural community, it was used in great part to hurry up the Indian corn crop. Egypt has gained £1 for its early Indian corn in exchange for a loss of £10 on its cotton."

Irrigation Report for 1903, page 9.—"The prohibition against the irrigation of land for the maize sowings was removed one month earlier than the usual date."

Page 14.—"A very large area was planted with cotton, but the same unfavourable climatic conditions were reproduced which had reduced the yield for several years."

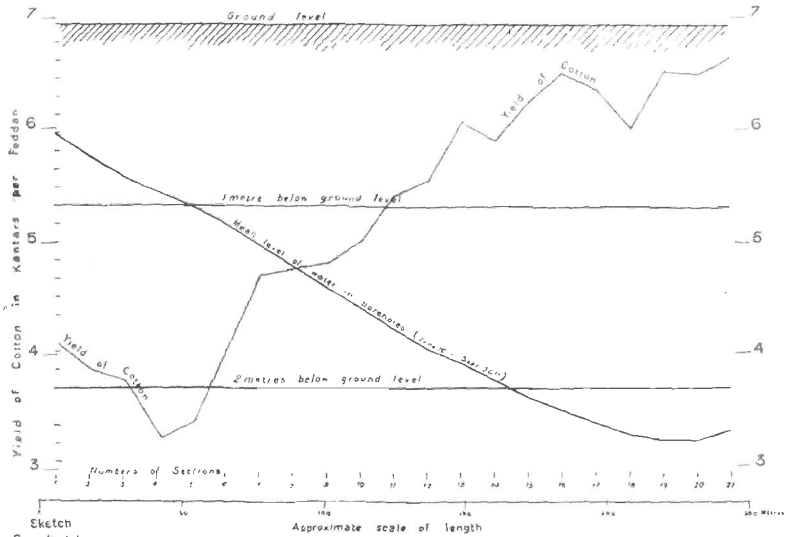
Irrigation Report for 1904, page 10.—"The prohibition against the irrigation of land for the early maize sowings was removed on the 15th June."

Page 14.—"The cotton crop must be classed as a comparative failure. Towards the end of July worms became very prevalent, and in certain localities they almost destroyed the crop."

Irrigation Report for 1909, page 24.—"The sharaki prohibition decree was gradually removed between the 20th June and the end of the month. There was a good maize crop throughout."

Page 27.—"The cotton has been the worst for many years, and it is not likely that we shall have more than an average of 3·2 cantars per feddan.

THE EFFECT OF WATER-LEVEL ON THE YIELD OF COTTON



Sketch
Supplied by
Survey Dept (PI)

This year I understand sharaki irrigation began July 1st, and the worms were terrible in August. In 1884, the first year I worked in the Delta, the maize crop irrigation did not begin before the 10th August. There were very few worms. Indeed, the first time the cotton worm made itself felt in Egypt was in 1879, following the high flood of 1878, when the summer supply of the Nile was so high that the Barrage was never closed at all, and yet all the canals ran freely through the summer."

Most interesting experiments as to the effect of sub-soil water on cotton have been carried out for a number of years at Korashia (State Domains) by Audebeau Bey, Chief Engineer, who has published his evidence in two or three annual reports (in French), and since 1909 Mr. H. T. Ferrar, of the Survey Department, has been carrying on independent experiments. He had tubes sunk into the soil for ascertaining the sub-soil water, measured these carefully, and grew cotton on soils with varying heights of sub-soil water. I inspected these experiments before the third picking, and could see the marked difference between the yields, the field with the low-water table showing very much more cotton than those with the high-water table. The detailed results of this important experiment are clearly indicated in the accompanying diagram.

Many of the experts at Cairo seem now to be convinced that the raising of the subsoil water and the water-logging are responsible in the main for the deterioration of quality and the diminution of quantity.

The disadvantages of the ample supply of water are, that the native who until recently was accustomed to a shortage of water and held the opinion that no matter how much water one can put on the fields, it is advantageous to the crop, persists in watering his crops even if they do not require it. Secondly, the levels of all the canals have been raised, and consequently also by infiltration the level of sub-soil water near the canals or where the subsoil is porous has been raised. The dealing out of the water supplies requires most careful study, and it is not unlikely that perfect knowledge as to this has not yet been acquired.

The Survey Department is at present engaged in experiments with a view to ascertaining the level of subsoil water all over the country and its effect on the cotton plant.

Mixing of Ashmouni and Afifi Cotton.

Fraudulent mixing of the inferior Ashmouni or Upper Egyptian cotton with Afifi or brown Egyptian cotton still takes place to a considerable extent, especially at Damanhour, where a number of native ginneries are well known to carry on this mixing. This fraudulent practice is receiving the closest attention of Lord Kitchener and the Department of Agriculture. The various Associations affiliated to the International Federation will do well to send a memorandum to their respective Foreign Offices urging that their Consuls in Egypt will endorse the steps which are being taken to bring about a removal of this injurious practice. Owing to the system of the Capitulations existing in Egypt, people under the protection of Foreign States are not bound by the Khedivial Decrees

unless accepted by the Powers. By getting the European Consuls-General to support such a Decree, the spinners would assure the more general carrying out of the same. It is suggested that all Ashmouni cotton bales should bear a distinctive mark. (*Decree now passed.*)

I was told that one-eighth of the crop of Upper Egypt is brought to Lower Egypt for mixing purposes. It is evident that the quality of cotton of the second generation, grown from such mixed Ashmouni and Afifi seed, must be very inferior. We know that this mixing has been the cause of Indian cotton having been reduced from a very long staple in olden times to the present short one. The question is of extreme seriousness for Egypt and for the cotton spinners, who have already sent a petition to the Department of Agriculture asking for the practice to be stopped.

Future.

The outlook for the future is decidedly hopeful. The Cotton Commission of 1909-10 has caused everyone connected with cotton to realise the dangerous position. Efforts for solving the various problems are being made in every direction; Government Departments and private individuals are carefully considering the situation. The advent of Lord Kitchener is indeed a most encouraging factor: he has been acquainted for several years with the cotton-growing question and its far-reaching results for Egypt, he is cognisant of every detail of it, and his relentless energy is bound to act as a powerful stimulus to every official in the Government's employ. Whatever is done to benefit Egyptian cotton growing is bound to be of direct advantage to the spinning industry of the world.

There are, as mentioned before, schemes under consideration for extending the area of agricultural land. Lord Kitchener mentioned to me that by a scheme which would be begun in January he hoped to be able to get, in years to come, 1,000,000 feddans under cultivation, half or a third of which would produce cotton. Other land reclamation schemes are spoken of, and consequently we may expect that every year in the near future will see an increased area under cotton. The active Department of Agriculture will no doubt deal energetically with seed distribution, pests and errors of cultivation, and although the Afifi cotton has degenerated there are signs of another new and improved quality, "Assili," taking its place.

February, 1912. ARNO SCHMIDT.

Additional Remarks to 1913 Edition.

A number of useful reforms have already been inaugurated since the foregoing report was first published.

Drainage. A great scheme for the drainage of the areas in the Delta which suffered most from water-logging has now been commenced, under the personal control of Lord Kitchener. At the same time great areas of derelict land in the North of the Delta will benefit by these drainage schemes and will in course of a few years become available for reclamation. The completion of the raising of Assuan Dam will provide the necessary water supply. Full reference to this matter is made in Lord Kitchener's address to the delegates on the occasion of the reception, November 4th, 1912, and in Mr. Lang Anderson's report on the Aboukir Estate (see article entitled Reclamation of Lake Aboukir).

Five Feddan Law: Protection of the Fellah. Lord Kitchener has also caused the introduction of a new law under which no owner of less than 5 feddans can be sold up under mortgage. This will tend to discourage the indiscriminate lending of money to small holders and should in the long run prove of great benefit to them by releasing them from the clutches of the money-lenders.

Village Cotton Markets. To secure to the fellah the full value of his crop, "Halakas," or local cotton markets, are being set up throughout the important cotton centres of the Delta, at which the latest information from Alexandria as to prices is regularly posted. Reliable weighing machines are available. In spite of the bitter and frequently unscrupulous opposition of private interests these "Halakas" are establishing their position, and will undoubtedly prove of great value to the fellaheen. If a cotton classifier were attached to each market, a still greater advantage might be gained.

Savings Banks. Influence has also been brought to bear by the authorities in favour of the Savings Banks, which had hitherto been very little used by the fellaheen. In these ways it is hoped gradually to improve the position of the small cultivators.

Mixing of Cotton. A decree was passed in 1912 to prevent the mixture of Ashmouni and Afifi cotton, but latterly a way of evasion has been found. Instead of mixing the above kinds Afifi is now being mixed with a very inferior grade called Okr. The 17 ginning factories existing in Damanhour are said to mix from 20 to 25 per cent. of Okr with low Egyptian cotton, and these mixtures are effected in such a way as to make detection most difficult. The

One of the recently established Cotton Markets (*Halaḳas*) in the Interior.

Okr cotton is a product of Afifi cotton which remains growing for about three years. Okr is cultivated in the district of Rosetta and Founa. I have no doubt that the keen eye of the Government will soon detect these frauds and take the necessary measures for preventing them.

Seed Breeding. The Mendelian Laboratory at Giza, controlled by Mr. W. Lawrence Balls on behalf of the Government Department of Agriculture, is now in full working order. New types of cotton adapted to the needs of the chief consumers of Egyptian cotton have been produced and active steps are being taken to propagate them in quantities. This will, however, take some time.

Cotton Warehouses. The cotton warehouses at Alexandria are antiquated in comparison with those which have recently been built in Manchester, Memphis, and Liverpool. Two years ago a scheme for modernising them was introduced, as the fire insurance companies insisted upon the installation of

One of the three Cotton Safes that are being constructed at Gabbari, near Alexandria.

automatic sprinklers. The objections to the existing Alexandria warehouses are that they are too high and that too much wood is used in their construction; further, the alleys between the warehouses are never free and not sufficiently broad to enable the handling of bales in case of emergency. It is also stated that workmen very frequently smoke cigarettes in the alleys and even in the warehouses. It is therefore no wonder that we hear frequently of fires at Alexandria.

Owing to a great fire which occurred a few years ago, one Alexandria firm making a speciality in very long staple cotton had a good portion of its stock, that had already been sold, burnt, and on the day after the fire the price for long staple cotton rose enormously and kept for a long time at a high premium. The fire had

occurred towards the end of the season, when certain kinds of cotton could only be replaced with difficulty. This caused a severe loss, and in order to avoid such a recurrence one firm is building three cotton safes, one of which is shown in the accompanying illustration. These are situated at Gabbari, where land is very cheap. A railway line connects the warehouses with the port and interior. The building is constructed of reinforced concrete; sprinklers and drenchers are provided: each block is divided into three sections, divided by reinforced concrete walls. Each section has two doors, to enable the bales to be pulled out at the end opposite to that at which a fire may be burning. The alley between the warehouses is very broad, and will not be used for storage under ordinary conditions. Each section will take 1,000 bales only, *i.e.*, 3,000 bales per warehouse. Consequently the bales will not be piled to any great height.

I was informed that the warehouse companies charge their clients 30 per 1,000 for fire insurance, and on applying to one of the largest tariff insurance companies in England, I was told that the following rates are charged to owners of Alexandria cotton warehouses:

INSURANCE RATES FOR BUILDINGS OF MASSIVE CONSTRUCTION.

	With High Pressure.		Without High Pressure.	
	Containing Steam-pressed Bales.	Otherwise.	Containing Steam-pressed Bales	Otherwise.
	%	%	%	%
If Sprinklered ..	4.50	6.75	7.20 − 25%	10.80 − 25%
If Sprinklered and Drenchered ..	4.20	6.30	7.20 − 30%	10.80 − 30%
If neither Sprinklered nor Drenchered....	6.00	9.00	7.20	10.80

N.B.—A reduction of 25 per cent. is allowed off the above rates for buildings built of reinforced concrete in conformity with the rules of the Fire Offices' Committee, but this reduction does not affect the rate for contents.

INSURANCE RATES FOR COTTON.

	With High Pressure.			Without High Pressure.		
	Sprinklered.	Sprinklered and Drenchered.	Not Sprinklered nor Drenchered.	Sprinklered.	Sprinklered and Drenchered.	Not Sprinklered nor Drenchered
	%	%	%	%	%	%
Cotton in steam-pressed bales....	5·25	4·90	7	8·40 − 25	8·40 − 30	8·40
Cotton otherwise..	10·10	9·45	13·50	16·20 − 25	16·20 − 30	16·20

Export of Egyptian Cotton. The list on the following page will, no doubt, be of interest,

January, 1913. ARNO SCHMIDT.

	NAMES OF EXPORTERS.	England.	France.	Russia.	Austria	Italy	Germany.	Spain.	Switzerland.	Belgium.	Holland.	Portugal	India.	Japan.	China.	Greece and Roumania.	TOTAL
1	Choremi Benachi & Co.	98,752	6,406	11,094	3,933	3,842	8,050	586	2,802	254	—	30	—	4,325	—	10	140,141
2	Carver Bros. & Co., Ltd.	101,827	5,526	5,366	481	430	2,743	1,544	8,861	—	—	—	315	1,250	—	—	128,343
3	R. & O. Lindemann	42,094	6,235	20,789	9,055	3,200	18,305	1,797	2,397	—	377	15	—	4,300	—	—	108,564
4	Peel & Co., Ltd.	79,300	10,182	1,230	2,178	1,256	4,007	3,013	2,746	—	31	50	—	2,726	—	—	106,719
5	J. Planta & Co.	21,118	3,208	92	5,023	7,529	4,526	2,756	5,812	2	4,795	20	—	2,605	—	—	57,086
6	G. Frauger & Co.	24,222	15,564	3,353	2,837	583	5,602	325	1,351	—	—	—	—	—	—	—	53,837
7	F. Andres & Co.	13,400	6,861	5,225	1,723	936	13,296	300	3,394	—	410	—	—	150	—	—	45,995
8	Mohr & Fenderl	11,392	6,015	7,849	3,315	754	4,779	3,262	3,376	1,151	—	—	—	400	—	—	42,293
9	G. Pilavachi & Co., Ltd.	34,578	—	1,901	150	115	—	295	—	—	—	—	1	804	—	—	37,841
10	Reinhart & Co., Ltd.	16,596	5,090	1,013	1,962	82	2,324	120	2,446	—	—	—	—	1,025	—	—	30,661
11	E. Mallison & Co	4,073	4,734	7,798	5,582	2,170	4,760	—	—	—	440	—	—	—	—	205	29,702
12	H. Bindernagel	22,819	675	—	2,206	—	567	—	30	—	—	—	—	100	—	—	26,397
13	Andritsakis Barsoum & Co.	15,169	2,421	525	450	406	388	—	32	—	481	—	—	—	—	—	19,872
14	Hahnloser & Co.	8,184	2,530	1,975	716	185	2,682	602	2,089	—	—	—	—	—	—	—	18,943
15	G. Riecken	4,672	1,205	1,180	3,801	1,052	829	—	—	—	2,391	—	—	4	—	—	15,134
16	W. Getty & Co.	7,982	1,648	204	941	230	1,522	32	1,159	—	160	—	—	630	—	—	14,448
17	J. M. Mezger	10,272	—	—	—	—	—	—	—	—	—	—	20	—	—	—	10,292
18	N. G. Casulli	9,865	30	—	69	—	—	—	—	—	—	150	—	—	—	—	10,107
19	Behor Barki & Co.	4,649	30	391	806	162	87	1,315	—	—	5	—	415	—	4	353	8,217
20	Moursi Borthers	4,382	1,197	—	510	45	30	1,303	—	—	120	—	200	—	—	—	7,787
21	Seeger Bros. & Co.	3,961	603	—	981	842	179	323	—	—	692	—	—	—	—	105	7,486
22	N. Huri & Co.	5,670	385	—	387	159	403	339	—	—	94	—	—	—	—	—	7,437
23	Hess & Carcas	4,213	329	—	741	—	416	721	31	—	31	—	—	—	—	15	6,497
24	The Duckworth Co.	3,841	—	—	36	37	33	—	—	—	1	—	—	51	—	—	3,999
25	G. M. Coury & Co. Succ., &c	351	807	—	—	98	703	—	1,281	—	31	—	—	—	—	—	3,271
26	B. Tilche & Figli	2,998	7	48	36	—	—	45	96	—	—	—	—	—	—	—	3,230
27	G. Petracchi & Co.	485	862	—	86	932	669	46	—	—	—	—	50	—	—	—	3,130
28	Pinto & Co.	416	—	—	—	2,230	—	—	—	—	—	—	—	—	—	—	2,646
29	Rodocanachi & Co.	2,487	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2,487
30	Sasson Israel & Co.	1,542	—	—	63	374	60	—	—	125	246	—	—	—	—	—	2,410
31	Anglo-Egyptian Bank	1,489	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,489
32	Moise Tilche Fils	419	284	—	186	—	170	135	—	98	—	—	—	—	—	—	1,292
33	Wm. Trapp & Co.	37	31	—	25	—	653	—	533	—	—	—	—	—	—	—	1,279
34	Deutsche Orient Bank	600	129	—	—	—	80	30	—	—	—	—	—	—	—	—	839
35	Crédit Franco-Egyptien	487	—	—	—	—	—	—	—	—	—	—	—	—	—	—	487
36	Sundries	1,887	—	—	22	30	32	—	—	—	—	—	—	200	—	1,712	3,883
	Total in Bales	566,229	82,994	72,330	48,954	27,459	77,895	18,889	38,439	1,630	7,245	265	1,001	18,567	4	2,400	964,301

APPENDIX I.

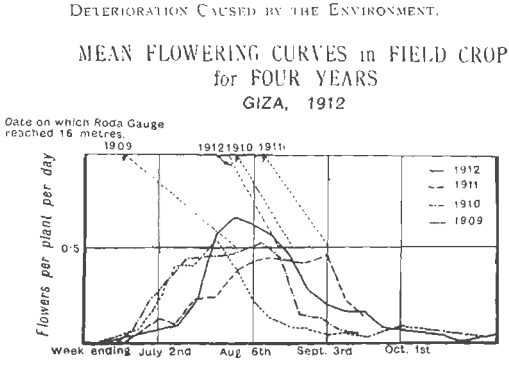
The Deterioration of Varieties of Cotton.

Being a Lecture delivered to a joint meeting of the International Federation of Master Cotton Spinners and Manufacturers, and of the Alexandria General Produce Association, at the Municipality Hall, Alexandria, Egypt, on October 30th, 1912, by W. LAWRENCE BALLS, *M.A., Fellow of St. John's College, Cambridge, Botanist to the Egyptian Government Department of Agriculture.*

The various forms of deterioration exhibited by cotton plants may be subdivided into two classes, and a transition stage between these two. Thus, the deterioration may be due to environmental causes, or to causes inherent in the constitution of the plants themselves. Frequently a change of environment brings about an apparent, though not real, change in the plant constitution.

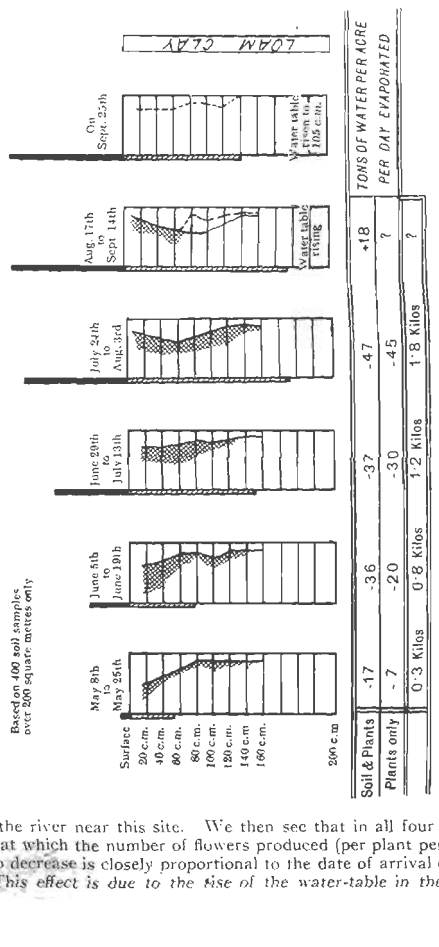
It is usual to discuss the topic of plant deterioration in very general terms, and I may therefore perhaps be permitted to remind you that almost every statement I shall make in these lectures is based upon statistical evidence which has accumulated during eight years of research, and not merely upon personal opinion.

DETERIORATION CAUSED BY THE ENVIRONMENT.



Those who are familiar with the Egyptian crop of these four years will notice that these records are very closely similar to the general behaviour of the whole of Egypt. Thus, 1909 and 1912 were very much alike, in that the crop began "to arrive" at an early date, and very rapidly. This was due to weather conditions,

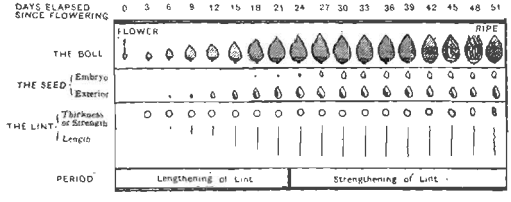
of which temperature was the most important. On the other hand, while 1909 collapsed hopelessly at an early date, the 1912 crop has maintained its early promise. The cause of this difference is indicated when we examine the date of the commencement of the Nile



flood in the river near this site. We then see that in all four years the date at which the number of flowers produced (per plant per day) begins to decrease is closely proportional to the date of arrival of the flood. *This effect is due to the rise of the water-table in the soil,*

Photograph of Root System.
Excavated and traced to a depth of 220 c.m

THE BOLL
Sequences of Development



SCALE OF DIAGRAMS { Boll, Actual size / Seed, x 2 / Lint Length, x 2 / Lint Strength, x 500(about) }

Drawn from material fixed during sixty days from July 16th, 1912

whereby the lower roots are deprived of oxygen, in the absence of which they die. A large and most important part of the root system being thus pruned away, the growth of the flowers and flowering branches is stopped, and the "flowering curve" falls almost to zero.

It may be asked why a rise of the water-table which, when complete, does not bring the water within a metre of the surface, should produce such marked effects. During the past summer I have procured a series of soil-water samples, which show that by the month of August the plant is actually taking more water from a depth of a metre and a half than from higher levels. The centre of gravity of the root system shifts downwards as the season goes on.

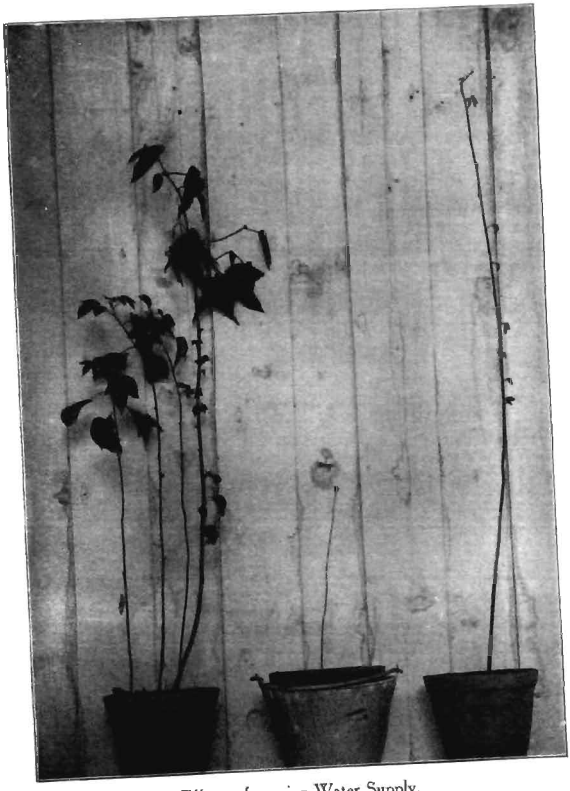
This fact may be better realised if we examine the root system itself. The root shown in this illustration was traced unbroken to a depth of 220 cm., which depth had been attained on September 1st, and this was by no means an exceptionally large root. At a depth of two metres there were hundreds of active absorbing rootlets, occupying a great mass of soil.

Although we have spoken only of the influence on flowering, yet all the other growth processes are affected by such an alteration of the environment. The developing cell which ultimately becomes the lint-hair is also checked in its growth. If still young, it does not grow to its normal length. If older, it does not thicken its wall properly, and so remains weak. In this way, quite apart from effects on yield, and hence upon price, the movements of the water-table become of direct interest to the spinner.

At the present time the principal interest of the effects of water upon a variety of cotton centres round the water-table, which may be regarded as water in excess. Until the year 1902, when the Assuan Dam ensured a sufficient supply of summer water, the interest lay in the other direction, namely, crop failure through shortage of water, though the risk of this was not comparable to what it had been in the past, when seven-year famines were matters of history. This set of three pots (see next page) represents extreme effects obtained by varying the water supply.

After becoming established under identical conditions until the middle of June, the three pots were treated in three ways. The right-hand one received no more water till October, when the photograph was taken. Though still alive and healthy, its leaves are almost invisible. The centre one was placed in a pail of water, which was kept full; it made no further growth, but just remained alive through the agency of the surface roots. The left-hand one received an ordinary allowance of water, and is normal, for pot culture.

Other environmental causes which produce effects resembling deterioration are: Sowing at the wrong time, planting at the wrong distance, or experiencing the wrong weather. Deterioration brought about by any such causes as these can be remedied by removing the cause itself. With two exceptions, the removal of the cause abolishes the deterioration immediately. The first exception relates



Effects of varying Water Supply.

to the organic life of the soil. If soil has been kept for long in an abnormal condition, it may take some time for the original soil flora of useful bacteria to re-establish itself. The second exception is cognate to the first, viz. :—

CHANGE OF ENVIRONMENT PRODUCING AN APPARENT CHANGE OF CONSTITUTION.

When we deal with "pure strains" or "pure lines" of plants we find that all the offspring of any individual are exactly alike in

constitution, and only differ externally in so far as one individual has experienced other vicissitudes than its neighbour. However abnormal the conditions of cultivation or weather may be, and however abnormal the appearance of the plant produced, the seed of that plant will give rise to normal offspring if it be replaced in normal conditions. *With "pure lines" a change of environment produces no change of constitution.*

When we deal with commercial varieties, which even at their best are rarely uniform for any crop, and never in the cotton crop, we may find a fictitious effect of environment, resulting from the fact that the commercial variety consists of many different "pure lines" and of innumerable crosses between them, which are closely similar in external aspect. If we transfer such a mixture to a new environment, some of these "pure lines" and their hybrid offspring will necessarily find it better suited to their growth and reproduction than others. The equilibrium of the population is disturbed, and natural selection begins to operate in a new direction. The well-suited plants increase in proportion from year to year, and we speak of the variety as having "deteriorated under its new surroundings" if matters have not gone in our favour, or as having become "acclimatised," if we still find good plants predominating.

A very crude example may make this clearer. Imagine that we have an island in the Nile which we have chosen to cultivate in cotton. Our sowing shall consist of a mixture of ordinary Egyptian, with a very quick-ripening strain of Uplands known as King. The King ripens its first bolls quite a fortnight before any Egyptian, and produces the first picking at about twice the rate. Suppose now that for two or three years in succession the Nile flood rises very early, just as King is beginning to open its bolls, and floods the island. Obviously, the proportion of Egyptian seed which ripens will be abnormally small, and in one or two generations we might kill off the Egyptian entirely, and have a population which consisted entirely of the quick-maturing Upland.

This is simply natural selection, and not a change of constitution, and the inevitable conclusion is that a process of acclimatisation, or of deterioration through transfer to a new locality, is in no sense a change in the constitution of any one plant, but a change in the proportions of the mixture which makes up the variety. That this point has not been recognised more widely is due simply to the fact that the mixed nature of the variety is not always visible without detailed examination and pedigree culture.

Deterioration due to Constitutional Causes.

We pass now to that deterioration of the variety which is due to causes inherent in the plants themselves, remembering that the plants themselves do not change, but that the proportion of the various kinds of plants in the variety is the thing which is altered. This kind of deterioration is impossible in a "pure strain," so long as it is kept pure, and excepting the remote possibility of "mutation."

The fact that we are able at the present day to make such definite statements about the effects of various causes, that we can

disentangle the working of natural selection from the working of environment directly, and—in general—the fact that the study of such a crop as cotton in field crop conditions has become precise in its methods, is due to an indirect application of the "Law of Heredity by Segregation," discovered by Gregor Mendel. Since you will be shown one or two simple examples of the working of the law at the exhibition in Cairo, and as Mendel's name is almost a household word in these days, I will not deal with it in detail, but shall proceed to the particular circumstances of cotton.

The interior of a cotton flower shows a brush of stalked sacs which contain pollen grains, surrounding a central style which protrudes from the summit of the ovary. The ovary contains the ovules which, when fertilised, you know as the seeds. The small yellow sculptured pollen grains germinate when placed upon the style, sending forth a pollen tube. This tube burrows through the tissue of the style until it reaches the ovary, which, when ripe, you know as the boll. This journey, of an inch or so, occupies about one day. Having reached the ovary, each tube searches for an ovule, burrows into it till it reaches a cavity in the centre, and there bursts. Inside this cavity there is a special cell, the egg cell; from the bursting pollen tube there escapes another cell, the male cell. These two cells, or, rather, their nuclei, fuse together to form a single cell, which is the initial stage of the existence of a new cotton plant. This fusion-cell proceeds to divide into a multicellular body, which ultimately fills the seed coat, and is recognised as the embryo, while the further development of this embryo after sowing into an adult plant bearing cotton is familiar to most of us. The essential point to remember in the story is this: The constitution of the plant (which may be defined as the way in which it reacts to any given set of environmental conditions) is determined irrevocably at the moment of fusion of the two cells, the egg and the male. In other words, the constitution of the plant is fixed by the constitution of the two parent sex-cells.

It remains to consider what is, or may be, the nature of the male cell, *i.e.*, what is the origin of the fertilising pollen grains. Within a pure strain the sex-cells are all identical in composition, and it is a matter of indifference whether the pollen grain comes from the same plant (self-fertilisation) or from a neighbour. Inside a commercial variety the case is altered; the neighbour will probably be of different constitution, and fertilisation by its pollen will then give rise to a hybrid. This in itself is of no immediate importance, but the seed of that hybrid will give rise to a family of diverse constitutions in the following year, and so to an irregular lot of staple.

Thus, a mixture of various kinds within the variety is not merely undesirable in itself, but it also leads to greater irregularity in the offspring if any crossing takes place.

The existence of extensive natural crossing in cotton under field conditions was first proved by the lecturer in Egypt, and has since been shown by other workers to hold good for most other parts of the world. In Egypt it amounts to from 5 per cent. to 10 per

cent. per annum. Since foreign pollen cannot move to another flower without external aid we have to consider the cause and nature of the forwarding agent. This agent in Egypt is almost always a bee.

The illustration shows the cotton flower from a "bee's-eye" point of view, and it will be easily realised that the bee, while

Bee's-eye View of the Flower.

working its way down to the nectaries at the base of the flower, will rub pollen off the brush of pollen sacs on to its back, which pollen he will probably deposit upon the style of the next flower which he visits. In the majority of cases this pollen will come from an adjacent plant, of the same nominal variety, but occasionally it will be derived from a field of another variety, which is even worse.

Thus, we conclude that any given variety may be contaminated, even if originally pure in the strictest sense of the word, not merely by such an obvious cause as seed-mixture, but also by this process of natural crossing.

A few comments on the effects of this crossing may be advisable. It has been a matter of common knowledge for centuries that

crosses between both animals and plants are usually much more prolific than either of their parents. This applies very strongly to crosses between Upland and Sea Island or Egyptian, and to crosses between our Hindi weed-cotton and Egyptian. The illustration shows a natural hybrid of Hindi found in a field of ordinary Egyptian Afifi.

Egyptian and Hindi Flowers.

Such a plant—which is, of course, an extreme example—produces four or five times as much seed as its neighbours, who are true to the Egyptian stock. Consequently, its offspring will be disproportionately numerous in the next year's crop, and the rate of contamination, or deterioration, will be markedly accelerated.

The same holds good, even for crosses between two varieties of Egyptian, which may be very similar externally. The existence of natural crossing thus results, not merely in the formation of new, abnormal plants, but also in an abnormal increase of the proportion of such plants in the population. Statistical results have shown that the formation of only 2 per cent. of natural hybrids with other Egyptians, inside a pure strain of Egyptian cotton, may lead in three years to a conversion of 20 per cent. of the strain to rogues, without any further assistance by crossing from outside the strain.

The deterioration of varieties from constitutional causes thus appears to depend on their initial impurity, on natural crossing within and from without, and on seed mixture from without.

To prevent such deterioration, we have first to begin operations with pure strains, then to propagate those strains without permit-

ting any natural crossing from without, and, lastly, to handle our seed so as to avoid mixture.

This matter will form the subject of a subsequent lecture.

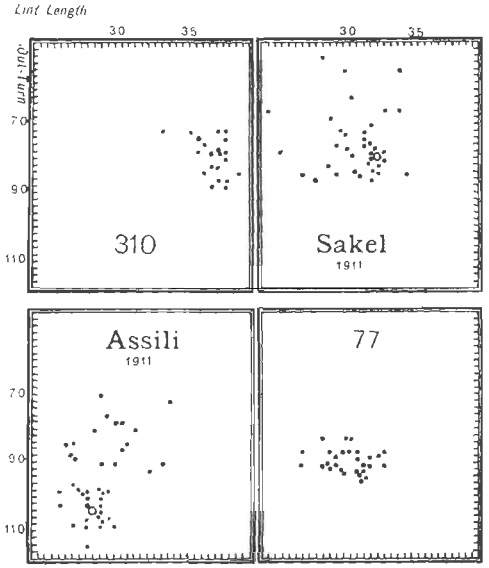
Natural Hybrid of Hindi.

In conclusion, we may examine the target diagrams, which show the composition of two of the newest commercial varieties, too young to have exhibited deterioration as yet, and then compare them with similar diagrams for pure strains. It will at once be obvious

that the commercial varieties are by no means "pure," but that they contain many non-typical plants, or rogues. In the case of the newer of the two it is also clear that a "type group" is still present, sharply detached from the rogues. These rogues amount to

COMPOSITION OF VARIETIES.

Target Diagram.



40 per cent. of the number of plants examined, although the variety was only in its first year on the market in commercial quantities. Internal crossing and natural selection would alone suffice to break down this type group, and to increase the proportion of rogues, without the help of crossing from the outside, or of seed mixture.

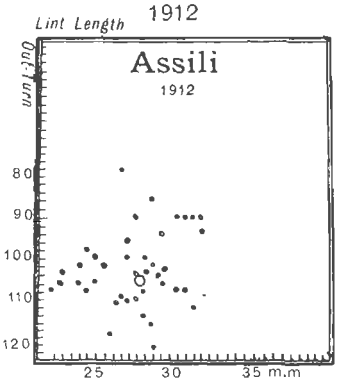
If we now examine the similar diagram plotted for the same variety a year later, again grown from commercial seed obtained from the same source, and in all respects identical, except in belonging to the next year's crop, we find that this boundary of the type group is already vanishing, that the rogues are no longer sharply

defined from the type, and that the onset of deterioration has begun, leading to a fall in ginning out-turn, to a rise in lint-length, and to a general increase in the irregularity of the product.

I believe that this is the first occasion on which the progressive deterioration of a variety of cotton has been statistically demonstrated.

COMPOSITION OF VARIETIES.

Target Diagram.



In closing this lecture I would wish you to carry away one summarising phrase in your memories, namely, that the deterioration of varieties of cotton is neither mystical, vitalistic, nor inevitable.

At Cairo we will resume the thread of to-day's arguments by showing how we propose to apply our knowledge to the establishment of a seed-supply system which shall be proof against the bogey of deterioration.

For most of the illustrations used in this lecture which are not reproduced here, reference should be made to the lecturer's "Cotton Plant in Egypt." Macmillan, London, 1912.

Description of the Exhibition held in Connection with the Conference of November 4th, at the Egyptian University.

THE COTTON PLANT.

1. *Spacing Plots.*—A series of Observations has been conducted during 1912 on two acres of land sub-divided into 100 plots, sown in 50 different arrangements of spacing, from 30 cm. apart on 75 cm. ridges, to 180 cm. apart on 150 cm. ridges. Half the plots of each kind were left with two plants in the hole, and half with only one plant. The density of sowing thus ranged from 36,000 to 1,500 plants per feddan.

The object of the experiment was three-fold :—

(*a*) To show that agricultural experiments are capable of very much higher precision than they have formerly obtained, when due consideration is paid to statistical requirements, and when a full analysis is made of the many components which make up such end-results as, *e.g.*, "Yield."

(*b*) To place our knowledge of the reasons for, and benefits from, the local method of very close planting, upon a scientific basis.

(*c*) To ascertain what advantage may be obtained by very wide planting in the productivity of single plants, since this is of great importance in the rapid propagation of seed supply.

Inspection of the diagrams will show that all these objects have been attained, together with a mass of invaluable physiological information.

The most striking result, perhaps, is the confirmation of the fellahin custom (in Giza district) of planting at 45 cm. on 75 cm. ridges. A closer spacing gives a heavier first picking.

2. *The Effect of Sowing Time.*—The spacing plots show the connection between space and crop; the smaller experiment, of which some results are plotted in this diagram, showed the connection between time and crop.

Sowings were made at weekly intervals, and recorded in the same way as in the previous experiment. They show that no profit attaches to sowing at too early a date, and the best results were given by the sowing of March 21st in every respect. After this date a loss ensues, but it should be noted that the usual date of sowing in this district is much earlier. It is very probable that, although the fellahin are correct in their spacing distance, they are inclined to sow too early. This "critical sowing date" could easily be worked out in this way by similar experiments for some three years in 10 different districts.

3. *Flowering Curves for Four Consecutive Years at Giza.*—These curves represent the number of flowers opening in each week

of the seasons 1909 to 1912, on the same area at Giza, reduced to terms of an average plant.

The chief feature is the "cutting off" of the curve, which in each year is closely proportional to the date on which the Nile flood reaches 16 metres above sea-level on the Roda Gauge. This effect is due to the asphyxiation of the roots by water infiltrated from the river through the deep-lying gravels.

It is worthy of note that these four curves are extraordinarily typical of the four years' crops over the whole of Egypt. Thus, the 1909 crop began just as well as the 1912 crop, while 1910 and 1911 were much slower in arriving. The fact that the early part of the curve is controlled by the weather—unless water is scanty—accounts for this.

4. *Comparison of Varieties.*—Similar graphs for the number of bolls ripening, showing the similarity of varieties which are very different in their lint. In other words, they are all subject in almost the same way to the same external influences.

The 1912 record is interesting as showing a deep drop at the time of second picking, due to shedding of the flowers, provoked by hot dry weather. This phenomenon is common in the Sudan, though abnormal in Egypt. The flowering curves—from which these bolling curves, of course, originate—were practically identical in both years.

These records are a part of some "Observation Row" tests of new varieties in comparison with existing ones.

5. *Routine Records.*—These are taken day by day in order to provide data for reference in comparison with other years or sites.

(*a*) *Surface Climate.*—The wind is recorded at one and a half metres above the ground by a simple anemograph. The temperature and humidity are recorded at 10 centimetres above the ground in the growing crop.

Certain differences from standard records are found. Thus, a wind at night, while cooling to the cultivator, keeps the plants warmer.

(*b*) *Growth per Day.*—The elongation of the main stem is an index of the growth of all parts of the plant until August. A group of plants is measured each day to a millimetre, and the mean growth per day of such a group is plotted.

The chief features are that growth follows the night temperature in the early part of the year, is depressed by hot days later on, and then passes to the control of the water-content of the soil.

(*c*) *Flowering per Day.*—The connection between the form of this curve and the weather is not yet clearly understood. The cutting off of the curve is due to the rise of the water-table, as shown in No. 3. Various sites in the same district show a close similarity in their alterations of rate of flowering.

(*d*) *Tube Well Records.*—Six wells on the plot are recorded weekly, and sometimes daily. One six-metre well, and two three-metre wells, have shown themselves to be in hydraulic communication through bands of loam in the clayey subsoil. They all move

in unison, showing a gradient towards the Nile at low stage, and away from it at flood time. Three other wells, intermediate between these, are almost independent, being isolated by a saucer of clay through which the infiltration can scarcely penetrate.

In 1911 the rising water overflowed the edges of this saucer or saucers, but in 1912 the rise was not sufficient to do this.

(*c*) *Soil-water Content.*—A series of determinations of the amount of water contained in the soil on which a field crop was growing has been made every three days throughout the past season. The data illustrate the manner in which the plant becomes more and more dependent upon deeper layers of soil for its water supply, and throw light upon several general physical problems of soil-water motion, as well as on irrigation practice.

6. *Target Diagrams of Varietal Composition.*—These diagrams represent a convenient method of presenting the composition—uniform or otherwise—of a family of plants in graphic form. They can be plotted in respect of any two characteristics, or even in respect of three, if a solid model is constructed. The two chosen for convenience are the lint-length and the ginning out-turn.

When grouped in respect of merely one character, any individual may be only slightly abnormal, but if it is slightly abnormal in respect of another character also, the sum total of its abnormalities will be shown by the fact that the dot which represents it will become detached from the type group.

Since differences of culture deflect the characteristics from the normal, the groups of plants to be compared should all be grown at the same time and under the same condition. A check on the reality of the grouping of the dots is given by comparison of the commercial varieties with pure strains (*e.g.*, 310 and 77), in which the variations are due solely to the environment, or to the method of determination; any differences which are not shown by pure strains under the same conditions must be due to constitutional differences. The target diagrams thus form a simple way of recognising the constitutional impurity of a variety.

The two Assili diagrams should be compared. They show the abolition of the well-defined group of Assili plants within the variety in a single year. The progression of contamination, or deterioration, is thus demonstrated.

7. *Lint Colour.*—Series of pedigree lints, demonstrating the Mendelian inheritance of colour. Two lint samples of historical interest are shown—a specimen of Afifi of 1893 and a sample of the first consignment of Sakellarides.

8. *The Development of the Cotton Fibre.*—The scale-drawn diagrams show how the development of the boll is sub-divided into various periods, in a way which has not previously been suspected. During the first half of the maturation of the boll, the length of the lint is fixed; during the second half its thickness—the chief component of strength—is determined. This distinction goes far to explain all irregularities in length, strength, ginning out-turn, &c., since the over-lapping of bolls of different ages under the same

environmental effect will produce most divergent results. Thus a spell of water-shortage will cause a young boll to produce short lint, while an older boll will produce weak lint, which may already have grown to normal length. Subsequently the short lint may thicken up to normal strength. These deductions have been tested and confirmed by collecting the bolls from a daily series of dated flowers for 60 days, but pressure of work has prevented the full results from being ready for presentment.

9. *The Food of the Plant.*—A diagram showing the hourly increase in the dry-weight of the leaf, due to the assimilation of carbon from the air. The amount increases with the rise of temperature from the early morning. About noon this increase is arrested by the closure of the stomata or breathing pores of the leaf, which is necessary to prevent too great loss of water and wilting. Since the assimilated food is transferred to other parts of the plant during the afternoon, the weight then decreases.

It should be noted that all previous records for assimilation in any plant of any country have been broken in this and other records, and the maximum value obtained is almost equal to the theoretically possible maximum, which is the absorption of a surface of caustic potash freely exposed to the wind.

10. *The Effect of Different Levels of the Subsoil Water.*—The curves show the results of a field experiment, carried out in 1911 on land in the Central Delta. The level of the water-table sloped from one end of the field to the other, and the curves show the effect of the water-table on the yield, the crop being much greater where the water-table was lowest.

11. *The Effect of Different Quantities of Water.*—During 1912 an experiment has been made on a field of six acres at Talbia, near Cairo. The field was divided into 16 plots, four of which were given the smallest practicable amount of water at each watering, four rather more, four again more, and four enough water to reach to the tops of the ridges. The subsoil water level was low throughout the season. The plant shows the arrangement of the plots.

12. *The Flowering and Bolling Curves.*—These curves show the number of flowers and bolls per plant per day as observed on the different plots. It will be seen that the lightly-watered plants matured much earlier than those more heavily watered. The third picking has not yet been taken, but it is probable that the plots with the medium watering will give the largest crop.

13. Cotton plants, typical of those found on the variously watered plots of the Talabi experimental field :—

No. 1. Very light watering.
2. Light ,,
3. Medium ,,
4. Heavy ,,

The waterings took place at equal intervals on the different plots, the amount of water applied alone being varied.

Note the small plants from the lightly-watered plots and the tall and woody plants from those plots receiving much water. The plants from the lightest-watered plots show little sign of producing

any more cotton, while those from the plots most heavily watered still bear numbers of green bolls. These, however, will probably not mature even if they escape the attack of the boll-worm.

14. Samples of cotton, *ginned* and *unginned*, from Talbia experiment field. These represent the first and second pickings from the differently watered plots :—

1. 1 A.* Very light watering.
2. 2 A. Light ,,
3. 3 A. Medium ,,
4. 4 A. Heavy ,,

15. *Strength of Cotton.*—A modified form of O'Neill's apparatus for testing the strength of single cotton fibres.

The fibres to be examined are attached to specially prepared perforated paper. The slip of paper with the fibre attached is placed in the machine and the paper cut at the two edges. This leaves the fibre in position for the test. The manipulation of the fibres is thus much simplified, rendering it possible to make the requisite number of tests (60) on a sample.

With this number of tests the probable error of the mean result is usually less than $\pm 0{\cdot}3$ gramme. With the lint from a single seed it may be as low as $\pm 0{\cdot}15$ gramme.

16. *Humidity in Cotton.*—Diagram showing the amount of moisture in Egyptian cotton (Mit Afifi) when in equilibrium with atmospheres of various degrees of humidity at a temperature of 19° C.

17. Specimens of the same cotton which have been kept in dry, normal, and moist atmospheres until they have attained equilibrium.

METEOROLOGICAL DIAGRAMS.

18. *Diagram to Show the Nile Levels in 1911 and 1912.*

19. *Rainfall Map of the Delta.*

20. *Maps Showing the Mean Maximum and Minimum Temperatures in July.*

21. *Mean Humidity for July Showing the Limits of Cotton Cultivation.*

22. *Mean Minimum Temperatures, November.*—Profitable cotton-growing in the Sudan depends on water supply and climate. Water supply is limited by the fact that Egypt wants all the water it can get up to June. Hence sowing is practicable in July only. This throws ripening back into November, and excessively low temperatures in November kill the bolls, as in 1910, so the northern extension of cotton in the Sudan is limited by minimum temperatures in November.

ENTOMOLOGICAL EXHIBIT.

23. Showcase with cotton worm in various stages, and insects parasitic on or preying on the cotton worm.

24. Showcases with other insects known to feed on cotton in Egypt and their parasites.

25. Microscopes with stained specimens of Microsporidium polyedricum, Bolle, the disease which attacks cotton worm and destroys it in large quantities.

GENERAL.

26. *Fortnightly Arrivals, Alexandria.*—These curves show the rate of arrival of cotton at Alexandria. The full curve shows the mean for seven years, and the other curves show the arrivals of last year and of the present year up to date.

27. *Lake Mariut in* 1801.—A map prepared during the French occupation (1798-1801) after the English had cut the bank between Lake Abu Qir and Lake Mariut. The map shows the former limits of Abu Qir Lake now under cultivation, and the tracing enables the former limits of Lake Mariut to be compared with the present limits.

28. *Contoured Map of the Mariut Area.*—This map is being prepared in connection with the scheme for drainage. The part coloured green shows the land which is below sea-level. Compare with Napoleon's map above.

29. *Map of the Delta.*—(Scale 1 :2,000,000).

30. *Map of Egypt.*—(Scale 1 : 1,000,000). This map shows the line across which unginned cotton may not be moved from South to North.

31. *Distribution of Cotton Cultivation.*—This map shows the relative proportion of land under cotton cultivation in the different "markazes."

(The admirable diagrams, maps, &c., referred to, are too numerous to be reproduced in the description of this highly interesting Exhibition.)

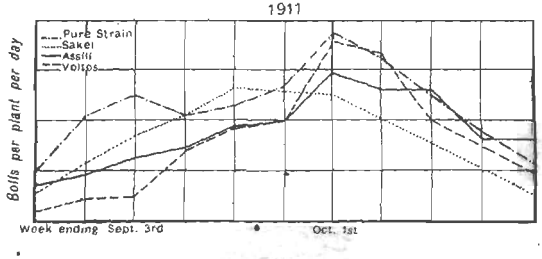
Seed Breeding.

Being a Lecture at the Polytechnical School, Giza, and at the Botanical Laboratory, Giza, on November 6th, 1912, by W. LAWRENCE BALLS, M.A., Fellow of St. John's College, Cambridge, Botanist to the Egyptian Department of Agriculture.

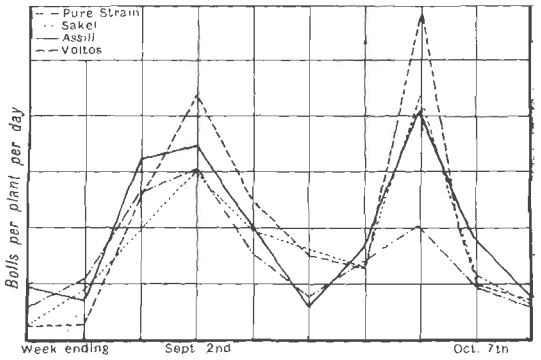
A précis of the Lecture is in the body of the report.

We saw in the previous lecture that the constitution of any given plant is fixed at the moment when it begins its existence as a single cell, through the union of the parental sex-cells. We have also stated that this "constitution" may be defined in one sense as "the manner in which the organism reacts to its environment." There are many characters of cotton which are apparently unaffected by the environment, such as the colour of the lint, though even here the absence of a reaction—in other words, the absence of fluctuation—is only apparent, and not real; the lint colour can change a little, but this change is so small that we cannot detect it under ordinary circumstances. Other characters in which the reaction to environment is more striking are the length and strength of the lint, especially the latter. Even here, however, Nubari as a whole is a few millimetres longer than Afifi, so that we have first-hand evidence as to the existence of constitutional differences between the two. Again, in respect of yield we pass a stage further to a point at which constitutional differences are relatively insignificant, and the peculiarities of our varieties are almost obliterated under the pressure of the environment.

COMPARISON OF VARIETIES
Bolling Curves



COMPARISON OF VARIETIES
Bolling Curves
1912



This diagram shows in a striking manner how, in two successive years, the crop of bolls was ripened in two very dissimilar ways. The partial failure of the second picking in 1912, which was noticeable on all very heavy or very light sub-soils throughout Middle and Upper Egypt, was due to a hot and dry spell at the end of July, which provoked shedding. Roughly speaking, yield is dependent on the environment; quality of the fibre on constitution. There are, however, many and important exceptions to this convenient mnemonic, even within the borders of Egypt.

In Egypt the constitutional differences between varieties are but slight in those characters which unite to make up the end-result of "yield." They do exist, but almost imperceptibly, unless we resort to statistical methods.

In other countries, such as the United States of America, these constitutional differences are more important. Truitt has a gigantic boll, King is very early in maturity, and so forth. Some day, when the more immediate problem of purifying the existing cottons (and multiplying them in pure strains commercially) has reached the stage of automatic working, I hope that the yield problem will be tackled by the Mendelian expert, who, with far greater knowledge than we now possess, will then occupy my post. You may regard this aspiration as simple greed, thinking that a mean crop of nearly 500lbs. of lint to the acre should be enough for any country, but I do not think so. When we consider the complex of components which unite to determine the yield, we must expect to be able to alter some, if not all, of them. I have myself succeeded in breeding out pure strains from crosses between Upland and Egyptian cotton,

which bore typical Egyptian and even Sea Island lints upon plant bodies which possessed some or most of the Upland characteristics.

Of the extremely intricate nature of inheritance in these hybrids I do not propose to speak to-day. The main difficulty, apart from natural crossing, is the impossibility of at present foreseeing what effect upon the lint may result from the change of some other characteristic. This necessitates most elaborate testing, even when the pure strains have been extracted, and such testing was beyond my means. Still, I am firmly convinced that much good work from the economic side could be done in this direction over and above the scientific value of the results. You may perhaps regard the latter aspect with tolerance when I assure you that such results have no little bearing on the complex heredity of Man himself.

So, for the present time in Egypt, the plant breeder is concerned chiefly with lint-length, colour, regularity upon the seed, and strength, though always bearing in mind that a variety may fill your demand to perfection, and yet be an agricultural failure which no one will grow twice, because it starts cropping a few days too late or too slowly (thus giving a small first picking and an excess of boll-worm-damaged cotton) or because it sheds its flowers on too slight a provocation, or because it prefers for some incomprehensible reason —the weather in Upper Egypt when we want it to flourish elsewhere.

The diagram already shown will illustrate such a case. Underneath the dominant effect of the environment we see that one variety was slow in beginning to crop in both the years represented.

Methods of Seed Breeding. The methods by which superior seed can be obtained may be grouped into four: The propagation of pure strains, the selection of superior plants, the rejection of inferior plants, and the preparation of hybrids afresh each year.

The Propagation of Pure Strains. The practical definition of these was given in the previous lecture. It will suffice to add that their habit of keeping uniform is due to the fact that their sex-cells are all exactly identical in composition, whether male or female.

The method of obtaining them varies in detail, but consists roughly in fertilising plants under control and growing their offspring till a plant is found whose offspring are all identical, excepting for differences which are known to be due to the environment only. Thanks to Mendel's Law, we are able to extract such pure strains even from crosses between very dissimilar kinds of cotton, with the assurance that they will breed as true, after two generations only, as if their pedigree had been unblemished. Moreover, we can effect any readjustment and redistribution of characters which we may desire, within the limits of the law. Thus, given a white long cotton and a brown short one, we can produce a white short one, and also a brown long one. Similarly, I can show you many samples of brown American Upland into which the colour has been transferred from Afifi.

In principle, and also in practice, the extraction of pure strains from the commercial varieties is the same as breeding them out from a deliberate cross. Most of the individuals in a field are more or less hybrid, and when we select one, self-fertilise it, and grow the selfed seed, we usually find similar "splitting" in the offspring. We are merely dealing with hybrids which have been made by a bee instead of by a botanist.

Now, the immense advantage of pure-strain seed supply lies in its automatic working. A pure strain, once isolated, needs no selection or supervision except to prevent contamination, which would, of course, render it impure. It behaves with chemical precision. When placed in a new environment it states its liking or dislike towards that environment for good and all in the first year, and no coaxing or coercion will persuade it to "acclimatise." Conversely, so long as it remains pure, it cannot deteriorate.

In certain crops the cultivation of pure strains is impossible on a profitable basis. Thus, pure strains of maize are composed of wizened little individuals, whose yield is insignificant. The ordinary plants in this case are to be regarded more properly as monstrous caricatures of their race, bloated to abnormal dimensions by their hybrid constitution, just as our clover crops are monstrosities resulting from the action of nodule bacteria.

In the case of cotton this objection does not apply, as may be seen by inspection of the diagram, where the pure strain, six years pure, is cropping rather better than the commercial varieties.

There are no objections to, and many advantages in the adoption of pure-strain seed supply, if the practical difficulties of retaining the purity of the strain on a commercial scale can be overcome.

Selection.

I should have liked to speak at greater length on this method of breeding cotton-seed, since no way of obtaining seed is fraught with greater possibilities of error and trouble if the selection is not practised intelligently. If you will recollect the greater productivity of first-generation hybrids, upon which we have already laid stress, and the superior quality of the lint they produce, of which specimens were shown you at the Exhibition, you will then hold one of the chief clues to the nature of these errors. Selection of the best plants in a field is usually a selection of the most hybrid plants, which, from their very constitution, are bound to give an irregular set of offspring. That the average of those offspring may be higher than that of the original field I would not attempt to deny, and continued selection among them may lead, and often does lead, to an increase in the number of superior plants—possibly even to the establishment of approximately pure lines—but this method of attaining our end is obviously clumsy, and has the great disadvantage of not leading to uniformity in the crop, which, in Egypt at least, is the essential requisite.

Very often, moreover, the selection is made on the basis of some feature which is due to variations in the environment and not to constitution. In this case the labour of selection is completely wasted, since such "fluctuations" are not inherited. Occasional examples which appear to contradict this are due to the chance inclu-

sion of a constitutional variation in the same direction, which, being inherited, makes its presence felt in after years.

Of course, from one point of view, the isolation of pure strains is a form of selection, but the ordinary selection method does not keep the offspring of each plant separately; they are all mixed together.

The only advantage of selection methods is their rapidity. By adjusting the stringency of our selection we can collect enough seed in one year to sow for the next year, or for the next but one, and when used with discretion in this way it forms a useful stop-gap while the propagation of pure lines is slowly taking place. Even this function can be filled more safely by rejection methods.

Rejection. The risk of including abnormal, and probably hybrid plants in our seed supply is reduced very largely if we simply eradicate the abnormalities or exclude them from our choice. The best selection work is really rejection, in that the selector selects to a certain type, but rejection is safer. The difficulty is to recognise the abnormal plants. When an Egyptian cotton variety has been in cultivation for a few years the type form is difficult to discover, and many plants which are typical in two or three characters may yet be rogues in all the rest.

A good and simple example of this method was the eradication of Hindi from Afifi by the Khedivial Agricultural Society and the State Domains.

Hybrid Seed Supply. Since the method of raising first-generation hybrids each year between two pure strains is almost impossible with cotton on a large scale, I will not detain you longer over it, except to point out that it shares with pure-strain methods the advantage of perfect uniformity, while its great disadvantage is that the seed has to be prepared afresh each year, or propagation by cuttings practised, the seed of the hybrids themselves being quite useless on account of the mixture of forms to which it gives rise in the second generation.

To close this account of seed-breeding methods I will illustrate their working from the target diagram of Assili in 1911 (see page 199). I might add that Assili is chosen merely because, having been caught young, it shows the type group more clearly than older varieties, partly on account of its very high-ginning out-turn.

I chose last year several plants whose respective dots all fell within the type group. The naturally fertilised seed was planted in bee-proof cages, inspected and reinspected for obvious natural hybrids, and as an additional precaution we removed the *best* plants from each hole, leaving only the backward ones. Seed from these cages will go into big cages next year, but it is not of guaranteed purity, since it may contain splitting forms. From these plants, after a target diagram has been plotted for each cage to detect any remaining rogues, we shall choose some for next year, and either in that year or the next we shall have the pure strain of type Assili established.

Had we been selecting, and selecting wisely, we should have taken all the plants of the type group, and mixed them, with the consequent loss of control over the pedigree. Had we been selecting unwisely, we should have chosen the plants with, *e.g.*, the longest lint, which—*you will notice*—lie *all outside the type group*, and at one sweep we should have lost the original stock of Assili.

Had we been rejecting we should have rejected all the *non-typical plants, and should have retained the Assili stock, with various natural hybrids included*, which we should again have rejected year after year. But this rejection would have been a much more difficult matter in 1912, for the type group is now scarcely distinguishable, being *blurred by the natural hybrids formed in 1911 between* the type group and the rogues.

Both the selection and the rejection would in any case have to be *continued year after year to maintain the type*, and such skilled and minute work—even if advisable—cannot be performed effectively by any Government, but can only depend on the cultivator himself, who is not likely to take the trouble when he happens to be an ordinary Egyptian fellah.

The Propagation of Seed.

Dealing henceforth with pure-line seed supply only, we come to consideration of the rate at which a single pure plant can be propagated to cover areas of agricultural importance.

I must ask you to remember that the problem is not concerned with the productivity of an area of land, but with the productivity of an individual plant over several years.

This production of seed can be controlled by us in two ways—by increasing the number of seeds borne by one plant, and by increasing the number of plants raised from a number of available seeds.

The constants may be taken roughly as follows :-

	Seeds produced by an average plant.	Plants obtained from 100 seeds.
Field Conditions.....	300	10
Laboratory Garden	1,000	60

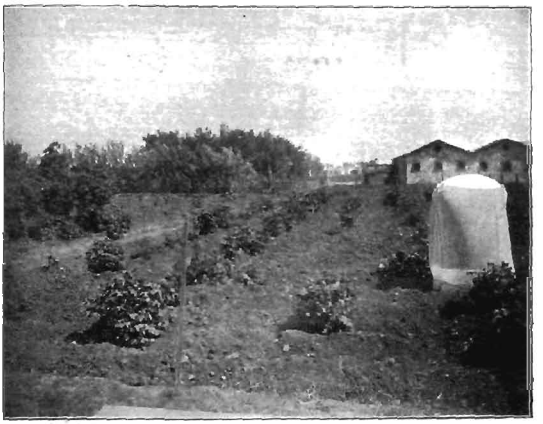
Thus, after one year we obtain 30 plants from one plant under field conditions, but 600 in the laboratory garden.

These figures are based on actual statistics of results over several years, and they show that a considerable change in velocity may be effected by wide-planting, seed-dressing, planting beans with the seed to break the soil, and so on. But this change is more important than it appears at first sight, for if we continue these precautions for a second year, raising 600 wide-sown plants on about half an acre of land, we could get from their seed 360,000 plants in the next year, as against 900 had we pursued field sowing throughout, if we were prepared to sacrifice 100 acres to wide sowing in one year more. Beyond this point it is not practicable to sacrifice land to wide sow-

ing, with a yield of two, instead of five, kantars to the acre, but you must note that we should start our next year with 8,000 times, *i.e.* $(\frac{600}{80})^3$ more seed than we should have had by practising field sowing throughout the three years, and from these hundred sacrificed acres we should take 300 ardebs of seed, which would sow a thousand acres of land in the fourth year from a single plant.

These figures sound incredible, but I have myself raised 11,000 bushels of wheat from a single grain in five years without very special precautions.

Thus, in four years we could provide the spinner with a noteworthy quantity of any strain he might desire, if it were found advis-



Wide-planted Cotton.

able, and even on conservative estimates the whole cotton area of Egypt could be replanted in 18-20 years from a single plant.

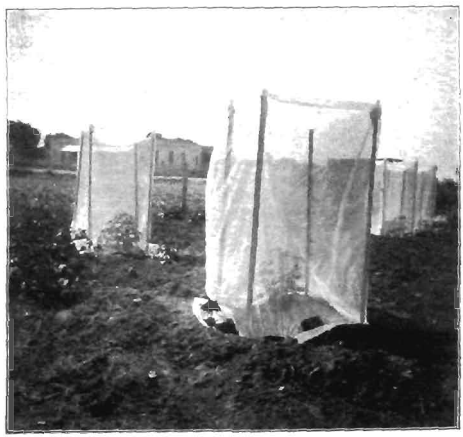
Maintenance of Purity during Propagation.

So far I have endeavoured to show that—thanks to Mendel's Law—there is no special difficulty in isolating pure strains of cotton, nor need the propagation of these strains into commercial amounts be unduly tedious.

We now come to the heart of the economic problem, namely, the avoidance of contamination when handling seed on a large scale.

In the first place I would ask you to notice that the risk of contamination is greatest with moderate quantities of seed, remembering that this contamination is chiefly due to natural crossing. Thus, we can protect single plants from bees by mosquito nets, and we can

ensure—by the usual precautions of a Genetics laboratory—that not one seed of any plant ever becomes mixed with seed from another. Even this apparently simple precaution requires a larger share of arrangement than you might imagine. For example, no seed which has fallen on the floor is ever placed in the files, even when we have seen it fall, or imagine that we have! Similarly, when an area of a hundred acres is sown with one variety, the risk of crossing is slight, since a bee alighting on any one plant will rarely bear pollen except from the same area. A point upon which we require precise information relates to the depth to which natural crossing extends into such a field. Probably we shall find that if seed from those plants in a marginal belt of 10 metres in width is excluded, the remainder

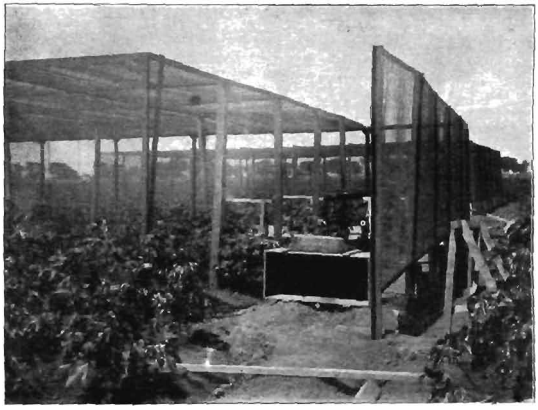


Single Plants under Nets.

of the seed will be almost untouched. Further, 500 kantars of cotton can be handled by itself in the ginning factory, the gins being cleaned before the seed-cotton is brought in.

With smaller quantities, covering half an acre to 10 acres, the risk is at its maximum, and without some protective device at this stage our scheme can be only partially effective. One obvious solution, especially applicable to 10-acre areas, is to plant them in the centre of a field of their descendants, who, forming a barrier of some hundreds of metres in width all round, will themselves attract and unload the visiting bees. But to obtain 10-acre plots we need the seed from a number of plants, so we must either provide each one of these plants separately with a mosquito net, costing 10s. each, or devise a simpler and safer method.

The plan which I have designed and tried during the past year has been to construct large cages, into which even a house-fly, still less a bee, is unable to make its way, and to grow 100 plants in a single cage, measuring 10 metres by 14 metres. It was generally believed, I fancy, that these trial cages would be a failure, but I am glad to say that they are completely successful, and that the yield from them will be equal to, if not actually greater than, the yield from identical but unprotected areas. The complete protection from boll-worm, ensuring good seed, even in the third and fourth pickings, is an important factor in this.



Bee-proof Cages. Showing "panel" construction on a sectional system. Note the transparency of three thicknesses of gauze as shown by the distant trees.

The design of these cages is sectional; the gauze contains 144 meshes to the square inch, and the wires of which it is composed are one-eightieth of an inch in thickness, inclusive of the paint upon them. Windage on a cage of this gauze is surprisingly small, and the circulation of air within the cage is scarcely impeded. The gauze is made up in panels each two metres square, on light iron frames, which are identical on all sides, and these frames are bolted up on posts and rafters of iron, which are again made to fixed pattern in length, number and position of holes drilled for the bolts, and so on. By inserting wooden posts inside to stiffen the rafters at every six metres, a cage made in this way can be extended to any desirable area, with only the trouble of calculating how many posts, rafters, curtains, turn-over slips, filling slips, bolts, and panels will be required, and there need be no difficulty in caging 50 acres in a single cage if it were advisable to do so. An inlet pipe for irrigation water, and a door in one of the panels, provide for inspection and cultivation. The cost of the present trial cages was ten shillings per metre of area caged, while temporary wooden cages cost about half this amount.

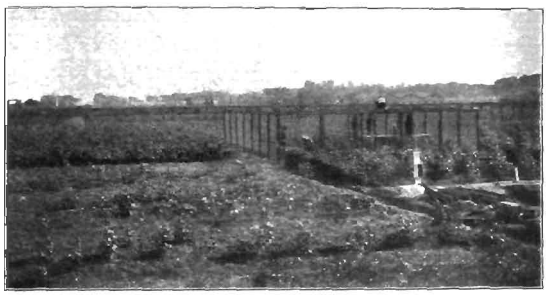
I propose next year to cultivate a few broods of spiders in every cage to deal with the few insects which work their way in by accident, or who may breed out from the soil after the cage is closed.

Pure strains planted in these cages will produce seed of absolute purity for the seed farms.

On and beyond the seed farms, however, we are bound to have *increasing amounts of contamination, which we must next consider.*

The Renewal of Seed.

At this stage we pass into the more purely administrative portion of the work, with which I have no direct concern. The principle upon which this administration must be based is defined by the botanist, however, as one of continuous renewal of seed. Each year a fresh generation of four or five plants will be grown under nets at the laboratory, from the netted seed of every pure strain available,



Bee-proof Cage in process of Erection at the Botanical Laboratory, Giza. Area, 140 square metres.

so that no strain once isolated will ever be lost, whether of immediate utility or not.

Of those strains upon which the spinners and the cultivators agree (probably some five or six in all), seed will be passed each year into the big cages, and from them to the seed farms, on which it will remain for two years, firstly as a centre plot, secondly as the wide protecting belt of which we have already spoken. The seed from the belt will go into cultivation, first with people who will guarantee the return of the seed. This returned seed will then pass into general cultivation under a system of inspection, whereof the motive will be the prevention and detection of admixed rogues. Successive generations will be of decreasing purity, and at a certain point the seed, having passed down all grades of purity from "A 1" at the cages to "X.n." in the hands of the small merchant, will be condemned, crushed, and replaced from behind. I might add that I anticipate this condemnation to ensue when the strain is still purer than any existing variety of to-day.

The system, when in full working order, should bear suggestive resemblances both to a travelling belt and to a quarantine board.

The belt of seed farms will continually carry forward seed to the cultivators, and if the consumers are not satisfied and demand a change, or if they forecast a coming change in the demand, to meet which they will want different quantities or qualities of cotton, we simply drop different amounts or kinds of seed on the belt at the laboratory end. The resemblance to quarantine arrangements is somewhat inverted, perhaps, but in both cases we have machinery in continual running order, capable of being thrown into action on the receipt of a cablegram.

Testing. Returning to the work of the laboratory, we have a very important and troublesome task to consider, namely, the testing of new strains. This part of the work is, moreover, heaviest when the work is just beginning. After a pure strain has been tested on 20 sites in different parts of the country for three successive years, we shall know exactly what its virtues and vices are, and no further testing will be required.

When, on the other hand, we are beginning operations, as at present, with some 20 strains, which will have increased to a hundred in another two years, and these have all to be tested together in order not to delay matters unduly, a great deal of trouble is involved.

Transfer from the conditions of the breeding plot and its results to the conditions and results of the field crop involves two important alterations, namely, from wide sowing to close planting, and from one climate to another. Thus, pure strain No. 310 yields equally with pure strain No. 77 when both are wide sown. In field crop at Giza the former sheds badly, and its yield drops to 70 per cent. only as compared with the latter.

Again, some varieties will not be persuaded to produce lint of good strength at Giza until the third picking, though the strength is at least normal further north. Apparently Giza is a little too hot for them. So, while possessing very important advantages in every other respect as a seed farm and laboratory site, our estimates of the strength value of a strain cannot be made at Giza alone. On the other hand, we can obtain cottons with good strength at Giza, which might not be strong further north, but would probably be better still when planted further south in Upper Egypt.

It is therefore incumbent upon us to establish a set of testing stations in various parts of the country, not less than 20 in number, in which to ascertain the suitability of each strain to each district, for the fact that pure strains do not acclimatise is one of their great advantages. Five years ago it would have been difficult, if not impossible, to have carried out tests on this scale with any precision, but it is now comparatively easy if we can only take sites which are easily accessible. This change has been brought about by the development here of a method whereby detailed observations are taken on Observation Rows and plotted into Plant Curves, and this method —which was almost accidental in its origin in 1906—has the additional advantage of requiring very small quantities of seed. This method is being used extensively, not only in the Giza Laboratory,* but also by fellow-workers, and it forms a most powerful instrument

* Exhibition Catalogue Nos. 1—9.

for research on cotton. We could obtain full tests of a strain in all the 20 stations postulated, if we could merely spare 7lbs. of seed. Five years ago we should have required 500lbs., and the significance of our results would actually have been inferior.

When conducting such tests we proceed as follows: A typical piece of land for the district is planted in the usual way with ordinary cotton, except on certain ridges, which are sown with the strain to be tested. Each of these ridges should contain about 100 plants of any one strain. The observation rows thus formed are not grouped together, but are scattered systematically about the field, five rows to each strain. Check rows of commercial varieties should be included as controls. The ordinary cotton thus forms a kind of packing material, producing normal air and root conditions round the observation row, which would be lacking if it was sown by itself, while the systematic scatter of the rows about the field helps to eliminate fluctuation due to patchiness of the soil and sub-soil.

The number of flowers opening each day or on alternate days from the first commencement of flowering is recorded, and when the crop begins to ripen, each row is picked once a week, the bolls being counted and weighed. Samples are collected and sent to the laboratory for ginning and grading, and all the figures recorded for flowering and bolling are sent on the filing cards, which are used as note-books, back to the laboratory to be computed to terms of an average plant and entered up on squared paper each week, so that the vicissitudes of every observation row may be followed week by week on the walls of the laboratory. You may realise the precision of the method better if I assure you that it would scarcely be necessary to inspect the work of the observers, since any flagrant attempt at scamping their work would be detected in the following week on the chart unless the deception were effected with remarkable skill.

It might seem that such a system would be cumbersome, and it may interest you to hear what staff—so far as I can see—could carry out the work effectively, assuming that the sites are chosen in the first instance with the fullest regard to accessibility, and to speed of transport from one to the next. The 20 stations could be divided into groups of five—one for each working day, and a spare day—each group being in charge of one plant observer at a salary of £3 to £4 a month. Each group should be arranged on the railway map in a rough circle, the four circles lying in the apex of the Delta, in the north-east and in the north-west Delta, and in Upper Egypt respectively. In the last case I fear that the circle would become a very elongated ellipse. Each observer would then work round his circle; twice or three times a week for flowering records, and then once in a week when the bolls began to open. An assistant at a low salary would be required to help in the picking counts when more than four strains were under test simultaneously, and with this assistance some seven strains could be handled.

It is scarcely necessary to point out that a computing clerk at the laboratory would have his hands full in keeping the computation of records up to date, and it is obvious that residential observers on permanent stations would be better than the peripatetic observers whom I have described.

Such are the main outlines of the testing scheme which I hope to institute, and if we consider the precision and permanent value of the data obtained, even allowing for third-class travelling expenses, the method cannot be stigmatised as expensive.

The Choice of Strains.

I have tried to show that it is possible to develop a system of seed supply for Egyptian cotton which will fulfil the most exacting requirements of the botanist, will be flexible and elastic in its reactions with the consumer, and yet can be administered with comparatively slight expense, except in the sacrifice of land to wide planting.

The last question, and from the consumer's point of view the first also, relates to the nature of the cottons to be grown. We have already heard something of the spinners' views on this point, and the position appears to me as follows:

First, for myself, as the botanist at the centre of this growing web, my task is simply to provide such a range of pure strains as will include every kind of cotton you may ask for, from the finest to the coarsest, though the ultimate tendency of Egypt is bound to be towards fine, long cottons, because of our natural advantages. Supplementary to this, I must prove by testing that the strains are agriculturally suitable, a matter which does not concern the consumers directly.

Secondly, your Federation must help by telling us what the spinner wants. Naturally, each spinner wants a large, and consequently cheap, supply of his own particular raw material in the first instance, but the Federation can take a broad view of the needs of the trade as a whole, and advise us how to apportion our various strains with the best results for all concerned. There need be no fear, with such guidance, that we should ever rush into over-production of some special kind at the expense of another. Probably, for years to come, when this scheme is in full swing, you will still refer to our Yannovitch, Abbassi, Ashmouni, Nubari, and Afifi. The variety name may bear some Arabic tag-mark equivalent to "reconstructed," but I trust that in other respects you will find no change, excepting in the uniformity and constancy of the crop, until you ask for some specific alteration.

The matter thus stands in this shape: We can produce every gradation of fint for you, and you must choose which ones you need.

The early stages of my enquiries into the nature of the demand for Egyptian cotton did not progress with anything comparable to the ease of the past week, and, having watched the exciting events of the last four years in Lancashire as an interested outsider, I sincerely trust that the link between us and you, which took so long to forge, will not now be allowed to rust.

The Botanical Laboratory of the Department of Agriculture, Giza.

LEAFLET GUIDE.

The building of the laboratory was commenced in September, 1911, and it was first occupied in March, 1912. Five feddans of land are attached to it, while an annex of 20 feddans more, with buildings and breeding cages, will be added in the near future, for the propagation of seed between the laboratory and the seed farms.

The laboratory staff consists of the botanist and assistant botanist, one head plant observer with three assistants, two lab-boys, with a night watchman, and three labourers, all but the first two being natives, at 250 to 180 piastres a month.

The laboratory is original in design and arrangement, and *unique in being residential.* The assistant botanist resides permanently in the building, while a room is at the disposal of the botanist. A very great advantage in efficiency and comfort results from this arrangement, which is, indeed, essential for the conduct of biological research on crops in a hot country.

The laboratory proper consists of an office; a large work-room, with grading north light, gin, incubator and oven bench, carpenter's bench, &c.; an instrument room for the more delicate instruments, with a telegraph wire leading out into the field crop, so that temperatures, stomatal apertures, &c., may be recorded inside the building without removing the instruments from their cupboards; a store room specially arranged for the filing of cotton samples, with a capacity of 5,000 filing boxes; a small greenhouse for the forcing of seed, and a tent serving as temporary accommodation for the native plant observers. The photographic dark room is also temporary.

ARRANGEMENT OF THE LAND, NOVEMBER, 1912.

Entering by the gate (east end), on the left hand, stretching up to the building, lies a series of 49 plots of third generations bred from an inter-Egyptian cross between pure strains of Afifi and Sultani, the first Mendelian investigation made between two Egyptian cottons, from which forms with long brown lint and Nubari types are being extracted.

The pieces of red wool denote flowers which have been self-fertilised by small hand nets, and should not be touched. Five thousand flowers were thus treated during the past year.

On the right hand, by the edge of the path, runs a row of plots, each sown from a prize sample of one variety. These plots show the heterogeneous nature of the varieties, and are being used to construct target diagrams.

Also on the right side, but behind these target plots, runs a double row of wire gauze cages, in which uncontaminated seed of three pure strains and four semi-pure strains is being raised. Some

of the cages are emergency wooden constructions; the rest are designed on a system of sectional panels.

At the head of the path, next the laboratory hedge, are three rows of King American Upland, now in its second flowering period. The two very prolific long-staple natural hybrids are good examples of the effect of a little foreign pollen.

Miscellaneous cottons from Asia Minor, red leaf cotton from the States, &c., with experiments on mixed pollination, occupy the rest of the ground immediately in front of the laboratory. Beyond these to the north is a set of 30 ridges of six different varieties and pure strains, five times repeated, for variety testing.

Every ridge is treated separately, the flowers being counted every day, and the bolls counted every week, &c.

At the back of the laboratory (south side) are a number of native Sudanese cottons, Caravonica, Peruvian kidney, Nyam Nyam kidney, and the Sudanese Asiatic tree cotton, which has been used elsewhere for making plot hedges.

The two acres at the west end of the land are devoted to an experiment on the effect of various spacings upon the yield per plant and per acre. There are 10 different spacings, from 30 cm. on ridges at 75 cm. up to 180 cm. on ridges at 150 cm. Five plots of each spacing are scattered about the area, to eliminate the enormous and sudden variation which the sub-soil undergoes, and each plot is halved. In one half two plants are left in each hole; in the other only one. Observation rows have been taken out of each of the hundred plots, thus eliminating the effect of "negeel" grass which was left in certain parts of the land by previous occupants, and on these rows the flowers have been counted every day, the bolls picked every week, and each of the 100 weekly pickings so handled as to give the weight of a single boll, of a single seed, and the ginning out-turn on each plot week by week.

The variety employed is Assili, which, though growing well at Giza, will not there produce very good lint. The staple is rather weak throughout.

Besides the obvious practical direction of this spacing experiment, an equally important object has been to show that very high precision may be reached in agricultural experiments by suitable methods. A most interesting result is that the maximum yield per feddan is given (6¾ kantars) at the sowing distance (45 cm.) practised by the local fellaheen.

A chain of six tube-wells along the plot gives the level of the water-table, which is here controlled chiefly by the river. Under a portion of the land there is, however, a saucer-shaped mass of clay over the edge of which the water-table did not flow this year. Thus, under the laboratory the water-level has not come nearer than three metres from the surface in 1912, though the foundations were laid in sub-soil water in 1911 owing to the higher flood in that year.

W. LAWRENCE BALLS.

The Reclamation of Lake Aboukir in Egypt.

A Short Account, by R. LANG ANDERSON, Managing Director of The Aboukir Company, Ltd.

Introductory. Whilst this paper is primarily concerned with a description of the Reclamation of Lake Aboukir, by the Aboukir Company, Ltd., it is necessary to give a brief general account of the North of the Delta, and record some facts of population, ownership, and value of the land.

Great Lakes. The great Lacustrine region of the Egyptian seaboard stretches from Alexandria to Port Said, and occupies roughly an area of 250 kilometres in length, with an average width of 10 to 12 kilometres. This area, occupied by Lakes Menzaleh, Bourillos, Edku, and Marcotis, and what was formerly Lake Aboukir, 250,000 to 300,000 hectares, or 600,000 to 750,000 Egyptian feddans in extent, is all capable of reclamation and cultivation, but it by no means exhausts the possibilities of adding to the cultivated surface of Egypt. These lakes are permanently under water of varying extent, diminished by evaporation in summer, and increased in autumn and winter by Flood Nile and rainfall. The beds of Lakes Menzaleh, Bourillos, and Edku are 1 to 2 metres below the sea level. During the winter they have openings to the sea through sandy channels, which carry off excess water when their surface rises above sea level, but these channels silt up when the current is too slow to keep them open.

The bed of Lake Marcotis is 4 to 4½ metres below sea level, and the surface level is only kept down to R.L. = 2·50 metres by powerful pumps at Mex, near Alexandria, which evacuate surplus water into the sea.

Marginal Land. Around the margin of the lakes proper there is a band of low-lying land, subject to inundation when northerly winter storms pile up the waters of the lakes on their south sides. This band has at no time adequate drainage, and all efforts to utilise the better drainage of summer would be rendered useless by one winter storm driving up the brackish or salt waters of the lakes. The area of marginal lands and other waste lands in Egypt exceeds the area of the lakes, and to the existing 6,000,000 feddans of cultivated land in Lower and Upper Egypt, there is the possibility of an increase of 1,500,000 feddans.

MEMO.

Egyptian.		English.		French.
1 feddan	=	1 acre and 184 yards	=	4,200 sq. metres.
£1	=	£Stg.1 0s. 6d.	=	Francs 25·92.

Drainage Projects. The Government drainage projects presently in hand (January, 1913) deal with the Central Gharbieh Province, where improved drainage will be given to land already cultivated, and to certain marginal lands. The question of draining the lakes proper does not enter into the drainage scheme on its present basis.

The Lake Mareotis drainage scheme will cause the disappearance of that lake, and part of the margin will become cultivable. If the water in the main drains is kept sufficiently low the whole bed of the lake can be reclaimed. There is not the least danger that land reclamation will proceed more quickly than the land can be absorbed by the population.

Population. The population of Egypt (adding increase since last census of 1907) is 12,000,000, on a cultivated area of 6,000,000 feddan.

That is, 476 per square kilometre, or 1,232 per square mile.

This is double the population per square mile of Belgium, taken as 622. The most densely-populated provinces of India do not carry 600 persons per square mile. Menoufieh Province, in Lower Egypt, has 1,700 souls per square mile. Egypt is purely an agricultural country, with no great industries to employ the people and congregate them in large towns. Infant mortality causes enormous ravages, as one-third of the total deaths are of children under one year, and another third children of from one to 10 years. Notwithstanding this leakage, the population increased from 6,831,131 in 1882 to 11,287,359 in 1907, an average increase of 2·6 per annum.

The possible 1,500,000 feddans which can be added to Egypt is equal to 25 per cent. of the existing area, and from many causes it can only be reclaimed gradually over a period of 20 years. The average increase is then 1¼ per cent., as against a population increasing at double that rate. Strenuous efforts will be needed to increase the area to keep pace with the increasing population.

Distribution of Land. In 1896 there were 608,373 small native proprietors owning 988,804 feddans, an average of 1·625 feddans. In 1911 the number had increased to 1,296,561 owning 1,383,317 feddans, an average of 1·066 feddans.

Whilst the increase in the number of small holders is satisfactory, the decrease of average holding is disquieting. Sub-division, carried to extremes, reaches a point where small areas, however fertile, cannot support a family.

There are 10,827 native proprietors with over 50 feddans. Their average is 164 feddans.

To the whole of Egypt's 5,458,608 feddans there are 1,441,250 proprietors, native and foreign, with an average holding of 3·787 feddans. Of these, the foreign proprietors number 7,827, owning 706,591 feddans, an average holding of 90·276 feddans.

Land Reclamation. Land reclamation in Egypt is usually a three-years' process. The Salt-Land and all uncultivated land is salt, has to be washed, then ploughed, and in many cases levelled. Inferior crops are then grown, and gradually the land becomes fit to produce cotton. The whole of

the block to be reclaimed is not taken up at once. Canals which would serve for a cultivated area requiring an ordinary supply of irrigation water would be insufficient for the same area whilst undergoing the process of washing to eliminate salt, and similarly with drains. Cattle have to be purchased, villages built, and labour found. Any sudden demand for labour and cattle would be difficult to satisfy without upsetting market rates. Population has to be attracted to settle on the lands when reclaimed. Success will attend gradual expansion more readily than efforts on too ambitious a scale, which would result in excessive cost, with more land taken up than could be judiciously handled. The cost of reclamation may be taken roughly as £20 per feddan, so that £30,000,000 is required in Egypt to reclaim land during the next 20 years. Nearly the whole of that sum will be spent on wages, cattle, and cattle food, and not 10 per cent. of it will be spent on European machinery or timber. This expenditure is apart from Government work on drainage pumps, and on new or existing main canals and drains, which must be made or remodelled for increased area added by the new lands.

Land Values. The 6,000,000 feddans of cultivated land in Egypt are worth an average of £100 per feddan. No cultivated land can be purchased under £50 per feddan, and at that price only land not fully developed could be had. There is much land worth £200 per feddan, purely for agricultural purposes. The native has no investment for money except in land, and he will eagerly purchase any land offered.

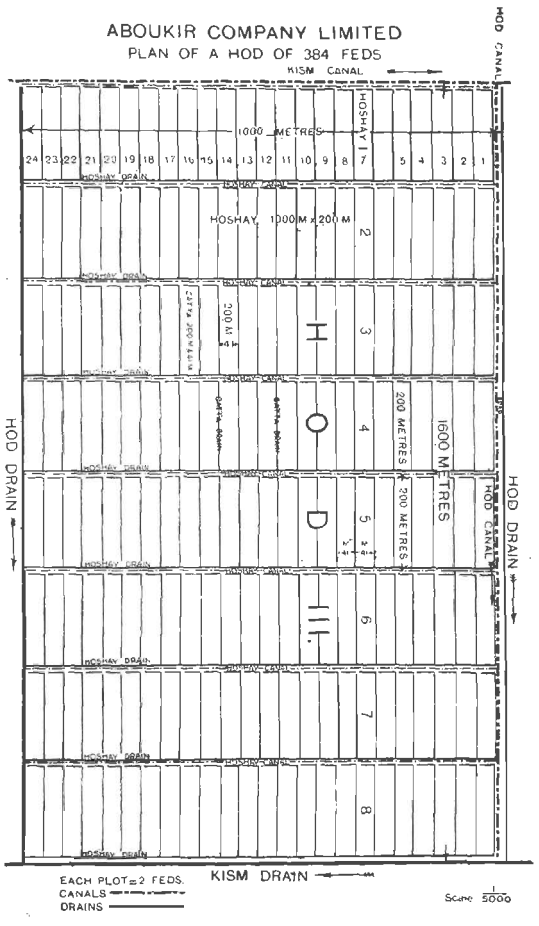
The new 1,500,000 feddans to be added to Egypt will not attain the value of old cultivated lands, enriched for ages by Nile silt. They are lower and more northerly, and never likely to give the same heavy yields. They should, however, be worth £75 per feddan when reclaimed and fully cultivated.

LAKE ABOUKIR RECLAMATION.

Early History. In March, 1887, a concession of Lake Aboukir was granted by the Egyptian Government to the late Mr. William Grant, who, with the assistance of a London syndicate, afterwards the Aboukir Company, Ltd., headed by the late Mr. Samuel Gurney Sheppard, immediately began the work of reclamation. In the terms of the concession, main canals and drains had to be dug, and large drainage pumps installed. Under the able direction of Mr. H. G. Sheppard, as resident engineer, all this work was accomplished in 18 months, and, after examination, passed by a Government Commission.

The agricultural development only became possible after the main works were completed, and the system of reclamation was initiated by the writer, and has been carried out by him since that time. This system is now generally adopted for all similar lands in Lower Egypt.

According to the concession, drainage pumps had to be installed, and two 48in. centrifugal pumps, driven by direct-acting compound engines, were erected by Messrs. J. & H. Gwynne. These pumps together delivered 350 metres cube of drainage water per minute into Aboukir Bay. The Government afterwards allowed


ABOUKIR COMPANY LIMITED
PLAN OF A HOD OF 384 FEDS
KISM CANAL
HOD CANAL
HOSHAY 1
1000 METRES
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 5 4 3 2 1
HOSHAY DRAIN
HOSHAY CANAL
HOSHAY, 1000M x 200 M
2
3
4
5
6
7
8
200 M
200 METRES
1600 METRES
H O D H I L L
HOD DRAIN
HOD DRAIN
KISM DRAIN
EACH PLOT = 2 FEDS.
CANALS
DRAINS
Scale 1/5000

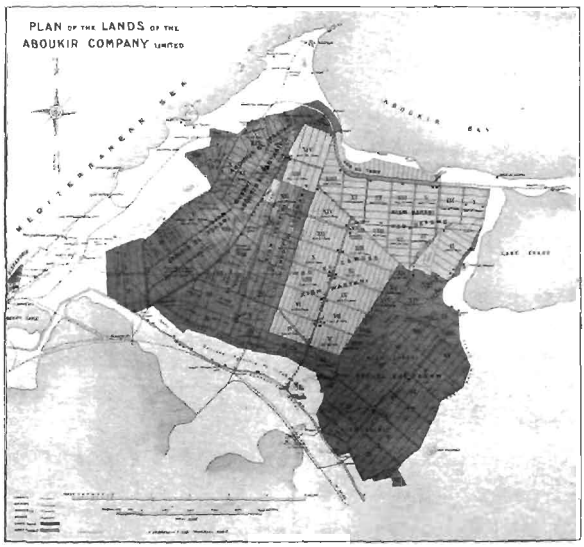
syphons to be made under the Mahmoudieh Canal, and by these, drainage now flows to Lake Mareotis, the surface of which is 6ft. lower than Aboukir, thus affording a better drainage system than could be obtained by pumping.

Description of Lake.

Lake Aboukir was the smallest of all the lakes, and contains an area of 30,000 feddans. The dimensions are:—

12½ kilometres in length, east to west, and
9½ kilometres in width, north to south.

The bed of the lake was nearly a dead level, one metre below sea, rising by a gentle slope to R.L. −0·50 on the west and east



margins. Aboukir was not a permanent lake. Drainage from adjoining cultivated land on the east, and winter rainfall, averaging 20 centimetres per annum, caused an accumulation of water in the lower parts to a depth of 30 centimetres in winter, but this was evaporated during the summer, leaving a crust of white salt, nearly pure sodium chloride, a few centimetres thick. Clearly marked traces of old water channels, and remains of foundations of houses confirm historical proof that Aboukir was cultivated, probably until the middle of the eighteenth century, when an irruption of the sea destroyed the cultivation.

Analysis of the Soil.

Before any washing was done, samples of the soil from the bed of the lake were analysed by Dr. Voelcker, of London. The results were as follows :—

	No. 1.	No. 2.	No. 3.
Oxide of iron	11·69	11·04	11·71
Iron pyrites	0·08	0·11	0·10
Alumina	6·36	10·88	11·95
Lime	2·98	7·73	8·03
Magnesia	1·79	0·93	0·50
Soda	0·79	—	0·41
Chloride of sodium	8·11	8·56	0·01
Potash	0·65	1·23	0·67
Sulphuric acid	2·23	2·56	0·14
Carbonic acid	0·19	4·75	5·59
Phosphoric acid	0·16	0·19	0·38
Insoluble silicates and sand	62·23	45·81	54·27
*Organic matter	3·64	6·21	6·24
	100·00	100·00	100·00
*Containing nitrogen	0·035	0·070	0·096
— Ammonia	0·042	0·079	0·116

Nos. 1 and 2 were from the bed of the lake, and No. 3 was taken from fully cultivated land in the vicinity for comparison. The large percentage of chloride of sodium is to be noted. All land in Egypt becomes salted if uncultivated, as capilarity brings up subsoil water, which is evaporated, leaving a crust of salt. Until salt is reduced to 1-1½ per cent. no crops can be grown, and even then only dineba or rice by plentiful application of water. Other crops of good quality will hardly stand ½ per cent. of salt.

Main Canals and Drains for Kisms.

The main drains and canals divided the land into six kisms of about 5,000 feddans each. The kisms are named North, South, Central, &c. Where possible the main canals and drains are given a slope of $\frac{1}{10,000}$, so that reasonable velocity can be given to the flow of the water. Extreme flatness of the land or adverse rise at times necessitates making slopes of only $\frac{1}{20,000}$, the minimum permissible.

Main canals are calculated to supply, when running full to ground level, 30 metres cube per feddan per day. At High Nile, when water is abundant, and washing new land demands greater supplies, the canals can carry water above the level of the berms, so increasing supply.

Drains should have the same sectional area as the corresponding canals, but with greater depth. Although drainage water is only one-third of the amount of irrigation water used for crops, drains, to be efficient, must only carry water in one-third or half their depth. If run full to ground level they are useless. Hence it arises that a drain must be as large as a corresponding canal, although carrying one-third of the water. During the early stages of washing land, the proportion of drainage is very much more than one-third.

Secondary Drains and Canals for Hods. The secondary system of canals and drains divides the land into hods, a typical one being 1,600 metres long by 1,000 metres wide. The area of such a hod is 381 feddans, a feddan being 4,200 square metres. The channels are designed to carry 50 metres cube per day. The minimum slope of these secondary channels should be $\frac{1}{10,000}$. If attainable, more slope is preferable. A kism does not require to be irrigated all at one time, but a hod often does, hence the greater allowance of water per feddan. Hods are numbered by Roman numerals.

Minor Channels for Hoshays and Gattas. The hods are divided into eight hoshays, 1,000 metres by 200 metres. At the side of the hoshay there is a canal and drain, with a road between.

The hoshays are divided into 24 gattas, 200 metres by 41 metres.

The 24 gattas of 41 metres equal 984 metres, whilst the length of the hoshay is 1,000 metres, but 16 metres are occupied by the road, canal, and drain of the hod. The area of a gatta is taken as 2 feddans, although actually slightly less. Government land tax is collected on gross areas without deduction for roads and drains and canals. Tenants or purchasers must therefore pay for land occupied by these necessary works, which serve their lands.

The gattas have only small drains, ·80 to 1 metre deep, ·25 wide at the bottom, and 1·00 to 1·25 metres at the top. No permanent irrigation channels for gattas are needed, as these are made each time the land is ploughed by a wide plough rut.

A plan of a typical hod is given to show the canalisation system.

Plots are all numbered according to the direction of the flow of irrigation water.

Thus on a lease or sale contract, North Kism, Hod III., Hoshay 3, Gattas 5—8, or N. III., 3 $^{5-8}$ indicates exactly the plot of land, and as each gatta is 2 feddans, a stranger could at once identify the 8 feddans in question.

Washing Soil. The canalisation being completed, the process of washing begins. The gatta has a bank all round it from the soil thrown up in making its drains. Water is admitted from the Hoshay Canal, and the plot flooded 10 centimetres deep. The water filters through, and enters the bottom of the drain, dissolving out the salt. Washing goes on from October till April, when water is abundant, and hardly needed for crops, and the plots are never dried. The amount of water which percolates through depends entirely on the porosity of the soil. If water is shut off from a gatta flooded 10 centimetres deep the surface will sometimes be dry in 24 hours, *i.e.*, 420 metres per feddan have percolated. Such a very porous soil would wash very quickly. On some impervious soils the water will not disappear for a week. In such a case, when it is seen that a soil is so retentive, another drain should at once be made up the middle of the gatta.

Three or at most four men should attend to the washing of a

hod. They have to see that the gattas are kept full and not allowed to overflow, that banks are not broken by wave action during wind, and that any soil slipping into the drains is at once removed. Inattention to these details loses time in reclamation, and a few neglected gattas scattered here and there prevent a hoshay being let in its entirety on a desired rotation.

Reclamation Crops.

Washing being completed in April, the land is dried off and ploughed. It is then sown in dineba (panicum crus galli), a species of millet which grows as a weed in rice fields. Either consumed green or made into hay, it is good fodder for cattle. Rice can also be grown, but it is more susceptible to salt, requires more constant water, and is more expensive to grow, and if it does not mature to a crop is worth nothing. When there is any doubt about land being sweet enough, it is best to grow dineba. It affords a perfect analysis of a whole plot. From the appearance of the different patches, prediction could be made of amount of residual salt remaining if subjected to chemical analysis.

In October, when dineba or rice have shown satisfactory growth, berseem, *i.e.*, Egyptian clover (Trifolium Alexandrinum) is sown. If dineba has not succeeded, it is pure waste of time and of expensive seed to sow berseem. Washing is therefore resumed for another season, and berseem sowing postponed. Good berseem crop is the goal of the land reclaimer. When that can be grown all other crops will follow, and the land may be let at good rents. It is useless to let partially reclaimed land at low rents to natives, in the hope that they will complete reclamation. They will only cultivate the best parts, and the rest, instead of advancing, will revert. The whole must then be taken back and done over again, with loss of time and money.

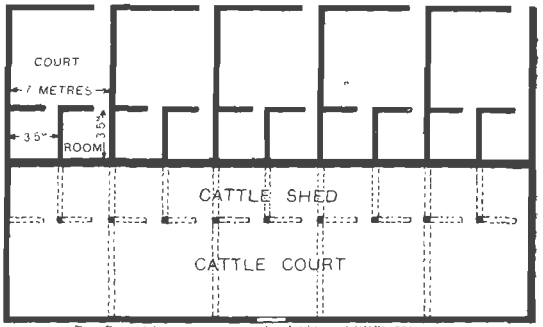
Houses.

As reclamation advances, houses have to be built. The usual Egyptian beehive-shaped mud hut of the fellah, of sun-dried brick, is quite unsuitable for Aboukir, and proved an entire failure. Bricks made of soil still salt will not dry properly, nor will they stand the rain and damp of the coast zone. Red burnt brick, made on the spot, is therefore used.

As soon as a hod is taken up for reclamation, a village (Arabic "Esbeh") is begun. The houses are 3·5 metres by 3·5 metres inside measurements by 3 metres high. Two ranges of 10 or 12 houses are placed parallel, about 20 metres apart. Walls at back and front constitute, with these houses, a court for cattle. See plan.

The inner lines of houses are not completed at first, the roof being carried on brick columns to form an open shed for cattle. The ploughmen and labourers engaged on a hod occupy the outer houses, the cattle the inner sheds. When reclamation of a hod is completed and the land let, men and cattle move to a new hod, and are succeeded by tenants. The front wall of the cattle sheds and the partition walls are then built in to form houses corresponding to the outer ones. A small enclosure wall is built for each two rooms to afford privacy. A tenant of 8 feddans is allowed two rooms and

ABOUKIR COMPANY LIMITED
Plan of an Esbeh Village and Cattle Court



The Dotted Lines represent the Additional Walls necessary to convert the Cattle Shed into Rooms

Scale 1/...

his small court without paying rent. The two rooms and enclosure cost £32.

Under the most favourable circumstances, with porous soil, easily washed land has been let 12 months after it was first taken in hand, but this is exceptional, two and more often three years being required to bring it to letting condition.

Tenants. Land having been got into condition for letting—and the point of having it really fit for tenants cannot be too strongly enforced—the next thing is to find tenants. On Aboukir the demand for land is keen, and deposits of £1 and £2 per feddan are freely offered by fellaheen desirous to become tenants. Leases are for three years. The average holding is 8 feddans. A tenant should, if possible, have two buffalo cows to plough his land, turn his water lifting wheel, and at the same time give a valuable milk yield and manure.

Berseem. Cotton is the crop on which a proprietor depends for his rent, and supervision must be exercised during its growth and picking. On Aboukir, cotton always follows berseem. Like all leguminous plants, berseem absorbs nitrogen from the air by bacteria in nodules on its roots, thus greatly enriching a soil naturally deficient in this element. It also adds humus, and, being largely fed off on the ground, the animal droppings have decided manurial value. The growing of berseem is encouraged as much as possible. Berseem, which is ploughed up in March for cotton, has yielded three cuttings. What is left for seeding, until June, yields five cuttings. A great deal of berseem is carted into Alexandria for sale at from 6s. to 10s. a cart load, and this is a large source of revenue to tenants. Nearly every horse in Alexandria is sent out to eat berseem in the fields for three or four weeks, at a daily charge of 1 P.T. to 2 P.T. (½d. to 5d.).

Cotton. A tenant puts half his land under cotton crop. He ploughs up berseem land in March, giving it three ploughings and a ridging up. The native plough is used. It is merely a one-tine grubber, and does not turn the sod, but it is efficient, and in the end, by dint of three ploughings, has done good work. So near the sea, cotton plants do not attain the large dimensions found in the older and richer provinces, farther south.

A distance of 80 centimetres, *i.e.*, 32in., between the ridges is enough, with 50 centimetres, *i.e.*, 20in., between the plants in the ridges. Plants are always left two together, so there are 10,500 double plants to the feddan. The tendency of natives is to plant too close and use far too much seed for every crop. A lot of cotton in the North Delta is grown 60 centimetres by 30 centimetres, resulting in 23,000 weak, spindly plants per feddan.

With the object of securing good quality seed, it is purchased by the company, either on the recommendation of the ginner or through the Government Agricultural Agency, and given out to the tenants at cost price.

The amount of seed used is 1½ kelas of seed per feddan, *i.e.*, 35lbs., and, although this is nearly double what is sown in America, it is only half of the amount which natives often use. As 15 or 20 seeds are dibbled into each hole, and only two plants are left when thinning takes place, there is an evident waste of seed. As seed costs about 12 P.T., *i.e.*, 2s. 6d. per feddan, the money economy would not be great, but with a limited quantity of valuable selected seed a larger area could be sown. Every endeavour is made to complete sowing by April 15th.

Sea Island Cotton. The seed sown on Aboukir has been usually Afifi. Special Sea Island seed was sown, and seemed to yield as well as Afifi. The quantity was hardly sufficient to attract attention in Liverpool, and, although the price was higher than Afifi, full value was not obtained. Importation of cotton seed to Egypt is prohibited, and the experiment has ceased.

Watering. A strict rotation of irrigation is observed, water being supplied for five days, followed by a stoppage of 11 days. If cotton is watered every second rotation, once in 32 days, it will not suffer. To prevent excessive use of water, it has all to be lifted by bullock-driven scoop wheels. The native likes to sow maize in July, the period when water is least abundant, and as the dry, parched maize land intended for maize requires heavy flooding for being sown, he is apt to neglect the cotton in favour of maize. In August the "red" water of early Flood Nile appears, and if used profusely on the cotton land, to make up for previous neglect, it starts a fresh growth of green twigs, to the detriment of ripening bolls. In many cases a loss ensues of from ½ kantar to 1 kantar of cotton per feddan.

Thinning. This is done by women and children, two plants being left to each hôle. It is often done much too late, when plants are too high, thus causing disturbance to the roots, and leaving spindly plants, with little hold in the soil.

Hoeing. Cotton appears above the ground about 15 days after sowing, and is very closely followed by a growth of weeds. The first hoeing takes place some 30 days after the plants come above ground, but the various operations are inter-dependent, and are ruled by opportunities of watering. After hoeing, the weeds should die and the thinning take place, and then a second watering.

A second hoeing is given a month after the first, and usually a third after a similar interval and before the plants are too high to allow free use of the hoe.

Picking. The first picking begins about the middle of September, and the second and third at intervals of four weeks. The third is not of much importance if the seed has been sown early. When sowing has been late, early rain, cold, and boll-worm prevent full development of any late pods. On light soils the first picking gives the bulk of the crop, the second picking is less, and the third picking does not exist.

The picking is done by women and children, and, if these are not sufficient, by men also.

Handling. The cotton as picked is delivered into the magazines of the company, each lot being weighed and examined, and the amount credited to the tenant. It is stored loosely in one large heap, but if any is found damp from early morning dew it is laid apart, and thinly spread before being added to the heap next day. A few children are employed to pick dead leaves or dirty cotton from the heap, but no attempt is made at sorting out qualities, beyond keeping the different pickings separate.

Marketing. The cotton is sold to an Alexandria merchant, sometime in September, when an approximate estimate of quantity can be made, although no guarantee is given of quantity.

The price is fixed at 70 P.T. to 80 P.T., according to agreement, above contracts, on any day between day of sale and, say, the 15th December, which may be chosen by the company. As delivery is given, the price may be fixed for that particular quantity, or one price may be fixed for the whole. The cotton is packed in bags, containing about 400-450lbs., in the presence of the purchaser's representative, who sees it weighed. It is then sent to the Mahmoudieh Canal by the company's light tram line, and shipped by native boat to Damanhour, Kafr Zayat, or other ginning centre.

The grower's kantar is 315 rotls (100 rotls equals 98½lbs.), and should yield 105-108 rotls of lint. The grower usually sells seed cotton, and has nothing to do with the ginning or subsequent operations.

Manure. Manure is rarely used for cotton. The farmyard manure produced is devoted by the native to his maize crop. Nitrate of soda when used is apt to produce excessive growth of leaf and wood and retard ripening, but this action is somewhat checked by the simultaneous use of superphosphates.

Insect Plagues. The first to attack the cotton is the cut worm (Agrotis Ypsilon), which cuts the stem of young plants right through, just at, or slightly below the surface of the ground, and utterly destroys them. It sometimes does much damage, and the ground must be resown.

Next appears the cotton worm (*Prodenia littoralis*).

The moth lays its eggs on the underside of the leaves. These hatch out in a few days, and the worms eat up, or riddle, the leaves. A constant look out is kept for the eggs, and if leaves containing them are at once picked and burned, any great damage can be averted.

The boll worm (Earias insulana) does much damage. The worm eats the seed and dirties the lint, and its presence is only known after the damage is done. As there is usually only one worm to a boll it cannot be attacked en masse, and is difficult to combat.

A new pink worm (Gelechia gossypiella) has appeared this year for the first time as an insect pest, and has done more damage than has hitherto been known in any year by all the other pests put together. It has been specially bad in North Behera, but if it spreads to other provinces, it will require an active campaign to check it. It attacks the seeds in the boll and also the flower.

The prices obtained for Aboukir cotton have been :—

	£	s.	d.			
1912—4	8	2	per kantar of 315 rotls seed cotton.			
1911—4	4	1	,,	,,	,,	
1910—5	2	6	,,	,,	,,	
1909—4	6	1	,,	,,	,,	
1908—3	12	4	,,	,,	,,	
1907—4	7	10	,,	,,	,,	
1906—4	0	0	,,	,,	,,	

Other Crops. Cotton is the principal crop grown, and it is delivered by the tenant to the proprietors in payment of the rent, any surplus over the rent being credited to the former. There are, however, other crops which are consumed by the tenant and his cattle, or sold. Maize occupies half the land during the summer.

There are therefore two crops a year, as in summer and autumn the whole land is under cotton and maize, and in winter under berseem, wheat, barley, and beans. Small areas are also devoted to sugar cane, sweet potatoes, tomatoes, melons, cucumbers, and vegetables of sorts. All these crops grow well on the land, and are a source of income to tenants.

Tenants. A typical tenant should have 8 feddans of land, own two buffalo cows (worth £30-£40), a donkey (£3), a wooden plough, and a hoe or two, with some small implements (£2). If on good land, an industrious tenant's account would be :—

Rent, 8 feddans at £6	£48	4 Feddans Cotton, at 3 kantars, 12 kantars, at £4½	£51
Cotton seed, ½ ardeb	·500	4 Feds maize, at 4 ardebs, 16 ards, at P.T. 120, half consumed	9·600
Picking cotton worm	·270	6 Feds berseem, one cutting sold on 2 feds	3·600
Drain cleaning	·400	2 Feddans wheat, 4 ards, at P.T. 150, half consumed	6·000
Cotton watchmen	·500	Milk of 2 buffaloes	24·000
Village watchmen	·400		
Sundry seeds and expenses	4·130		
	£54·200		
Profit	40·000		
	£94·200		£94·200

If a tenant picks his own cotton worm and clean his own drains he is not charged for these outlays.

He has more wheat or maize than he and his family can eat, and has half of it to sell, and berseem and straw feed his cattle. He can sell his milk to a European Laiterie at Esbet Khourched, or to local men, who go round the esbehs collecting it at 1s. per gallon or 30 centimes per litre. The fellah lives frugally on bread made of maize, wheat, or barley, or all mixed together, beans with a little oil, a few onions, or cucumbers. All of these things he can grow for himself, and he has chickens and milk. His clothing is not an expensive item. A fellah is paid £1 per month wages, and can support himself and family comfortably on that sum.

Tenants' accounts are settled once a year—in December, after he has delivered his cotton. A note is made out of rent and other debits, and of the value of the cotton sold. If the tenant has not cleared his rent, he either pays something from other sources of revenue, or the balance is carried over. In the case of credit balances the tenant receives half the amount in cash, the remainder standing at his credit, but in no case does the company retain more than one-third of the ensuing year's rent. The year 1912 has not been a good one on account of the pink boll worm doing much damage, but in Wastani Division in 1910 and 1911 the cotton produced 15 per cent. and 22 per cent. respectively above the rent roll, thus giving the tenants very good credit balances, and proving that the average rental of over £5½ was by no means too high.

Aboukir Co., Ltd., Finance.

The Aboukir Company, Ltd., had at its disposal during the earlier years £166,630 from ordinary shares and debentures, and there were also deferred shares, not representing money, but given to the original syndicate as profit. In 1906, 131,870 new shares were issued at a premium of £0. 12s. 6d. per £1 share, and this premium was used to pay a bonus to which the ordinary shares were entitled.

The capital now stands at £300,000, in 300,000 ordinary shares of £1 each, all of the same class, and £125,000 debentures, bearing 5 per cent. interest. The actual cash proceeds of shares (£83,130 not representing subscribed capital) was £216,970.

The company spent on 19,377 feddans of land sold for £572,376 the sum of £276,628, showing a profit of £295,648. On the remaining 10,600 feddans there has been spent £330,000. The land sold was in some cases only partly reclaimed, and in the earlier years

a good deal of it was sold at low rates owing to financial exigencies.

In addition to Aboukir lands, the company owns a property of 1,600 feddans in Gharbieh Province.

For the last six years the company has paid an 8 per cent. dividend on £300,000.

Since the company commenced, 25 years ago, there has been distributed in dividends, bonus to shareholders, and debenture interest the sum of £439,571.

The policy of the company was to sell land as soon as marketable, and the result was that the rental in 1905 was only £394, all rent-producing land having been sold. Sales were then stopped, and a rental began to be steadily built up, until for the year 1913 it is £37,000, an average annual increase of £5,300. Some 7,000 feddans are now let at an average of over £5. A tenant's holding is usually 8 feddans, and whilst there are leases for larger areas, it is in cases where there is more than one adult to the family.

Of the 3,000 feddans still in the hands of the company, much is in an advanced stage of development, and will be further improved and all of it let during the course of the next few years. A gross rental of £60,000 should be produced from the company's 10,600 feddans, not including the Gharbieh property of 1,600 feddans.

The value of these lands, with the company's other assets and the Gharbieh property, will then be £1,000,000. The value of the 19,000 feddans already sold is to-day about £2,000,000. A large block of 1,000 feddans, nearest to Alexandria, and suitable for vegetable growing, was sold at £180 per feddan, and other properties at £120.

There has thus been created great wealth out of Lake Aboukir, 30,000 feddans, which can now carry a population of 20,000 souls, and in time will double that number. Labourers, purchasers, and tenants have all benefited, and the shareholders of the company have gained good returns.

Aboukir, the smallest of the lakes, is now a most prosperous tract of country, and serves as an example of what will inevitably be done hereafter with the 1,500,000 feddans of the great lakes and their marginal lands, now lying idle and waste.

The Agricultural Drainage of the Egyptian Delta.

By JOHN A. TODD, B.L., Professor of Economics and Commerce, University College, Nottingham, formerly of the Khedivial School of Law, Cairo.

The problem of agricultural drainage in Egypt is by no means new. The earliest English irrigation engineers never lost sight of the fact that drainage ought to keep pace with the improved irrigation facilities which it was their first business to provide. They had before them the example of the waste lands ("*Berea*," *plural* "*Berari*") in the north of the Delta which before Arab times had been fruitful plains supporting a large population, but which had since become almost uninhabited areas of swampy or salted wastes.

The problem was therefore of the twofold nature of prevention and cure—to prevent the lands, which were still so fertile or would become cultivable with an increased water supply, from degenerating into a state similar to that of the Berari, and to cure the deterioration of the latter by reclamation. But the latter problem had to stand over, for the methods of reclamation likely to be adopted depended on the provision, not only of drainage, but also of a liberal water supply to wash the salt out of the soil, and there was then no possibility of meeting such a demand for increased irrigation facilities. Not even the construction of the Assuan Dam 20 years later was sufficient for such extensions; it is only now when the raising of the dam is completed that such increased supply comes within the range of possibility.

But though the necessity of guarding against damage by increased irrigation was fully realised by Sir Colin Scott Moncrieff, it was impossible, under the severe financial pressure of these early days, to obtain the funds required for improved drainage. It is matter of common knowledge that since then not only have the arrears of expenditure upon drainage never been made up, but millions more have been spent on irrigation and only thousands on drainage. The truth is that, from the first, improved drainage never kept pace with irrigation, but in recent years the enormous development of the latter so completely outstripped the former that the fact that they ought to run together had been almost lost sight of.

A long succession of relatively low Niles up to the year 1907 seems to have directed the attention of the irrigation authorities too much to the difficulties of coping with the needs of the increasing area of cultivation, which in such years strained the capacity of even the Assuan Dam almost beyond its limits. Drainage, in the form of the construction and remodelling of large Government main drains, still received large grants, but these seem in later years to have been more and more difficult to provide within the limits of the Budget; and any attempt to tackle the whole question of improved drainage throughout the country was forced into the background.

The high flood of 1908, however, followed by the high and early flood of 1909, culminating in the disaster to the cotton crop of that year, changed the whole situation, and brought home sharply to the authorities the fact that in directing so much effort and expenditure to the problem of maintaining a sufficient supply of water for the worst years, too little attention had been paid to the dangers of an over-supply in years of good flood, due to the want of sufficient drainage to carry off the excess.

Even before 1909 considerable uneasiness had been caused by the apparent reduction in the total crop, calculated upon the basis of the average yield per feddan (acre), and the Commission appointed by the Khedivial Agricultural Society in 1908 called attention in their Report to the insufficient drainage of certain districts, both as regards construction and maintenance, and at the same time expressed the opinion that in many cases efficient drainage would involve pumping.

The Government Commission of 1909-10, in their Report emphasized the same note of warning, and gave the first official recognition to the theory which had rapidly been gaining ground that the reduction of the average yield was at least partly due to an excessive water supply. (*See Rapport Général de la Commission du Coton*, 1910, p. 6 *et seq.*, and their Recommendations, para. 1, Nos. 1 to 8, p. 31 *et seq.*)

Before proceeding to discuss in detail the lessons of the 1909 crop and the remedies now proposed, it is necessary to go at some length into a description of the geographical conditions of the Delta and the history of the irrigation and drainage system.

GEOGRAPHICAL.

The Nile Delta from Cairo to the sea contains roughly 4 million acres, bounded on the west by the Behera and Nubaria Canals, extending to near Lake Mariout, between which and the sea stands Alexandria; and on the east by the Ismailia and Abbasia Canals, extending to the Suez Canal at Port Said. Along the Mediterranean shore is an almost continuous series of more or less salt lakes, from Mariout, which is cut off from the sea, and is at present about 2½ metres below sea level, through Lake Aboukir (now drained and cultivated by the Aboukir Company), Lake Edku, and Lake Borollos to Lake Menzaleh, at the east end of which is Port Said. All these three communicate with the sea, which controls their level. The whole of this area is, from an agricultural point of view, practically rainless. At Alexandria the average annual rainfall is about 8 inches, but at Port Said it is only about 3½ inches, and near Cairo an occasional shower or a wet day in winter is responsible for an average of about an inch per annum. But in no part of the country is it possible to grow crops without irrigation. The whole agriculture of the country is dependent upon the Nile, which made it.

Ten miles below Cairo the Nile divides into the two channels known as the Rosetta and Damietta branches, which have their respective mouths on the Mediterranean at these two ports, the former lying between Lakes Edku and Borollos, and the latter on the western shore of Lake Menzaleh. The sides of the triangle are,

roughly, 120 miles in length, as the crow flies, while the curving coast line of the base of the triangle extends for 75 miles along the Mediterranean.

At the point of bifurcation of the two branches of the Nile stands the great weir known as the Delta Barrage, from above which the Behera Canal strikes off, following the left or west bank of the Rosetta branch, the Tewfiqi Canal to the east of the Damietta branch, and the Menufia Canal northwards through the angle between the two branches. The Ismailia Canal leaves the Nile on its east or right bank just below Cairo.

At Atf, on the Rosetta branch of the Nile, about 74 miles below the Delta Barrage, the Mahmoudia Canal strikes off westwards to Alexandria, joining up with the northern extensions of the Behera Canal. At Zifta, on the Damietta branch, and 35 miles below the Delta Barrage, stands a second barrage or weir, which reinforces the lower reaches of the Tewfiqi Canal system and the Bahr Shebin (the continuation of the Rayah Menufia).

For present purposes the Delta may be regarded as divided by imaginary lines running east and west into three ill-defined zones or sections, showing different conditions as regards drainage: (1) The Southern or Upper Zone, lying south of a line drawn through (say) Kafr el Zayat, Tanta, Zifta, and Zagazig. In this district the land is considerably above sea level, and natural drainage by gravitation would be quite easy. But so far such drainage has not been thought necessary, and there are practically no drains in existence. (2) The Middle Zone, lying between the lines above indicated, and another drawn through Damanhour, Dessuk, Kafr el Sheikh, Mansourah, Simbellaween, and Abu Hamad. In this area the natural slope available for drainage is less, but no important provision for drainage was in former years thought necessary. The Government have in recent years spent large sums on main drains through this zone, but the fellabeen are only beginning to learn the value of these and to make use of them by draining their fields into them. Great difficulty has also been experienced, owing mainly to lack of funds, in keeping the main drains clear of silt, weeds, &c., while private owners do not seem even to realise the necessity of such clearance. Such drains as did exist in this district have, therefore, within recent years become quite inadequate to meet the enormously increased water supply, for it is in this district that the effect of that increase has been most marked. Roughly speaking, the whole district is more or less suffering from an excess of water supply relative to drainage, with the result that good land has deteriorated in value, and in many cases land which was formerly regarded as the best is now lying derelict,—waterlogged, and salted to such an extent as to be not worth cultivating. (3) The Northern or Lower Zone, from the northern boundary of the Middle Zone to the lakes or the sea, in which no natural drainage is possible, because the land is, to a large extent, hardly above sea level at all, and, indeed, in the case of large areas in the Behera, considerably below it. With the exception of large main drains passing through from the Middle Zone, this district has practically no drainage at all, and now consists almost entirely of waste land. Large areas of it are

covered by the lakes in flood time, and in summer are white with salt. To the west, parts of it bordering on the desert are little less sandy than the desert itself, yet the quality and quantity of the crops that are actually being taken from such high-lying patches as have been drained, irrigated, and reclaimed are surprising. Further east the "*boor*" land or dry waste has the appearance of good, black land ruined by want of drainage and water, and only awaiting reclamation to become as fertile as any in the country. The whole district carries the most scanty population and wears an aspect of utter desolation, which is only aggravated by the contrast of occasional patches of cultivation, showing how different the whole appearance of the country might be under other conditions. It is believed that the best cotton might be grown in the northern districts near the sea. The area available is enormous, and the prospects opened up by visions of the whole of this country added to the existing area of Egyptian cotton land, are dazzling.

HISTORY OF EGYPTIAN IRRIGATION.

The history of the present irrigation system of Egypt may be divided roughly into three periods, separated by the main facts of that history, viz., the completion of the Delta Barrage and the construction and raising of the Assuan Dam. These periods may be briefly treated as follows:—

(1) *Up to* 1885 (*Completion of the Delta Barrage*).

The original system of irrigation in Egypt was by basins, large enclosed areas flooded by the rise of the Nile, which was allowed to lie upon the land for a period varying up to 40 days, and then run back into the Nile as the flood went down. This system gave excellent winter crops, but practically nothing in summer except in the most northerly areas, where there is a slight rainfall, and it left the whole of the country dependent on the height to which the Nile rose. A high flood meant plenty; too high meant destruction; too low meant that all but those near the river lost everything, and probably died of starvation.

But about 1820 Jumel, a French-Swiss engineer, discovered a plant, growing for decorative purposes in a Cairo garden, which he recognised as cotton of a quality likely to be valuable for commercial uses. He succeeded in interesting Mohammed Aly in the matter, and the latter, all afire with the new idea, promptly set out upon great schemes of cultivation to suit it. For this a new system of irrigation was necessary, for the basin irrigation meant the flooding of the land just as the cotton crop was ripening. The new system, now known as perennial irrigation, was therefore introduced, and developed with the energy characteristic of Mohammed Aly. The meaning of it was that, in place of an overwhelming flood once a year, the land should receive by canals a constant but limited supply of water as required throughout the year, thus enabling the land to be cultivated during the summer as well as the winter. As the extraordinary fertility of the soil of Egypt seems to be quite equal to the task of growing crops all the year round, and almost without intermission for years in succession, the result was to increase the yield of the land, and particularly of cotton, in an extraordinary degree.

But the task of irrigation lay not merely in the making of such canals. Every year the flood, bringing down the heavy silt which makes the coveted "red water," left the canals choked with a bed of ooze, and this had to be removed at any cost before the level of the water in the river fell. The greater volume of water, and the swifter flow in the river, prevented it silting up like the canals, with the result that the canal bed at its intake would be raised above the reduced level of the water in the Nile itself, and no water would pass into the canal at all during the following spring or summer. Not only so, but a deep canal bed was the only way to ensure an ample supply of water in the canal in the following flood, especially if the latter should be low.

The result was the development of the *Corvée* system of forced labour for the annual canal clearances, which in subsequent years became one of the greatest burdens and abuses of the country. Thousands of men from every part of the country were brought in chains for great distances from their own homes and at most inconvenient times (when their own land required cultivation) to dig with their fingers, lacking other tools, the wet mud from the canal bottoms. The work had to be done at high pressure, which could only be maintained under the whip, and the descriptions given of the conditions under which it was carried out are simply ghastly, not only in their inhuman cruelty, but in the utter wastefulness of the system from an economic point of view.

It was to reduce the evils of this system that the Delta Barrage was first conceived by the famous French engineer, Bellefonds de Linant, in 1833, begun, on the present site and plans, by Mougel Bey in 1842, and finally repaired and completed by Sir Colin Scott Moncrieff in 1890. The idea was, by erecting a weir across the Nile at the bifurcation of the two branches, not only to regulate the flow of the Nile into these two branches, but also to maintain the water at a higher level in the river up stream of the barrage, where the mouths of the great canals take off, thus making it possible, not only to do with less depth in the canals at all times, but also to increase the supply entering the canals in spring and summer, and thus to neutralise to a considerable extent the effect of a low summer supply. The advantages to be expected were: (*a*) To give a much greater supply of water in the canals, and during a longer period of the year. Incidentally, this would reduce the amount of "sharaki" land, *i.e.*, land which, having received no water, is barren for the year, and therefore pays no land tax. (*b*) To reduce the labour of the Corvée by allowing a higher bed level in the canals; and (*c*) by raising the surface levels of the canals to give free flow or flush irrigation to such lands as lay below the higher level, thus saving the cost of pumping from the canals to the land level. This is known as "*Berraha*" irrigation (literally "*Bi el raha*," meaning "with ease").

But this great scheme proved at first a heart-breaking failure. Finished in 1861 at a supposed cost of £4,000,000, it gave nothing but trouble from the first. In 1867 the floors of 10 of the arches on the Rosetta branch showed such subsidence that the whole scheme was practically abandoned.

At the time of the British occupation in 1882 the whole question of Delta irrigation had been under discussion, and, the barrage being regarded as hopeless, an alternative scheme of pumping on a hugh scale was under consideration. In 1883, when Sir Colin Scott Moncrieff was brought from India to take charge of the new irrigation service, he found the contract for the first instalment of these pumping schemes, the Behera section, already signed, while further schemes, to involve a capital outlay of £700,000 and an annual working cost of £248,550, were in contemplation. The story of how he rejected these schemes, and, in face of difficulties and discouragements, set himself to repair and complete the barrage, has been told by one of his assistants,* and need not be repeated. It is only necessary to say that from 1884 onwards it more and more completely fulfilled the duties originally intended by its designers, and changed the whole face of the Egyptian Delta.

(2) *Up to* 1902 (*Completion of the Assuan Dam*).

The success of the barrage was complete. The water supply of the country as a whole, and therefore the area of land under cultivation, increased by leaps and bounds. Sakiehs, shadoofs, and other pumping appliances lay derelict in many districts, and the Corvée diminished to vanishing point. The only difficulty experienced as the result of these improvements was the marked increase of drainage into the lakes to the north, with the result that their level was raised, and occasional flooding in the Behera Province caused damage. To meet this the Government erected pumps at Mex, on the narrow strip of land between Lake Mariout and the sea near Alexandria, by means of which the level of the lake was maintained at about 2½ metres below sea level.

But the system still failed to meet all requirements in one respect. The increased area of cultivation demanded more and more water, with the result that the total supply available in the Nile in a low year was not sufficient, while even in the best years there was a period of great scarcity in early summer before the arrival of the flood. To meet this shortage the idea was mooted of a great storage reservoir at some point far up the Nile, which could be filled at the end of the flood, and held ready to supplement the diminishing supply in the Nile in spring and early summer. Such was the scheme of the Assuan Dam, which was completed in 1902, and now the Nile system may be compared to a long lock, open throughout to the sea in flood time, but closed at the lower end by the Delta Barrage during spring and summer, and kept full to the necessary level by the carefully regulated emission of the water stored up in the great reservoir at the first cataract.

The regulation and distribution of the water supply is embodied in the system known as "rotations," which, however, are of two kinds. Summer rotations mean that during the early summer there is not enough water in the canals for every cultivator to take as much as he likes. All the larger canals are therefore divided by regulators into three sections, which are open or closed to the cultivators of land along their banks in "rotations" of six days open,

* Major (now Sir) Hanbury Brown, "History of the Delta Barrage."

and 12, 15, or 18 days closed. Thus, under easy conditions, each section is open for six days, and closed for 12, *i.e.*, six open out of 18. (*This is now usually made seven out of 21, so that each section* opens in turn on the same day of the week, which is more convenient for administration). Later on, or with less ample supply, a rest day is inserted between the turns, upon which the whole canal is closed to allow the water to rise to the necessary level in *the next section, thus giving six days open out of 21.* If water is very scarce it may be necessary (as it has been in 1912) to insert two rest days, thus giving only six open out of 24, thus :—

A						Closed		B						Closed		C						Closed	A
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

To take water from a section during the closed period is a criminal offence. The length of the rotations, or interval between the periods, varies according to the supply available, which again depends on two main factors—(*a*) the height and the date of the fall of the previous year's flood, because these regulate the date of arrival of the point of low Nile at which the water stored in Assuan must be drawn on to supplement the falling river, and (*b*) the probable date of arrival of the coming flood, for obviously the rotations of water available depend chiefly (the total stock of water available being practically the same in every year and limited only by the size of the dam) upon the length of time over which that stock has to be spread. Thus, a low or early falling flood in the previous autumn, followed by a late flood in the following summer, produces the worst conditions of summer supply; while a late or heavy flood in the previous autumn, such as in 1908, followed by an early or high Nile, as in 1909, means that the summer rotations are reduced to practically nothing at all, for there is ample water to carry over from the low-water point in, say, March or April, till the arrival of the flood in July.

But these "summer rotations" must be distinguished from the "flood rotations," which serve an entirely different purpose. After the arrival of the flood the chief object of regulation is to prevent an over-supply, and this has been attempted by running the main canals in periods of alternate weeks at high and low level. The idea is that a canal running at high level is bound to cause a certain amount of infiltration of water into the low land adjoining, especially if the soil is not of an impervious nature, while a canal running empty is really acting for the time as a drain, and drawing back superfluous irrigation water. At the same time this serves a second important purpose. The fellah, whose one aim in life is to get all the water he can, is very slow to believe that under the new conditions of ample summer supply he may damage his crop by over-irrigation after the flood arrives. Where Berraha irrigation is available he simply turns on the water and leaves it flowing, sometimes not even taking the trouble to come back and close the channel at night. Practically the only way to remedy this tendency to over-irrigation is to withdraw the water supply altogether at intervals

by almost emptying the canal, so that the water falls below the level of his intake.

A further point in connection with water control must be mentioned. It was found that the areas devoted to rice growing in the northern parts of the Delta require an amount of water disproportionate to their value, for rice must stand continuously in water, which must be frequently renewed. The area upon which rice cultivation was to be allowed was therefore defined and restricted when necessary—very severely, for example, in 1912. The drawback of this is that rice is a reclamation crop which cleans out salted land, and the restriction of such cleaning crops is to be regretted. (See Report of K. A. S. Commission, 1908.)

A further difficulty arose with regard to the durra or maize crop. This, which is the staple food of the fellaheen, used to be planted after the arrival of the flood. But the new system of perennial irrigation made it possible to plant it much before that, though probably only by the consumption of a great deal of water to the detriment of other crops. To prevent summer water being thus used for durra to the deprivation of cotton, it was forbidden to plant, or at least to water, maize until a certain date fixed by what is generally known as the "Sharaki" decree.* The date of this decree depends on the summer supply. If that is sufficient the restriction may be removed before the flood arrives, the rotations being, however, retained, and this produces an illogical result. In order to control the supply of water, no cultivator may erect water-lifting machinery drawing water from a canal without the permission of the irrigation authorities, whose business is to see that the capacity of the pump is not too great. The standard generally applied is that it should only be large enough to water 40 per cent. of the land in the usual six days open turn, that being supposed to be the maximum area under cotton in a three-years' rotation. It is notorious, however, that a two-years' rotation is the more common nowadays, but the official attitude is entirely opposed to this, and to recognise or condone it by changing the 40 per cent. standard was, of course, impossible. But when the "sharaki" decree is taken off it means that the whole area of the land is put under cultivation, yet as long as the rotations are on, *i.e.*, until the arrival of the flood, the maximum supply by pumping available for the land, according to the regulations, is only 40 per cent.† Hence the burning desire of the fellah for shorter rotations, and the efforts of the irrigation officers to make the removal of the "sharaki" decree as early as possible, and to get rid of the summer rotations altogether as soon as possible. In 1909 the date of the "sharaki" decree was nearly a month earlier than in previous years. Since 1909 relief has been given by suppressing the rest days as soon as any rise at all

* This, however, must not be confused with the exemption of "sharaki" lands from land tax already referred to.

† Pipes for free flow irrigation must also be authorised by the Irrigation Department, and are restricted to a diameter sufficient to irrigate the whole area in the seven days of Flood Rotations, for practically the whole area is under crop in flood. Where free flow irrigation exists in summer the correct supply is given by reducing the number of days in which the canal is at the high level necessary or free flow irrigation to three instead of six.

made itself felt in the Nile with the approaching flood, thus giving seven days open out of 21; then, by allowing the turns to overlap a day, giving eight open out of 21. The overlap may be increased gradually until the arrival of full flood ends the summer rotations.

The alleged drawback of the early withdrawal of "sharaki" is, however, that in the anxiety to give early water for the durra the interests of the cotton crop are liable to suffer, for it is now pretty generally admitted that the early withdrawal of the summer rotations, followed by the apparently inevitable over-watering, is not an unmixed advantage. Thus, in 1909 the summer rotations were very easy; the "sharaki" decree was dated June 20th to June 30th, and the entire withdrawal of summer rotations practically coincided with it. This seems to have given rise to the impression that it was the early suspension of the "sharaki" decree which is injurious to the cotton crop. Under this impression many have been discussing the question whether the durra crop must be delayed, and, therefore, in all probability exposed to risk of loss, in order to save the cotton crop from damage by early watering, which means in most cases over-watering.

This impression, however, is not correct, the error lying in the assumption that the removal of the "sharaki" and the immediate giving of an almost unlimited water supply are practically synonymous. The probable cause of the damage in 1909 was the abundance of the summer supply, and the early arrival of the flood, which permitted high levels in the canals throughout the summer—there was practically no summer scarcity at all—and the early removal of the summer rotations. In a year of poor or average summer supply, however, the early removal of the "sharaki" would probably not be injurious to the cotton crop through excess of water, provided the water levels in the canals were kept low, to prevent infiltration and reduce free flow supply, and provided also that the summer rotations were retained till the usual date, about August 15th.

Even in a year of early flood, like 1909, the safer conditions of a late flood can be produced in the Delta canals, by escaping the surplus water in the river down the branches of the Nile to the sea.

In view of this explanation, it is maintained that there is really very little need for such an unfortunate opposition between the two crops. It must be remembered on this point that the durra crop is the fellah's food supply, while the price of his cotton goes chiefly to pay his rent, taxes, and debts.

(3) *Since the Completion of the Assuan Dam.*

The Assuan Dam completed the system of which the Delta Barrage was the foundation. Since 1902 water scarcity has, relatively speaking, ceased to exist. In low years every ounce of water is still required, while the equitable distribution of the available supply requires the constant care of the whole irrigation staff. Daily and hourly they have still to refuse piteous appeals for more water, for the habit of the old days dies hard. In bad years, too, such as 1912, there are districts, mostly at the tails of canals, where really serious shortage is still felt, but on the whole the system has been a triumphant success.

The improved conditions showed themselves in many ways. Summer rotations in the Upper and Middle Zones were much easier. The supply of water everywhere was increased, new areas were brought under cultivation which in former years were not worth cultivating, even in a good year, because in a bad year they would not receive water. With water at a higher level in the canals berraha irrigation became still more common. The increased supply also made it possible to undertake the conversion to perennial irrigation of the last remaining basins in Middle Egypt, namely, those of Giza, Beni Souef, Minia, and Assiut. The only thing which still seemed to be outside the limits of the increased supply was the extension of irrigation for the northern districts as a condition precedent to the reclamation of the Berrari.

It was, therefore, decided to proceed with the heightening of the Assuan Dam by another 5 metres, thus making it possible to raise the water level for storage by 7 metres, and increasing the available storage accommodation by 1,400,000,000 cubic metres. This work, which was taken in hand in 1907 and is now completed, brings within sight the reclamation of the Berrari, and that involves, as the first step, the provision of a whole system of new drains.

But in the meantime other events had brought the question of drainage sharply to the front. The steady fall in the yield of cotton per feddan culminated in the disaster of 1909, when a crop, which up to the third week of October promised to beat all previous records, suddenly wilted and fell to the ground, with the result that in one week the estimates dropped from 7½ millions of kantars to little over 5 millions, and the actual out-turn was only 5,000,772 kantars. Such a disaster naturally aroused great discussion, but out of the innumerable explanations put forward one gradually assumed prominence, namely, excessive water supply. Mr. W. Lawrence Balls, then Botanist to the Khedivial Agricultural Society, now in the Government Agricultural Department, pointed out that what was happening to the plant was exactly the result which might be expected from the asphyxiation of the root system of the plant by the sudden rise of the "water table" or level of the subsoil water at a critical period of the plant's growth, while all available knowledge of the actual water conditions throughout the Delta went to confirm the theory first put forward by the late Mr. J. R. Gibson, of the State Domains, that the damage was due to too much water. Subsequent discussion has modified first opinions as to the exact way in which the damage is done in particular cases, but the principle is now generally admitted that the level of the subsoil water is an essential factor in the growth of the cotton crop; that in the Middle and Lower Zones at least that level has been materially raised in recent years by the increased irrigation facilities; that the raising has been due to two main causes—(*a*) infiltration of water into the subsoil from the Nile or from adjacent high level canals, and (*b*) excessive surface watering by irrigation, the relative intensity of these causes in each case varying, not only according to the situation and level of the ground, but also according to its porosity or otherwise.

The remedies were more obvious than easy. To lower the level of the canals wherever possible, and to teach the fellah the danger of over-watering were only the first steps. The entire renovation

of the existing drainage system was also clearly indicated, as well as its extension to large areas of the country where practically none exists. This, it was soon proved, was not only necessary to prevent the conditions of 1909 being repeated, but would be the essential preliminary to any attempt to cure the damage done by the gradual rise of the water table culminating in the flood of 1909, for the damage was partly cumulative. The rise of the water table from the salted subsoil to the surface or near it, left the ground in a soured and salted condition, which did not entirely or immediately disappear with the subsequent fall of the subsoil water to its old level. It therefore became apparent that a great deal of what practically amounted to reclamation would be required, to restore what had formerly been good land to its proper condition, and the first step to such restoration was the provision of drainage.

Everything, therefore, pointed to the necessity of the whole question of drainage being taken up at once and thoroughly. But the difficulties were enormous. Financial considerations alone were enough to cause hesitation, while incomplete knowledge as to the real cause of the trouble seems to have justified a policy of caution. The conditions of the subsequent years 1910 and 1911 went far to contribute to such an attitude, for the relatively good crops of these years have done much already to make the public forget the lessons of 1909. On closer examination, however, it will be found that these years really bear out the same lesson as that of 1909. The 1908 flood was the first high flood after a long series of relatively low years, and the Nile did not fall to the low-water point until very late in the following spring. By that time it was already known from the gauges which now mark the rise of the river from the lakes to the Cairo Barrage, that the coming flood was to arrive early. The irrigation authorities therefore saw that the conditions of the summer supply were to be exceptionally favourable, and though rotations were laid down as usual, these were very easy, and in the event the water supply proved so ample that there was practically no need to enforce them. Then came the flood, three weeks earlier than usual, and rising quickly to practically the same height as in 1908. The result was just such as might have been foreseen. The country had never had time to dry up during the summer, and was like a sponge only half squeezed dry. The full supply thrown upon the land so much earlier than usual brought matters to a crisis, and in many districts throughout the country the fields were absolutely waterlogged, the water lying just below, if not actually above the surface. The result was very serious boll shedding, which, coinciding with a bad attack of boll worm, involved the loss of a large part of the expected second picking, and practically the whole of the third.

The marked difference of the result in 1910 was mainly due to what are now recognised, by a peculiar revulsion of public feeling, as more favourable flood conditions. Though of average height, the Nile flood was late, with the result that summer rotations were more strictly enforced and the period of over-watering greatly delayed, and the advantage thus gained was further eked out by the weather conditions during the autumn. An unusual spell of fine, warm weather, lasting till late in the year, assisted greatly, by promoting

evaporation, in the prevention of excessive water in the soil, with the result that the crop, which in October was estimated at only 6½ millions, actually beat all records, and finally gave a total outturn of 7,573,537 kantars.

Analogous conditions in 1911 produced a similar result. In spite of a heavy attack of cotton worm during the summer, the lateness of the Nile flood, followed by another fine, warm autumn, again, much to the surprise of everyone concerned, brought out a crop of almost record dimensions (7,424,208 kantars).

Fortunately, however, these relatively good results have not led the responsible authorities to overlook the danger of the repetition of the conditions of 1909. To make that impossible requires more than regulation of the water supply, which would be futile without the entire re-casting and extension of the drainage system. Large expenditure on a comprehensive scheme of this sort is the first step towards remedying the damage done. It is also the only way to derive the full benefit from the expenditure on the raising of the Assuan Dam. The reclamation of the Berrari would of itself be sufficient amply to justify that expenditure.

The present position of the whole question may therefore be summarised as follows:—

(1) The Upper Zone has now an ample water supply under the worst conditions as to the flood, and probably too much in good years, owing to the easy summer rotations and the tendency of the fellaheen to over-water their lands, especially after the flood arrives.

(2) The Middle Zone has also received a greatly increased water supply, and, as natural drainage is insufficient and artificial drainage has not kept pace with the increased irrigation facilities, there has been considerable damage done by the raising of the water table and the deterioration by salting and water-logging of what was once good land.

(3) The Lower Zone is almost entirely without either irrigation or drainage. If the latter were provided the raising of the Assuan Dam will now provide the increased water supply necessary for irrigation and reclamation, for which therefore this district is now ripe.

THE GOVERNMENT SCHEME.

The proposal, elaborated by Mr. Murdoch Macdonald, C.M.G., Under-Secretary of the Ministry of Public Works, and which is now in process of being carried out, is to provide drainage meantime only for the Middle and Lower Zones above described. This decision rests upon the belief that the Upper Zone does not require drainage, or at least that it can wait. It is not thought that much damage has been done by water in these high-lying lands, which are sufficiently above sea level to possess natural drainage. It is hoped that it will be sufficient in their case to introduce a more careful system of regulation of the water supply, so as to minimise infiltration of water into the subsoil, and to check as far as possible the tendency of the fellaheen to over-irrigate. These ends may be secured by the following means: (*a*) By keeping the canals permanently at a lower level, so as to reduce if not practically to

abolish "berraha" irrigation, which is already relatively uncommon in this zone during summer. As long as the fellah gets water for nothing he will not exercise discretion in the amount taken. Nothing but the absolute impossibility of getting it, or the labour of pumping it, will effectually check the tendency to excess. In spite of the fact that the abolition of "berraha" irrigation will mean an outlay which is relatively serious to the small proprietor, it is strongly held by many of the best authorities that it would be worth it. To make him lift the water, though it were only a couple of feet, would cost little, and would repay him in the long run by an increased crop. (*b*) By running the canals full and empty in alternate periods. The usual period for these flood rotations is seven days full and seven days empty. At the same time this system of flood rotations should be extended over the whole country, and continued throughout the winter, from the arrival of the flood till the commencement of summer rotations in the following summer. Until recently the canals ran full all winter, except for the period of about 40 days, when they were entirely closed for winter clearance. (*c*) A great deal could be done in the direction of keeping back the high levels in the canals at the beginning of an early flood, which would otherwise fill the canals too early. At present the Delta Barrage is closed down from about April to August, and the very first rise in the river is utilised to raise the level in the canals, long before the date at which in the old days the arrival of the full flood brought high levels to the canals. The result is the anticipation of flood levels in the canals, which in years of early flood, such as 1909, is of very doubtful advantage. Such regulation, of course, can only affect those districts irrigated entirely by canals; nothing can be done with the Nile or the lands directly watered from it. But even an experimental regulation of the level in the canals during a year of early flood would offer a most useful comparison between the effect on the lands adjacent to the Nile and those served by the canals. Infiltration of subsoil water from the Nile and the high-level canals has certainly had a considerable share in the damage in past years. To control the one while the other is beyond control would provide a very useful object lesson in the causes of the damage.

It may be said that these proposals will cause an outcry among the fellaheen, who are to be deprived of the easy water supply which they have enjoyed of recent years. But it is almost admitted now in Egypt that to give the fellah all he wants in regard to water is not likely to be the wisest course. Indeed, perhaps the worst indictment of the policy of the Irrigation Department in the years previous to 1909 is that they did to some extent follow such a policy.

But while it is not proposed in the meantime to tackle the drainage of the Upper Zone, the possibility of such an extension has been carefully kept in view, and nothing is being done under the present scheme which will not fit in with such a development if thought desirable later on. At present public opinion, of a much higher grade than the fellaheen, is certainly not converted to the necessity for it.

With regard to the Lower and Middle Zones, the broad out-

lines of the Government scheme are as follows: It is proposed to deal with the whole country by sections, taking two sections at a time. Already a commencement has been made with two sections known as the Western Behera or Mariout Scheme, and the Central Gharbieh or Borollos Scheme, and it is hoped to have these finished in from three to four years. The remainder of the northern area will probably fall into about six more sections, and the whole work is estimated to occupy about 16 years.

The following general principles have been laid down for the two sections of the scheme now in hand: (1) The whole country is to be covered with a network of Government drains, with secondary and tertiary channels leading into them, and so close together that no part of the district will be more than 2½ kilometres from a Government drain. As part of the land to be drained is at or under sea level, an artificial outfall must be provided, and this will be done by great pumping stations, erected and maintained by the Government at the tails of the main drains. The level of the drains will be such as to give a minimum of 1·50 metres (5 feet) between the surface of the water in the drains and the surrounding soil level. This will hold good for all Government main drains, as well as secondary and tertiary, and it means that, even making the fullest allowance for greater slope in private channels, no field in the whole area need have less than a clear metre of effective depth of drainage in the drain along its borders. (2) The slope of the main drains is to be not less than 5 centimetres per kilometre, or $\frac{1}{5000}$. This is a very ample slope for drains of the dimensions intended, and should greatly assist in the work of keeping the drains clear of silt and weed. Special arrangements will, however, be made, in view of the necessity of clearance, and wherever possible the drains will be kept clear of all permanent obstructions, so that dredgers may pass up for clearing purposes.

These general conditions may be supplemented by the following details of the two schemes now commenced.

WESTERN BEHERA SCHEME

It had at first been intended to include the land drained by the existing Khairy drain, which at present has its outlet in Lake Edku, in the scheme for this section, and replace it by a new drain, following, instead of crossing, the contour. In view of the fact, however, that this drain had recently been entirely remodelled at great expense and was doing the work quite efficiently, it was finally resolved to omit that section from the present scheme, and to leave it to form part of the adjoining section next to be dealt with, which will drain into Lake Edku. The reduced area of the scheme therefore is now 480,000 feddans, the whole of which will be served by the main drain, having its outfall at Mex at a level of 6 metres below sea level. It will include the whole of Lake Mariout.

The whole of this area is now being surveyed in detail, with a view to laying off the lines of the proposed main drains.

The pumping station at Mex will consist of 12 pumps, driven by steam engines capable of developing 1,000 h.p. each. It will lift the whole drainage water of the area through a height of

6 metres (say 20 feet) into the sea, and is calculated to deal with the maximum quantity of drainage water in flood time on the basis of 15 cub. metres per feddan per day.

The pumping installation is, of course, designed for the maximum flood supply, and during other parts of the year a large part of it will not be required.

To ensure a steady supply of water at the pumps a small area of the lowest part of Lake Mariout, close to the pumps, will be left to form a basin or compensating reservoir.

CENTRAL GHARBIEH SCHEME.

This scheme is to drain an area of 470,250 feddans by one main channel having its outfall at the pumps at Khasha, near Baltim, which will lift the whole drainage of the area into Lake Borollos through a height of 3 metres.

It may be added that when it is found desirable to drain the area of Lake Borollos itself, this can easily be done by providing an outfall drain from the pumps at Khasha to the sea.

According to the revised plans the pumping installation at Khasha will consist of 12 pumps, driven by either steam or Diesel oil engines, capable of developing about 400 h.p. each, and of lifting a total amount of water equivalent to a flood maximum of 15 cub. metres per feddan per day. A small compensating reservoir, similar to that at Mex, will be formed by dredging close to the pumping station.

POINTS OF CONTROVERSY.

So large and important a scheme, involving a revolution in the drainage of the country, has naturally aroused controversy on many points, the most important of which may be summarised as follows:—

(1) Whether the whole scheme should be undertaken by Government alone, or whether the whole or any part of it should be left to private enterprise, either in the form of drainage and reclamation companies, or the cultivators themselves.

(2) What depth of drainage should be provided, this involving also the question of the slope to be given to the Government drains.

(3) Whether drainage should be by gravitation or by pumping, and if the latter, whether the pumping should be concentrated in great central installations at the tails of the drains or divided into zones with separate pumping stations.

Of these three questions, the first practically settles itself in Egypt. With large numbers of small proprietors, most of whom possess no capital, individual drainage which could be anything approaching effective is impossible, not only because the cost is quite beyond the means of the average fellah, but because the difficulties of separate ownership render a unified scheme impossible. It is beyond argument that main drains at least must be laid down on one centralised plan. Past experience has shown that the separate ownership of small plots of ground offers almost insuperable difficulties to the execution of even small private drains. One

proprietor, who, being more advanced than his neighbours, desires to drain his own lands, finds his way blocked by an adjoining proprietor, whose land lies between his and the necessary outfall. The existing powers of the law to compel a right of way are far from efficient; indeed, they practically apply only to irrigation and not to drainage channels at all. It was only this year that a means was provided of dealing with foreign landholders on this question.

Where, owing to the want of sufficient natural outfall, an artificial depth must be obtained at the tails of the drains by pumping, as is admittedly necessary in the Behera scheme, it is obvious that the work can only be carried out by a central body, and past experience goes to show that the entrusting of such work to private companies is not likely to give the best results. There is, therefore, practically no question now that the only way in which the present scheme could have been carried out is by the Government.

There still remains, however, the question whether the drainage which the Government proposes to give to the areas affected will meet the maximum requirements of every part of the areas affected, or whether in certain districts, or throughout the whole area, supplementary pumping, to give a greater depth of drainage, will be found either necessary or profitable. The answer to the question turns mainly upon the second point of controversy above indicated, namely, the depth of drainage required.

The question of the maximum depth of drainage desirable is really the crux of the whole controversy, and the answer depends mainly on one factor, namely, the requirements of the cotton plant. Some apology may be necessary at this point for the assumption that the cotton crop is the only one to be considered in this question of drainage. It is a popular fallacy that the cotton crop is the only, or even the most important, source of Egypt's agricultural wealth. This idea is often seen in the outcry against the so-called "one crop" policy of Egypt. The exaggerated importance of the cotton crop is easily explained by the fact that it bulks so largely in the exports of the country. The value of the record cotton crop of 1910 was estimated at over £.E.35,000,000, a sum, by-the-way, considerably in excess of the declared value of the total exports for the year. But these figures give a very unreal impression of the true relative importance of cotton in Egyptian agriculture. As a matter of fact, the area under cotton is not the largest of her crops, for durra (maize) occupies an even larger area. In 1909 the figures were: Cotton, 1,642,610 feddans; maize, 1,840,653 feddans. Again, as already mentioned, from the point of view of the small native cultivator, the durra crop is in a way more important than the cotton, for the latter only goes to pay his creditors, his landlord, and the Government land tax, while the durra is his chief article of diet, and therefore appeals to him much more directly.

The reason for the exclusive attention paid to cotton in the discussion of the present scheme is not economic, but botanical, for it is now known that the cotton plant is the most deep-rooted of all the crops grown in Egypt, and is therefore the ruling factor in the question of drainage.

The available information as to the botanical character and requirements of the cotton plant is due to the work of Mr. W. Lawrence Balls, already quoted. He has shown conclusively that, *under favourable conditions*, the root system of the cotton plant will go well over 2 metres below ground, and from this he deduces the fact that, where a depth of 2½ or even 3 metres is obtainable, it should be given. But the actual depth required varies greatly in different districts according to the climate, for the rate of growth of the root depends almost entirely on soil temperature, being twice as fast at the most favourable temperature as it is at 10 degrees lower. This fact has the most important bearing on the present question. While in Giza province, where most of Mr. Ball's observations have been made, a depth of 3 metres may be worth paying for; it is quite certain that such a depth would be waste of money along the Mediterranean shore, where the climate is much cooler and the growing period shorter. It is probable, therefore, that in the northern districts the proposed depth of 1½ metres will be ample, while in the southern and warmer portions of the areas at present under discussion there are no data available to show how much more depth of free subsoil would be economically profitable, for the extra cost in excavation, as well as in the surface area occupied by the drains, increases in proportion to the desired depth.

But another point has also been emphasized by Mr. Balls, namely, that the ruling factor in the history of the crop is not the maximum depth of clear soil available, but rather the minimum, or, still more important, the period at which the maximum changes to the minimum, owing to the rise of the subsoil water in flood time. It has been proved that a deep water table in early summer draws the roots of the plant down in search of water, and that the worst damage is caused by a sudden rise of the water in flood time (especially if the flood is early), asphyxiating the lower part of the root system, and causing the boll shedding which did so much harm in 1909. The truth of this theory is now thoroughly established by the fact that the failure of the crop in 1909, and its comparative success in 1910 and 1911 are in direct correlation with the date and height of the rise in the water table in autumn. It is immaterial whether the increase of the subsoil water is due to infiltration or surface watering; if the joint effect is to raise the water table till it submerges the roots of the plant, mischief will result, in direct proportion to the date and height of that rise. A depth of only a metre of clear subsoil, maintained throughout the whole season, is therefore better than a depth of 3 metres in summer reduced to 1½ metres in early autumn by the early arrival of the flood.

Applying these facts to the conditions of the Lower and Middle Zones, the following conclusions may be stated with tolerable certainty. In the Lower Zone the climate is certainly not suitable for a very deep-rooted plant requiring a long growing season. In the Berrari districts the Government scheme will result in a minimum level of 1·50 metres in the Government drains, which will, in the greater part of the district, give an actual level of 1·75 metres. This is believed to be ample for this district, if it can be maintained at this uniform depth throughout the whole season. It is not likely that the water table will ever sink below that depth, because there

is no drainage beyond that artificially maintained by the Government channels, and the level of these cannot be lower than that of the tail pumps. Again, evaporation in these northern parts is not likely to affect the subsoil water seriously. On the other hand, if the drains prove sufficient to prevent the subsoil water ever rising above the normal level, the chances of the cotton plant are excellent, for it will quickly adapt itself to the normal conditions. It must be remembered, however, that the efficiency of the proposed drains to maintain this normal level cannot be guaranteed. Little is known yet of the distance to which a drain can prove effective, especially in view of the infinite variety in the nature of the soil in Egypt, and it is quite likely that cultivators who rely entirely on the Government drains to carry off whatever amount of water they choose to throw on their lands in flood time will find the drainage quite insufficient. It is certain that, especially in heavy, impervious soil, private owners will find it necessary to supplement the Government drains by a system of private drains, leading into the Government drains. But it is beyond doubt, judging from the experience of existing land companies, such as the Aboukir and Behera Companies, that to give even a metre of drainage results in a very marked improvement, which is shown by the land fetching as much as £E.100 per acre.

With regard to the Middle Zone, the question is not so easily answered. It is certain that the minimum depth which the Government propose to give will be a great improvement on the average conditions existing in these districts now. Whether more might be desirable, it is impossible to say at present. As far as engineering difficulties are concerned, it could be quite easily given under the present scheme, but it is difficult to say whether the gain would cover the increased cost. It is more than doubtful whether deeper drainage would be appreciated in the present state of knowledge among the small cultivators. Where drainage has already existed for some time they are only now learning to take advantage of it. Passing along a good Government drain one often sees private drains run into it at a much less depth than could easily be given, simply because the fellah does not think it worth while to make them as deep as he could. 1·50 metres is therefore more than is likely to be taken advantage of for some time to come. It would, however, be short-sighted policy to limit the possible developments of the scheme in future to the depth at present decided upon. In preparing the plans for the present schemes, therefore, provision has been made in all permanent works along the line of the drains for the possible deepening of the drain by a further 50 c.m. in the future. This, then, provides for a depth of 2·00 metres in the future, which, in the present state of knowledge and in view of the climatic conditions of the district, may be regarded as a safe margin.

There still remains the third point of controversy—whether the drainage to be given by the Government system should be entirely dependent on artificial outfall maintained by pumping, or whether it would be possible to deal with parts of the area by gravitation. Admitting that a large part of the country, including practically the whole of the Behera, must be dependent on pumping, there are

two methods of carrying it out: (*a*) By running the main drains at a low level, so that private drains throughout the whole area may drain into them by gravitation (*berraha*), the whole contents of the drain being finally raised to the outfall at the sea or the lakes by central pumping installations at the tails of the main drains; or (*b*) by running the main drains by gravitation to the sea, this involving more or less high main drains throughout, into which the secondary drains of the whole area would be pumped by sectional pumping installations. These pumping sections or zones would consist of 5,000 to 10,000 feddans each, generally placed on both sides of the main drain, with a syphon underneath the canal connecting the deep drain on the far side to the pump.

The advantages claimed for the sectional pumping system are easily understood. In the first place high-level main drains (meaning not necessarily drains at a higher level than the adjoining land, but merely drains of less depth than proposed under the Government scheme) would, of course, cost much less, in the first place, for excavation, as well as for the purchase of land for surface and works.* Again, if it can be shown that there is any considerable portion of the area which might be drained direct to the sea by gravitation, as might have been possible, for example, in the Central Gharbieh scheme, it does seem uneconomical to turn this drainage into a deep drain, from which it has in the long run to be pumped into the sea. In the Behera scheme this argument appeared in a modified form. There was practically no part at all of the area which could be drained without some pumping. On this point a great deal depends on the relative size of the area, which might be dealt with on the more economical method, and this again, as already pointed out, depends on the degree of fall or slope to be given in the main drains. The raising of that slope to 5 c.m. per kilometre may be thought excessive, but it is at least erring on the side of safety. These main drains are the basis of the whole system, and the one thing essential is that they must be kept clear and running freely. A steeper slope means better flow in every way, easier maintenance, and less clearance, and it is difficult to find any other consideration of sufficient weight to set against that. If it be admitted that the proposed slope is justifiable, then the possible saving in respect of the area which could be drained without pumping is reduced to relatively small figures.

There is, however, a further argument put forward for the sectional pumping scheme, namely, that in all cases the pumping required for each section would be reduced to the minimum, *i.e.*, where a section lies comparatively high a small lift into the main drain would suffice to give it deep enough drainage. Thus, the whole drainage of that section would only require to be lifted, say, 1 metre, instead of being thrown into the main drain and finally lifted, say, 3 metres into the sea, and, of course, the cost of pumping is directly proportional to the height of the lift.

Or the same argument may be put in another way, that under the sectional system it would be possible to give every section exactly the depth of drainage it requires. Thus, a pocket or

* But to prevent seepage, they would require deep "*gannabias*" or parallel catch drains, which would more than counterbalance this gain.

depression could be given deep drainage, while an adjoining high-lying section would require much less, and only the drainage of the deep section would require to be lifted through the full height.

The exact weight to be given to these arguments depends almost entirely on detailed knowledge of the particular areas involved. If the district embraced in either of the present schemes included many areas of irregular depth, so that adjoining sections gave widely different conditions, there might be much to be said for the sectional method. The strength of a chain is the strength of its weakest link. To remedy the weakness of certain links by increasing the weight of the whole chain proportionately is certainly less economical than to take out all the weak links and put them in a chain by themselves. But the question is one of fact, and those who know the districts in question are alone competent to judge. The contour maps of the district seem rather to show a steady and gradual slope from the south to the north, with only occasional small pockets or depressions. So far from the proposed schemes giving a great deal more than necessary to the most of the country, in order to give the necessary minimum to the worse parts, it is rather a case of uniform slope from top to bottom, so that the maximum depth of excavation at the worst point will not greatly exceed the minimum at the best. The few small depressions or pockets which do exist can easily be dealt with specially, even to the extent of abandoning the minimum depth in their case rather than unduly increasing the depth throughout the whole system. As a matter of fact, the plans, so far as already prepared, do not show any great difference between the deepest and shallowest excavations.

It seems, therefore, not to be putting this argument unfairly to say that it resolves itself into the question of an area of about 125,000 feddans in the Central Gharbieh scheme, and, while admitting the weight of this, it comes to be simply a question of relative advantage.

A further advantage is claimed for the high-level drain scheme that the tails of all the irrigation canals, many of which are at present turned into other canals going further north, and finally lose themselves in a rather indefinite way in the Berrari, could be turned into the main drains. This would ensure a freer flow in the canals and a more efficient application of the flood rotations, because a canal with a free outflow into a drain not very far away can be thoroughly emptied in its "off" week. It would, of course, be a very different proposal to empty canals into drains if these drains had to be finally pumped out, but under the gravitation scheme this would be unnecessary.

This question seems also to be largely a matter of fact. So far as the tails of the canals to the far north are concerned, it should be equally simple to turn them into the main drain below the pumps or run them direct into the sea at any other convenient point. As regards the existing tails of the canals further south, which at present find their way into other canals and thence to the sea by gravitation, it is probably true that this is not as good an outfall as the proposed emptying into the main drain, which also finds its way by gravitation to the sea. But it must be remembered

that the essential sequel to the present drainage schemes is a very great development of the irrigation system in the northern districts, and it is probable that when these extensions are completed many of the canals which at present lose themselves in the Berrari will be carried direct through to the sea, with an ample water supply in them and ample duty for it to perform. There will then be less need for tails of canals running into drains.

It remains now to state the objections to the high-level scheme, and the advantages of the central pumping scheme proposed by the Government. In the first place it may be pointed out that, so far as these drains were really high level, *i.e.*, above or not much below the surrounding soil level, they would simply be adding to the already objectionable number of water channels which, owing to their level, have helped to saturate the surrounding soil by infiltration. Needless to say, a drain carrying salt water at that level is still more objectionable than a canal which carries sweet water.

It is doubtful whether the remedy proposed to meet this objection, viz., "*gannabias*," or parallel catch drains, would be effectual. The ways of infiltration water in the peculiarly variable subsoil of Egypt still leave a great deal to be found out. It is quite capable of finding its way straight down through the bottom of the canal, travelling laterally under the "*gannabia*," and coming up again at a considerable distance.

It need only be mentioned in passing that in Behera a gravitation drain, besides serving only a very limited area, would for a large part of its length be running in an embankment several metres above the surrounding soil. It is not supposed that such a scheme would be seriously suggested.

But the chief advantages of the central pumping scheme are the obvious ones of simplicity and economy. Of these the former is in Egypt hardly less important than the latter. A system which would involve, in the Central Gharbieh scheme for example, 14 separate pumping stations in place of the one at Baltim proposed by the Government, will immediately suggest to those who have experience of running such work in Egypt, very serious danger of inefficient running, carelessness and stupidity leading to all kinds of unsatisfactory working and damage, for which the Government might be held responsible. Engineers are neither born nor made in Egypt, and to find an efficient and reliable staff for the number of pumping stations which would be required by the time the whole of the Delta had been covered with such stations, is more than any man who knows Egypt would care to face.

But the argument of the enhanced cost, both of construction and maintenance of a large number of small stations, will probably be the most convincing argument to the professional engineer. One large station is so obviously the most economical way of dealing with the drainage that it will require very strong arguments on the other side to outweigh it.

With this outline of the considerations affecting the general drainage projects of the Government, the matter may be left to the consideration of technical experts.

JOHN A. TODD.

PROGRAMME

OF THE VISIT OF THE DELEGATES OF THE INTERNATIONAL FEDERATION OF MASTER COTTON SPINNERS' AND MANUFACTURERS' ASSOCIATIONS TO EGYPT.

SUNDAY, 27TH OCTOBER, 1912.

2 p.m. Arrival of most of the delegates at Alexandria. Landing and drive through the city to the Hotel Savoy.
8 p.m. Dinner at the Hotel Savoy.

MONDAY, 28TH OCTOBER.

9-30 a.m. Leave Hotel Savoy in carriages for the "Kom el Shogafa" and inspect the antiquities.
1 p.m. Lunch at the Hotel Savoy.
Arrival of the remaining delegates per Austrian Lloyd Steamer. Landing and drive through city to the Hotel Savoy.
3 p.m. Visit to the Museum of the delegates who arrived on October 27th.
8 p.m. Dinner at the Hotel Savoy.

TUESDAY, 29TH OCTOBER.

10-30 a.m. Drive from Hotel Savoy.
11 a.m. Visit to the Cotton Presses.
1 p.m. Lunch at the Hotel Savoy.
3 p.m. Visit to the Museum of Antiquities for those who arrived on October 28th.
7-20 p.m.
7-30 p.m. } Three special trains to convey the delegates and ladies
7-40 p.m. } to San Stefano.
8-15 p.m. Banquet offered by the Alexandria General Produce Association at San Stephano. A special train will convey the delegates back to Alexandria.

WEDNESDAY, 30TH OCTOBER.

10-30 a.m. Drive from Hotel.
11 a.m. Congress Meeting at the Alexandria Town Hall.
A Paper will be read by Mr. W. Lawrence Balls, M.A., on the "Deterioration of the quality of cotton."
Discussion on Damp in Cotton and Seed Selection at the Ginneries.
1 p.m. Lunch at the Hotel Savoy.
2-30 p.m. Leave the Hotel Savoy in special trains for a Garden Party at Nouzha, given by the Municipality of Alexandria.

THURSDAY, 31ST OCTOBER.

9-15 a.m. Leave the Hotel Savoy in special trains for the station.
9-40 a.m. Leave by special train Alexandria.
10-25 a.m. Arrival at Aboukir; walk along sea-shore.
About Noon. Lunch on Aboukir shore.
2 p.m. Leave Aboukir by train for Maamourra.
Visit the Aboukir Estates, where tea will be offered by the Aboukir Estate Co.
6-25 p.m. Return by train from Gabriel Station to Alexandria.

FRIDAY, 1ST NOVEMBER.

DELTA EXCURSION BY TRAIN DE LUXE.

8-45 a.m. Drive from Hotel.
9-15 a.m. Leave Alexandria Station.
10-50 a.m. Arrival at Kafr-el-Zayat. Visit to the various ginneries.
1 p.m. Lunch in train.
3-30 p.m. Leave Kafr-el-Zayat for Tantah.
4-30 p.m. Drive through Tantah.
Tea will be offered by the Municipality of Tantah in the park.
8 p.m. Dinner in the train.
10-30 p.m. Leave Tantah.
10-50 p.m. Arrive at Mehallet-Roh.
Sleep in train. The train will remain standing during the night in a siding.

SATURDAY, 2ND NOVEMBER.

7-40 a.m. Train leaves Mehallet-Roh.
8-55 a.m. Arrival at Sakha.
Inspection of the State Domain.
12-30 p.m. Lunch in the train.
5-30 p.m. Train leaves Sakha.
Dinner in the train.
8-45 p.m. Arrival at Cairo.
Drive to Shepheard's Hotel.

SUNDAY, 3RD NOVEMBER.

8-45 a.m. Drive from Shepheard's Hotel to Museum.
Visit to Museum.
Noon. Drive from Museum to Mena House, where lunch will be served.
Afternoon. Visit the Pyramids and the Sphinx Temple (camels and donkeys will await party at Mena House).
Return in carriages to Shepheard's Hotel.
8 p.m. Dinner at Shepheard's Hotel.

MONDAY, 4TH NOVEMBER.

Official Visits (all the delegates, but no ladies).

9 a.m. Drive from Hotel to H.E. the Prime Minister, who will receive the delegates at 10 a.m.

10-45 a.m. Visit to Viscount Kitchener of Khartoum at the British Agency.

11-45 a.m. Visit to H.E. the Minister of Public Works.

Return to Shepheard's Hotel.

1 p.m. Lunch at Shepheard's.

2-30 p.m. Carriages leave the Hotel for a Congress meeting and Exhibition at the Egyptian University.

3 p.m. Beginning of meeting: chair will be taken by H.E. Sirry Pacha, Minister of Public Works.

(*a*) Paper by Mr. G. C. Dudgeon, *Director General of the Agricultural Department*, on "*The Improvement of Quality and Yield of Cotton.*"

(*b*) Paper by Dr. Gough on the "*Insects of Egyptian Cotton.*"

8 p.m. Dinner at Shepheard's Hotel.

TUESDAY, 5TH NOVEMBER.

EXCURSION TO SAKKARA.

8-30 a.m. Drive from Hotel to landing stage opposite the Semiramis Hotel.

9 a.m. Government Steamer leaves landing stage

Open-air lunch at Sakkara.

5 p.m. Return by steamer.

7 p.m. Arrival of steamer at Rhoda.

Drive to Hotel.

8 p.m. Dinner in Hotel.

WEDNESDAY, 6TH NOVEMBER.

8 a.m. Carriages leave the Hotel for visit of the Citadelle, the Mosques, and the Tombs of the Khalifs.

1 p.m. Lunch at Shepheard's Hotel.

2-30 p.m. Carriages leave the Hotel for the Polytechnical School at Giza.

3 p.m. Congress Meeting. Chairman: H. E. Sirry Pacha, Minister of Public Works.

Paper by Mr. W. Lawrence Balls, M.A., on "Seed Breeding," after which an inspection of the experimental plots of the Agricultural Department will be made.

Return in carriages to Hotel.

8 p.m. Dinner at Shepheard's Hotel.

THURSDAY, 7TH NOVEMBER.

EXCURSION TO THE BARRAGE.

8-15 a.m. Drive from Hotel to Rod El-Farag.
9 a.m. Government Steamer leaves Rod El-Farag.
10 a.m. Arrival at the Barrage.
11-30 a.m. Departure by steamer from the Barrage.
12 noon. Cold lunch will be served on the steamer.
1-30 p.m. Arrival at Rod El-Farag and drive to Hotel.
2 p.m. Arrival at Shepheard's Hotel.
3 p.m. Drive from Hotel to the Zoological Gardens, where H.E. Sirry Pacha, Minister of Public Works, offers tea (garden party).
Return in carriages to the Hotel.
8 p.m. Dinner at Shepheard's Hotel.

FRIDAY, 8TH NOVEMBER.

EXCURSION TO TOUKH.

11 a.m. Drive from Hotel to railway station.
11-15 a.m. Departure of special train for Toukh.
11-45 a.m. Arrival at Toukh and drive to Deir.
12-45 p.m. Arrival at Deir.
Lunch offered by H.E. Ibrahim Pacha Mourad.
3-30 p.m. Departure; on the way inspection of cotton fields.
5-30 p.m. Arrival at Cairo.
7 p.m. Dinner at Shepheard's Hotel.
8-30 p.m. Carriages leave the Hotel for the Egyptian University, where the last Congress Meeting will be held.
Chairman: Sir Charles W. Macara, Bart.
Paper by Abdul Hamid Bey Abaza on "Cotton Cultivation and the Mixing of Cotton on the Plantations."
Replies from Spinners on questions raised during the Conferences.
Return in carriages to the Hotel.

APPENDIX—SUDAN REPORT.

THE SUDAN COTTON ORDINANCE, 1912.

An Ordinance for improving and maintaining the quality of cotton in the Sudan and other purposes.

It is hereby enacted by the Governor-General of the Sudan in Council as follows:—

SHORT TITLE.

1.—*This Ordinance may be cited as the Cotton Ordinance,* 1912.

INTERPRETATION.

2.—In this Ordinance the Director of Agriculture means the Director of Agriculture and Forests, and includes any person duly authorised to act on his behalf.

IMPORT OF COTTON SEED.

3.—No cotton seed shall be imported into the Sudan except in accordance with such rules as may be framed under Section 16, or until such rules shall be issued under a permit granted by the Director of Agriculture.

IN PRESCRIBED AREAS COTTON SEED TO BE SUPPLIED OR APPROVED BY DIRECTOR OF AGRICULTURE.

4.—The Governor-General in Council may from time to time prescribe areas or districts, and in such areas or districts as may be prescribed no cotton seed may be used for sowing unless supplied for the purpose by or under the authority of the Director of Agriculture, or approved by the Director or an Inspector of that Department.

IN PRESCRIBED AREAS COTTON TO BE PICKED CLEAN.

5.—In such areas or districts as may be prescribed by the Governor-General in Council cotton must be picked clean, free of all leaves, bolls, and dirt, and none but clean cotton shall be sold or offered for sale.

IN PRESCRIBED AREAS OLD COTTON PLANTS TO BE DESTROYED.

6.—(i.) In such areas or districts as may be prescribed by the Governor-General in Council the occupier and owner of any land shall be responsible to destroy all cotton plants on such land after the first season's crop has been picked from them, and on no account shall cotton plants be allowed to remain for a second season or more than one year in the ground.

(ii.) Provided nevertheless that the Director of Agriculture may by permission in writing exempt the owner or occupier of any plot of land from the obligation imposed by the last sub-section.

LICENSES FOR GINNING FACTORIES.

7.—(i.) No person shall erect or use a ginning factory or permit the same to be used unless he holds a license from the Director of Agriculture.

(ii.) The owners of all ginning factories existing upon the publication of this Ordinance shall be entitled to obtain a license upon application to the Director of Agriculture within three months from the publication of this Ordinance.

CONDITIONS AND RENEWAL OF LICENSES.

8.—(i.) Licenses shall be issued in accordance with conditions imposed or framed from time to time by the Governor-General in Council under Section 16, and for such periods as the Governor-General in Council may from time to time decide. They shall be renewable at the expiration thereof unless there have been breaches in respect of the ginning factory of the provisions of this Ordinance, or of any regulations issued under this Ordinance.

REVOCATION OF LICENSES.

(ii.) A license may be revoked by the Director of Agriculture for breach in respect of the ginning factory of any of the provisions of this Ordinance, or of any regulations issued under this Ordinance.

TRANSFER OF LICENSES.

(iii.) A license shall not be transferable except with the consent in writing of the Director of Agriculture.

INSPECTION OF GINNING FACTORIES.

9.—Every ginning factory shall at all times while working be open to the inspection of the Governor, or of an Inspector of the province, or an official duly authorised by the Director of Agriculture.

SEPARATION OF COTTON SEEDS.

10.—(i.) Different varieties of cotton shall be kept separate previous to ginning, and shall be ginned separately.

(ii.) The gins shall be carefully cleaned of all seeds of one variety before the ginning of another variety is begun.

USE OF COTTON SEED FROM COTTON GINNED IN THE SUDAN.

11.—(i.) Cotton seed from cotton ginned in the Sudan shall not be used for sowing in the Sudan unless in accordance with rules to be framed under Section 16, or, until such rules shall be issued, under a permit to be granted by the Director of Agriculture.

REGULATIONS FOR COTTON SEED LEAVING GINNING FACTORIES.

All other cotton seed produced in Sudan ginning factories shall not leave the ginning factory except for export or for such other purpose as may be permissible under rules to be framed under Section 16, or, until such rules are issued, under rules made by the Director of Agriculture, with the approval of the Governor-General in Council.

EMPLOYMENT OF CHILDREN.

12.—No child shall be employed in any ginning factory unless he is over the age of nine years and is medically fit.

FENCING OF MACHINERY.

13.—(a) Every flywheel directly connected with a steam engine

or other mechanical power in any part of a ginning factory, and every part of a steam engine.

(*b*) Every hoist near which any person is liable to pass or be employed; and

(*c*) Every other part of the machinery, or mill gearing of a factory which may in the opinion of the Inspector of the province be dangerous if left unfenced, and which he may have ordered to be fenced:

shall while the same is in motion be kept by the occupier of such ginning factory securely fenced.

Any order under clause (*c*) may be set aside on appeal or otherwise by the Governor of the province.

PRECAUTIONS AGAINST FIRE.

14.—The occupier and manager of every ginning factory shall be responsible to keep in good order and in accessible positions in the factory a sufficient supply of fire buckets or other means for extinguishing fire.

NOTICE OF ACCIDENTS.

15.— When any accident occurs in a ginning factory, causing death or bodily injury, whereby the person injured is prevented from returning to his work in the factory during 48 hours next after the occurrence of the accident, the occupier of such factory, or in his absence his principal agent in the management of such factory shall give notice of the accident to the Mamur of the district within 24 hours of the occurrence of the accident, or in the event of it not being ascertained within that period that the accident is one of which notice is required to be given, shall give such notice within 24 hours of this being ascertained.

POWER TO MAKE RULES.

16.—The Governor-General in Council may make rules for the purpose of maintaining or improving the quality of cotton grown in the Sudan, and for the regulation of the working of ginning factories, and for protecting the health and safety of persons engaged therein, and in particular he may :—

(*a*) Prohibit the cultivation and export of cotton of inferior quality, or of any particular kind, or of all cotton other than specified kinds or qualities.

(*b*) Prohibit the export of unginned cotton.

(*c*) Regulate the import, distribution, or use of cotton seed, or prohibit the import, distribution, or use of cotton seed of inferior quality, or of any particular kind, or of cotton seed other than certain specified kinds or qualities.

(*d*) Make regulations for the sowing and use for other purposes of cotton seed from cotton ginned in the Sudan, and provide for the inspection of cotton seed and cotton ginned and unginned.

(*e*) Make regulations for factories, for the issue of licenses under Section 8, for their inspection, and for the ginning, baling, and preparation of cotton and cotton seed.

(*f*) Make regulations with respect to the hours and conditions of labour of children and young persons in ginning factories.

(*g*) Make regulations for grading or classifying cotton, and for making it compulsory for cotton to be graded or classified by an official classifier, and for the marking of bales of cotton or parcels of cotton seed, and for the prevention of the export of cotton, which is not graded, classified, and marked.

(*h*) Make regulations requiring cultivators, owners, and managers of ginning factories and others to furnish such statistics in connection with their business as may be determined.

(i.) Fix penalties not exceeding a fine of £.E.10 for contravention of any regulation.

PENALTIES.

17.—Any person who in breach of this Ordinance or of any order or rule made thereunder :—

(*a*) Imports cotton seed contrary to Section 3.

(*b*) Uses cotton seed contrary to Section 4.

(*c*) Suffers cotton to be picked, otherwise than in accordance with, or sells or offers for sale or purchases cotton contrary to Section 5.

(*d*) Suffers cotton plants to remain in land occupied by him for more than one year contrary to Section 6.

(*e*) Erects or uses a ginning factory without a license contrary to Section 7.

(*f*) Refuses an authorised official access to any part of a ginning factory contrary to Section 9.

(*g*) Mixes different varieties of cotton or gins together different varieties of cotton contrary to Section 10.

(*h*) Removes or suffers any cotton seed to leave a ginning factory contrary to Section 11.

(*i*) Allows any child to perform any work forbidden by, or to work in contravention of Section 12.

(*j*) Neglects to fence any machinery in contravention of Section 13.

(*k*) Neglects to provide or keep in good order such fire buckets or other means for extinguishing fire in contravention of Section 14.

(*l*) Neglects to send any notice or to furnish any return in contravention of Section 15.

shall be punished with a fine which may extend to £.E.10.

Provided that no prosecution shall be instituted except with the previous sanction of the Governor or Director of Agriculture.

COTTON AND SEED MAY BE CONFISCATED WHEN AN OFFENCE IS COMMITTED.

18.—Any cotton or cotton seed in respect of which any offence under any section of or under any of the regulations made under

this Ordinance has been charged or is suspected of having been committed, shall be liable to seizure by a magistrate, police officer, or customs officer, and cotton or cotton seed in respect of which any person has been convicted of an offence under any section of or under any regulation made under this Ordinance may by order of a magistrate of the first or second class be confiscated.

BURDEN OF PROOF AS TO AGE OF PERSON.

19.—When an act or omission would, if a person were under nine years of age, be an offence punishable under this Ordinance, and such person is in the opinion of the Court apparently under that age, it shall be on the accused to prove that such person is not under that age.

BY WHAT COURT OFFENCES TRIABLE.

20.—Offences may be tried by a magistrate of the first or second class and summarily or otherwise.

Made by the Governor-General of the Sudan in Council this 11th day of November, 1912.

(Signed) G. F. CLAYTON, *Secretary to Council.* (Signed) REGINALD WINGATE, *Governor-General.*

The Cotton Regulations 1913.

ISSUED UNDER THE COTTON ORDINANCE, 1912.

In accordance with the provisions of Sections 3, 4, 5, 6, and 16 of the Cotton Ordinance, 1912, the Governor General in Council hereby orders and prescribes as follows:—

DISTRICTS PRESCRIBED UNDER SECTION 4.

1.—The district of Tokar, Red Sea Province, is a prescribed district to which the provisions of Section 4 of the Ordinance shall apply.

Hence no seed other than that supplied for the purpose by or under the authority of the Director of Agriculture or approved by the Director or an Inspector of that Department shall be sown within the limits of the said district.

Approval of the Director of Agriculture or an Inspector of that Department will not be given for the introduction of any variety or varieties of cotton seed for sowing in the said prescribed district other than a variety or varieties previously notified in the Sudan Government Gazette.

DISTRICTS PRESCRIBED UNDER SECTIONS 5 AND 6.

2.—The provinces of the Red Sea, Kassala, Blue Nile, Sennar, Khartoum, and Berber are prescribed districts to which the provisions of Sections 5 and 6 shall apply.

Hence within the limits of the said provinces cotton shall be picked clean free of all leaves, bolls, sand and dirt, and none but

clean cotton shall be sold or offered for sale. The occupier and owner of any land shall be responsible to destroy all cotton plants on such land after the first season's crop has been picked from them, and on no account shall cotton plants be allowed to remain for a second season or more than one year in the ground.

COTTON NOT TO BE PLACED ON THE BARE GROUND.

3. In the districts mentioned in the last clause all cotton must be picked into sheets, baskets, or other receptacles, and when picked must not be placed on the bare ground.

SPECIES OF COTTON PROHIBITED UNDER SECTION 16 (*a*).

4.—The cultivation and export of the species of indigenous cotton known as "Abu Hareira," is hereby prohibited in Sennar Province.

PROHIBITION OF EXPORT OF UNGINNED COTTON UNDER SECTION 16 (*b*).

5.—The export of unginned cotton from the Sudan is prohibited unless under a written permit from the Director of Agriculture.

Provided nevertheless that this prohibition shall not extend to the export by land of unginned cotton into Abyssinia and Erytrea.

PERMIT TO IMPORT COTTON SEED.

6.—Whereas by virtue of Section 3 of the Ordinance no cotton seed may be imported into the Sudan except under a permit from the Director of Agriculture, applications for permit to import cotton seed must be made to the Director of Agriculture in writing, and must give full particulars of the quantity, variety, and place of origin of the seed it is proposed to import.

The Director of Agriculture shall not grant a permit unless satisfied as to the quality and origin of the cotton seed.

Unless otherwise stated in the permit, cotton seed may be imported into the Sudan through Port Sudan only.

COTTON SEED TO BE FUMIGATED ON IMPORT.

7.—Cotton seed imported into the Sudan from places other than Egypt shall, and from Egypt shall, if so required by the Director of Agriculture, before crossing the Customs boundary, be submitted by the consignee or owner to fumigation to the satisfaction of an Inspector or Sub-Inspector appointed under the Plants Diseases Ordinance, 1911, and the Customs Authorities shall not allow such cotton seed to cross the Customs boundary unless the importer produces a certificate signed by such Inspector or Sub-Inspector that the fumigation has been carried out.

TOKAR COTTON TO BE OFFICIALLY CLASSIFIED AND WEIGHED.

8.—(i.) All cotton grown in the Tokar District must be brought into the Tokar cotton market to be there classified by the official classifier and weighed by the official weigher.

All bales or bags containing such cotton shall be marked by the official classifier with the Government mark, and no cotton shall be put up for sale in the market unless so marked.

(ii.) It is prohibited to move cotton grown in the Tokar district out of the district unless in bales or bags bearing the Government mark.

DESTRUCTION OF NOXIOUS WEEDS.

9.—The occupiers of cultivated land in the Tokar plain must destroy all noxious weeds, such as "hambuk" and "ushur" and other plants likely to harbour pests on their land.

FEES IN TOKAR COTTON MARKET.

10.—The Governor of the Red Sea Province may by public notice fix fees for the official classification, weighing and marking of cotton in Tokar cotton market.

No cotton in respect of which any such fees are payable may be removed from the Tokar cotton market until the fees have been paid.

COTTON GROWN ELSEWHERE THAN IN TOKAR DISTRICT.

11.—Unginned cotton which has been grown in any district other than Tokar shall not be brought into the Tokar cotton market nor passed off as, nor mixed with, cotton grown in the Tokar district at any time while in the Sudan.

COTTON INTENDED FOR EXPORT NOT TO BE ADULTERATED.

12.—Cotton intended for export shall not be adulterated with any other substance.

LICENSES FOR ERECTING OR USING GINNING FACTORIES.

13.—Licenses for ginning factories shall be annual and shall be renewable on the 1st day of January in every year. They shall be in the form set out in the schedule.

Applications for licenses shall be addressed to the Director of Agriculture, Khartoum, by letter, and should state:—

(i.) The name and residence of the owner.

(ii.) The situation of the ginning factory.

(iii.) Detailed information of the number and kind of gins and presses erected or to be erected.

EMPLOYMENT OF CHILDREN.

14.—(i.) No child under the age of nine years shall be permitted to enter the work rooms in any factory.

(ii.) No child between the age of nine and 12 years shall be employed in any factory unless he has been examined by a Government medical officer, who has certified his age and that he is fit for such work.

(iii.) Such certificate must be produced on demand by the Governor or Inspector of the Province or Mamur.

HOURS OF WORK FOR CHILDREN.

15.—(i.) No child shall be employed in any factory, nor permitted to remain in the work room in any factory during the night, that is, between 7 p.m. and 5 a.m.

(ii.) No child shall actually be employed in any factory for more than seven hours in any one day.

INTERVAL OF REST.

16.- Every child who is actually employed in any factory for six hours in any one day shall be allowed an interval or intervals of rest amounting in the aggregate to at least half an hour.

CHILDREN NOT TO BE EMPLOYED NEAR DANGEROUS MACHINERY.

17.— In any factory where children are working, the machines known as Gourbal and Afrita must be placed in a special room, or must be securely fenced from the places where the children work by a partition wall or railing, and no child shall be allowed to work in the part of a room appropriated to any of these machines, nor in a room containing any of them unless the machine or machines be securely fenced off as aforesaid from the places where the children work.

TABLE OF HOURS OF WORK FOR CHILDREN.

18.—The occupier of every ginning factory must furnish the Governor with a table of the hours of work for children in the factory, such table to be drawn up in accordance with these regulations, and shall post up and maintain a copy of such table in English and Arabic in a prominent position in the factory.

STATISTICS TO BE PROVIDED BY MANAGERS OR OWNERS OF GINNING FACTORIES.

19.—Every manager or owner of a ginning factory shall furnish to the Director of Agriculture annually, or at such shorter periods as he may direct, statistics of the number and varieties of gins running, the amount and quality of unginned and ginned cotton entering and leaving the factory, the quantity of cotton seed leaving the factory, and of the number of persons employed in the factory, and such other statistics concerning the work of the factory, as the Director of Agriculture may from time to time require.

In every factory a copy of the Cotton Ordinance, 1912, and the regulations issued in connection with this Ordinance (in Arabic and English) shall be placed in a prominent position.

Copies of the Cotton Ordinance, 1912, and the regulations issued in connection with it can be obtained from the Director of Agriculture and Forests.

PENALTY.

20.—Any person contravening any of these regulations shall be punishable with a fine which may extend to £.E.10.

THE SCHEDULE.

Form of License.

(ISSUED UNDER THE COTTON ORDINANCE, 1912.)

to enable

(Name) * ....

(Address) ....

to *erect and** use a cotton ginning factory of† .... .. gins and† ..... . presses at . . .. of the following description : (*Insert full particulars as to kind of gins and presses*).

... ...

. .. .

This license is renewable on the 1st day of January, 19 , and is not transferable save with the written consent of the Director of Agriculture and Forests. It is revocable by the same authority for breach in respect of the ginning factory of any of the provisions of the Cotton Ordinance, 1912, or of any regulations issued from time to time under the said Ordinance.

(Signed)

Director of Agriculture and Forests.

Date day of 19

(Signed) (Signed)

Secretary to the Council. *Governor-General.*

....day of .....19.....

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* Cancel italicised words if factory already erected.
† Insert No. of gins and presses.

Copy of Agreement with Tenants at the Gezira Agricultural Experimental Station (Tayiba).

MANAGERS:
THE SUDAN PLANTATIONS SYNDICATE, LTD.

An agreement made between ..... of the first part hereinafter called "The Tenant" and the Sudan Plantations Synd., Ltd. (acting as managers for the Gezira Agricultural Experimental Station) hereinafter called "The Company" of the second part.

Whereas the said tenant has leased from the company ..... feddans of land at Tayiba for the cultivation of cotton, wheat and leguminous and other crops, and the said tenant having seen the land specified, and having a thorough knowledge of its boundaries.

Now it is hereby agreed between the parties:—

1.—The tenant shall cultivate about one-third of the land in a cotton crop, about one-third of the land in a wheat crop, and the remaining land in leguminous and other crop.

2.—The rent for the aforementioned ..... feddans shall be at the rate of ..... piastres per feddan.

3.—The tenant shall pay rents and all other monies due to the company on or before the 15th March, 19..

4.—The company shall between the 15th July and last day of February following, supply water necessary for the irrigation of the various aforesaid crops according to the rules of cultivation, but in case of any compulsory circumstances preventing the water from reaching the land at any time, or on account of any machine being broken, or any other compulsory reason the tenant shall have no claim against the company for any compensation on account of the water not reaching the land under cultivation; but this is without prejudice to any claim that the tenant may have to reduction of rent.

5.—The tenant shall deliver back to the company the land free of all cultivation, together with all gadwells clean and in proper working order on the 1st day of April, 19....

6.—The tenant shall not sublet the land or any part thereof without the written permission of the company.

7.—As the land is let to the tenant without security, which is contrary to the custom in similar cases, the tenant agrees that the crops and all animals belonging to the tenant shall be a security for the rights of the company, and the tenant therefore engages himself

not to remove any of the crops or animals without the written consent of the company unless the company has received the rent for the whole year and all advances and other sums of any kind due to it. The company's rights are a first charge on the crops and animals, and in the event of the tenant becoming insolvent or making any arrangements with his creditors, or if any legal execution takes place against any of his property the company may seize the crop and animals.

8.—The tenant shall in all things obey the reasonable orders of the company's officials in all matters relating to the cultivation, irrigation, and harvesting of the aforesaid crops. In case of the tenant becoming careless in the cultivation of his crop the company shall have the right without the consent of the tenant to take such steps as the company may consider proper for the safeguarding of the crops, and any expenses incurred thereby shall be charged against the tenant, and shall be recoverable from the proceeds of the crops without waiting for the consent of the tenant.

9.—In the case of any tenant who, in the opinion of the company, shall be in need of advances in money or kind to enable him to cultivate and harvest his crops, the company will be prepared to make such advances at such times, on such conditions, and to such extent as the company shall in its absolute discretion think fit. But in the event of the tenant becoming careless or using such advances for other purposes, the company shall discontinue such advances, and shall have the right to take such steps for the safeguarding of the crops as are mentioned in Clause No. 8 of this agreement.

10.—The English copy of this contract is the official contract. The Arabic translation is merely for the information of the tenant.

Zeidab ....191....

Signed by—

The Tenant .....

Company .....

THE SUDAN PLANTATIONS SYNDICATE, LTD.,
AT ZEIDAB.

Copy of Agreement for Purchase of Water

An agreement made between the undersigned of the first part hereinafter called "The Tenant" and The Sudan Plantations Syndicate, Ltd., hereinafter called "The Company" of the second part:—

Whereas the tenant has requested from the company the necessary water to irrigate the growing of cotton, wheat, and dhurra crops on his own privately owned lands.

Now it is hereby agreed between the parties:—

1.—The tenant shall pay the company the sum of 250 P.T. on each feddan cultivated for cotton, and the sum of 125 P.T. on each feddan cultivated for wheat, and the sum of 125 P.T. on each feddan cultivated for dhurra as water rent.

In the event of the tenant cultivating more than one crop on the same land, the tenant shall pay to the company the sum of 250 P.T. on each feddan so cultivated.

2.—The company shall supply the necessary water for the irrigation of the various aforesaid crops according to the rules of cultivation up to and inclusive of the 1st day of May, 1913, but in case of any compulsory circumstances preventing the water from reaching the land at any time, or on account of any machine being broken, or any other compulsory reason, the tenant shall have no claim against the company for any compensation on account of the water not reaching the land under cultivation; but this is without prejudice to any claims that the tenant may have to reduction of rent.

3.—The tenant shall pay water rents due on each crop at the time of harvesting such crops, and all moneys due to the company shall be paid before the 1st day of May.

4.—The tenant who signs this contract shall be responsible and liable to pay all water rents in full for all land cultivated on the Sagia or Sagias cultivated by him or his partners.

5.—The tenant shall not sublet his land or any part thereof without the written permission of the company, as the water is supplied to the tenant at a lower rate than that in force on the company's land.

6.—As the water is supplied to the tenant without security, which is contrary to custom in similar cases, the tenant agrees that all his crops and live stock shall be a security for the rights of the company, and the tenant therefore engages himself not to remove or dispose of any of his crops or live stock without the written consent of the company, unless the company has received the water rents due to it either in money or in kind.

7.—The tenant shall obey the reasonable orders of the company's officials in regard to the regulating of the water supply. The tenant is willing, should he allow the water to break his gadwells and flow on to adjoining lands, to pay a reasonable compensation to the company for the water so lost.

8.—The tenant is prepared to make his own gadwells, and to keep them in proper repair, and to clean them in order not to impede the flow of water to other tenants further on.

9.—The English copy of this contract is the official contract. The Arabic translation is merely for the information of the tenant.

The Tenant .....

The Company .....

Zeidab .....*191*...

THE SUDAN PLANTATIONS SYNDICATE, LTD.,
AT ZEIDAB.

Copy of Agreement for Tenant Hiring Land

An agreement made between.. ... .of the first part hereinafter called "The Tenant" and the Sudan Plantations Syndicate, Ltd., hereinafter called "The Company" of the second part.

Whereas the said tenant has leased from the company 30 feddans of land at Zeidab for the cultivation of cotton, wheat, and leguminous crops, and the said tenant having seen the land specified and having a thorough knowledge of its boundaries.

Now it is hereby agreed between the parties:—

1.—The tenant shall cultivate about one-third of the land in a cotton crop, about one-third of the land in a wheat crop, and the remaining land in a leguminous crop.

2.—The tenant shall pay the company the sum of 412 to 512 piastres for each feddan as rent on the land cultivated for cotton, and the sum of 258 piastres for each feddan of land cultivated for wheat crop, and the sum of 154 piastres for each feddan of land cultivated for leguminous crop, as rent.

3.—The tenant shall pay rents due on each crop at the time of harvesting such crops, and all other moneys due to the company shall be paid on or before the 30th April, 19 .

4.—The company shall supply the necessary water for the irrigation of the various aforesaid crops according to the rules of cultivation, but in case of any compulsory circumstances preventing the water from reaching the land at any time, or on account of any machine being broken, or any other compulsory reason, the tenant shall have no claim against the company for any compensation on account of the water not reaching the land under cultivation, but this is without prejudice to any claim that the tenant may have to reduction of rent.

5.—The tenant shall deliver back to the company the land cultivated in cotton and leguminous crops free of all cultivation, together with all gadwells clean and in proper working order on the 1st day of April, 19 , and the land cultivated in a wheat crop in like manner on the 30th day of April, 19 .

6.—The tenant shall not sublet the land or any part thereof without the written permission of the company.

7.—As the land is let to the tenant without security, which is contrary to the custom in similar cases, the tenant agrees that all live stock in his possession and crops shall be a security for the rights of the company, and the tenant therefore engages himself not to remove or dispose of any of his live stock and crops without the written consent of the company unless the company has received

the rent for the whole year, and all advances and other sums of any kind due to it. The company's rights are a first charge on the tenant's live stock and crops, and in the event of the tenant becoming insolvent, or making any arrangements with his creditors, or if any legal execution takes place against any of his property the company may seize his live stock and crop or whatever the law allows.

8.—The tenant shall in all things obey the reasonable orders of the company's officials in all matters relating to the cultivation, irrigation, and harvesting of the aforesaid crops. In case of the tenant becoming careless in the cultivation of his crop the company shall have the right, without the consent of the tenant, to seize his live stock and crops, and take such steps as the company may consider proper for the safeguarding of the crops, and any expenses incurred thereby shall be charged against the tenant, and shall be recoverable from the proceeds of his live stock and crops without waiting for the consent of the tenant.

9.—In the case of any tenant who, in the opinion of the company, shall be in need of advances in money or kind to enable him to cultivate and harvest his crops, the company will be prepared to make such advances at such times, on such conditions and to such extent as the company shall in its absolute discretion think fit. But in the event of the tenant becoming careless or using such advances for other purposes, the company shall discontinue such advances, and shall have the right to take such steps for the safeguarding of the crops as are mentioned in Clause No. 8 of this agreement.

10.—The English copy of this contract is the official contract. The Arabic translation is merely for the information of the tenant.

Interest at 8 per cent. per annum on advances.

Signed by

The Tenant .....

Company .....

Zeidab, 19 .

APPENDIX III.

"Reconnaissance before the Battle."

The Cotton Worm: Its Destruction, and a Way to Obtain a Crop.

(A CIRCULAR DRAFTED BY LORD KITCHENER, AND ISSUED FOR THE INSTRUCTION OF EGYPTIAN FARMERS.)

This circular should be read to the assembled fellaheen in every village on three Fridays following each other, and should be posted on all Government offices.

The "Omdehs" should always keep a copy and read it occasionally to the fellaheen, particularly to those that are seen to be neglectful of carrying out the advice contained in it.

It should also be read in all the schools and kuttabs in the Mudiriehs, and the schoolmasters should see that the boys and girls understand it clearly. The children should also be told to convey the information to their parents and relations.

Copies can be given to all fellaheen who desire them.

The Government will grant a good reward to anyone who discovers a practical way of killing the cotton worms in the berseem without injuring the berseem itself or the cattle which feed upon it.

CULTIVATION OF COTTON.

SEED.

It is well known to you all that the prosperity of the fellaheen depends upon the successful cultivation of the land. In order that the crops may be good ones, and that the labour given to them may not be wasted, it is necessary to examine the fields constantly, and to destroy the pests as soon as they appear to prevent the crops being destroyed. Care should therefore be taken to follow the advice given in this paper regarding the cultivation of the cotton crop and the destruction of the cotton worms and boll-worms which often do so much damage to it. It is most important that everyone should give his greatest attention to these pests, and you should all remember that those people who are negligent and allow the cotton worms to multiply upon their land are not only doing themselves harm but are also doing great damage to all their neighbours. The "omdehs" (heads of villages) should take particular care that no one either by neglecting to destroy cotton worms at the proper periods, or by growing food for the worms to live upon, should cause damage to be done to the fields of those of their neighbours who work hard, and carefully follow the advice given.

In order that the best results may be got it is essential in the first place that *good seed* shall be used. It is not sufficient for a fellah to take any seed which may be offered to him by the small seed merchant. The grains may look all right, but it may be found when the plants have

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In order that the best results may be got it is essential in the first place that *good seed* shall be used. It is not sufficient for a fellah to take any seed which may be offered to him by the small seed merchant. The grains may look all right, but it may be found when the plants have

grown up that the seeds are not of a kind suitable for the particular district. It may also be found that a great many different kinds of seed are mixed, and the cotton crop will therefore be irregular, and fetch a lower price than if it was all of one kind. In order to assist the small cultivators in getting good and reliable seed, the Government has made arrangements that they shall be able to buy carefully-chosen seed at the market place near their own fields, and that the seed shall be delivered in one ardeb (sack of 270lbs.) and half-ardeb bags, and that any small landowner who is not in arrears in the payment of his tax may receive up to 3 ardebs and be allowed to pay for the seed along with his Government tax in the following November. The Government can supply any of the following kinds of cotton seed: Mit Afifi, Nubari, Yannovitch, and Sakelaridis in Lower Egypt, and Ashmouni in Upper Egypt, and anyone wishing to obtain these should ask the "omdeh" or "serraf" of his village, who has been told to make the necessary arrangements.

ROTATION OF CROPS, AND CROPS AFTER WHICH COTTON CAN BE CULTIVATED.

We have shown how the fellah can get good seed, he must therefore determine how much he should ask for, or in other words he should make up his mind how much of his land he will give to cotton. The *rotation* of crops which is recommended as most suitable for average lands, and which does not exhaust the soil, is one in which the land is divided into three parts, each part having cotton upon it in succession, so that each part only has cotton upon it once in three years. In this plan the three years' planting will be as follows:—

	Plot I.	Plot II.	Plot III.
1st year.	Berseem followed by maize or bare fallow.	Wheat followed by maize or bare fallow.	Cotton, preceded by berseem, not left later than January.
2nd year.	Same as II.	Same as III.	Same as I.
3rd year.	Same as III.	Same as I.	Same as II.

It is not good for the soil to plant it two years in succession with cotton, as the soil becomes weak and will not grow satisfactory crops unless renewed by expensive manures. If it is thought that the land is strong enough to have cotton upon half of it, it should be carefully watched, and if it shows signs of giving a smaller crop a berseem crop followed by a fallow may give back its strength.

TIME OF PLANTING.

The *time of planting* cotton is so important that everyone should carefully consider the advice we give here. In Lower Egypt from March to April is the best time and in Upper Egypt where it is warmer, from February to March. Many of you fear to plant your cotton

early owing to the cold winds which sometimes kill the young plants as soon as they spring up. If this happens, the labour of re-sowing the whole field is not very great, and the advantage of getting an early crop of cotton if the plants are not killed by cold, is that you will be able to get the greater part of your crop picked before it can be damaged by boll-worms.

MAKING RIDGES, AND THE DISTANCE OF PLANTING.

The *distance* at which cotton seed should be planted and the distances between the ridges are matters of great importance. In good land the spacing between the plants should be from 40 to 50 centimetres, and the ridges should be eight or nine to the two kassabas. In bad land in the north of the Delta where the plants do not grow large the plants can be spaced from 30 to 40 centimetres apart and from 10 to 12 ridges may be allowed in each two kassabas. It is wrong to suppose that by planting closer a larger crop can be got. If you plant closely, the result is that more leaves and fewer flowers are produced. You all know that the more flowers that appear the better the cotton crop should be, but you have no use for more leaves. In order to produce flowers the cotton plant requires light and air, but with a large quantity of leaves we get less of both, and in addition we provide the cotton worm moths, of which we shall presently speak, with favourable places to lay their eggs, sheltered from the sun, which would destroy them. The ridges should run from east to west, so that the seed may be planted upon the south side of each ridge to protect the young plants from the cold north winds and to allow them to get as much sun as possible.

WATERING.

Cotton is a plant which does not require much water if the cultivation of the soil is good, and if the surface is kept finely broken up after each watering, and not allowed to form large cracks. Many of you water your cotton fields whenever you find the water in your canal, but really your cotton would be much better if it did not get so much. Until the month of June it is better not to give water more often than once in 35 to 40 days, and during the time from June to August you should give waterings every 20 days. Remember that water is given to the plant so that it may drink it in through the roots mixed with the useful matter which is in the soil, which requires to be in a liquid form before it can be taken by the plant. If you were wishful to satisfy your own thirst you would only take enough water to do so. You would not keep your head under water so long that you would drown. Why, then, should you flood your cotton so heavily at some times of the year? The result is the same; if you give too much water to the cotton, you drown some of the roots, and there is a loss of cotton caused by the fall of buds. Remember, therefore, never to let the cotton plants stand in water.

WEEDING.

Weeding cotton must be carried on whenever it is necessary. If we allow weeds to grow in a cotton field it means that we are permitting the cotton plants to be robbed of some of their food. We must, therefore, destroy the robbers. Some weeds, especially "*Melukhia*"

and "*Qotn Shaitani*," are also food for the cotton worm, and if allowed to remain we shall be giving assistance to the cotton worms to increase, and damaging our own as well as our neighbour's crops.

THE INSECT PESTS WHICH INFEST, DESTROY, AND FEED UPON COTTON.

We have spoken above of the manner in which the cotton plant should be grown in order to get the best result, but we must not forget that in spite of all the care which we give it in cultivation we must be prepared to fight the enemies which attack it. You are therefore advised to be watchful, and to destroy the pests as soon as they are seen. In order that you may be able to understand how the cotton worms and boll-worms come to appear in the fields, we will now give you an account of the life and generation of each of these. The belief that these pests come to the cotton with the dew can easily be shown to be a wrong one. If they came with the dew, they should be everywhere when the dew falls; but we find them in one field but not in the next, although the dew has fallen equally on both fields. It is moreover easy to follow the whole life of each of the pests.

THE FIRST ENEMY OF THE COTTON PLANT. THE COTTON WORM.

The *cotton worm* passes through five or six generations every year, and in each generation it has four distinct stages. The first stage is the egg, the second is the worm, the third the chrysalis, and the fourth the moth.

THE EGG.

The *eggs* are laid by the female cotton-worm moths on the plants which are suitable as food for the worms as soon as they are hatched. They will therefore be seen on berseem, cotton, maize, melukhia, qotn shaitani, and many other plants. We must not expect to see the eggs by merely looking at a field or plant of any of these as we pass by it, because it is chiefly upon the lower side of the leaves that the eggs are laid. The moth lays the eggs in these places so as to protect them from the heat of the sun, which would quickly kill the young worms as soon as they came out. How shall we recognise the eggs when we are searching for them? Fortunately this is easily done, as the moth lays them in masses consisting of from 100 to 1,200 in each mass. Each egg in the mass will produce a cotton worm if left undisturbed, and from this you will all understand how very important it is to destroy the masses as early as possible. If one mass of eggs is left and from it we get 1,200 cotton worms, the next generation of 360,000 worms might be produced in six weeks' time. Fortunately many worms and eggs are destroyed in each generation by other insects and birds. The egg masses of the cotton worm, besides being laid by the moth in places which are sheltered from the sun, are covered with a woolly covering which protects them from wet.

THE WORM.

The *worms* are hatched from the eggs in a few days and feed underneath the leaves on which the egg-masses were laid. After three or four days, when they have grown stronger, they separate and go on to

other leaves. It is easy for any of you to notice when the young worms have attacked your cotton, as the lower leaves look like lace from the small holes which the worms have eaten in them. After the worms have separated, they hide themselves during the day in cracks in the ground, as the heat of the sun is too great for them. Most of them will therefore feed on the plants at night.

THE CHRYSALIS OR THE RED WORM.

The worm goes into the ground after it has eaten enough and has grown to its full size, and in the ground it makes a cell of mud and changes into a *chrysalis*. You will find the chrysalis by digging the soil round the plants after the cotton worm seems to have left your cotton—they are reddish brown and are without legs.

THE MOTH.

After a few days the *moth* comes out of the chrysalis shell, and grows its wings as soon as it has managed to get above the ground. The male moths then fly about looking for the females, and pair with them. The females generally lay most of their eggs near the places where they have come out from their chrysalides, but when their bodies have become lightened from having laid many eggs they fly about, and often travel far before they lay the rest of their eggs.

GENERATIONS OF THE WORM.

Each generation of cotton worms passes through all the stages we have mentioned above; but as we must try to destroy the insect in every generation we will now explain where it can be found. In the beginning of the year, and until the cotton has got plenty of tender leaves upon it, the worm is to be found in the berseem (a kind of clover) where it is difficult to see it. The first generation has been reduced by the cold of the winter, and there are therefore few left; but since, as we have said before, one mass of eggs can produce 360,000 in the next generation, the next generation is a large one, and the third which is produced when the berseem is finishing, a much larger one still. This last is the one which appears on your cotton plants, the moths having flown to the young cotton to lay their eggs because the berseem is too tough and dry for the young worms to feed on. When the cotton leaves become too tough also the following generations of moths find a tender food for their young upon the dhurra (maize) and the new berseem. From these explanations you will all understand how the cotton worm is continuously produced.

THE MEANS OF DESTRUCTION.

Now let us consider the best way to *destroy* the pest. Many people, as some of you know, have been ready to suggest ways of killing the cotton worm when they are in the cotton; but we ask you to think carefully over this matter, and then judge whether this is the best thing to do. If you had a fine ripe crop of wheat in your field, and your neighbour's field was on fire and burning towards your field, would you wait until your own field was on fire before you tried to put the fire out, or would you try to stop the fire in your neighbour's field before your own was damaged? In the first case you might kill the fire, but not until you had lost a part of your crop, and in the second case you

might save a portion of your neighbour's crop as well as the whole of your own. It is the same with regard to the cotton worm—the best remedy is to destroy it before it has got into your cotton or before it can damage your cotton. We therefore urge you to destroy the cotton worm in the berseem, as every two worms which you can kill in the berseem is equal to the destruction of from 20,000 to 360,000, which would have appeared in your cotton. It is surely easier to kill *two* in the berseem crop than such a large number in the cotton. We advise you therefore to search for and destroy all worms in the berseem: If after you have done this the egg masses are found upon your cotton, you are strongly urged to follow the order of His Highness' decree, and pick off and destroy all the leaves bearing the egg masses. If you all follow this advice, there should be very little harm done by the remaining cotton worm; but it must be remembered that anyone who does not follow the advice given is not only injuring himself but his neighbour also.

THE SECOND ENEMY OF THE COTTON.

THE BOLL-WORM.

The *boll-worm* requires a treatment different from that applied to the cotton worm. It also has about six generations in the year, and has the same four stages in each generation.

THE EGG.

The *eggs* are laid singly by the female moth, which flies long distances by night in order to find leaves on which to lay its eggs. These eggs are laid upon cotton, bamieh, til (a kind of hemp), hibiscus, and mallow.

THE WORM.

The *worms* feed first inside the young stems of the plants upon which the egg is laid, and afterwards in the flower buds and bolls.

THE CHRYSALIS.

When the worm is fully fed it makes a small cocoon between the branches or on the outside of a boll and changes into a *chrysalis*. In the winter time many of these cocoons, attached to the cotton sticks, which the fellaheen keep for fuel, are carried away by the fellaheen; if the sticks are not used at once, the chrysalides remain in safety until they turn into moths and fly off.

THE MOTH.

The *moths* are green or dull yellow in colour. Instead of laying their eggs near where they have come out, as the cotton worm does, they fly long distances, and in the winter they search for cotton, bamieh, til, and hibiscus shoots which spring from the plants which have been carelessly cut down or left by the fellah instead of being pulled up as is recommended by the Government.

GENERATIONS OF THE WORMS.

The *generations* are carried on in this way through the time when there is a scarcity of food, and in consequence of this scarcity the number of boll-worms in the early part of the year is small, but, as we have mentioned in the case of the cotton worm, each generation becomes more and more numerous as the food becomes more plentiful until we

find that at the end of the year nearly every boll of cotton and nearly every bamieh pod contains one or more boll-worms. It is easy to see the damage which is done to the cotton as it becomes black and the lint is spoilt.

MEANS OF DESTRUCTION.

How then shall we prevent the attack of boll-worms which in the worm stage live in the stems, buds, and bolls, and are therefore protected from any effect of poisons, &c.? We cannot destroy the eggs in the manner we do in the case of the cotton worm, as these are laid singly and are so small that they are very difficult to find. We know that the food of the boll worm consists of a very few different kinds of plants, not, as in the case of the cotton worm, of a large number of different crops and weeds. The remedy is therefore to completely destroy all these plants at one period of the year so that the first generations shall find nothing to feed upon when they appear. Fortunately it is possible to destroy all the cotton, bamieh, and til at the end of each year without damaging anybody. In the case of cotton sticks which are useful for fuel we advise that these should be pulled up so that no sprouts can come up from their roots, and that all the bolls and leaves should be stripped from them before they are stored away; or that the sticks should be passed through a fire so that the leaves and dry bolls are destroyed before the sticks are stored. At the same time as the cotton sticks are pulled up, all the bamieh and til plants which are often carelessly left should be burned or buried. You will understand that in this way you can starve the boll-worms and make their numbers so much smaller that the following generations will be very small and do little damage.

APHIS NADWA-ASSALIA OR EL-MANN.

We have only to mention one other insect pest which does serious harm to cotton when it is grown into a mature plant, and this is the Aphis (Nedwa el Assalia). This insect is very small, but it is by its great numbers that it does harm. The best way of killing the insects is by spraying infected plants with a mixture of petroleum and soap. The Inspector of Agriculture of your province should be asked to help if you want any further advice.

(Signed) ISMAIL SIRRY,
Minister of Public Works.

November 1st, 1911.

Report presented to the First Meeting of the Commission to Study the Cotton Worm and Boll Worm, 3rd February, 1912, by G. C. Dudgeon, Director-General of the Department of Agriculture.

In order to prevent the duplication of work conducted by the Cotton Worm Commission, I have drawn up a short report detailing the investigations which have been carried out by the Department of Agriculture, and which are still in progress. These investigations embrace the following lines of research and their contingent application.

TESTING OF INSECTICIDES.

(1) A number of insecticides have been recommended by various people, and have been carefully examined and tested. In this connection it may be remarked that in the majority of instances the correspondents have shown a great ignorance of the primary necessities, with regard to insecticides and their application. It is not necessary to refer here to any of the suggestions which have already been attended to by the Department, but it must not be assumed that it is intended to discourage the people in the country from continuing to send their suggestions. Since the formation of the Commission it is, however, proposed that such suggestions should be referred to the Commission for examination and report in future.

It has not been found necessary to advertise in the country for insecticides to be sent for trial. Several contact insecticides which seemed promising have been tested by the Department, but none of them have yet proved sufficiently reliable or cheap for application.

Internal insecticides are usually much more effective and cheaper for application than contact insecticides, but as most of the internal insecticides have the disadvantage of being poisonous to man and the higher animals, many have been discarded for these reasons. Experiments have been undertaken to test the toxic effect of numerous chemicals upon the cotton worm in the hope that a chemical substance harmless to man and destructive to the worm might be discovered, but as yet no great success has been achieved in this direction. Tests are being made by the Department to ascertain the period during which berseem treated with Paris green after cutting remains dangerous to cattle. This experiment is not yet complete.

(2) Arrangements are being made by the Department to rear a large number of cotton worms during the coming season, in order to continue the study of their parasites and diseases. The cotton worm appears to be attacked by various micro-organisms, but it may or may not be possible to cultivate them. A disease similar to Pebrine has been observed, and the Department is importing diseased larvae of other lepidopterous insects from abroad in order to test the possibility of introducing new insect diseases.

The parasites found in the cotton worm and boll worm in India and the West Indies are being introduced by the Department for

propagation in their laboratory. Keeping the boll worm in check by the introduction and multiplication of *Rhogas lefroyi* gives promise of success.

(3) The Department has proposed, and in some cases obtained, legislation under the following heads :—

(*a*) Protection of insectivorous birds.
(*b*) A revision of the Cotton Worm Law.
(*c*) A revision of the Boll Worm Law;

and the following additional proposal is in contemplation :—

A plant protection ordinance to prevent the introduction of insect and fungoid pests.

(4) Experiments of scientific value are contemplated to ascertain the optimum condition of humidity and temperature favouring the development of the cotton worm and the effect of humidity in retarding or accelerating the hatching of the cotton-worm moth from the pupa.

(5) It is contemplated testing the moth traps at present used in Egypt, with a view to evolve an efficient trap which can be cheaply constructed and which proves a suitable check upon the insects.

Organisation for the Execution of the Decrees concerning the Cotton-Worm and Boll-Worm.

COTTON-WORM, 1911.

The organisation necessary for ensuring the destruction of the eggs and caterpillars of the cotton worm, in accordance with the laws of 1905, 1906, 1907, and 1910, together with the Ministerial Orders on the subject, is in the hands of the Ministry of the Interior.

This organisation includes the whole of the executive staff in the provinces, from the Mudir or Governor of the Province, through the Mamur or head of an administrative district called the Markaz, to the Omda or headman of the village, with the Sheikhs or village elders.

Each of these is responsible for the work in his own district, the last unit being the Sheikh, who is charged with seeing that the work is properly done by the cultivators in a small portion of the village land which is allotted to him for this purpose.

All these authorities depend on the Ministry of the Interior for executive purposes, and for this reason the cotton-worm work is organised and carried out by that ministry, with the assistance and technical advice of the Department of Agriculture. This department had five inspectors in the provinces during this summer, and they were detailed to assist the Mudirs of the provinces in which they were posted by carrying out a general and continuous inspection of the work.

As a further assistance, a large temporary staff was appointed, as when the worm begins to appear all through the cotton districts it would be impossible for the ordinary staff to cope with the attack, especially as they are only appointed in sufficient numbers to deal with the ordinary duties of government.

The temporary staff consisted of 21 sub-inspectors and 296 Moawins, or assistants, subsequently increased to 330.

The sub-inspectors were mostly Europeans, and the great majority of them were possessed of the Diploma of the Agricultural School, to ensure a thorough knowledge of agriculture in the country. They were put in charge of a restricted number of Markazes, and their duties were constant patrolling and inspection of the villages and fields of these districts, to ensure the work being properly done in them by the Moawins and the executive, namely, Omdas and Sheikhs.

The Moawins were allotted similar duties in groups of villages, arranged according to the areas grown in cotton, with due consideration of the distances to be traversed. They had to report daily to the Mamurs the condition of the villages under their supervision, and, under the Mamur's orders, to see that the work was efficiently done.

A number of forms were used by which the Omdas reported daily to the Mamurs, and the latter to the Mudirs, the amount of land attacked by the worm and the amount cleared. The Mudirs reported weekly to the Ministry of the Interior.

In the third week of July it was found that the attack had suddenly assumed seriously abnormal proportions on the appearance of the second brood of worms.

The climatic conditions, unusually cool and damp, were unfavourable to the growth of the cotton, and at the same time most favourable to the increase of the worm. Besides this, the cotton was planted somewhat later than usual because last year cultivators who had sown early had to re-sow in large quantities, owing to the failure of the early sowings consequent on cold weather. The first brood, therefore, seems largely to have found the berseem a better crop in which to feed, and on the removal of the berseem the later broods attacked the cotton, which in the earlier period was comparatively exempt.

It is a curious trait of the ordinary fellah that he will not by himself take a step in such matters as these for his own interests. He is intensely conservative and distrustful of Government measures of a new sort, and it must be remembered that measures against cotton worm were first taken as recently as 1905. We are told, for instance, that in Mohammed Ali Pasha's time he was obliged to compel the fellaheen by force (which in those days included the now forgotten use of the courbash) to give proper attention to their crops, including the use of manure.

This summer, then, as previously, the fellah proved not only indifferent but often actually hostile to the measures taken to protect his crops, and, moreover, with his usual fatalism, prone to despair before the magnitude of the disaster threatened.

For all these reasons the task set to the executive authorities assumed exceptionally large proportions, and additional assistance was immediately given to them. Three Under-Secretaries of State went down into the provinces to see themselves that proper energy was applied, many officials of the Ministry of the Interior and other departments were detailed to take their share in the work, and boys and men to the number of 4,250 were sent down from Upper Egypt to pick the eggs and worms.

Further, strict orders were sent to the local authorities that they were to give this work precedence over all other, and all the officials, police and civilian, had duties assigned to them in connection with it.

The whole cotton country, in short, was put in a state of movement and energy, with the result that by the middle of August the attack was well in hand, and in many places quite subdued. The heat which then came so late was also useful in aiding the growth of the cotton and the destruction of the eggs and the young worms. By the middle of September the country was declared free, with the exception of the northernmost districts, which are always backward owing to the climate, and in which accordingly the work was continued until the end of September. The loss is estimated in most districts at about 5 to 8 per cent., in some it is only 1 to 3 per cent., but in the few worst and most exceptional districts as high as 16 to 20 per cent.

BOLL-WORM.

The Decree of 1909 lays down that all cotton sticks must be pulled up or uprooted by the end of December each year, and with them "bamia" and "til" (hemp) plants, so as to ensure the boll-worm being deprived of its food during the winter months, and thus as far as possible eradicated. An exception is made for "oqr" cotton—that is, cotton left over to a second season in the poor land of some of the northern districts. For this it is laid down that the "oqr" plants are to be cut down to a certain height (30 centimetres, reduced this year to 10) before January 15th of each year. In cases where the law is not carried out at the dates given, the administrative authorities are empowered to hire labourers to get the work done, charging the cost to the cultivators.

The organisation adopted by the Ministry of the Interior to ensure the carrying out of the law is the same as regards the local authorities as that for the cotton-worm work, from the Mudir down to the Sheikh. But as the work itself is very much easier and simpler, the temporary staff required is much smaller. It consisted in 1910 of one special inspector for the whole work and one sub-inspector aided by two Moawins for each province (with the exception of two of the larger provinces, which were provided each with two sub-inspectors and four Moawins). The special staff was employed from December 1st to January 15th, and the work was completed with, on the whole, but little delay.

It is proposed this year to employ six inspectors of the Agricultural Department, to be assisted by their own Moawins, 10 in number, and nine special sub-inspectors to be appointed from December 1st to the end of January.

It is now reported from many sources that the boll-worm this season has appeared in very small quantities, negligible in comparison to the attack of 1910, and it may be assumed that the measures taken last winter are largely to be credited with this decrease. Exception must, however, be made of the southernmost districts where boll-worm is still rife.

G. D. HORNBLOWER.

Cairo, *November 14th*, 1911.

Contract for the Purchase of Cotton by Ginner from Farmer or Banker, when the Price is to be fixed later.

On the undermentioned date, the undersigned..... residing at .....sells to Messrs. ..... at least ..... Cantars, at the most ..... Cantars, cotton from the village of ..... and under the following conditions :—

I. Said cotton is of ..... quality, seed cotton of the 191.. crop, consisting of ..... cantars first picking, and ..... cantars second picking : the cotton must be clean and free from such defects as *sakta*, dead leaves, damp, reddish colour, *mabrouma* or foreign qualities.

II. The weight of the cantar must be 315 rotles of seed cotton ; the weight of tare must be deducted, it is to be .....

III. The price per cantar shall be that of the contracts ruling on the Alexandria Exchange on the day of closing with an increase of .....Piastres already agreed upon.

The seller has the right of fixing the price from to-day up to the .....

The price shall be settled after the first closing of the Alexandria Exchange, either at noon or at evening, for the first month of the contracts of the new crop that is quoted on the official price boards of said Exchange ; the minimum quality must serve as a guide when establishing the price.

IV. All expenses up to point of delivery shall be paid by the seller.

V. The seller shall deliver the cotton to the purchaser as the picking advances, and he shall not hold back delivery of the cotton. He hereby undertakes to supply the minimum quantity sold which he guarantees to deliver and in no case, not even in case of "force majeure," shall he attempt to absolve himself of the consequences of non-delivery.

The purchaser shall give a receipt for each quantity delivered.

VI. The delivery shall take place at.....and commence for the first picking on ....., and shall terminate on ..... it shall commence for the second picking on.....and terminate .....

VII. When the seller desires to fix the price, he must advise the purchasers by wire (or by letter, provided it is delivered at the office of the purchaser not later than ..... o'clock) ..... hours before closing of the Exchange, Sundays and such holidays excluded as those on which no business is transacted in Alexandria.

The seller must state in his advice of price settlement the quantity for which he wants the price fixing ; if this is not done, it shall be understood to refer to the minimum quantity sold.

VIII. Consequent upon the undertaking of the seller, as per Article V., to deliver the minimum quantity, say ..... cantars, he agrees to pay to the buyer the difference in price on the quantity not delivered: this difference will be.....

If the price has not been fixed, the seller is bound, in case of a difference in the premium offered below or above the contract, to pay the difference between the premium agreed to according to Article III. and that actually ruling for the same cotton on the last day fixed for the end of the delivery, in the district where the cotton grows.

If the price has been fixed, the seller is bound, in case of a rise in the price of the contracts, to pay for any quantity short delivered, at the option of the purchaser:—

(*a*) either the difference between the settlement price .....of the premium agreed upon, as per Article III., and the price actually in force for similar seed cotton in the district where it is grown, on the last day fixed for the end of delivery.

(*b*) or the difference between the contract price on the day of the last settlement and the price of the contracts on the last day of delivery.

(*c*) It is nevertheless the right of the purchaser, and he has the option, to buy in the market the quantity short-delivered after a lapse of three days of the sending of an official note through the Mixed Tribunal; such purchase is for account and on the responsibility of the seller, who will then be bound to pay the difference between the purchase price and that of the settlement.

IX. If, by the....., the seller has not fixed the price, the closing price of the contracts of the same date will be considered by the parties as the settling price.

X. The buyers pay to the sellers against receipt the sum of .....as a token of good faith ("arrehs"), which will be deducted in proportion to each delivery from the price of the cotton.

XI. In case of delivery before the fixing of the price, the buyers shall, by demand of the seller, pay to the latter the amount which they may think advisable to advance beside the "arrehs," considering the state of the market and the contracts running. If in this case a fall in prices takes place so that the value of the cotton delivered does not cover the amount advanced, the buyers will be able to advise the seller by wire, or by writing, requesting them to remit within 24 hours a sum of P.T.....per cantar delivered, in order to cover the margin; failing arrival of the remittance the buyers have the right, if they deem fit, to fix the price without any responsibility and without any previous advice. When the price has been fixed it must be communicated to the seller.

XII. The buyers will supply the necessary sacks. Any sack which has remained in the hands of the seller will be debited to him at the rate of.....

XIII. When the delivery has been finished and the price been fixed, the account will be rendered. The party who then owes money must pay the balance due at once, and if the seller delays doing so, he shall pay interest at the rate of 9 per cent. per annum.

Executed in duplicate,

the.....191

Contract for the Purchase of Cotton by Ginner from Farmer at a fixed Price.

On the undermentioned date, the undersigned..... residing at.....sells to Messrs.....at least..... cantars, at the most.....cantars, cotton from the village of ..... and under the following conditions :-

I. Said cotton is of.....quality seed cotton of the crop of 191.., at the rate of.....cantars from the first picking, and.....cantars from the second picking. The cotton shall be clean, free from defects, such as "*sakta*," dead leaves, damp, reddish colour, *mabrouma* and foreign qualities.

II. The weight of the cantar to be 315 rotles of seed cotton, the weight of tare to be deducted at.....

III. The price per cantar shall be fixed at.....P.T.

IV. All the expenses up to the point of delivery shall be paid by the seller.

V. The seller shall deliver the cotton to the buyer at the rate at which the picking advances. For each quantity delivered a receipt shall be given to him by a representative of the buyer.

The seller shall not hold back delivery of the cotton, and binds himself to deliver the minimum quantity sold, which he guarantees to deliver, and in no case, not even in case of "force majeure," can he free himself from the consequences of non-delivery.

VI. The delivery shall take place at..... It shall commence on the.....and terminate for the first picking on the....., and re-commence on the.....and terminate on the.....for the second picking.

VII. The buyers advance to the seller a sum of..... as a token of good faith ("arrehs") against receipt; this shall be deducted from the price of cotton on delivery being made.

VIII. In consideration of the undertaking of the seller, as per Article V., to deliver the minimum quantity, viz.....cantars, he is bound, in case of a rise, to pay to the buyer the difference of price on the quantity not delivered; this difference shall be at the option of the buyers.

(*a*) The difference between the above sale price and the price ruling for similar cotton grown in that district, on the last day fixed for the delivery.

(*b*) The buyers have the right and power to buy in the market the quantity short-delivered three days after sending an official note through the Mixed Tribunal; such purchase is for account and responsibility of the seller, who shall then be bound to pay the difference between the purchase price and the above price.

IX. The buyer shall supply to the seller the necessary sacks. Any sacks which have remained in the hands of the seller shall be debited to him at the rate of.....P.T.

X. When the delivery has been finished, accounts shall be rendered. The party who then owes money shall pay at once the balance due, and in case of delay on the part of the seller, interest at the rate of 9 per cent. per annum shall be charged from the day fixed as the end of delivery.

Executed in duplicate,

the.....191...

Copy of an Account Sale between Bank and Farmer.

.....BANK..... No.....

ALEXANDRIA.

Account Sales of 35 bales cotton sold for..... account and risk of.....at..... on the 29th September, 1911.

Lot 61. B/35		C. 322·46	P.T.	
Tare	6·30			
Damp & Samples	3·35	9 65		
		312·81	377·½	118,085·8
Expenses.				
Receiving, carting, and errands			P.T.	
		3 per bale	105	
Storage		2 „ „	70	
.....				
Insurance		@ 5/16%	369	
.....				
Weighing and Watching		25/40 par Cantar....	201·3	
Gratuities		20/40 par Balle	17·5	
Taxes	½%	.....	29·5	
Postages	½%	.....	29·5	
Brokerage	½% }			
Commission	½% }	1½.....	1,476·1	2,297·9
				115,787·9
S.E. & O.	Credited on the 30th Sept., 1911 ..			113,500
	Valeur ce jour			2,287·9

Alexandria, October 30th, 1911.

For the.....Bank.....

Alexandria-Branch.

.....*Manager.*

N.B.—Please take note that this cotton has not yet been pressed. We are sending you nevertheless enclosed the Net amount of the Account sales under your responsibility, because should the buyers find damaged cotton inside the bales *when they press it or excess of moisture, we shall claim from you as per* the recognised usage of our market.

Copy of Lease of Land.

THE ABOUKIR COMPANY LIMITED.

.....*Division*

No.....

Between.....acting for THE ABOUKIR COMPANY, LIMITED

hereinafter called the Lessor

and.....hereinafter called the Lessee.

ARTICLE 1.—The Lessor lets to the Lessee *the* land inscribed at the rents and for the period stated in this Table.

KISM.... HOD....				DATE OF ENTRY.	Years.	RENT PER FEDDAN.			AMOUNT.			REMARKS.
Hos-hay.	Gatta.	Fed.	Kir.			1	2	3	1	2	3	
Total Area						*Total Rental*						

ARTICLE 2.—The Lessee accepts the Lease of the said Land in its present condition and hereby declares his full knowledge of the same and renounces all right to object either to the quantity or condition thereof or otherwise at this or at any future time.

ARTICLE 3.—*The Lessee shall* at his own expense maintain in good condition all the water-lifting machines, drains, irrigating canals and roads within the limits of the said Land and shall also, from time to time and without charge, co-operate in the work of cleaning the large drains and irrigating canals serving the said Land.

ARTICLE 4.—*The Lessor shall be responsible for all Government taxes.*

ARTICLE 5.—If, through accident, "force majeure," or other circumstances beyond the control of the Lessor, the crops or seeds of the Lessee should be injured or destroyed, or, if through inundation or scarcity of water, the Lessee should be prevented from preparing, sowing, or cultivating the said Land, he shall have no claim to any diminution of the said rent, or to any other indemnity.

ARTICLE 6.—The Lessee shall not assign or sub-let the said Land or any part thereof without the written consent of the Lessor.

ARTICLE 7.—The Lessee shall not, under any pretext, abandon the cultivation of the said Land. He shall maintain the same in good condition and shall cultivate the same according to the best agricultural usages. Only one-third of the land shall be cultivated in summer crop, and cotton shall only be sown on the same land after an interval of two years. The cotton crop as harvested shall be delivered daily to the magazine of the Lessor, who shall sell the same at his discretion in payment of any rent or other debt due, and account to the Lessee for the Balance.

ARTICLE 8.—*On the termination of the lease the Lessee* shall give up possession of the land, buildings, and constructions all in thorough order without any indemnity for growing crops, or for any *buildings or constructions.*

ARTICLE 9.—The Lessee shall permit the Lessor or his Agents at all reasonable times to enter upon the said Land and inspect the same and the canals and drains within the limits of the same.

ARTICLE 10.—The rent shall be payable yearly, on the first day of November, and the first rent shall be due on the first day of November following the date of entry to the said Land.

ARTICLE 11.—The Lessee shall at all times reside in the villages on the Lessor's property and shall not rent any Land not on the Lessor's property without the written consent of the Lessor.

ARTICLE 12.—In the event of the Lessee making default in payment of the rent on the days fixed for the same, the Lessor shall be at liberty to take possession of all crops and cattle belonging to the Lessee and to sell them in payment of rent due.

ARTICLE 13.—In the event of the Lessee failing to comply with any of the conditions of this contract, or doing or suffering any act or thing to be done, whether by judicial process or acts of his own or otherwise, whereby the Lessor's security for the payment of the said rent may be diminished, or whereby the Lessee makes himself obnoxious to other tenants on the Lessor's property, or which are prejudicial to the interests of the Lessor and his tenants or Inhabitants of his villages, the Lessor shall be at liberty to eject the Lessee from possession of said Land without being liable for any claim for damages, interest, or any other claims whatsoever.

ARTICLE 14.—In the event of the Lessor selling all or any part of the said Land or of the Lessor's title to the said Land or any part thereof being invalidated by a judicial decision at the instance of third parties, this Lease shall cease and determine at the end of the then current year without giving to the Lessee any right to indemnity or damages.

ARTICLE 15.—The Lessee shall not remove any of his live-stock from the Land and shall not sell or in any way diminish his ownership in any such stock without the written consent of the Lessor or his Agents.

Date.....190

Lessor ..... Lessee .....

ACTING FOR THE ABOUKIR COMPANY LIMITED.

Witness ..... *Witness* .....

List of Publications dealing with Egyptian Cotton.

THE AGRICULTURAL JOURNAL OF EGYPT. Published by the Department of Agriculture. Cairo.

AREAS PLANTED IN COTTON IN 1909 AND IN 1910 (2 vols.). By E. M. Dowson. Director-General of the Survey Department, and J. I. Craig, M.A., F.R.S.E.; published by the Survey Department, Cairo.

MOVEMENTS OF THE SUBSOIL WATER IN UPPER EGYPT. By H. T. Ferrar; published by the Survey Department, Cairo. 1911.

STUDIES OF EGYPTIAN COTTON. By W. Lawrence Balls, M.A. Year Book of the Khedivial Agricultural Society, Cairo, for 1909.

ANNUAIRE STATISTIQUE DE L'EGYPTE, 1911. Statistical Department, Cairo. (Also an English edition, 1909.)

POLITICAL ECONOMY FOR EGYPTIAN STUDENTS. By John A. Todd, B.L.; published by Wm. Hodge & Co., Glasgow and Edinburgh.

YEAR BOOKS OF THE KHEDIVIAL AGRICULTURAL SOCIETY, CAIRO.

TEXT BOOK OF EGYPTIAN AGRICULTURE. Published by the Ministry of Education, Egypt.

ERWACHENDE AGRARLAENDER. By Siegfried Strakosh, Vienna: published by Paul Parey, Berlin.

COTTON INVESTIGATIONS IN 1909 AND 1910. By W. Lawrence Balls, M.A.; published in Cairo Scientific Journal, No. 60, Sept., 1911.

SOME COMPLICATIONS IN MENDELIAN COTTON BREEDING. By same Author; published by L'Institut égyptien, 5me série.

THE PROSPECTS OF THE EGYPTIAN COTTON CROP. By same Author; published in the Cairo Scientific Journal, No. 39, December, 1909.

THE PHYSIOLOGY OF THE COTTON PLANT. By same Author: published in the Cairo Scientific Journal, No. 46, July, 1910.

THE EFFECT OF SUBSOIL WATER ON THE COTTON CROP. By same Author. Also a NOTE ON A METHOD OF TAKING WATER LEVELS. By F. Hughes, F.C.S.: published by the Khedivial Agricultural Society, April, 1910.

RAPPORTS PAR M. AUDEBEAU BEY POUR 1909 ET 1910. Ingénieur en Chef des Domaines de l'Etat Egyptien; published by the State Domain Administration, Cairo.

EGYPTIAN IRRIGATION. By Sir Wm. Wilcocks (new edition in preparation).

THE NILE IN 1904. By Sir Wm. Wilcocks.

THE NILE RESERVOIR DAM AT ASSUAN AND AFTER 1903. By the same Author.

THE HISTORY OF THE BARRAGE AT THE HEAD OF THE DELTA OF EGYPT, 1896. By Major R. H. Brown; and another similar work by the same Author in 1902.

PRELIMINARY NOTE ON THE SUBSOIL WATER IN LOWER EGYPT. By H. T. Ferrar: published by the Survey Department, 1910.

RAPPORT GÉNÉRAL DE LA COMMISSION DU COTON, 1910. Imprimerie Nationale, Cairo.

THE ASSUAN RESERVOIR AND LAKE MOERIS, 1904.

THE WHITE NILE AND THE COTTON CROP. Two papers read by Sir Wm. Wilcocks before the Khedivial Geographical Society, 1907 and 1908.

THE DRAINAGE OF THE DELTA OF EGYPT. By E. W. Perceval Foster, C.M.G., of the Behera Company, Alexandria, 1910.

INSECTS INJURIOUS TO THE COTTON PLANT IN EGYPT, AND OTHER PAPERS. By F. C. Willcocks, *Entomologist to the Khedivial Agricultural Society*; published in their Year Books 1905, 1906, and 1909.

APPENDIX IV.

STATISTICS. STATUTES, &c.

COPIES of the STATISTICS

ISSUED BY

The International Federation of Master Cotton Spinners' and Manufacturers' Associations

IN REGARD
TO THE CONSUMPTION OF COTTON AND
STOCKS OF COTTON IN SPINNERS' HANDS

CONSUMPTION OF COTTON FOR YEAR ENDING AUGUST 31st, 1912

(Spinners' Returns.)

COUNTRIES	Number of Spinning Spindles in work. Actual Returns	CONSUMPTION IN ACTUAL BALES. American.	East Indian.	Egyptian.	Sundries.	TOTAL	TOTAL WORLD Estimated Number of **Spinning** Spindles
GREAT BRITAIN	48,733,945	3,289,976	39,957	329,957	105,708	3,765,462	55,317,083
GERMANY	10,562,082	1,375,694	224,116	106,836	63,640	1,770,286	10,725,732
RUSSIA**	7,769,907	545,831	18,369	72,251	1,398,628*	2,035 079	8,800,000
FRANCE	7,146,810	804,516	82,538	73,727	27,062	987,843	7,400,000
INDIA	4,415,588	79,552	1,524,032	1,052	1,915	1,606,551	6,195,214
AUSTRIA	4,797,935	644,812	162,373	33,543	23 368	804,096	4,797,935
ITALY	3,023,004	616,162	101,842	21,245	13,511	812,760	4,580,000
SPAIN	1,900,000	284,890	13,308	15,410	10,142	323,750	2,200,000
JAPAN	2,026,839	365,240	810,464	20,515	145,620	1,341 839	2,191,960
SWITZERLAND	1,285,246	59,606	2,824	25,112	3,289	90,831	1,408,456
BELGIUM	1,387,654	171,899	60,998	537	948	234,382	1,387,654
SWEDEN	378,092	73,626	4,875	128	98	78,727	529,772
PORTUGAL	410,000	50,260	1,020	980	15,680	67,940	480,000
HOLLAND	453,752	73,962	8,822	—	2,033	84,817	453,752
DENMARK	83,684	24,342	331	—	472	25,145	83,684
NORWAY	73,568	9,690	894	—	201	10,785	73,568
U. S. AMERICA†	30,313,000	5,308,000	*not stated*	*not stated*	*not stated*	5,308,000	30,313,000
CANADA	778,346	114,665	—	453	300	115,418	855,293
MEXICO, BRAZIL, &c.***	597,620	4,607	—	375	242 699	247,681	2,900,000
TOTAL	126,737,132	13,957,330	3,116,763	701,985	2,055,314	19,831 392	140,693,103
TOTALS							
August 31st, 1911.....	121,277,197	11,559,401	3,647,714	664,822	1,947,133	17,819,070	137,278,752
August 31st, 1910.....	119,473,025	11,145,178	3,683,912	639,596	1,561,825	17,030,511	133,384,794
August 31st, 1909.....	115,971,004	12,098,280	2 479,315	781,107	1,308,735	16,667 437	131,503,062

†The figures for the U.S.A. have been supplied by the Census Bureau at Washington, D.C. The 5,368,000 bales represent bales of 500 lbs. each.

* Mostly Russian Cotton, bales of 270-290 lbs. each.

** The figures for Poland and Finland are [illegible]

STOCKS OF COTTON IN SPINNERS' HANDS on the 31st AUGUST, 1912.

("Invisible Supply"—Spinners' Returns.)

COUNTRIES	Number of Spinning Spindles, Actual Returns	STOCKS IN ACTUAL BALES. American.	East Indian.	Egyptian.	Sundries	TOTAL.	TOTAL WORLD Estimated Number of Spinning Spindles.
GREAT BRITAIN	48,733,945	245,839	10,826	74,438	29,722	360,825	55,317,083
GERMANY	10,562,082	197,838	59,832	25,186	15,402	298,258	10,725,732
RUSSIA**	7,769,907	95,148	4,555	19,606	480,524*	599,833	8,800,000
FRANCE	7,146,810	89,004	36,534	19,794	8,350	153,682	7,400,000
INDIA	4,415,588	64,440	420,622	325	736	486,123	6,195,214
AUSTRIA	4,797,035	99,857	59,359	7,086	4,505	170,807	4,797,935
ITALY	3,623,004	93,948	32,901	4,178	2,100	133,127	4,580,000
SPAIN	1,900,000	30,104	4,182	1,540	2,454	38,280	2,200,000
JAPAN	2,026,839	152,847	385,904	8,564	16,514	563,889	2,191,960
SWITZERLAND	1,285,246	12,090	877	7,951	510	21,428	1,408,456
BELGIUM	1,387,654	21,862	28,513	102	333	50,810	1,387,654
SWEDEN	378,092	10,644	725	272	1	11,642	529,772
PORTUGAL	410,000	5,980	390	280	1,850	8,500	480,000
HOLLAND	453,752	8,304	2,178	—	263	10,745	453,752
DENMARK	83,684	1,321	—	—	145	1,466	83,684
NORWAY	73,568	1,484	593	—	105	2,182	73,568
U. S. AMERICA†	30,313,000	871,000	—	*not stated*	—	871,000	30,313,000
CANADA	778,346	41,319	—	398	275	41,992	855,293
MEXICO, BRAZIL, &c.***	597,620	1,076	—	315	43,560	44,951	2,900,000
TOTAL	126,737,132	2,044,105	1,048,031	170,035	607,349	3,869,540	140,693,103
TOTALS							
August 31st, 1911.....	121,277,197	1,135,166	997,492	127,569	448,825	2,619,052	137,278,752
August 31st, 1910.....	119,473,025	1,123,828	995,892	111,718	292,350	2,523,786	133,384,794
August 31st, 1909.....	115,971,004	1,887,600	757,041	201,810	336,941	3,183,392	131,503,062

† The figures for the U.S.A. have been supplied by the Census Bureau at Washington, D.C. The 871,000 bales represent bales of 500 lbs. each.
* Mostly Russian Cotton, bales of 270-290 lbs. each.
** The figures for Poland and Finland are given separately on page 8.

COTTON SPINNING SPINDLES, 31st AUGUST, 1912. (Spinners' Returns.)

Countries	Mule Spindles in work as per Returns	Ring Spindles in work as per Returns	Spindles spinning Egyptian Cotton as per Returns	Spindles spinning American East Indian and Sundry Cottons as per Returns	Spindles in course of Construction as per Returns	Total Number of Spindles as per Returns in work at present	Total World Estimated Number of **Spinning** Spindles
GREAT BRITAIN	39,848,727	8,885,218	13,256,816	35,477,129	461,172	48,733,945	55,317,083
GERMANY	5,302,120	5,259,962	*1,376,070*	*9,186,012*	271,286	10,562,082	10,725,732
RUSSIA	3,247,204	4,522,703	951,296	6,818,611	186,440	7,769,907	8,800,000
FRANCE	3,967,536	3,179,274	1,439,632	5,707,178	73,640	7,146,810	7,400,000
INDIA	1,200,015	3,215,573	20,258	4,395,330	192 688	4,415,588	6,195,214
AUSTRIA	2,527 267	2,270,068	556,513	4,241,422	126,544	4,797,935	4,797,935
ITALY	991,199	2,631,865	198,680	3,424,384	...	3,623,064	4,580,000
SPAIN	760,000	1,140,000	—	1,900,000	...	*1,900,000*	*2,200,000*
JAPAN	39,845	1,986,990	278,908	1,747,931	103 000	2,026,839	2,191,960
SWITZERLAND	1,052,438	232,808	850,000	435,246	-	1,285,246	1,408,456
BELGIUM	541,418	846,236	4,300	1,383,354	40,288	1,387,654	1,387,654
SWEDEN	107,268	270,824	—	378,092	—	378,092	529,772
PORTUGAL	100,000*	310,000*	—	*410 000*	4,000	410,000	480,000
HOLLAND	195,072	258,680	—	453,752	—	453,752	453,752
DENMARK	13,376	70,308	—	83,684	—	83 684	83,684
NORWAY	36,736	36,832	—	73,568	—	73,568	73,568
U. S. AMERICA	5,000,000	25,313,000*	660,000*	29,653,000	*not stated*	*30,313,000*	30,313,000
CANADA	374,565	403,781	12,350	765,996	—	778,346	855,293
MEXICO, BRAZIL, &c...	6,284	591,336	—	597,620	37,172	597,620	*2,900,000*
TOTAL	**65,311,070**	61,426,062	19,604,823	107,132,309	1,496,230	120,737,132	140,693,103

* Approximately.

VISIBLE SUPPLY.

(As published in *Cotton*, August 31st, 1912.)

The following statement, in thousands of bales, includes English, Continental, American, Egyptian, and East Indian Stocks and Afloat up to 30th Aug., 1912, and the corresponding dates in the previous three years:—

	1912	1911	1910	1909
AMERICAN.				
STOCK—Liverpool and Manchester†	497	263	248	752
Continent	336	94	138	302
U.S. Ports	286	197	227	193
U.S. Interior	91	97	60	81
AFLOAT—Great Britain *	42	61	34	6
Continent	70	138	87	78
TOTAL	1,322	850	784	1,412
EGYPTIAN.				
STOCK—Liverpool and Manchester†	49	54	25	39
Continent	2	1	1	3
Alexandria	32	42	37	45
AFLOAT—Great Britain	8	—	4	12
Continent	2	2	3	3
TOTAL	93	99	70	102
EAST INDIAN.				
STOCK—Liverpool and Manchester†	9	40	25	7
London	10	11	5	18
Continent	21	37	38	29
Bombay Harbour*	6	1	22	2
AFLOAT—Great Britain	12	7	6	13
Continent	56	26	48	41
TOTAL	114	122	144	108
SUNDRIES.				
STOCK—Great Britain	87	101	39	54
Continent	7	9	7	6
AFLOAT—Great Britain	21	19	11	10
Continent	—	—	—	—
TOTAL	115	129	57	70
GRAND TOTAL	1,644	1,200	1,055	1,692
* *Bombay on Shore not included*	454	310	320	172

† The Manchester Stock included is that lying in Dock Warehouses only.

STOCKS.

	1912	1912	AUG. 30TH. 1911
	THIS WEEK	LAST WEEK	
LIVERPOOL:			
AMERICAN	472,340	520,810	258,950
BRAZILIAN	34,110	24,410	50,200
EGYPTIAN	32,800	36,060	44,600
PERUVIAN	32,240	33,970	39,630
WEST INDIAN, &C.	3,260	2,990	1,800
AFRICAN	16,160	15,810	8,090
EAST INDIAN, &C.	8,850	8,360	39,670
TOTAL	599,760	642,410	442,940
* MANCHESTER	60,512	73,268	27,957
LONDON	11,165	14,370	11,706
UNITED STATES:			
At the PORTS	286,000	252,000	197,000
,, INTERIOR TOWNS (28)	91,000	87,000	97,000
NEW YORK	115,000	119,000	90,000
NEW ORLEANS	23,000	23,000	27,000

* AMERICAN.—Dock Warehouses, 25,434 bales; Transit Warehouses, 26,480 bales. Total, 51,914 bales. BRAZILIAN.—Dock Warehouses, — bales; Transit Warehouses, — bales. Total, — bales. PERUVIAN.—Dock Warehouses, 60 bales; Transit Warehouses, — bales. Total, 60 bales. EGYPTIAN.—Dock Warehouses, 16,213 bales; Transit Warehouses, 300 bales. Total 16,513 bales. EAST INDIAN, etc.—Dock Warehouses, — bales; Transit Warehouses, 1,025 bales; Total, 1,025 bales. Grand Total 69,512 bales.

The following Stocks at RUSSIAN Ports are NOT included in the above statement.

	American	Egyptian	East Indian	Sundries.
ST. PETERSBURG	6,150	—	—	—
REVAL	6,441	—	—	—
RIGA	1,863	—	—	—
ODESSA	—	1,365	—	—
WINDAU	—	—	—	—
TOTAL BALES 1912	14,254	1,365	—	—
,, ,, 1911	7,574	730	—	—
,, ,, 1910	10,252	2,732	1,271	1,212

MILL STOCKS AND CONSUMPTION OF ALL KINDS OF COTTON,

on the basis of Spinners' Returns, calculated per 1,000 Spindles.

COUNTRIES	MILL STOCKS (Actual Bales), 31st August.						CONSUMPTION (Actual Bales), for Year ending 31st August.					
	1912	1911	1910	1909	1908	1907	1912	1911	1910	1909	1908	1907
GREAT BRITAIN	7·40	4·27	4·47	6·93	7·80	9·48	77·27	70·47	63·50	65·82	72·74	80·24
GERMANY	28·24	23·66	26·98	33·13	34·68	54·46	167·61	165·23	165·69	173·64	181·45	180·72
RUSSIA	77·20	67·21	57·57	60·88	76·40	64·42	261·92	266·43	264·99	236·56	260·07	233·42
FRANCE	21·50	18·54	19·63	26·07	24·46	28·80	138·22	132·99	133·56	139·09	141·17	139·85
INDIA	110·09	85·78	86·97	108·15	93·57	—	363·84	352·18	360·35	387·29	399·26	—
AUSTRIA	35·60	30·06	31·97	42·81	55·82	77·24	180·10	172·08	176·54	184·45	183·77	196·68
ITALY	36·74	36·08	30·10	43·35	61·66	89·81	224·33	214·66	192·44	235·38	245·68	255·01
SPAIN	20·15	19·77	27·55	49·54	12·27	32·44	170·39	179·17	148·83	172·15	185·43	184·32
JAPAN	278·21	174·12	161·69	196·55	159·43	267·36	662·04	716·98	684·88	611·43	625·31	787·19
SWITZERLAND	16·67	9·64	9·17	12·15	13·56	18·79	70·67	59·95	60·38	64·82	63·60	63·21
BELGIUM	36·62	32·27	27·37	37·90	38·88	51·43	168·91	178·32	149·79	170·75	182·76	174·76
SWEDEN	30·79	36·24	44·28	40·78	48·59	54·86	208·22	205·01	208·45	187·94	227·84	234·22
PORTUGAL	20·73	19·72	20·17	17·88	30·21	49·13	165·71	156·96	121·87	137·63	186·19	242·84
HOLLAND	23·68	21·23	22·31	22·79	17·15	43·65	186·92	191·68	182·42	201·44	195·19	186·69
DENMARK	17·52	18·10	13·33	9·61	19·10	24·20	300·48	273·29	236·18	297·17	267·82	—
NORWAY	29·66	23·36	26·27	21·72	24·54	30·08	146·60	152·31	153·52	148·46	150·20	161·87
U.S. AMERICA	28·73	18·11	8·27	32·68	21·40	37·95	177·09	162·65	166·01	183·03	164·30	196·03
CANADA	53·95	11·07	14·36	33·10	29·13	—	138·29	138·83	150·08	146·72	144·50	—
MEXICO, BRAZIL, &c.	75·22	50·34	61·86	59·98	59·40	—	411·45	361·44	351·89	457·40	—	—

GENERAL.—The owners of more than 90 per cent. of the total spindles in the world have made returns; it must be, however, borne in mind, when drawing conclusions from the figures in these tabulations, that the consumers of American and Egyptian Cotton are represented by a higher percentage than 90, as the missing 10 per cent. is partly accounted for through the smaller response from India, Mexico, Brazil, Turkey, &c., where indigenous cottons are almost exclusively used.

The total number of Spinning Spindles in work is, for most countries, arrived at by the addition of the comparatively few spindles which have not sent returns to those actually reported. When referring to Cotton Consumption, even cotton experts, brokers, and others frequently fall into the error of not distinguishing between doubling, waste, and spinning spindles. Doubling and waste spindles do not use raw cotton, and are *not* included in these statistics.

The **CURTAILMENT OF PRODUCTION,** as given below, has been calculated over the total number of spinning spindles for which returns have been received:—

England	France	Austria	Italy
55·5 hours due mainly to coal strike and weavers' lock-out.	54 hours	180 hours	160·94 hours

Japan		Holland
27·5 per cent. on coarse yarns)	until	7·4 hours
20 per cent. on fine yarns)	March, 1912.	

Mexico	Norway	India
85·3 hours	307·7 hours due to a strike	44·64 hours

INDIA, JAPAN, MEXICO, BRAZIL. Owing to the long distances which separate these countries from the offices of the International Federation, the spinners in these countries have been asked to make their returns up to the 15th August instead of 31st.

RUSSIA.—Most of the bales figuring in the "Sundries" are of Russian cotton weighing 270lbs. to 290lbs. each.

FINLAND AND POLAND are included in the figures for Russia. The separate figures for these countries are:—

Finland—	Mule Spindles				41,716	
	Ring Spindles				68,968	
	Total				110,684	
	American	East Indian	Egyptian	Sundries	Total	
Consumption	16,512	51	111	—	16,674	
Stocks	2,498	—	45	—	2,543	
Poland—	Mule Spindles				392,068	
	Ring Spindles				519,766	
	Total				911,834	
	American	East Indian	Egyptian	Sundries	Total	
Consumption	117,594	12,773	5,173	185,633	321,173	
Stocks	12,998	3,670	2,024	73,626	92,318	

MEXICO AND BRAZIL.—The separate figures are:—

Mexico—	Mule Spindles				6,284	
	Ring Spindles				217,578	
	Total				223,862	
	American	East Indian	Egyptian	Mexican	Total	
Consumption	4,607	—	375	34,607	39,589	bales
Stocks	1,067	—	315	5,220	6,611	,,
Brazil—	Mule Spindles			4,940		
	Ring Spindles			339,342		
	Total			344,282		
				Brazilian		
	Consumption			199,642	bales	
	Stocks			37,188	,,	

UNITED STATES OF AMERICA.—The figures have been cabled by the Bureau of the Census, Washington, D.C., and represent bales of 500lbs. each. About 125,000 bales of Egyptian Cotton have been shipped during last season to the U.S.A. and these are included in the figures given by the U.S. Census Bureau.

ARNO SCHMIDT, *Secretary.*

MANCHESTER, *September 30th*, 1912.

STOCKS OF COTTON IN SPINNERS' HANDS on the 1st MARCH, 1912.

("Invisible Supply"—Spinners' Returns.)

COUNTRIES	Number of Spinning Spindles. Actual Returns	STOCKS IN ACTUAL BALES.					TOTAL WORLD. Estimated Number of **Spinning** Spindles.
		American.	East Indian.	Egyptian.	Sundries.	TOTAL.	
GREAT BRITAIN	48,220,302	287,276	8,104	101,929	32,834	430,143	55,164,794
GERMANY	10,335,274	249,545	35,252	33,272	10,513	328,582	10,598,752
FRANCE	7,155,079	123,983	16,504	27,716	10,059	178,262	7,400,000
RUSSIA†††	7,320,117	111,120	2,642	15,220	412,840††	541,822	8,800,000
INDIA	3,712,773	24,077	299,849	254	28,036	352,216	6,300,000
AUSTRIA	4,718,282	137,787	29,959	9,130	7,510	184,386	4,718,282
ITALY	3,382,377	110,003	23,287	5,613	2,005	140,908	4,022,065
SPAIN	1,713,220	47,500	9,600	2,340	7,200	66,640	1,853,000
JAPAN	2,176,960	65,699	90,447	4,598	12,612	173,356	2,176,960
SWITZERLAND	1,235,198	16,298	355	10,032	635	27,320	1,407,272
BELGIUM	1,371,975	40,455	14,812	80	1,168	56,515	1,371,975
PORTUGAL	390,520*	7,440	234	134	1,850	9,658	480,000
HOLLAND	454,412	7,905	1,256	—	264	9,425	454,412
SWEDEN	386,454	12,748	2,022	317	1	15,088	529,772
NORWAY	74,536	1,492	155	—	37	1,684	74,536
DENMARK	83,160	1,480	—	—	—	1,480	83,160
U.S. AMERICA†	29,522,597*	1,543,000	—	*not stated*	—	1,543,000	29,522,597
CANADA	609,905	26,052	—	—	—	26,052	855,293
MEXICO, BRAZIL, &c.**	700,985	2,082	65	—	111,729	113,876	2,900,000
TOTAL	123,564,126	2,815,942	534,543	210,635	639,293	4,200,413	139,312,870
TOTAL March 1st, 1911	122,226,091	2,565,500	707,767	205,247	582,226	4,060,740	135,596,724

* Approximately.

** BRAZIL: 453,602 spindles reported, with 34,616 bales Brazilian cotton in stock. MEXICO: 247,383 spindles reported, with 2,082 bales American, 65 bales East Indian, 76,759 bales Mexican, and 354 bales Sundries.

† The Stock figures for the U.S.A. have been supplied by the Census Bureau in Washington, D.C. The 1,543,000 represent bales of 500 lbs. each. The Census Bureau states that the consumption for the first half year has been 2,623,000 bales against 2,401,000 bales in the corresponding six months of 1911, and against 2,527,000 in 1910 season.

†† Mostly Russian and Persian cotton, bales of 370,000 lbs. each. ††† [illegible]

COTTON SPINNING SPINDLES, 1st MARCH, 1912. (Spinners' Returns.)

Countries	Mule Spindles in work as per Returns	Ring Spindles in work as per Returns	Spindles spinning Egyptian Cotton as per Returns	Spindles spinning American, East Indian, and Sundry Cottons as per Returns	Spindles in course of Construction as per Returns	Total Number of Spindles as per Returns in work at present	Total World. Estimated Number of **Spinning** Spindles
GREAT BRITAIN	39,776,223	8,444,079	12,322,328	35,897,974	710,332	48,220,302	55,164,794
GERMANY	5,193,212	5,142,062	1,255,202	9,080,072	188,119 *	10,335,274	10,598,752
FRANCE	4,019,764	3,135,315	1,385,344	5,769,735	89,292	7,155,079	7,400,000
RUSSIA	3,220,728	4,099,389	839,854	6,480,263	139,524	7,320,117	8,800,000
INDIA	953,323	2,759,450	—	3,712,773	?	3,712,773	6,300,000
AUSTRIA	2,537,404	2,180,818	580,347	4,137,935	103,284	4,718,282	4,718,282
ITALY	874,598	2,507,779	229,708	3 152,669	50,240	3,382,377	4,622,065
SPAIN	600,050	1,113,170	—	1,713,220	—	1,713,220	1,853,000
JAPAN	53,040	2,423,920	246,464	1,930,496	15,000	2,176,960	2,176,960
SWITZERLAND	1,007,082	228,116	850,000	385,198	—	1 235,198	1,407,272
BELGIUM	486,463	885,512	5,800	1,366,175	23,072	1 371,975	1 371,975
PORTUGAL	100,000*	290,520*	2,500	388,020	?	390,520*	480,000
HOLLAND	198,988	255,424	—	454,412	—	454,412	454,412
SWEDEN	108,868	277,586	750	385,704	—	386,454	529,772
NORWAY	21,076	53,460	—	74,536	—	74,536	74,536
DENMARK	52,684	30,476	—	83,160	—	83,160	83,160
U. S. AMERICA	5,500,000*	24,022,597*	650,597*	28,872,000	?	29,522,597	29,522,597
CANADA	310,737	299,168	—	609,905	—	609,905	855,293
MEXICO, BRAZIL, &c.	35,536	665,449	—	700,985	720	700,985	2,900,000
TOTAL	65,049,836	58,514,299	18,368,894	105,195,232	1,319,583	123,564,126	139,312,870

*Approximately.

VISIBLE SUPPLY

(As published in *Cotton*, March 2nd, 1912).

The following statement, in thousands of bales, includes English, Continental, American, Egyptian, and East Indian Stocks and Afloat up to 1st March, 1912, and the corresponding dates in the previous three years:—

AMERICAN.	1912.	1911.	1910.	1909.
Stock Liverpool and Manchester†	1,033	1,239	888	1,356
Continent	902	665	746	935
U.S. Ports	1,348	704	650	760
U.S. Interior	546	518	563	681
Afloat—Great Britain	362	191	77	184
Continent	628	375	180	275
Total	4,819	3,642	3,104	4,191
EGYPTIAN.				
Stock—Liverpool and Manchester†	82	91	36	75
Continent	3	6	4	7
Alexandria	274	243	172	310
Afloat—Great Britain	35	18	23	30
Continent	9	17	8	8
Total	403	375	243	430
EAST INDIAN.				
Stock—Liverpool and Manchester†	5	5	26	8
London	2	5	2	5
Continent	15	17	38	24
Bombay Harbour*	8	15	22	13
Afloat—Great Britain	5	6	20	11
Continent	78	167	225	176
Total	113	215	333	237
SUNDRIES.				
Stock—Great Britain	44	46	17	43
Continent	8	7	8	8
Afloat—Great Britain	8	8	6	5
Continent	1	—	—	
Total	61	61	31	56
GRAND TOTAL	5,396	4,293	3,711	4,914
*Bombay on Shore not included	620	442	580	440

† The Manchester Stock included is that lying in Dock Warehouses only.

STOCKS.

	1912 THIS WEEK	1912 LAST WEEK	MARCH 1ST. 1911
LIVERPOOL:			
American	992,930	987,860	1,180,920
Brazilian	15,340	15,910	31,830
Egyptian	61,280	72,180	70,160
Peruvian	21,940	23,040	6,200
West Indian, &c.	1,290	1,360	1,380
African	4,400	5,080	3,860
East Indian, &c.	4,890	5,280	4,840
Total	1,102,070	1,110,710	1,299,190
*Manchester	91,578	91,898	117,338
LONDON	3,168	2,490	8,530
UNITED STATES:			
At the Ports	1,348,000	1,467,000	704,000
At the Interior Towns (28)	546,000	582,000	518,000
New York	174,000	173,000	267,000
New Orleans	276,000	318,000	152,000

* American.—Dock Warehouses, 39,890 bales; Transit Warehouses, 27,009 bales. Total, 66,899 bales. Brazilian.—Dock Warehouses, — bales; Transit Warehouses, 298 bales. Total, 298 bales. Peruvian.—Dock Warehouses, — bales; Transit Warehouses, 50 bales. Total, 50 bales. Egyptian. —Dock Warehouses, 21,488 bales; Transit Warehouses, 2,429 bales. Total, 23,917 bales. East Indian, &c.—Dock Warehouses, 75 bales; Transit Warehouses, 339 bales. Total, 414 bales. Grand total, 91,578 bales.

The following Stocks at RUSSIAN Ports are NOT included in the above statement.

	American	Egyptian	East Indian	Sundries
St. Petersburg	100	—	—	—
Reval	8,973	—	—	—
Riga	2,038	—	—	—
Odessa	—	1,563	—	—
Windau	1,416	—	—	—
Total Bales 1912	12,527	1,563	—	—

MILL STOCKS AND CONSUMPTION OF ALL KINDS OF COTTON,

on the basis of Spinners' Returns, calculated per 1,000 Spindles.

Countries	MILL STOCKS (Actual Bales), 1st March.				CONSUMPTION (Actual Bales), for Year ending 31st August.				
	1912	1911	1910	1909	1911	1910	1909	1908	1907
GREAT BRITAIN	8·02	8·20	8·50	9·72	70·47	63·50	65·82	72·74	80·24
GERMANY	31·79	30·62	34·51	40·86	165·23	165·69	173·04	181·15	180·72
FRANCE	24·91	24·32	28·58	29·95	132·99	133·56	139·09	141·17	139·85
RUSSIA	74·02	67·53	85·41	76·88	266·43	264·99	236·56	250·07	233·42
INDIA	94·87	63·95	70·13	91·75	352·18	360·35	387·29	399·26	—
AUSTRIA	30·08	35·34	39·25	48·84	172·08	176·54	184·46	183·77	196·68
ITALY	41·66	41·43	43·42	55·10	214·66	192·44	235·38	245·68	255·01
SPAIN	38·90	37·49	37·28	39·49	179·17	148·83	172·15	185·43	184·32
JAPAN	79·63	166·79	120·85	131·77	716·98	684·88	611·43	625·31	787·19
SWITZERLAND	22·12	16·32	19·07	21·77	59·95	60·38	64·82	63·60	63·21
BELGIUM	41·19	50·29	45·32	48·04	178·32	149·79	170·75	182·76	171·76
PORTUGAL	24·73	23·45	25·40	39·92	150·96	121·87	137·95	180·19	242·84
HOLLAND	20·74	18·60	27·36	35·51	191·68	182·42	201·44	195·19	186·69
SWEDEN	39·04	48·03	36·12	51·23	205·01	208·45	187·94	227·84	234·22
NORWAY	22·59	30·87	20·15	29·76	152·31	153·52	148·46	150·20	161·87
DENMARK	17·80	16·30	12·67	15·38	273·29	236·18	297·17	267·82	—
U.S. AMERICA	52·27	53·51	59·79	65·78	162·65	166·04	183·03	164·30	190·03
CANADA	42·71	71·05	59·55	41·00	138·83	150·08	146·72	144·50	—
MEXICO, BRAZIL, &c.	102·45	90·84	92·60	61·14	361·44	351·89	457·40	—	—

CONSUMPTION OF COTTON FOR YEAR ENDING AUGUST 31st, 1911.

(Spinners' Returns.)

COUNTRIES.	Number of Spinning Spindles in work. Actual Returns.	CONSUMPTION IN ACTUAL BALES.					TOTAL WORLD. Estimated Number of **Spinning** Spindles.
		American.	East Indian.	Egyptian.	Sundries.	TOTAL.	
GREAT BRITAIN	48,028,180	2,854,512	100,193	325,927	103,848	3,384,480	54,522,554
GERMANY	10,199,362	1,144,170	375,133	106,091	59,798	1,685,192	10,480,090
FRANCE	7,112,075	711,075	131,503	70,771	31,866	945,815	7,300,000
RUSSIA (including Poland and Finland)	6,574,347	482,206	29,745	51,008	1,188,660	1,751,619	8,671,664
INDIA	4,201,779	5,791	1,472,598	1,414	———	1,479,803	6,250,000
AUSTRIA	4,309,857	467,406	232,120	29,102	12,962	741,650	4,563,745
ITALY	3,379,126	402,595	284,390	20,979	17,413	725,377	4,582,065
SPAIN	1,746,741	205,221	68,524	16,003	23,214	312,962	1,853,000
JAPAN	1,749,107	107,280	814,816	16,004	315,978	1,254,078	2,131,494
SWITZERLAND	1,264,832	47,366	4,052	21,787	2,024	75,229	1,481,230
BELGIUM	1,326,722	138,395	97,021	448	722	236,586	1,326,722
PORTUGAL	390,520	48,250	1,005	842	11,200	61,297	475,696
HOLLAND	431,452	65,573	16,634	50	444	82,701	431,452
SWEDEN	406,494	65,422	16,640	829	443	83,334	527,772
NORWAY	74,320	9,222	1,859	———	239	11,320	74,320
DENMARK	79,655	19,701	1,451	———	617	21,769	79,655
U.S. AMERICA	28,872,000	4,696,000	*not stated*	*not stated*	*not stated*	4,696,000	28,872,000
CANADA	639,734	87,020	———	437	457	88,814	855,293
MEXICO, BRAZIL, Etc.	500,894	696	30	3,070	177,248	181,044	2,800,000
TOTAL	121,277,197	11,559,401	3,647,714	664,822	1,947,133	17,819,070	137,278,752
TOTALS.							
August 31st, 1910	119,473,025	11,145,178	3,683,942	639,596	1,561,825	17,030,511	133,384,794
August 31st, 1909	115,971,004	12,098,280	2,479,315	781,107	1,308,735	16,667,437	131,503,062
August 31st, 1908	111,217,883	11,690,516	2,276,586	658,256	1,154,179	15,779,537	128,923,659

STOCKS OF COTTON IN SPINNERS' HANDS on the 31st AUGUST, 1911.

("Invisible Supply"—Spinners' Returns.)

COUNTRIES	Number of Spinning Spindles, Actual Returns	STOCKS IN ACTUAL BALES					TOTAL WORLD, Estimated Number of Spinning Spindles
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN	48,028,180	115,882	16,346	46,493	26,265	204,986	54,522,554
GERMANY	10,199,362	113,672	92,653	21,464	13,568	241,357	10,480,090
FRANCE	7,112,075	65,127	43,544	16,398	6,785	131,854	7,300,000
RUSSIA (including Poland and Finland)	6,574,347	93,033	7,900	16,085	324,857	441,875	8,671,664
INDIA	4,201,779	2,297	357,695	434	———	360,426	6,250,000
AUSTRIA	4,309,857	54,521	66,625	6,161	2,267	129,574	4,563,745
ITALY	3,379,126	54,354	58,317	5,615	3,588	121,904	4,582,065
SPAIN	1,746,741	24,274	6,234	1,681	2,345	34,534	1,853,000
JAPAN	1,749,107	41,872	217,520	6,824	38,340	304,556	2,131,494
SWITZERLAND	1,254,832	5,849	831	4,720	701	12,101	1,481,230
BELGIUM	1,326,722	13,068	29,207	97	443	42,815	1,326,722
PORTUGAL	390,320	5,240	260	400	1,800	7,700	475,696
HOLLAND	431,452	6,015	3,119	———	25	9,159	431,452
SWEDEN	400,494	8,547	6,061	22	103	14,733	527,772
NORWAY	74,320	1,011	609	———	116	1,736	74,320
DENMARK	79,655	762	561	———	119	1,442	79,655
U.S. AMERICA	28,872,000	523,000	*not stated*	*not stated*	*not stated*	523,000	28,872,000
CANADA	639,734	6,638	———	351	90	7,079	855,293
MEXICO, BRAZIL, ETC.	500,894	4	10	794	27,413	28,221	2,800,000
TOTAL	121,277,197	1,135,166	907,492	127,569	448,825	2,619,052	137,278,752
TOTAL							
August 31st, 1910	119,473,025	1,123,826	995,892	111,718	292,350	2,523,786	133,384,794
August 31st, 1909	115,971,904	1,887,600	757,041	201,810	336,941	3,183,392	131,503,062
August 31st, 1908	111,217,883	1,543,663	750,001	153,915	280,466	2,728,045	128,923,659

COTTON SPINNING SPINDLES, 31st AUGUST 1911 (Spinners' Returns).

COUNTRIES	Mule Spindles in work as per Returns	Ring Spindles in work as per Returns	Spindles spinning Egyptian Cotton as per Returns	Spindles spinning American, East Indian and Sundry Cottons as per Returns	Spindles *in course of* Construction as per Returns	Curtailment of Production during the past twelve months* Hours	Total Number of Spindles as per Returns in work at present	TOTAL WORLD. Estimated Number of **Spinning** Spindles
GREAT BRITAIN	39,977,255	8,050,025	13,169,923	34,858,257	896,924	113	48,028,180	54,522,554
GERMANY	5,214,959	4,984,403	1,331,604	8,867,758	257,868	140	10,199,362	10,480,090
FRANCE	4,049,118	3,062,957	1,323,862	5,788,213	66,556	105	7,112,075	7,300,000
RUSSIA	2,861,995	3,712,352	667,135	5,907,212	128,876	43	6,574,347	8,671,604
INDIA	1,094,213	3,107,566	18,338	4,183,441	67,568	207	4,201,779	6,250,000
AUSTRIA	2,348,501	1,961,356	491,834	3,818,023	56,190	418	4,309,857	4,563,745
ITALY	1,069,968	2,309,158	202,520	3,176,606	49,032	339	3,379,126	4,582,065
SPAIN	725,111	1,021,630	100,000*	1,046,741	———	—	1,746,741	1,853,000
JAPAN	27,829	1,721,278	212,027	1,537,080	27,840	**	1,749,107	2,131,494
SWITZERLAND	1,036,192	218,640	850,000	404,832	———	180	1,254,832	1,481,230
BELGIUM	510,086	815,736	6,000	1,320,722	46,508	—	1,326,722	1,326,722
PORTUGAL	100,000*	290,520*	———	390,520	———	?	390,520	476,696
HOLLAND	192,748	238,704	———	431,452	6,240	13	431,452	431,452
SWEDEN	116,296	290,198	5,500	400,994	2,000	111	406,494	527,772
NORWAY	34,860	39,460	———	74,320	———	184	74,320	74,320
DENMARK	11,583	68,072	———	79,655	———	119	79,655	79,655
U.S. AMERICA	5,500,000*	23,372,000*	600,000*	28,272,000*	?	?	28,872,000	28,872,000
CANADA	319,110	320,624	———	639,734	———	18	639,734	855,293
MEXICO, BRAZIL, ETC.	40,320	460,574	20,000	480,894	46,109	20	500,894	2,800,000
TOTAL	65,231,044	56,046,153	18,098,743	102,278,454	1,651,711	——	121,277,197	137,278,752

* Approximately.

** JAPAN.—There has been in force during the last year organised curtailment of production of 27·5 per cent. on coarse yarns, 20 per cent. on fine yarns, and this will be continued until March, 1912.

MILL STOCKS AND CONSUMPTION OF ALL KINDS OF COTTON,

on the basis of Spinners' Returns, calculated per 1,000 Spindles.

COUNTRIES.	MILL STOCKS (Actual Bales), 31st August.					CONSUMPTION (Actual Bales), for Year ending 31st August.				
	1911	1910	1909	1908	1907	1911	1910	1909	1908	1907
GREAT BRITAIN	4·27	4·47	6·93	7·80	9·48	70·47	63·50	65·82	*72·74	80·24
GERMANY	23·66	26·98	33·13	34·68	51·46	165·23	165·69	173·64	181·45	180·72
FRANCE	18·54	19·63	26·07	24·46	28·80	132·99	133·56	139·09	141·17	139·85
RUSSIA	67 21	57·57	60·88	76·40	64·42	266·43	264·99	236·56	250·07	233·42
INDIA	85·78	86·97	108·15	93·57	—	352·18	360·35	387·29	399·26	—
AUSTRIA	30·06	31·97	42·81	55·82	77·24	172·08	176·54	184·45	183·77	196·68
ITALY	36·08	30·10	43·35	61·66	89·81	214·66	192·44	235·38	245·68	255·01
SPAIN	19·77	27·55	49·54	12·27	32 44	179·17	148·83	172·15	185·43	184·32
JAPAN	174·12	161·69	196·55	159·43	267·36	716·98	684·88	611·43	625·31	787·19
SWITZERLAND	9·64	9·17	12·15	13·56	18·79	59·95	60·38	64·82	63·60	63·21
BELGIUM	32·27	27·37	37·90	38·88	54·43	178·32	149·79	170·75	182·76	171·76
PORTUGAL	19·72	20·17	17·88	30·21	49·13	156·96	121·87	137·95	180·19	242·84
HOLLAND	21·23	22·31	22·79	47·15	43·65	191·68	182·42	201·44	195·19	186·69
SWEDEN	36·24	44·28	46·78	48·59	54·86	205·01	208·45	187·94	227·84	234·22
NORWAY	23·36	26·27	21·72	24·51	30·08	152·31	153·52	148·46	150·20	161·87
DENMARK	18·10	13·33	9·61	19·10	24·20	273·29	236·18	297·17	267·82	—
U.S. AMERICA	18·11	18·27	32·68	21·40	37·95	162·65	166·04	183·03	164·30	190·03
CANADA	11·07	11·36	33·10	29·13	—	138·83	150·08	146·72	144·50	—
MEXICO, BRAZIL, Etc.	56·34	61·86	59·98	59·40	—	361·44	351·89	457·40	—	—

("Invisible Supply"—Spinners' Returns.)

Countries.	Number of Spinning Spindles. Actual Returns.	STOCKS IN ACTUAL BALES.					Total World. Estimated Number of Spinning Spindles in work.
		American.	East Indian.	Egyptian.	Sundries.	Total.	
GREAT BRITAIN	48,688,061	200,845	15,626	92,216	30,334	399,021	53,859,247
GERMANY	10,045,769	188,858	09,147	33,783	15,808	307,596	10,299,597
RUSSIA††	6,731,395	97,715	6,020	15,908	334,944**	454,587	8,600,000
FRANCE	6,978,867	100,998	27,671	27,374	6,017	162,060	7,200,000
INDIA	4,291,679	1,689	280,640	592	145	283,046	6,195,671
AUSTRIA	4,286,692	94,083	43,189	8,181	6,055	151,508	4,686,433
ITALY	3,855,750	91,936	53,606	8,528	5,680	159,760	4,215,000
JAPAN	1,880,396	43,337	152,845	6,235	111,210	313,627	2,095,232
SPAIN	1,712,640	42,300	11,500	2,300	8,100	64,200	1,853,000
SWITZERLAND	1,307,664	10,579	1,213	8,917	632	21,341	1,485,454
BELGIUM	1,322,075	33,807	38,895	129	1,593	74,424	1,322,075
SWEDEN	418,793	15,772	3,827	494	20	20,113	529,772
PORTUGAL	287,400*	4,560	620	360	1,200	6,740	475,696
HOLLAND	465,246	6,521	2,134	—	—	8,655	405,246
DENMARK	83,240	1,004	333	—	20	1,357	83,240
NORWAY	75,768	1,703	501	—	135	2,339	75,768
U.S. AMERICA†	28,500,000*	1,525,000	—	—	—	1,525,000	28,500,000
CANADA	620,005	44,051	—	—	—	44,051	855,293
MEXICO, BRAZIL, and Other Countries***	675,051	762	—	230	60,333	61,325	2,800,000
TOTAL March 1st, 1911	122,226,091	2,565,500	707,767	205,247	582,226	4,060,740	135,596,724
TOTAL March 1st, 1910	119,154,411	2,753,714	625,050	215,508	572,326	4,166,688	133,421,004

† The Stock figures for the U.S.A. have been supplied by the Census Bureau in Washington, D.C. *The 1,525,000 represent* bales of 500lbs. each. 135,000 bales of foreign cotton were *imported into* the U.S.A. since September 1st, 1910. The Census Bureau states that the *American consumption* for the first half-year has been 2,401,000 bales, against 2,527,000 bales in the corresponding six months of the previous season.

* Approximately.

** Mostly Russian and Persian cotton, bales of 270-290lbs. each. †† Including Poland: 725,598 spindles reported, with 20,805 bales

MILL STOCKS AND CONSUMPTION OF ALL KINDS OF COTTON,

on the basis of Spinners' Returns, calculated per 1000 Spindles.

COUNTRIES	MILL STOCKS (Actual Bales), 1st March,				CONSUMPTION (Actual Bales), for Year ending 31st August,				
	1911	1910	1909	1908	1910	1909	1908	1907	1906
GREAT BRITAIN	8·20	8·50	9·72	10·94	63·50	66·82	72·74	80·24	80·18
GERMANY	30·62	34·51	40·86	49·14	165·69	173·64	181·45	180·72	182·97
RUSSIA	67·53	85·41	76·88	67·60	264·90	236·56	250·07	233·42	—
FRANCE	23·32	28·58	29·05	34·45	133·56	139·09	141·17	139·85	139·02
INDIA	65·95	70·13	94·75	96·86	360·35	387·29	399·26	—	—
AUSTRIA	35·34	39·25	48·84	73·15	176·54	184·45	183·77	196·68	190·79
ITALY	41·43	43·42	55·10	76·52	192·44	235·38	245·68	255·01	283·52
SPAIN	37·40	37·28	39·40	40·20	148·83	172·15	185·43	184·32	204·81
JAPAN	166·79	120·85	131·77	117·32	684·88	611·43	625·31	787·19	—
SWITZERLAND	16·32	19·07	21·77	27·37	60·38	64·82	63·60	63·21	66·31
BELGIUM	56·29	45·32	48·64	63·08	149·79	170·75	182·76	171·76	171·62
PORTUGAL	23·45	25·40	39·92	51·90	121·87	137·95	180·19	242·84	197·67
HOLLAND	18·60	27·36	35·51	35·06	182·42	201·44	195·19	186·69	—
SWEDEN	48·03	36·12	51·23	52·82	208·45	187·94	227·84	234·22	—
NORWAY	30·87	20·16	29·76	32·21	153·52	148·40	150·20	161·87	—
DENMARK	16·30	12·67	15·38	17·29	236·18	297·17	267·82	418·73	—
U.S. AMERICA	53·51	59·79	65·78	40·35	166·04	183·03	164·30	190·03	194·43
CANADA	71·05	59·55	41·00	43·51	150.08	146·72	144·50	—	—
MEXICO, BRAZIL, &c.	90·84	92·60	61·14	103·22	351·89	457·40	—	—	—

COTTON SPINNING SPINDLES, 1st MARCH, 1911. (Spinners' Returns.)

COUNTRIES	Mule Spindles in work as per Returns	Ring Spindles in work as per Returns	Spindles Spinning Egyptian Cotton as per Returns	Spindles Spinning American, East Indian, and Sundry Cottons as per Returns	Spindles in course of Construction as per Returns	Total Number of Spindles as per Returns in work at present	TOTAL WORLD. Estimated Number of **Spinning** Spindles in work
GREAT BRITAIN	40,504,850	8,183,211	13,122,934	35,565,127	1,145,336	48,688,061	53,859,247
GERMANY	5,263,696	4,782,273	1,250,000*	8,795,369	306,899	10,045,369	10,299,597
RUSSIA	3,025,287	3,706,108	529,318	6,202,077	138,840	6,731,395	8,600,000
FRANCE	3,988,466	2,990,401	1,511,102	5,467,765	129,900	6,978,867	7,200,000
INDIA	1,191,868	3,099,821	9,698	4,281,981	50,072	4,291,679	6,195,671
AUSTRIA	2,339,551	1,947,141	562,000	3,724,692	46,100	4,286,992	4,686,433
ITALY	909,781	2,946,969	174,168	3,681,582	9,512	3,855,750	4,215,000
JAPAN	55,480	1,824,916	170,412	1,709,984	64,102	1,880,396	2,095,232
SPAIN	600,000	1,112,640	100,000	1,612,640	none	1,712,640	1,853,000
SWITZERLAND	1,079,664	228,000	743,664	564,000	none	1,307,664	1,486,454
BELGIUM	543,590	778,485	4,000	1,318,075	55,368	1,322,075	1,322,075
PORTUGAL*	95,800	191,000	none	287,400	none	287,400	475,696
HOLLAND	222,004	243,242	none	465,246	none	465,246	465,246
SWEDEN	117,504	301,289	4,664	414,129	none	418,793	529,772
DENMARK	13,376	69,864	none	83,240	none	83,240	83,240
NORWAY	21,748	54,020	none	75,768	none	75,768	75,768
U. S. AMERICA*	5,000,000	23,500,000	600,000	27,900,000	?	28,500,000	28,500,000
CANADA	296,637	323,368	none	620,005	none	620,005	855,293
MEXICO, BRAZIL, &c.	33,102	641,949	none	675,051	38,900	675,051	2,800,000
TOTAL	65,301,794	56,924,297	18,781,960	103,444,131	1,985,029	122,226,091	135,506,724

*Approximately.

COUNTRIES	Number of Spinning Spindles in work. Actual Returns	CONSUMPTION IN ACTUAL BALES					TOTAL WORLD. Estimated No. of Spinning Spindles in work
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN	48,088,513	2,548,707	87,592	322,596	94,650	3,053,545	53,397,466
GERMANY	10,045,684	1,129,117	378,065	99,792	57,452	1,664,426	10,200,000
FRANCE	6,889,549	711,362	122,614	63,479	22,717	920,172	7,100,000
RUSSIA (including Poland** and Finland)	5,406,904	375,071	25,463	50,500	981,740*	1,432,774	8,234,137
INDIA††	4,158,942	7,147	1,489,339	2,108	75	1,498,669	5,657,231
AUSTRIA	4,151,594	457,415	234,894	30,299	10,316	732,924	4,643,275
ITALY	3,509,041	401,613	239,582	16,866	17,229	675,290	4,200,000
SPAIN	1,700,000	161,921	60,720	12,650	17,712	253,003	1,853,000
JAPAN	1,812,000	130,000	914,400	13,200	183,400	1,241,000	1,948,000
SWITZERLAND	1,273,286	48,622	4,308	21,917	2,029	76,876	1,496,698
BELGIUM	1,321,780	108,125	88,907	220	736	197,988	1,321,780
PORTUGAL	378,016	40,130	300	800	4,840	46,070	475,696
HOLLAND	426,354	58,579	18,219	none	976	77,774	426,354
SWEDEN	377,423	60,421	15,961	1,889	402	78,673	470,000
NORWAY	73,656	9,695	1,306	none	307	11,308	73,656
DENMARK	83,208	16,666	2,242	none	744	19,652	83,208
U.S. AMERICA†	28,349,000	4,707,000	not stated	not stated	not stated	4,707,000	28,349,000
CANADA	788,667	117,331	none	625	408	118,364	855,293
MEXICO, BRAZIL, &c. ††*** ..	639,408	56,256	none	2,655	166,092	225,003	2,600,000
Total	119,473,025	11,145,178	3,683,912	639,596	1,561,825	17,030,511	133,384,794
TOTALS							
August 31st, 1909 ..	115,971,004	12,098,280	2,479,315	781,107	1,308,735	16,667,437	131,503,062
August 31st, 1908 ..	111,217,883	11,690,516	2,276,586	658,256	1,154,179	15,779,537	128,923,659
August 31st, 1907 ..	100,521,078	11,668,575	1,768,293	616,896	855,429	14,909,193	114,096,168

† The figures for the U.S.A. have been supplied by the Census Bureau at Washington, D.C. The 4,707,000 bales of American Cotton represent bales of 500 lbs. each.

* [illegible] and 65,000 bales Sundries.

STOCKS OF COTTON IN SPINNERS' HANDS on the 31st AUGUST, 1910. ("Invisible Supply"—Spinners' Returns.)

COUNTRIES	Number of Spinning Spindles. Actual Returns	STOCKS IN ACTUAL BALES					TOTAL WORLD Estimated No. of **Spinning** Spindles in work
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN	48,088,513	128,285	20,801	44,665	21,255	215,006	53,397,466
GERMANY	10,045,684	112,615	128,833	18,913	10,698	271,059	10,200,000
FRANCE	6,889,549	64,274	52,992	12,552	5,455	135,273	7,100,000
RUSSIA (including Poland** and Finland)	5,406,904	87,784	10,598	12,571	200,353*	311,306	8,234,137
INDIA††	4,158,942	1,734	356,203	3,752	26	361,715	5,657,231
AUSTRIA	4,151,594	49,559	76,004	4,154	2,993	132,710	4,643,275
ITALY	3,509,041	44,246	57,889	2,492	995	105,622	4,200,000
SPAIN	1,700,000	33,484	8,566	1,915	2,871	46,834	1,853,000
JAPAN	1,812,000	29,400	243,400	4,000	16,200	293,000	1,948,000
SWITZERLAND	1,273,286	5,973	1,414	4,016	277	11,680	1,496,698
BELGIUM	1,321,780	9,975	25,974	7	217	36,173	1,321,780
PORTUGAL	378,016	5,175	100	400	1,950	7,625	475,696
HOLLAND	426,354	5,575	3,842	none	94	9,511	426,354
SWEDEN	377,423	7,521	8,270	858	62	16,711	470,000
NORWAY	73,656	1,223	679	none	33	1,935	73,656
DENMARK	83,208	730	327	none	52	1,109	83,208
U. S. AMERICA†	28,349,000	518,000	not stated	not stated	not stated	518,000	28,349,000
CANADA	788,667	8,592	none	223	147	8,962	855,293
MEXICO, BRAZIL, &c. ††*** ..	639,408	9,681	none	1,202	28,672	39,555	2,600,000
Total	119,473,025	1,123,826	995,892	111,718	292,350	2,523,786	133,384,794
TOTALS							
August 31st, 1909 ..	115,971,004	1,887,600	757,041	201,810	336,941	3,183,392	131,503,062
August 31st, 1908 ..	111,217,883	1,543,663	750,001	153,915	280,466	2,728,045	128,923,659
August 31st, 1907 ..	100,521,078	2,073,386	912,164	140,371	208,489	3,334,410	114,096,168

† The figures for the U.S.A. have been supplied by the Census Bureau at Washington, D.C. The 518,000 bales of American Cotton represent bales of 500 lbs. each

†† Per 15th August, 1910. * Mostly Russian and Persian Cotton of 270—290 lbs. each.

** Poland: 430,725 spindles reported, with 4,743 bales American, 2,055 bales East Indian, 1,412 bales Egyptian, 12,635 bales Sundries.

*** Brazil: 257,020 spindles reported, with 28,595 bales Brazilian Cotton in stock; Mexico: 237,430 spindles [illegible]

COTTON SPINNING SPINDLES, 31st August, 1910. (Spinners' Returns.)

Countries.	Mule Spindles in work as per Returns	Ring Spindles in work as per Returns	Spindles spinning Egyptian Cotton as per Returns	Spindles spinning American, East Indian, and Sundry Cottons as per Returns	Spindles in course of Construction as per Returns.	Approximate curtailment of production during the past twelve months	Total number of Spindles as per Returns in work at present	Total World. Estimated Number of Spinning Spindles in work
Great Britain	40,101,083	7,987,430	12,508,873	35,579,640	1,463,300	14·1%	48,088,513	53,397,466
Germany	5,317,969	4,727,715	1,233,078	8,812,606	392,770	10%	10,045,684	10,200,000
France	4,033,724	2,855,835	1,390,174	5,499,375	171,110	4%	6,889,549	7,100,000
Russia (includ. Poland and Finland)	2,619,036	2,787,868	738,514	4,668,390	150,840	2·3%	5,406,904	8,234,137
India	1,227,549	2,931,393	11,464	4,147,478	84,794	3·1%	4,158,942	5,657,231
Austria	2,370,419	1,781,175	552,746	3,598,848	86,138	20%	4,151,594	4,643,275
Italy	1,175,251	2,333,790	167,400	3,341,641	15,000	18·6%	3,509,041	4,200,000
Spain	698,348	1,001,652	100,000	1,600,000	*none*	15%	1,700,000	1,853,000
Japan	28,000	1,784,000	201,000	1,611,000	89,000	10%	1,812,000	1,948,000
Switzerland	1,050,332	222,954	850,000	423,286	*none*	10%	1,273,286	1,496,698
Belgium	549,938	771,842	3,400	1,318,380	27,192	11·6%	1,321,780	1,321,780
Portugal*	126,005	252,011	*none*	378,016	*none*	?	378,016	475,696
Holland	195,396	230,958	*none*	426,354	*none*	6·1%	426,354	426,354
Sweden	105,392	272,031	14,182	363,241	59,772	5·7%	377,423	470,000
Norway	21,076	52,580	*none*	73,656	*none*	8·4%	73,656	73,656
Denmark	13,376	69,832	*none*	83,208	*none*	12·5%	83,208	83,208
U. S. America*	5,000,000	23,349 000	600,000	27,749,000	?	?	28,349,000	28,349,000
Canada	380,759	407,908	15,320	773,347	*none*	8·4%	788,667	855,293
Mexico, Brazil, &c.	37,586	601,822	20,000	619,408	32,972	2·3%	639,408	2,600,000
Total	65,051,239	54,421,786	18,406,151	101,066,874	2,572,888	—	119,473,025	133,384,794

*Approximately.

MILL STOCKS AND CONSUMPTION OF ALL KINDS OF COTTON, on the basis of Spinners' Returns, calculated per 1,000 Spindles.

COUNTRIES.	MILL STOCKS (Actual Bales), 31st August.					CONSUMPTION (Actual Bales), for Year ending 31st August.				
	1910	1909	1908	1907	1906	1910	1909	1908	1907	1906
GREAT BRITAIN ..	4·47	6·93	7·80	9·48	9·22	63·50	65·88	72·74	80·24	80·18
GERMANY	26·98	33·13	34·68	54·46	38·32	165·69	173·64	181·45	180·72	182·97
FRANCE	19·63	26·07	24·46	28·80	20·16	133·56	139·09	141·17	139·85	139·02
RUSSIA	57·57	60·88	76·40	64·42	—	264·99	235·61	250·07	233·42	—
INDIA	86·97	108·15	93·57	—	—	360·35	387·29	399·26	—	—
AUSTRIA	31·97	42·81	55·82	77·24	43·05	176·54	184·45	183·77	196·68	190·79
ITALY	30·10	43·35	61·66	89·81	69·78	192·44	235·32	245·68	355·01	283·52
SPAIN	27·55	49·54	12·27	32·44	11·89	148·83	172·15	185·43	184·32	204·81
JAPAN	161·69	196·55	159·43	267·36	—	684·88	611·43	625·31	787·19	—
SWITZERLAND	9·17	12·15	13·56	18·79	12·90	60·38	64·82	63·60	63·21	66·31
BELGIUM	27·37	37·90	38·88	54·43	34·19	149·79	170·75	182·76	171·76	171·62
PORTUGAL	20·17	17·88	30·21	49·13	57·95	121·87	137·95	180·19	242·84	197·67
HOLLAND	22·31	22·79	47·15	43·65	—	182·42	201·44	195·19	186·69	—
SWEDEN	44·28	46·78	48·59	54·86	—	208·45	187·94	227·84	234·22	—
NORWAY	26·27	21·72	24·54	30·08	—	153·52	148·46	150·20	161·87	—
DENMARK	13·33	9·61	19·10	24·20	—	236·18	297·17	267·82	418·73	—
U.S. AMERICA	18·27	32·68	21·40	37·95	30·76	166·04	183·03	164·30	190·03	194·43
CANADA	11·36	33·10	29·13	—	—	150·08	146·72	144·50	—	—
MEXICO, BRAZIL, &C...	61·86	59·98	59·40	—	—	351·89	465·21	—	—	—

REMARKS.

General.—The organised Short-Time movement has been quite universal, as is shown on page 360. No definite figures have been cabled as regards the Short-Time in the U.S.A., but this year's consumption of 4,707,000 bales against last year's consumption of 5,241,000 bales shows clearly that extensive Short-Time has been run in the States.

The shortage of American Cotton has led to a freer use of East-Indian Cotton, a fact which is brought forward by a comparison of the present with former tabulations.

The total number of Spinning Spindles in work is, in most countries, arrived at by the addition of the comparatively few spindles which have not sent returns to those actually reported. When referring to Cotton Consumption, even cotton experts, brokers, and others frequently fall into the error of not distinguishing between doubling, waste, and spinning spindles. Doubling and waste spindles do not use raw cotton.

Great Britain.—Twenty-six firms, representing 688,705 spindles, report that they have given up cotton spinning. The completion of several new mills has been postponed indefinitely. The consumption of American Cotton is 106,086 bales less than the previous year, during which over forty millions spindles stopped for seven weeks owing to a lock-out. The reduced consumption of all kinds of cotton this year is 99,999 bales; moreover, it has been ascertained that the trade has been on considerably coarser counts, which means that a larger weight of cotton has been used per spindle. These facts prove conclusively the extent of the Short-Time worked during the past twelve months.

India.—Eight firms, representing 132,800 spindles, report that owing to bad trade they have stopped spinning. The erection of two new mills has been abandoned.

Japan.—A further curtailment of production of 27½ per cent. on coarse counts and 20 per cent. on medium and fine counts begins on October 1st. Mills in Japan work usually day and night (22 hours).

India, Mexico, Brazil.—Owing to the long distances which separate these countries from the offices of the International Federation, the spinners in these countries have been asked to make their returns up to 15th August instead of 31st.

U.S.A.—The United States Census Bureau is responsible for the collection of the American figures.

ARNO SCHMIDT, *Secretary.*

MANCHESTER, *27th September*, **1910.**

STOCKS OF COTTON IN SPINNERS' HANDS on the 1st MARCH, 1910.

("Invisible Supply"—Spinners' Returns.)

COUNTRIES	Number of Spinning Spindles. Actual Returns	STOCKS IN ACTUAL BALES.					TOTAL WORLD. Estimated Number of **Spinning** Spindles in work
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN	48,818,234	248,430	19,603	100,368	46,781	415,182	53,729,982
GERMANY	9,891,460	214,901	72,240	35,052	18,546	341,339	10,058,370
FRANCE	6,615,503	124,378	32,910	25,165	6,639	189,092	7,033,187
RUSSIA†	5,861,461	90,533	4,653	19,365	386,072*	500,623	8,200,000
INDIA †††	3,290,358	8,957	200,897	588	20,740	231,182	6,053,231
AUSTRIA	4,303,046	104,877	51,828	9,284	2,919	168,908	4,557,137
ITALY	3,824,777	98,765	56,931	5,161	5,226	166,083	4,150,000
SPAIN	1,702,000	43,100	9,500	2,400	8,450	63,450	1,900,000
JAPAN †††	1,710,766	34,692	142,081	7,473	22,508**	206,754	1,954,880
SWITZERLAND	1,309,432	13,598	1,416	9,330	629	24,973	1,496,698
BELGIUM	1,312,780	31,705	24,039	107	3,038	59,489	1,312,780
PORTUGAL	378,016	6,922	300	180	2,200	9,602	475,696
HOLLAND	420,978	5,762	5,066	*none*	692	11,520	420,978
SWEDEN	411,493	11,604	2,707	525	26	14,862	470,000
NORWAY	75,128	1,261	188	*none*	65	1,514	75,128
DENMARK	70,708	740	61	*none*	95	890	77,644
U. S. AMERICA††	28,000,000	1,674,000	*not stated*	*not stated*	*not stated*	1,674,000	28,000,000
CANADA	589,400	35,099	*none*	*none*	*none*	35,099	855,293
BRAZIL, MEXICO, and Other Countries†††	562,881	4,390	30	*none*	47,700***	52,120	2,000,000
TOTAL March 1st, 1910	**119,154,411**	**2,758,714**	**825,050**	**215,598**	**572,328**	**4,166,688**	**133,421,004**
TOTAL March 1st, 1909	113,752,697	3,044,644	535,627	269,043	416,813	4,266,927	130,795,927

† Including Russian Poland, spindles reported: 740,822. 18,635 bales American, 1,791 bales East Indian, 980 bales Egyptian, 31,660 bales Russian and Sundries. Total estimated spindleage in Russia Poland: 1,249,506.

†† The figures for the U.S.A. have been supplied by the Census Bureau at Washington, D.C. The *1,674,000 bales of American* Cotton represent bales of 500 lbs. each. The Census Bureau states that the American consumption for the first half year of this season has been 2,627,000 bales, *500* lbs. each.

††† Per 15th February, 1910.

* Mostly Russian and Persian Cotton of 270-290 lbs. each. ** Including 21,220 bales of Chinese Cotton.

CONSUMPTION OF COTTON FOR YEAR ENDING AUGUST 31st, 1909.

(Spinners' Returns.)

COUNTRIES	Number of Spinning Spindles in work. Actual Returns	CONSUMPTION IN ACTUAL BALES.					TOTAL WORLD Estimated Number of Spinning Spindles in work
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN	47,868,046	2,654,793	61,845	356,821	80,887	3,153,544	53,311,630
GERMANY	10,070,180	1,249,326	342,190	107,004	50,037	1,748,557	10,162,908
FRANCE	6,794,130	733,227	115,940	72,881	22,929	944,977	7,000,000
RUSSIA	5,677,272	469,597	18,299	131,066	718,770*	1,337,642	7,800,000
AUSTRIA	4,200,610	521,169	209,459	34,481	9,681	774,790	4,351,910
ITALY	3,131,987	481,646	224,232	17,708	13,445	737,031	4,000,000
SPAIN	1,702,000	216,820	32,230	17,580	26,370	293,000	1,900,000
JAPAN	1,654,819	177,984	670,065	14,120	149,643	1,011,812	1,731,587
SWITZERLAND	1,390,282	57,616	4,205	25,899	2,399	90,119	1,496,698
BELGIUM	1,231,165	126,278	80,978	520	2,441	210,217	1,231,165
PORTUGAL	450,696	43,350	820	930	17,075	62,175	450,696
HOLLAND	424,773	67,349	17,864	*none*	352	85,565	424,773
SWEDEN	377,501	61,597	8,748	480	122	70,947	450,000
NORWAY	75,844	10,277	903	*none*	80	11,260	75,844
DENMARK	77,558	19,822	2,538	*none*	688	23,048	77,558
U.S. AMERICA	27,783,000	5,085,000†	*not stated*	*not stated*	*not stated*	5,085,000	27,783,000
INDIA	1,908,679	6,154	688,622	1,319	43,121	739,216	5,800,000
CANADA	777,422	112,500	465	1,100	*none*	114,065	855,293
MEXICO, BRAZIL, and Other Countries	375,040	3,775	2	*none*	170,695‡	174,472	2,600,000
TOTAL	115,971,004	12,098,280	2,479,315	781,107	1,308,735	16,667,437	131,503,062
TOTALS.							
August 31st, 1908	111,217,883	11,690,518	2,270,886	658,256	1,154,179	15,779,537	128,923,659
August 31st, 1907	100,521,078	11,668,575	1,768,293	616,896	855,429	14,909,193	114,096,168
August 31st, 1906	86,072,303	5,704,208	986,111	578,753	302,309	7,571,381	77,115,125
August 31st, 1905	46,720,929	4,174,088	667,452	402,745	125,728	5,370,013	68,222,736

* The larger part being Russian Cotton of about 270-290 lbs. each bale.

† The figures for the U.S. America have been cabled by the Bureau of the Census, Washington, D.C. The 5,085,000 bales of American Cotton represent bales of 500 lbs. each.

STOCKS OF COTTON IN SPINNERS' HANDS on the 31st AUGUST, 1909.

("Invisible Supply"—Spinners' Returns.)

COUNTRIES	Number of Spinning Spindles. Actual Returns	STOCKS IN ACTUAL BALES.					TOTAL WORLD Estimated Number of Spinning Spindles in work
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN	47,868,046	208,624	10,752	88,200	24,165	331,741	53,311,630
GERMANY	10,070,180	186,924	108,168	24,296	14,281	333,669	10,162,908
FRANCE	6,794,130	97,940	53,327	16,820	9,016	177,103	7,000,000
RUSSIA	5,677,272	87,520	5,824	35,124	217,176*	345,644	7,800,000
AUSTRIA	4,200,610	95,816	71,619	8,476	3,922	179,833	4,351,910
ITALY	3,131,987	87,176	38,501	4,214	5,874	135,765	4,000,000
SPAIN	1,702,000	64,600	7,920	3,450	8,340	84,310	1,900,000
JAPAN	1,654,819	64,449	233,346	9,550	17,911	325,256	1,731,587
SWITZERLAND	1,390,282	11,356	1,609	9,278	731	22,974	1,498,698
BELGIUM	1,231,165	17,930	28,012	262	455	46,659	1,231,165
PORTUGAL	450,696	5,983	300	155	1,620	8,058	450,696
HOLLAND	424,773	5,784	3,723	*none*	175	9,682	424,773
SWEDEN	377,501	13,065	3,640	706	248	17,659	450,000
NORWAY	75,844	1,220	378	*none*	40	1,647	75,844
DENMARK	77,558	498	122	*none*	125	745	77,558
U. S. AMERICA†	27,783,000	908,000†	*not stated*	*not stated*	*not stated*	908,000	27,783,000
INDIA	1,908,679	1,694	189,559	539	14,630	206,422	5,800,000
CANADA	777,422	24,777	212	740	*none*	25,729	855,293
MEXICO, BRAZIL, and Other Countries.	375,040	4,235	29	*none*	18,232‡	22,496	2,600,000
TOTAL.....	115,971,004	1,887,600	757,041	201,810	336,941	3,183,392	131,503,062

TOTALS.							
August 31st, 1908	111,217,883	1,543,663	750,001	153,915	280,466	2,728,045	128,923,659
August 31st, 1907	100,621,078	2,073,386	912,164	140,371	208,489	3,334,410	114,096,168
August 31st, 1906	66,072,303	684,282	343,117	107,915	75,296	1,210,610	77,115,125
August 31st, 1905	46,726,929	615,745	192,158	83,683	43,651	935,237	68,222,736

* The larger part being Russian Cotton of about 270-290 lbs. each bale.

† The figures for the U. S. America have been cabled by the Census Bureau, Washington, D.C. The 908,000 bales of American [illegible] of 500 lbs. each.

STOCKS OF COTTON IN SPINNERS' HANDS on the 1st March, 1909.

("Invisible Supply"—Spinners' Returns.)

COUNTRIES	Number of Spinning Spindles Actual Returns	STOCKS IN ACTUAL BALES.					TOTAL WORLD. Estimated Number of Spinning Spindles in work
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN	47,794,671	303,844	13,637	118,414	28,493	464,388	53,471,897
GERMANY	9,819,293	252,778	108,538	29,218	10,673	401,207	9,881,321
FRANCE	6,085,491	123,996	31,890	19,449	6,898	182,233	6,750,000
RUSSIA	5,750,159	113,576	8,689	23,623	296,195*	442,082	7,829,210
AUSTRIA	4,122,295	127,711	60,078	10,948	2,611	201,348	4,162,295
ITALY	3,587,405	139,797	47,574	7,062	3,235	197,668	4,000,000
SWITZERLAND	1,414,660	15,083	1,499	12,878	1,334	30,794	1,493,012
JAPAN	1,492,089	54,193	101,644	7,395	33,378	196,610	1,695,879
SPAIN	1,272,000	31,723	12,750	2,923	2,834	50,230	1,853,000
BELGIUM	1,026,651	27,215	21,500	374	227	49,316	1,200,000
PORTUGAL	440,716	8,468	91	139	8,896	17,594	450,000
HOLLAND	417,214	9,482	5,333	—	—	14,815	417,214
SWEDEN	325,911	13,232	3,424	—	39	16,695	430,000
NORWAY	65,664	1,768	160	—	26	1,954	75,000
DENMARK	66,076	591	425	—	—	1,016	77,644
U. S. AMERICA	27,846,000	1,789,000**	2,400	35,400	5,000	1,831,800	27,846,000
INDIA	1,300,175	4,388	115,895	667	2,237	123,187	5,756,020
CANADA	627,403	24,102	—	966	656	25,724	855,293
MEXICO BRAZIL, and Other Countries	298,764	3,698	—	487	14,081***	18,266	2,552,142
TOTAL	113,752,697	3,044,644	535,527	269,943	416,813	4,266,927	130,795,927

TOTALS							
March 1st, 1908	87,972,808	1,558,367	759,157	225,554	248,776	2,791,854	125,097,583
March 1st, 1907	71,354,603	1,194,685	348,720	230,627	137,139	1,911,071	—

* 282,507 bales of 270-290lbs. each are Russian Cotton.

** The figures for the U. S. America have been supplied by the Census Bureau at Washington, D.C. The 1,789,000 bales of American Cotton represent bales of 500lbs. each.

*** 7,991 bales are Mexican Cotton, and 6,090 bales are Brazilian Cotton.

CONSUMPTION OF COTTON FOR YEAR ENDING AUGUST 31st, 1908.

(Spinners' Returns.)

Countries	Number of Spinning Spindles in work. Actual Returns	CONSUMPTION IN BALES. American	East Indian	Egyptian	Sundries	Total	Estimated Total Number of Spinning Spindles in work
GREAT BRITAIN ..	46,664,236	2,891,127	67,252	349,756	86,268	3,394,403	52,817,582
GERMANY	9,091,905	1,223,394	400,050	98,815	37,384	1,759,643	9,882,505
FRANCE.....	6,232,700	685,648	117,959	54,179	22,149	879,935	6,731,316
AUSTRIA	3,996,460	463,760	232,969	27,596	10,125	734,450	4,026,460
ITALY.....	3,559,069	598,140	241,141	19,802	15,344	874,427	4,181,000
SWITZERLAND	1,439,060	57,574	4,955	27,162	1,840	91,531	1,493,012
BELGIUM	1,162,041	116,877	93,944	853	716	212,390	1,162,041
JAPAN	1,612,000	195,000	600,000	11,000	196,000	1,008,000	1,637,000
SPAIN	1,660,000	220,715	45,621	17,651	23,843	307,830	1,850,000
PORTUGAL	370,407	44,731	190	892	20,931	66,744	450,000
RUSSIA	3,691,267	313,470	8,705	46,081	554,796*	923,118	7,855,210
HOLLAND	396,160	57,876	18,710	—	740	77,326	396,160
SWEDEN	319,889	63,459	9,206	—	217	72,882	390,000
NORWAY	74,936	10,301	888	—	66	11,255	74,936
DENMARK	77,044	17,081	3,466	—	247	20,794	77,044
EGYPT	20,000	—	—	3,000	—	3,000	20,000
U.S. AMERICA	27,846,000	4,575,000	not stated	not stated	not stated	4,575,000	27,846,000
INDIA	1,204,969	47,613	425,290	1,159	30,975	505,037	5,500,000
CANADA	729,724	105,137	—	310	—	105,447	795,293
MEXICO	199,652	2,607	180	—	41,779†	44,566	730,000
BRAZIL	202,264	—	—	—	109,259‡	109,259	1,000,000
ARGENTINE	7,500	1,000	—	—	1,500	2,500	7,500
TOTAL	111,217,883	11,690,516	2,270,586	658,256	1,154,179	15,779,537	128,923,659
Totals							
August 31st, 1907	100,521,078	11,668,575	1,768,293	616,896	855,429	14,909,193	114,096,168
August 31st, 1906	66,072,303	5,704,208	980,111	578,753	302,309	7,571,381	77,115,126

The figures for the U.S. America have been collected by the Bureau of the Census, Washington, D.C.

* ... weighing 270 to 290 lbs. each. † 40,857 bales are Mexican cotton. ‡ All Brazilian grown cotton

STOCKS OF COTTON IN SPINNERS' HANDS on the 31st AUGUST, 1908.

("Invisible Supply"—Spinners' Returns.)

COUNTRIES	Number of Spinning *Spindles*, Actual Returns	STOCKS IN BALES. American	East Indian	Egyptian	*Sundries*	TOTAL	Estimated Total Number of Spinning *Spindles* in work
GREAT BRITAIN ..	46,664,236	262,050	19,062	64,465	18,442	364,019	52,817,582
GERMANY	9,691,905	150,658	157,014	21,078	7,498	336,248	9,882,505
FRANCE.....	6,232,700	81,678	50,234	13,456	7,156	152,424	6,731,316
AUSTRIA	3,996,460	99,775	109,361	12,018	1,974	223,128	4,026,460
ITALY.....	3,559,069	116,194	92,930	6,150	4,157	219,431	4,181,000
SWITZERLAND	1,439,080	8,824	1,565	7,712	1,412	19,513	1,493,012
BELGIUM	1,162,041	13,715	30,882	368	214	45,179	1,162,041
JAPAN	1,612,000	52,000	161,000	5,000	39,000	257,000	1,637,000
SPAIN	1,660,000	10,368	4,187	2,495	3,320	20,370	1,850,000
PORTUGAL	370,407	6,893	—	793	4,295	11,101	450,000
RUSSIA	3,691,267	97,061	7,180	20,006	157,777*	282,024	7,855,210
HOLLAND	396,160	7,459	11,188	—	30	18,677	396,160
SWEDEN	319,889	10,627	4,880	—	34	15,541	390,000
NORWAY	74,936	1,337	440	—	62	1,839	74,936
DENMARK	77,644	740	692	—	51	1,483	77,644
EGYPT	20,000	—	—	250	—	250	20,000
U.S. AMERICA	27,846,000	596,000	not stated	not stated	not stated	596,000	27,846,000
INDIA	1,264,969	7,129	99,386	445	11,399	118,359	5,500,000
CANADA	729,724	20,877	—	379	—	21,256	795,293
MEXICO	199,652	388	—	—	10,338†	10,726	730,000
BRAZIL	202,264	—	—	—	13,165‡	13,165	1,000,000
ARGENTINE	7,500	—	—	—	222	222	7,500
TOTAL	111,217,883	1,543,663	750,001	153,915	280,466	2,728,045	128,923,659
TOTALS							
August 31st, 1907	100,521,078	2,073,386	912,104	140,371	208,489	3,334,410	114,096,168
August 31st, 1906	66,072,303	684,282	343,117	107,915	75,296	1,210,610	77,115,125

The figures of the U.S. America have been collected by the Bureau of the Census, Washington, D.C.

* 140,745 bales are Russian grown cotton. † 9,823 bales are Mexican cotton. ‡ All Brazilian cotton.

STATISTICS OF THE STOCKS OF COTTON IN SPINNERS' HANDS
on the 1st MARCH, 1908. ("Invisible Supply"—Actual Returns.)

COUNTRIES.	Number of Spinning Spindles Actual Returns	STOCKS IN BALES					Estimated Total Number of Spinning Spindles in work
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN	46,077,926	354,611	18,245	105,302	26,470	504,628	51,976,650
GERMANY	9,570,347	251,664	177,716	31,460	9,405	470,245	9,592,855
FRANCE	6,352,704	135,520	48,147	26,007	9,288	218,962	7,006,428
AUSTRIA	3,746,444	139,605	119,507	10,491	4,510	274,113	3,777,044
ITALY	3,106,530	146,773	81,681	4,542	5,565	238,561	3,800,000
SWITZERLAND..	1,449,428	21,548	3,440	13,318	1,391	39,697	1,492,170
BELGIUM	1,155,787	28,609	43,614	444	182	72,849	1,155,787
JAPAN	1,497,000	48,200	121,800	4,000	2,000	176,000	1,540,000
SPAIN	1,136,000	28,448	12,150	2,692	2,542	45,832	1,800,000
PORTUGAL	336,902	9,983	1,531	320	5,657	17,491	378,016
RUSSIA	3,663,998	75,290	5,730	13,373	153,044*	247,437	6,800,000
HOLLAND	386,220	5,468	7,765	99	200	13,532	386,220
SWEDEN	365,400	14,184	5,104	—	—	19,288	420,000
NORWAY.....	73,360	1,933	365	-	54	2,352	73,360
DENMARK	66,060	554	586	—	—	1,140	76,060
1908 TOTAL ..	78,984,106	1,262,390	647,381	212,048	220,308	2,342,127	90,274,590
TOTALS.							
March 1st, 1907 ..	71,054,503	1,194,585	348,720	230,627	137,139	1,911,071	85,455,894
March 1st, 1906 ..	54,297,537	754,148	254,929	149,200	78,903	1,237,180	73,394,800

* This includes 136,722 bales of Russian Cotton.

STATISTICS OF CONSUMPTION OF COTTON FOR THE YEAR ENDING AUGUST 31st, 1907 (Actual Returns).

Countries	Number of Spinning Spindles Actual Returns	Consumption in Bales. American	East Indian	Egyptian	Sundries	Total	Estimated Total Number of Spinning Spindles in work
GREAT BRITAIN	43,154,713	2,939,389	68,967	331,219	133,248	3,462,823	50,679,641
GERMANY	9,191,940	1,135,538	380,367	98,615	46,660	1,661,180	9,339,448
FRANCE	6,603,105	707,541	128,856	66,016	21,010	923,423	6,800,000
AUSTRIA	3,584,434	436,735	231,845	28,634	7,793	705,007	3,616,434
ITALY	2,867,862	491,598	214,013	13,110	12,616*	731,337	3,500,000
SWITZERLAND..	1,413,896	55,684	4,117	27,601	1,978	89,380	1,484,450
BELGIUM	1,110,600	125,136	64,388	613	619	190,756	1,140,000
JAPAN	1,356,713	252,000	605,000	9,000	202,000	1,068,000	1,483,497
SPAIN	1,387,500	186,655	38,746	13,209	17,244	255,754	1,850,000
PORTUGAL	358,000	45,500	200	505	40,731	86,936	420,000
RUSSIA	2,351,513	156,915	10,850	24,761	356,366	548,892	6,500,000
HOLLAND	395,678	59,389	12,818	23	1,640	73,870	395,678
SWEDEN	326,860	63,010	13,125	—	424	76,559	415,000
NORWAY.....	65,776	9,492	1,155	—	—	10,647	71,776
DENMARK	48,104	16,903	3,240	—	—	20,143	59,044
LEVANT	23,184	—	—	—	13,100	13,100	60,000
EGYPT	39,200	190	606	3,590	—	4,386	39,200
1907 Total ..	74,279,078	6,681,575	1,768,293	616,996	855,429	9,922,193	87,851,168
U.S. AMERICA....	26,242,000	4,987,000	—	—	—	4,987,000	26,242,000

The figures for America were supplied by the U.S. Census Bureau, which collects the statistics only once every year, viz., in October.

STATISTICS OF THE STOCKS OF COTTON IN SPINNERS' HANDS

on the 31st AUGUST, 1907. ("Invisible Supply"—Actual Returns.)

COUNTRIES	Number of Spinning Spindles Actual Returns	STOCKS IN BALES					Estimated Total Number of Spinning Spindles in work
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN	43,154,713	292,176	20,268	70,196	26,476	409,116	50,679,641
GERMANY	9,191,940	244,480	221,746	22,431	11,994	500,651	9,339,448
FRANCE	6,603,105	103,779	64,536	15,492	6,357	190,164	6,800,000
AUSTRIA	3,584,434	106,503	159,169	8,064	3,128	276,864	3,616,434
ITALY	2,867,862	143,255	104,015	3,653	6,639	257,562	3,500,000
SWITZERLAND	1,413,896	13,476	3,482	8,067	1,536	26,561	1,484,450
BELGIUM	1,110,600	22,153	37,849	228	225	60,455	1,140,000
JAPAN	1,356,713	57,560	267,180	3,072	34,918	362,730	1,483,497
SPAIN	1,387,500	25,176	11,614	2,829	5,400	45,019	1,850,000
PORTUGAL	368,000	8,750	50	152	8,639	17,591	420,000
RUSSIA	2,351,513	40,837	4,152	5,587	100,928	151,504	6,500,000
HOLLAND	395,678	4,942	11,560	100	670	17,272	395,678
SWEDEN	326,860	12,208	5,491	—	232	17,930	415,000
NORWAY	65,776	1,575	404	—	—	1,979	71,776
DENMARK	48,104	516	648	—	—	1,164	59,044
LEVANT	23,184	—	—	—	1,348	1,348	60,000
EGYPT	39,200	—	—	500	—	500	39,200
1907 TOTAL	74,279,078	1,077,386	912,164	140,371	208,489	2,338,410	87,854,168
U.S. AMERICA	26,242,000	996,000	—	—	—	996,000	26,242,000

The figures for America were supplied by the U.S. Census Bureau, which collects the statistics only once every year, viz., in October.

STATISTICS OF THE STOCKS OF COTTON IN SPINNERS' HANDS ON 1st MARCH, 1907. ("Invisible Supply"—Actual Returns.)

COUNTRIES	Number of Spinning Spindles Actual Returns	STOCK IN ACTUAL BALES					Estimated Total Number of Spinning Spindles
		American	East Indian	Egyptian	Sundries	TOTAL	
GREAT BRITAIN..	42,375,163	393,514	14,218	127,923	40,262	575,917	49,880,000
GERMANY.....	9,124,143	243,927	98,260	30,403	10,388	382,978	9,500,000
FRANCE.....	6,383,547	150,660	36,664	28,100	8,126	223,540	6,750,000
AUSTRIA	3,451,380	136,616	72,438	14,402	2,915	226,371	3,600,000
ITALY.....	3,125,563	137,612	76,473	5,421	6,184	224,690	3,547,000
SWITZERLAND ..	1,382,350	19,311	1,797	14,693	1,525	37,326	1,467,752
SPAIN.....	1,266,472	33,940	12,868	2,838	2,088	51,734	1,800,000
BELGIUM	1,090,638	24,815	24,036	295	443	49,589	1,125,000
PORTUGAL	337,400	6,070	—	140	5,800	12,010	367,400
RUSSIA	1,707,985	25,514	4,183	6,412	59,093	95,202	6,500,000
HOLLAND.....	382,698	6,307	6,092	—	—	12,399	382,698
SWEDEN	308,296	14,122	2,073	—	237	16,432	412,000
NORWAY	59,824	1,377	184	—	78	1,639	65,000
DENMARK	59,044	810	434	—	—	1,244	59,044
TOTAL.....	71,054,503	1,194,585	348,720	230,627	137,139	1,911,071	85,455,894

STATISTICS OF CONSUMPTION OF COTTON FOR YEAR ENDING AUGUST 31st, 1906 (Actual Returns).

Countries	Number of Spinning Spindles Actual Returns	CONSUMPTION IN BALES.					Estimated Total Number of Spinning Spindles
		American	East Indian	Egyptian	Sundries	Total	
GREAT BRITAIN	41,885,774	2,815,331	51,313	316,598	175,466	3,358,708	48,826,144
GERMANY	8,864,618	1,094,025	357,834	112,940	57,205	1,622,004	9,730,209
FRANCE	6,402,757	685,435	113,248	67,252	24,177	890,112	6,702,800
AUSTRIA	3,377,259	402,077	209,443	25,208	7,636	644,364	3,621,220
ITALY	1,910,919	366,917	153,041	14,711	7,105	541,774	3,500,000
SWITZERLAND ..	1,395,436	58,355	4,990	27,413	1,770	92,528	1,462,752
BELGIUM	1,042,612	108,987	67,697	1,546	709	178,939	1.122,000
SPAIN	1,000,000	150,858	28.545	13,014	12,398	204,815	1,800,000
PORTUGAL.....	192,928	22,223	—	71	15,843	38,137	360,000
Total.....	66,072.303	5,704.208	986,111	578,753	302,309	7,571,381	77,115,125

STATISTICS OF THE STOCKS OF COTTON IN SPINNERS' HANDS
on 31st AUGUST, 1906. ("Invisible Supply"—Actual Returns.)

Countries	Spindles	Stocks in Bales					Estimated Total Number of Spinning Spindles
		American	East Indian	Egyptian	Sundries	Total	
GREAT BRITAIN	41,885,774	276,844	15,913	53,849	39,750	386,356	48,826,144
GERMANY	8,864,618	169,898	128,046	24,963	16,804	339,711	9,730,209
FRANCE	6,402,757	67,167	43,409	13,322	5,181	129,079	6,702,800
AUSTRIA	3,377,259	57,230	83,072	4,006	1,077	145,385	3,621,220
ITALY	1,910,919	81,323	46,138	2,622	3,277	133,360	3,500,000
SWITZERLAND	1,395,436	8,766	2,405	6,051	780	18,002	1,462,752
BELGIUM	1,042,612	13,938	20,676	737	394	35,645	1,122,000
SPAIN	1,000,000	4,560	3,558	2,224	1,550	11,892	1,800,000
PORTUGAL	192,928	4,556	—	141	6,483	11,180	360,000
Total	66,072,303	684,282	343,117	107,915	75,296	1,210,610	77,115,125

STATISTICS OF THE STOCKS OF COTTON IN SPINNERS' HANDS ON 1st MARCH, 1906. ("Invisible Supply"—Actual Returns.)

Countries	Spindles	Stocks in Bales.					Estimated Total Number of Spinning Spindles
		American	East Indian	Egyptian	Sundries	Total.	
GREAT BRITAIN	31,331,372	245,681	8,665	80,487	45,262	380,095	47,500,000
GERMANY.....	8,569,738	175,121	85,441	26,438	7,800	294,800	8,800,000
FRANCE.....	5,353,600	80,202	23,715	13,014	6,938	123,869	6,400,000
ITALY.....	2,418,900	120,432	53,885	7,241	3,951	185,509	2,800,000
SPAIN.....	900,000	13,700	6,587	3,081	1,678	25,046	1,700,000
SWITZERLAND ..	1,414,498	14,986	1,978	11,704	1,606	30,364	1,462,800
PORTUGAL	280,000	8,183	—	—	9,281	17,464	350,000
BELGIUM	1,061,879	23,760	22,466	269	377	46,872	1,084,700
AUSTRIA	2,967,550	72,083	52,192	6,876	2,010	133,161	3,297,300
Total.....	54,297,537	754,148	254,929	149,200	78,903	1,237,180	73,394,800

STATISTICS OF CONSUMPTION OF COTTON FOR YEAR ENDING AUGUST 31st, 1905 (Actual Returns).

Countries	Spindles	Consumption of Cotton, 1st September, 1904, to 31st August, 1905, in Bales					Total Spindles Estimated
		American	East Indian	Egyptian	Sundries	Total	
GREAT BRITAIN ..	28.695,599	1,828,238	34,981	213,375	44,136	2,120,730	46,000,000
GERMANY	8,100,801	1,059,481	315,900	96,781	27,573	1,499,735	8,800,000
FRANCE	4,133,311	463,499	75,021	38,999	11.097	588,616	6,200,000
ITALY.....	2,405.274	483,379	182,624	13,960	9,034	688,997	2,760,000
SPAIN	725,000	125.110	9,739	11,088	3,896	149.833	1,700,000
SWITZERLAND ..	1,424.754	66,067	6.066	27,110	2,139	101,382	1,456,546
PORTUGAL	334,190	43,983	44	377	27.825	72,229	334,190
BELGIUM	908,000	104,331	43,077	1,055	28	148,491	972,000
TOTAL.....	46,726,929	4.174.088	667,452	402,745	125.728	5,370,013	68,222,736

STATISTICS OF THE STOCKS OF COTTON IN SPINNERS' HANDS
on 31st AUGUST, 1905. (Invisible Supply—Actual Returns.)

Countries	Spindles	Cotton in Stock, 31st August, 1905, in Bales.					Total Spindles Estimated
		American	East Indian	Egyptian	Sundries	Total	
GREAT BRITAIN	28,695,599	182,786	4,384	39,207	21,639	248,016	46,000,000
GERMANY	8,100,801	188,797	90,788	24,024	6,485	310,094	8,800,000
FRANCE	4,133,311	51,053	26,914	8,523	4,115	90,605	6,200,000
ITALY	2,405,274	130,921	55,520	3,380	2,858	192,679	2,760,000
SPAIN	725,000	16,700	1,300	1,480	520	20,000	1,700,000
SWITZERLAND..	1,424,754	13,918	1,743	6,595	675	22,931	1,456,546
PORTUGAL	334,190	14,026	33	161	7,350	21,570	334,190
BELGIUM	908,000	17,544	11,476	313	9	29,342	972,000
Total.....	46,726,929	615,745	192,158	83,683	43,651	935,237	68,222,736

STATUTES

OF THE

International Federation of Master Cotton Spinners' and Manufacturers' Associations.

STATUTES.

Adopted at the Second International Congress held in Manchester, June, 1905.

Object.

1.—The purpose of this International Federation shall be to watch over and protect the common interests of the Industry, and to advise Associations of the action to be taken against any common danger.

2.—The means to be employed are :—

(1) The holding of Congresses of Delegates from the Associations in all countries becoming affiliated with the International Federation.

(2) The appointment of a Committee of Management, who shall :—

(*a*) Control the work and expend the moneys of the Federation under the instruction of the Congress.

(*b*) Distribute information of practical value in carrying on and improving the conditions of the Cotton Trade.

(*c*) Assist in the formation, strengthening, and assimilating of Associations in all Spinning and Manufacturing Centres of the Cotton Industry.

(*d*) Call together the Delegates to special Congress when the need shall arise.

(*e*) Consult the Associations by correspondence, and distribute and collect voting papers from the Associations on any International movement in connection with the Trade.

(*f*) Take any other action in common interest of the Trade that may be decided upon by Congress.

Membership.

3.—All Associations of Cotton Spinners and Manufacturers are eligible for affiliation with the International Federation, subject to their acceptance by Committee and Congress.

Financial.

4.—A Levy shall be paid by each Association according to its number of Spindles and Looms.

5.—Spindles shall include Mule, Ring, Throstle, and Doubling. Two Doubling Spindles to be equal to one Mule Spindle.

6.—Each Association joining the Federation shall pay an Entrance Fee of $\frac{3}{1000}$ of a penny per Spindle, and one halfpenny per Loom (one Loom to be equal to 25 Spindles). This Entrance Fee shall include the current year's Levy.

7.—For the year 1905, and each succeeding year until otherwise determined, a Levy shall be made of $\frac{1}{200}$ of a penny per Spindle and one-eighth of a penny per Loom.* Associations are liable for the coming year's Levy unless they have handed in their resignation at least three months before the end of the current year. Resignation forfeits all rights to any accumulated funds.

8.—All Levies shall, after the year 1904, be due for payment before the end of September.

9.—In case any Association shall fail to pay its Levy, or send Delegates to the Congress, the name of such Association shall be placed before the Congress to take what steps it may think fit.

Offices.

10.—The Offices of the Federation shall be in Manchester. Any change in the head-quarters must be by decision of the Annual Congress.

By-Laws for Committee.

11.—The Committee of Management shall consist of one Delegate from each country affiliated to the International Federation, having in membership with the Federation not less than 750,000 spindles or its equivalent in spindles and looms, and the Committee, from its own members, shall appoint a Chairman, Vice-Chairman, and two Honorary Treasurers of the Federation. Each country shall appoint its own Delegate. The country which the Chairman of the Committee of Management represents shall be entitled to another representative on the Committee.

12.—For the Committee of Management, five shall form a quorum.

13.—Each country shall have the right to appoint a substitute to attend the meetings of the Committee in the event of its representative being unable to attend. This substitute, in order to become conversant with the work of the Committee, may accompany the duly appointed representative to any meetings of Committee, if the Associations in his country so desire, but in the latter case his expenses

* The Levy for the year 1912-13 has been fixed by the Congress at $\frac{1}{180}$ of a penny per Spindle, and ¼d. per Loom, plus 20 per cent.

will not be paid by the International Federation, nor has he power to vote, and it is not expected that he will take part in discussions at the meetings.

14.—The Committee shall appoint its Secretary, or Secretaries, and other Assistants, Bankers, Auditors, and Solicitors, and such appointments shall be confirmed annually or otherwise.

15.—The Committee shall have power to appoint, from its own body, any of its members for the purpose of obtaining information or undertaking preparatory work in connection with any of the objects of the Federation. Such information or preparatory work to be reported upon periodically to the Committee through its Secretary.

16.—Should a position as Officer or Member of the Committee become vacant by death or resignation, the Committee shall have power to fill such position, if an Officer, from its own body; if a Member of the Committee, from the Delegates from the country represented.

17.—The Committee shall meet when it is desirable, but where possible the consultation shall be done by correspondence. When possible, at least four weeks' notice shall be given of any meeting of the Committee of Management.

18.—On the request of one-fourth of the Members of the Committee (which always includes the Officers), the Chairman shall call a meeting.

Expenses of Members of Committee.

19.—The Members of the Committee of Management, when attending meetings of the Committee, shall be allowed first-class fares and 40 francs per day for out-of-pocket expenses.

Bank Account.

20.—The Bank Account shall be in the names of the Chairman of the Committee and the Secretary at head-quarters, and all cheques shall be signed by the Chairman, or one of the Honorary Treasurers, and countersigned by one of the Secretaries.

21.—The Bank Account shall not be overdrawn, and no expenditure or liability shall be incurred for which there are no funds in the Bank.

Close of Financial Year.

22.—The financial year shall end December 31st.

Dissolution.

23.—In case of dissolution the funds in hand shall be divided on the basis of the contributions made by the affiliated Associations.

Regulations for Congress.

24.—The Congress shall be in a different country each time.

25.—When possible, at least four weeks' notice shall be given of any meeting of Congress.

26.—The Associations in each country shall appoint Delegates to attend the Congresses. No restriction shall be placed on the number of Delegates any Association may send, but the voting power shall be as follows :—

One vote for each Million Spindles or part thereof.

One vote for each 40,000 Looms or part thereof, but not more than Twenty Votes to be given by any one country.

Voting shall be by the showing of hands, but shall be by ballot if desired by 25 per cent. of those present empowered to vote.

27.—Each Association shall, before the end of March, appoint its Delegates for the following Congress, and shall at once intimate to the Secretary the names, postal addresses, and cable addresses of such Delegates.

28.—Fourteen days' notice shall, if possible, be given to the Secretary at Head-quarters of any change in the appointment of Delegates.

29.—The expenses of Delegates shall be paid by the Association they represent, or by the Delegates themselves.

30.—If a Delegate be unable to be present, he may be replaced by another representative of his Association. This representative, however, must present satisfactory credentials to the Committee.

31.—Any Association wishing to bring a subject before the Annual Congress, or propose the alteration of a Rule, shall forward its resolution to the Secretary at head-quarters before the end of March.

32.—The member of the Committee of Management representing the country in which the Congress assembles shall preside over such Congress. The names of the Delegates shall be called over; after which the Chairman of the Committee of Management shall present a report, to be followed by the reading of the Financial Statement.

33.—The remaining proceedings shall be arranged by the Committee of Management, but shall be subject to alteration should the Congress desire.

34.—Permission may be granted for the discussion of matters which do not comply with Rule 31, but no vote can be taken.

35.—In order to expedite the discussions of the ongress, the introducer of any subject shall be allowed one hour. Subsequent speakers shall be allowed fifteen minutes, which the Chairman may at his discretion extend to thirty minutes.

36.—Delegates may speak in English, French, or German, but it is desirable that they use the English language in order to obviate, as far as possible, the necessity of translation.

37.—No resolution in any Congress shall be voted upon except 75 per cent. of the Delegates empowered to vote are present, and no resolution shall be carried except by a majority of 75 per cent. of those voting.

38.—No resolution shall be voted upon at the sitting in which it has been introduced (unless a 75 per cent. majority be in favour of such vote being taken), except for the appointment of Officers of the Congress and the fixing of the next place of the Congress.

39.—The place of meeting for the next Congress shall be decided upon at the last meeting of a Congress.

Official Reporters.

40.—Official Reporters shall be appointed to take a verbatim report of all proceedings, and submit a general report of the day's proceedings for the Committee's approval before giving it to the Press.

Visitors.

41.—No strangers shall be allowed to attend the sittings of Congress, except they have a special written permit from the Committee.

Voting by Correspondence.

42.—Voting by correspondence with the Associations shall be by Spindles (one Loom equalling 25 Spindles, and two Doubling Spindles to be equal to one Mule Spindle). The ratio of voting power shall be as per Rule 26.

Alteration of Rules.

43.—These Rules may be added to, varied, or rescinded at any Annual Congress, but notice of any proposed alteration shall be sent by the Secretary with the notice convening the Annual Congress.

Local Committees.

44.—Local Committees may be formed in each country for the purpose of discussing questions of international interest. The meeting forming such Local Committee shall be convened by the various representatives on the Committee of Management.

International Cotton Congresses have been held in the following countries :

1904, Switzerland (Zurich).

1905, England (Manchester and Liverpool).

1906, Germany (Bremen).

1907, Austria (Vienna).

1908, France (Paris).

1909, Italy (Milan and Rome).

1910, Belgium (Brussels).

1911, Spain (Barcelona).

Conferences with cotton planters and others have been held under the auspices of the International Cotton Federation in

1907, United States of America (Atlanta, Ga.)

1912, Egypt (Alexandria and Cairo).

MEETINGS of the COMMITTEE

of the International Federation of Master Cotton Spinners' and Manufacturers' Associations have been held in :—

May, 1904	ZÜRICH.
October, 1904	PARIS.
April, 1905	BRUSSELS.
June, 1905	MANCHESTER
,, ,,	LIVERPOOL.
July, 1905	LONDON.
November, 1905	PARIS
June, 1906	BERLIN.
	BREMEN.
November, 1906	LONDON.
May, 1907	VIENNA.
	ATLANTA, GA., U.S.A
January, 1908	MANCHESTER.
June, 1908	PARIS.
December, 1908	GENEVA.
May, 1909	ROME.
	MILAN.
October, 1909	FRANKFORT-ON-MAIN.
June, 1910	BRUSSELS.
November, 1910	LONDON.
May, 1911	LISBON.
	BARCELONA.
October, 1911	BERLIN.
May, 1912	SALZBURG.
October, 1912	ALEXANDRIA.
November, 1912	CAIRO.
January, 1913	HAVRE.
	PARIS.

Frequent meetings of international sub-committees, dealing with special subjects, have met in centrally-situated cities.

Congress Reports and Other Publications.

(Published in the best-known languages, and circulated throughout the world.)

Congress Reports.

1904—SWITZERLAND (Zurich).
1905—ENGLAND (Manchester and Liverpool).
1906 GERMANY (Bremen).
1907—AUSTRIA (Vienna).
1908—FRANCE (Paris).
1909—ITALY (Milan and Rome).
1910—BELGIUM (Brussels).
1911—SPAIN (Barcelona).

(This Report includes an historical record of the International Cotton Federation, contributed by the President, Sir Charles W. Macara, Bart.)

Conferences with Cotton Planters and others under the auspices of the International Cotton Federation.

1907—UNITED STATES OF AMERICA (Atlanta, Ga.).
1912—EGYPT (Alexandria and Cairo).

Other Publications.

Report. Cotton Growing in India (November, 1909—January, 1910). Arno Schmidt, Secretary.

Reception in London by the Secretary of State for India (Lord Morley), July 27th, 1910.

Government Luncheon and Receptions in London by the Secretary of State for India (Lord Crewe) and by the President of the Board of Trade (Mr. Sydney Buxton, M.P.), November 21st, 1910.

Report. Cotton Growing in India (December, 1911—January, 1912). Arno Schmidt, Secretary.

Reception in London by the Secretary of State for India (Lord Crewe), July 1st, 1912.

Report. Cotton Growing in Egypt (December, 1911). Arno Schmidt, Secretary.

Report. Cotton Growing in the Anglo-Egyptian Sudan (1913). Arno Schmidt, Secretary.

Half-yearly Statistical Returns of Stocks of Cotton held by Spinners.

Yearly Statistical Returns of Cotton Consumption.

Approximate Number of the SPINDLES of the World SPINNING EGYPTIAN COTTON EXCLUSIVELY.

England	14,000,000	spindles.
Germany	1,400,000	,,
France	1,400,000	,,
Switzerland	875,000	,,
Russia	800,000	,,
U.S.A. (conjectural)	600,000	,,
Austria	500,000	,,
Italy	250,000	,,
Japan	212,000	,,
Spain	100,000	,,
India	21,000	,,
Egypt	20,000	,,
Belgium	6,000	,,
Sweden	6,000	,,
Total	20,190,000	spindles.


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