GOSAMVARDHANA

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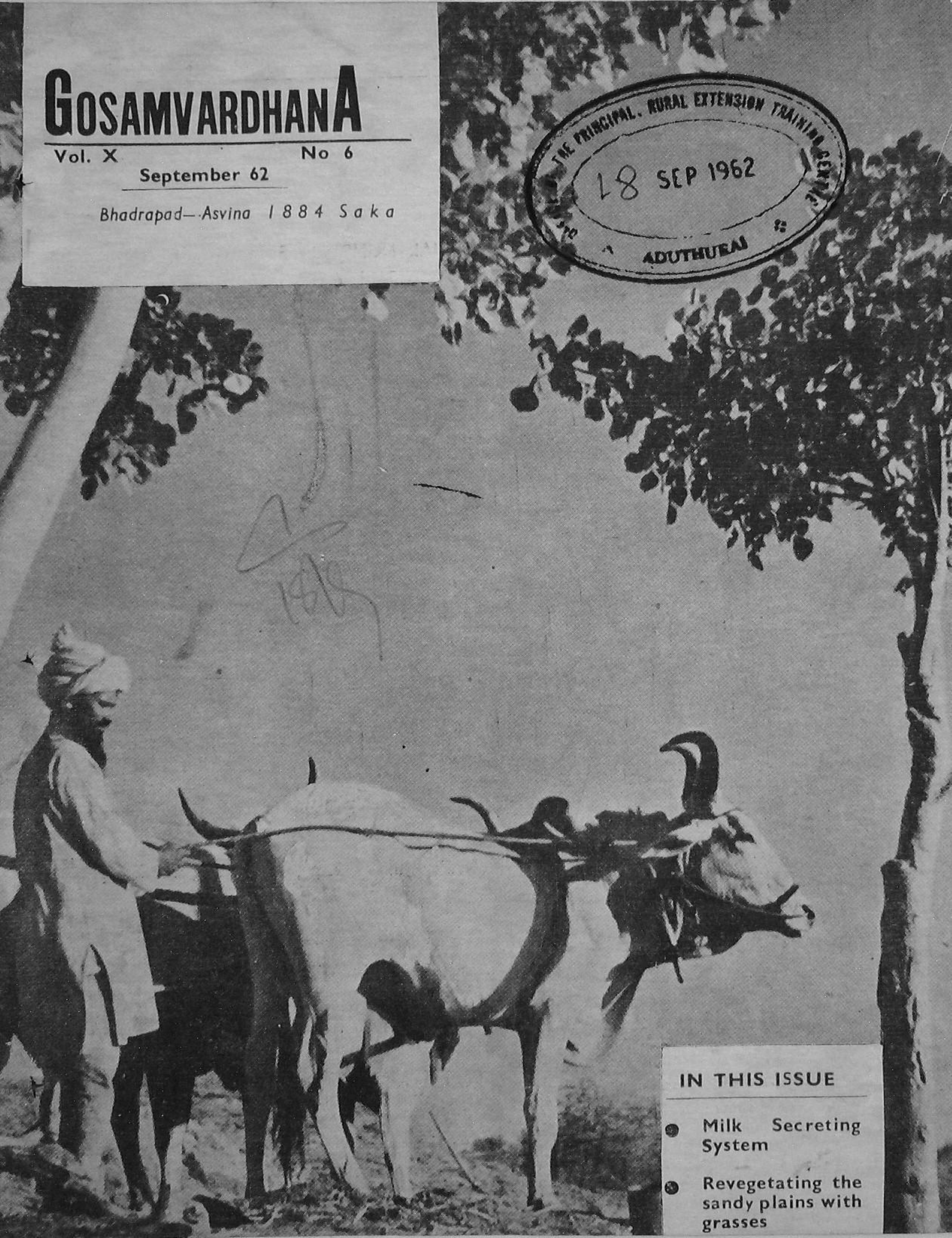
September 62

Bhadrapad—Asvina 1884 Saka



IN THIS ISSUE

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- *Quality of animals depends upon the quality of the personnel also, etc. etc.*

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OUR COVER :—**PREPARATION OF LAND**

Editorial

OUR NEW PUBLICATIONS

''A Heart to Heart talk with the members of the Panchayats'': a series of articles has been published in our journal under this heading. This series was specifically addressed to the members of the Panchayats because now the responsibility of implementing the various facets and aspects of planning and developmental projects is devolving on them with ever increasing quantum. In the aforesaid series an analysis was presented about the various problems connected with the cattle development and the vital role the cattle have to play in bringing prosperity to the Country. Inspired by the interest and response shown by our readers and particularly by the members of Panchayats, the Central Council of Gosamvardhana is publishing this series in the form of a booklet which will soon be available from our office.

We are also happy to inform our readers that this year also a Special Number on the theme; QUALITY—the base of Prosperity will be brought out at the time of the Gosamvardhana Week celebrations to be observed from the 29th October to 5th November. This Special Number will be embellished with graphic and pictorial representation of the activities in the field of cattle development apart from valuable contributions from the experts in the field and the Directors of Animal Husbandry and other important authorities. We are confident that the readers will find authentic material on the questions concerning the quality as the main factor of bringing prosperity.

The extent to which our publications can contribute to the better understanding of the various cattle development aspects would be the index of service we are in a position to render in the dissemination of basic information in the field of Gosamvardhana.

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MILK *FOR THE MILLIONS IN ASIA & FAR EAST*

by
Dr. D. Jayaraman
Dairy Development Officer
Andhra Pradesh

THE present population is approximately 3000 million and it will be doubled in 40 years. The population in Asia and Africa excluding India and Japan is about 1152 million. It is a strange thing that although no man alive has ever grown to manhood without depending upon milk, but it is a fact that some people are more often than not, underfed or even starved of milk. It is degrading to know that there is a saying in China that "whosoever drinks the milk of a cow creates a bond of familial parentage with the cow". Some feel, it gives worms to children, others like the Chingalese believe, that it causes disease. New Hebridians think it is disquesting, Tanganyika women are forbidden to drink milk. However in India and Japan something is really being done to provide fairly a good supply of milk in urban areas. In other under developed countries it is no doubt the taste for milk is being aided by UNICEF, 'F.A.O.', and Colombo Plan. There are places where milk is liked, but where local factors make it so scarce and where people are not able to develop the habit of drinking and enjoying the benefits. Increased interest in milk production is of recent origin and due to rigorous climatic conditions, scarcity of feed, insufficient number of good dairy animals, poor dairy husbandry practice, yield per animal could not be increased in most of the countries except Japan.

In India it is one of the most interesting problems. We have the greatest herd of cattle, people like milk, yet milk is not available adequately at all places. The reason for this state of affairs can be better understood if we study our culture. The cow is a sacred animal as the milk and its products used as food and sacrificial offerings to Gods and as such cows cannot be killed. This has led a large proportion of herd made up of unproductive, uneconomical, and infirm animals. Besides this there is severe competition between the animal crops and human crops presence of poor productive animals, in adequate feed and in efficient use of the feed that is available. The position is however undergoing a great change in India as all state capital city schemes and

intensive milk supply schemes have set the pattern for the future.

Even the Europeans and Americans have advanced their agriculture and technology only from the second half of the last century. France which was once starving for milk and milk products is now the second largest producer of butter in Europe.

Dairy Development in Asia and Far East is being systematically developed mainly by bilateral aid programmes, and international organisations. Unfortunately these developments cover relatively small areas, mostly cities. India has established 45 co-operative milk processing units and Government sponsored units and handling about 125000 gallons of milk per day. It is hoped that there will be sufficient number of milk plants to furnish one third of the population of India with pasturised milk. Japan developed the milk industry after the second World War. The progress in the efficiency of the production per animal is much more higher than in other countries. But the development took place in limited areas and is found to be expensive when compared to other foods. Progress has been made in Ceylon and Pakistan in establishing modern dairies. Malaya imports condensed and evaporated milk and is creating interest in dairying. Phillipines established 'filled' milk industry and wants to make it a permanent one besides importation of pure bred dairy animals. What happened in Europe during the last century is now happening in Asia. These countries except China are being more industrialised with an attendant improvement in the standard of living of their people.

In 1953 at Hague on the occasion of the XIII International Dairy Congress, the following words were spoken by Prince Behard of Netherlands "one-third" of the world has surplus of milk—two thirds of the world are starving for the need of them". This statement fell on the ears of top officials of Dairy Industry Society International. The industry leaders everywhere worked together to map out new patterns of utilisation for milk, opened new markets and out crossed the traditional lines of distribution of fluid milk. Once these new approaches were blocked, the Government assisted and worked together more closely than ever before.

American has been most active in supply of enormous quantities of surplus milk products etc. through F.A.O. New Zealand has shown increasing interest in the eastern markets. The gifts of large quantities of milk and milk products particularly non-fat powders from other countries created the habit of consuming dairy products. In 1959 consumption of milk shipped by UNICEF was about 100 million pounds reaching some 5.3 million children and mothers. In 1960 the milk shipped is estimated at 70 million pounds reaching about 3.5 million beneficiaries. While there was discussion regarding consumption of milk for 1961, one of the delegates expressed his strong support for an aid for milk conservation to utilise the local resources to attach nutrition problem. This has necessitated to lower the price of milk for people with low income as toned milk, double tonned milk, standardized milk and subsidized milk. These are already being successfully employed and would be tried increasingly in UNICEF assisted schemes.

In all developmental programme more attention should be directed to increase the efficiency of the dairy animal. Without improve-

ment in her condition and performance, there can be no real progress. To achieve progress, there is immediate need to train personnel to deal with dairy cattle husbandry, extension work, veterinarians associated with milk production schemes, artificial insemination, technical and plant personnel.

To implement the dairy schemes, several problems have to be solved. There is no single solution to the problem. The situation varies considerably from place to place. In the areas of China, the influence of milk supply would be cultural, in India it would be chiefly an agricultural, social, industrial and economic proposition. In Africa, it would be a matter of veterinary science, bacteriology and immunology before an agricultural problem. In western world, it would be probably a matter of economics and distribution.

It is our cherished hope that the day will come when not only (1) sick children, especially those suffering from protein deficiency (2) infants totally or partially deprived of mother's milk (3) children in the weaning and post weaning periods (1 to 3 years) and (4) pregnant and nursing women, but every one, every day and everywhere to have enough and more milk.

GROWING FODDER ON PANCHAYAT LANDS IN PANJAB

THE economy of the village is primarily dependent upon its agricultural output. But on the whole, village has either no financial resources or if these exist, these are very meagre and thus do not permit undertaking any work of development. In order to enable the village to become self-sufficient unit, as a first step, Panchayats have been elected and established in each village to look after the welfare and improvement of the village. Funds to meet the cost of improvement were necessary. To start with Government placed at the disposal of the Panchayat all such land known as Shamlat meant for the common use of the village and Panchayats were expected to carry on the work with the revenues raised from such lands. But because of certain limitations and personal indifferences it has not been possible to achieve the object and recently the government has considered advisable to assist the Panchayats in the management of these areas to get maximum income from Panchayat land so that the same could be utilized for the uplift of the village.

There are more than is 14-15 lakh acres of Panchayat land and the income derived from it is only nominal. But with proper management and extension of irrigation it is expected to yield more than Rs. two crores and which in due course may increase to Rs. six crores or so per year.

Ways and means to achieve this object are under the active consideration of the Government.

The panchayat lands commonly known as Shamlat lands in every village as they existed primarily provided a grazing area for the village cattle without any cost. With the contemplated change of making panchayat land to yield maximum income to meet the charges of local development works in the villages most of the cultural area is to be brought under cultivation for food and fodder production. It evidently means that the village cattle which used to be fed on grazing at no cost, will be deprived of this source and there

will be no other alternative than to maintain them on fodder production. Panchayats will be well advised to earmark some area for fodder production which they can sell to the farmers at reasonable cost.

In order to acquaint the panchayats as to the various crops and their improved varieties they may grow on such areas information about each crop is given and if they need to have any other information and seed of these crops in small quantities they may write to the Economic Botanist Fodder, Sirsa (Department of Agriculture Punjab).

There are more than a dozen fodder crops grown in the State and if they are sown according to their requirements in the different parts, they can assist the farmers in maintaining his milch and draught cattle in condition.

Crops grown during the two seasons i.e. Kharif and Rabi, their improved varieties, and their cultivation and requirements are given as :—

Improved Varieties.

Kharif—Sorghums Crop—Jowar

No : 20 non sweet.
No : 29 non sweet.
No :263 sweet.
new varieties 1/54 and vi/54

Sorghum is one such crop which is grown throughout the State under varying conditions and is considered one of the best forages for livestock. It is highly sustaining and can stand a wide variety of conditions both irrigated and barani. It needs fertile heavy soil though it would grow on all soils except very sandy areas.

With 20-40 seers seed rate per acre sown from May-July the crop is ready within 60-70 days for forage yielding 300-400 mds per acre but higher yields can be obtained with fertilizers especially nitrogenous ones from $1\frac{1}{2}$ to 2 mds of Ammonium Sulphate per acre.

Crop is grown alone and in mixture with guara and thus forms a very nutritious and balanced forage. All varieties can be grown throughout but their special features are mentioned below :

No. 20 is suited to moisture shortage conditions and can stand storage better than others for long periods. It has thin stalks and lax ear.

No. 29/1 is suited to high rainfall conditions as it would escape attack of red leaf spot and gives very high yields of forage.

No. 263 is a sweet variety, medium thick stalk and suited to irrigated conditions.

There are other varieties, viz. 62 etc. which appear superior to these but have still to be brought on the list of approved seed of the department.

Agronomic work on the crop has been done extensively and it has been revealed that nitrogenous fertilizers enhance the forage yield to a great extent. The optimum doze of $1\frac{1}{2}$ to 2 mds per acre is enough.

Sudan grass is another new fodder crop which is capable of giving a number of cuttings during the season. It can withstand hot and dry conditions better than Jowar

As such it has been successfully grown during the hot and dry period of April-May when growth of jowar remains very stunted. It is thus a very useful forage especially for milch cattle during this period when farmer is faced with shortage of green fodder. Berseem is over and jowar is still to be sown. Farmers are therefore advised to put small area

under this crop which when adequately manured meets his needs to a very great extent.

Crop is sown in April with 10-12 seers seed-rate per acre in a well prepared Vattar soil and would grow very quickly under favourable conditions of soil and moisture. Fertilizers especially nitrogenous 2-4 mds increase the yield by 100-150%. Crop is ready for first cutting in about 50 days and then can be cut at intervals of 40 days giving in all 4 cuttings in the season. Total yield may be as high as 600-800 mds per acre but on an average 500 mds per acre is obtained.

Seed setting is rather poor in this crop. As such its expansion has been limited but another seed crop is possible from a ratoon crop.

Sweet varieties of Sudan grass are being developed.

Cowpeas

It is a very good nutritious legume. Forage is available in May-June if crop is sown in April but sowing can be undertaken upto the end of July and the crop late the season sets very good pods and seed.

No. 1 Cowpeas has been in the field being superior in forage and seed yield. But there are a number of varieties suiting forage and table purposes under study. Varieties obtained from abroad have also not shown superiority over No. 1. Cowpeas material was classified into 20 types and they are under comparison still to find a better variety.

Sown at the rate 12-15 seers per acre, crop yields about 250-300 mds of green forage in 60-70 days and if crop is allowed to set seed, it yields about 5-6 mds of seed per acre.

Moth—	Type 3	Both draught resistant legume of the Kharif.
Guara—	No. 2	

Generally grown in mixture with non legumes with which they form very balanced feed for livestocks.

Teosnite.

A new forage introduced recently but is very high yielding under irrigation. As such it is preferred in some areas of the State where new soils are coming under cultivation.

12-16 seers seedrate is enough to sow an acre. Sowing starts from April onwards but it is the July sown crop that makes good growth for seed and fodder both and enable green forage to be available from July onwards. Early sown crop gives two cuttings of forage upto September. Seed setting is quite good in the crop and yield of 10-15 mds per acre have been obtained at Sirsa.

Rabi

Crops include Oats, Berseem, Senji, Metha Rapes, Turnips etc.

Oats

It is an important sustaining forage grown primarily under irrigation but can do well under assured rainfall conditions. About half a dozen improved varieties have been evolved and all of them give very high forage yields. Of these there are three viz. Weston 11, Brunkr 10 and I.P. Hyb. 3 which are ready for forage in January and Feburary and ripe in April, and the other three 1/29, Algerian 19 and Fulghum are ready for forage in February-March or by April and ripe for grain by the end of April or early May.

Sown @ 25-30 seers seedrate per acre in October-November, crop grows well with a couple of irrigations during the growing period for fodder and another irrigation for ripening. Forage yields vary from 400-600 mds per acre under good conditions but on an average 300-350 mds per acre are obtained.

There are other varieties such as Hindustan which has bold kernel and has been found to be suitable both for forage and grain. Since importance of Oats is increasing for grain which is now being used for breakfast products, work to evolve high yielding white kernel varieties is in progress.

Berseem

It is the king among fodder crops. Introduced from Egypt it has adapted very admirably to the irrigated conditions of the State. Work on the crops has been under way both to find out superior varieties as well as to find ways and means to increase its forage yield by Agronomic methods.

Of all varieties Mascavi has done best under our conditions. It gives 4-5 cuttings during the season from November to April and yields 600-1000 mds per acre.

Yields can be enhanced considerably by applying Farm Yard Manure @ 10-20 tons per acre and other fertilizers such as Ammonuim Sulphate on poor and exhausted soils alone and in combination with phosphatic fertilizers.

Crop is sown in September-October @ 8-10 seers per acre. Addition of culture enables the crop to make good growth to start with which is mixed with seed in a gur solution.

If sown mixed with a small quantity of rape, yields are greatly enhanced in the first cutting.

Crop is ready for first cutting in November and at intervals of 40 days after cutting in severe winter upto February and 30—35 days in March-April.

In all 4-5 cuttings are taken which yield 600-1000 mds per acre.

The crop if to be reserved for seed is allowed to set seed after taking three cuttings which under favourable conditions have yielded 5-12 mds of seed per acre at Sirsa.

It is one of the best crops cultivation of which enables supply of nutritious and palatable fodder throughout winter season and every farmer is advised to put some area under it to meet his demand for both milch and draught cattle.

Senji & Metha

Senji No. 1 and Metha No. 8 have been placed on the list of approved seeds of the department. Both are very good catch crop legumes and enable very high yields of green fodder.

Turnips

White greentop has done very well and yields highest of all the varieties.

Rapes

Japanrape (Light green leaved) has upheld its superiority both in forage and seed setting.

Lucerene

One of the most important perennial legume No. 9 an improved variety has outyielded all others. It sprouts quickly, makes erect growth and enables 8-10 cuttings of green fodder during the year without much casualties. Sown in October-November in rows @ 3-4 seers seed per acre is ready for first cutting in January and later on at intervals of 30-40 days.

Highly nutritious and sustaining forage especially for working stock but is very commonly used for dairy cattle in cold countries like United Kingdom, United States of America and Newzealand in preference to all other forages.

The Department of Agriculture, Punjab (Fodder Research Section, Sirsa) has published the details how to get maximum yield of various fodder crops, and panchayats are well advised to get a copy of each for reference.

(*Note received from the Development Deptt. of the Punjab*)

By Dr. R.N Govindaswami

MILK

SECRETING SYSTEM

MILK is a secretion from the mammary gland, commonly called the udder of the cow soon after the calf is born. This gland of the cow was designed by nature to provide a highly nutritous and easily digested substance to sustain its calf and thereby preserve the race. This substance, milk, proved so desirable and valuable as a food for man that he has used it as a basis upon which to build a great enterprise. If this product of the mammary gland of the cow can supply an entire national and even international dairy industry with all its raw product, then we should find this a sufficient incentive to learn a good deal about it.

The Mammary System

The entire mammary system in the cow consists of an udder, the organ of milk secretion; the teats, which are meant to remove the product of secretion (milk); the arteries, which are largely responsible for the input of nutrient materials; and the veins, which handle most of the by-products output of the mammary system.

The Udder Make-up

The udder of the cow is composed of four more or less separately identifiable compartments or glands. These four glands are not entirely separate, because there is rather a free interchange of blood, both arterial and venous, between the front and the rear quarters of each half of the udder. There is some exchange of blood between the two halves of the udder as well.

The principal support of the udder is the median suspensary ligament. This ligament sends out fibres along the abdominal wall directly above the centre of the udder. This plate of fibres serves as an anchor for the thicker fibrous material which forms on the median line directly above the centre of the udder and extend downward in fan-like fashion on the inside and between the two halves of the udder, thus providing a firm support. A good udder should be reasonably large, possess a level floor, and be neatly attached both front and rear. The teat should be squarely placed, long perpendicularly, and be of good size.

Interior Structure of a Cow's Udder

Steps necessary in milk secretion and its removal from the udder are as follows. (1) Entrance into the udder of the materials from which milk is to be made. (2) The change from the raw materials received in the udder to the substance, milk .(3) Storage of the accumulated milk until time of removal. (4) Ejection of milk in the milking precess. (5) Removal from the udder of the by-products of milk secretion other than milk itself. It requires

an intricate structure in the udder to accomplish these five things.

The blood is the principal vehicle that conveys nutrients and oxygen to the udder and that removes the by-products and waste materials from the udder. The blood propelled by the heart flows under considerable pressure through the right and left external pudic arteries into the right and left halves of the udder respectively. Almost at point of entry into the udder this large pudic artery branches into smaller mammary arteries, and through these the blood reaches the capillaries found in all parts of the udder. After the arterial blood reaches the cells in which the process of milk secretion takes place, it is picked up by minute veins to supply larger mammary veins. Through the mammary veins a considerable part of the blood reaches the external pudic vein and finally returns to heart. An alternate venous system, the one most often spoken of in judging involves the large abdominal vein referred to as the milk vein and through it a portion of the blood also finds its way back to heart.

Epithelial Cells in Udder Secrete Milk

The responsibility for the elaboration of milk is put upon a vast army of epithelial cells all located within the udder. Each minute cell, when the cow is lactating (milking), becomes a diminitive factory for milk production. The epithelial cells are arranged around a tiny alveolus. A number of these alveioli form lobules, very much as grapes from around a central stem. Several lobules form a lobe and each lobe is drained by a single duct which combines with other ducts and finally milk reaches, at some stage of milking process, the cistern of the gland which is located directly above the teat. During the time milk is accumulating between milkings, and especially just before milking the entire milk removal system of tubules, ducts, and cisterns is gorged with milk. In the show ring this accumulation of milk in the udder is known as (bagging up).

How Milk is Made

Milk is one of nature's most complex materials. None of its major ingredients, such as butterfat lactose (milk sugar), casein or milk albumen, are found anywhere else in the cow's body. By very complicated process they are made in the cells lining the inside of the alveoli from raw materials that are drawn out of the circulating blood. Very tiny amounts of the ingredient of the blood passing through the udder are removed. Consequently, the udder is supplied with enormous facilities for the circulation of blood. It is said that about four hundred gallons of blood must circulate through the udder for each gallon of milk that is made. While there are substances, particularly those that produce flavour in milk, that pass directly from blood through the membranes into the milk, by far greater portions of the milk ingredients are manufactured from specific raw materials in the blood. These raw materials get into the blood from feed stuffs through the digestive tract. While milk can be altered slightly by different feed constituents, such alterations are minor. If a particular required raw material is not present in the blood, the level of milk production will be reduced to that supported by this ingredient rather than altering the composition of the milk.

When Milk is Made

Reports of recent experiments have shown that all of the milk that is obtained at a milking is present in the udder when the milking begins. Further, no milk is manufactured during the milking process. Immediately after the udder has been

emptied the alveolus is collapsed. As milk is secreted into the alveolus it gradually fills up. At first the new secretion meets no pressure but as the alveolus fills back pressure develop that interfere with the rate of milk formation and ultimately stop secretion.

It is said that the rate of milk secretion is the most rapid right after the milking is finished. At this time the pressure within the alveoli develops ufficiently so that the rate of secretion is slowed down and continues to slow down until finally a pressure inside the alveolus of about one-quarter of that of the blood pressure is attained when milk secretion stops completely. Milking a cow every six hours will prevent the development of back pressures within the alveoli and allow the maximum rate of secretion to go on in the interim between milking.

How the Milk is made available to the milker

Any one that has milked cows by hand will know that a small amount of milk is always obtainable. This is the milk that drained down into the large ducts and the gland sinuses. After this milk has been drawn out, no more milk can be drawn for a short time if the cow has not been stimulated before milking. The reason for no milk coming is that the milk will not drain out of the alveoli and fine ducts in which it is principally stored. These cavities are so small that they act like a sponge and the milk must be squeezed out of the alveoli into the larger ducts from where it may flow by its own weight into the gland sinus to the teat sinus from where it may be expressed by the milking act.

This squeezing effect is brought by the contraction of muscles within the udder that squeeze the alveoli much like one squeezes the rubber bulb to force liquid out of a medicine dropper. The muscle cells that contract are not controlled voluntarily by the cow but respond to the stimulus automatically. The response is known as reflex. One of the very important facts to know and understand is the way in which a cow makes milk available to the milker. Understanding and carrying out fundamentals involved in this process make the difference between a good and a poor milker. The automatic or a spontaneous response with a let-down of a milk requires the application of a proper stimulus and having the cow in the proper mood to respond to the stimulus. The stimulus for the let-down of milk is basically that of the nursing act of the calf. This act stimulates two nerve endings in the skin of the teat that perceive warmth and those that preceive pressure or touch. As a result of the stimulation of these nerve endings, the pituitary gland a small gland located just below the brain, secretes a harmone known as oxytocin into the blood stream by which it is carried to the udder. When the harmone reaches the udder it causes the muscle cell therein to contract and force the milk out of the alveoli into the larger ducts.

Harmones Influence on Secretion of Milk

Nature intended the product of the mammary gland to nourish the non precocious young. Therefore, reproduetion and milk production are closely related together. The closely associated vital processes are as follows :— (1) Growth, (2) sexual Maturity, (3) Ovulation, (4) Fertilisation, (5) Gestation, (6) Parturition, and (7) Lactation. The processes of the cycles are repeated with each new lactation except growth and sexual maturity.

In the cow the function of the ovary is indispensable to ovulation which is the starting

point of the reproduction cycle. A number of harmones have a part in ovarian behaviour. The stimulating harmone of the follicle prepares the area of the ovary that is to produce and liberate the ovum (female reproductive cell). The release of estrogen into the blood stream creates the desire of the female to mate (oestras). The luteinizing harmone (LH) ruptures the ovarion follicle and releases the ovum into the fallopian tubes where it is usually fertilized. Another harmone produces the carpus luteum; still another causes developing embryo to be carried to term.

The mammary gland developes largely because of harmones estrogen and progesterone. It secretes milk larglely because of the presence of a lactogeninc harmone, oxytocin. Milk secretion is sustained throghout lactation because of the presence of this harmone. The source of many of the harmones is very small gland located at the base of the brain and known as pituitary gland. This small gland has two lobes or parts. The lobe farthest forward is called anterior, and it is more important of the two in producing harmones to control growth lactation, and many other body processes.

Habits of Cow

Dairycows are creatures of habit. If they are fed and milked at a particular time of the day, say 5 a.m. and 5 p.m., they expect to be fed and milked at those times. If the operator does not appear within a few minutes of the regular hour, the cows become restless and disturbed and run about in their stanchions. Under such conditions cows do not respond to the stimulus as they normally do when milked at regular time. Certain barn operation, especially those that involve milking should be carried out at the same time each day and, if possible, in the same manner and by the same person. The cow responding to these habits of managment is prepared to do her part at time of milking. For example, when the feed vessels rattle she expects to be fed; when her udder is washed she looks forward to being milked. The milking should be quietly and completely done. The effect harmone oxytocin when released into the blood stream of the cow is temporary in nature. The major influence continues for a period of 5 to 8 minutes. Milking and stripping should, therefore, be completed before the influence of milk-release harmones wears off.

A Good Milking Programme

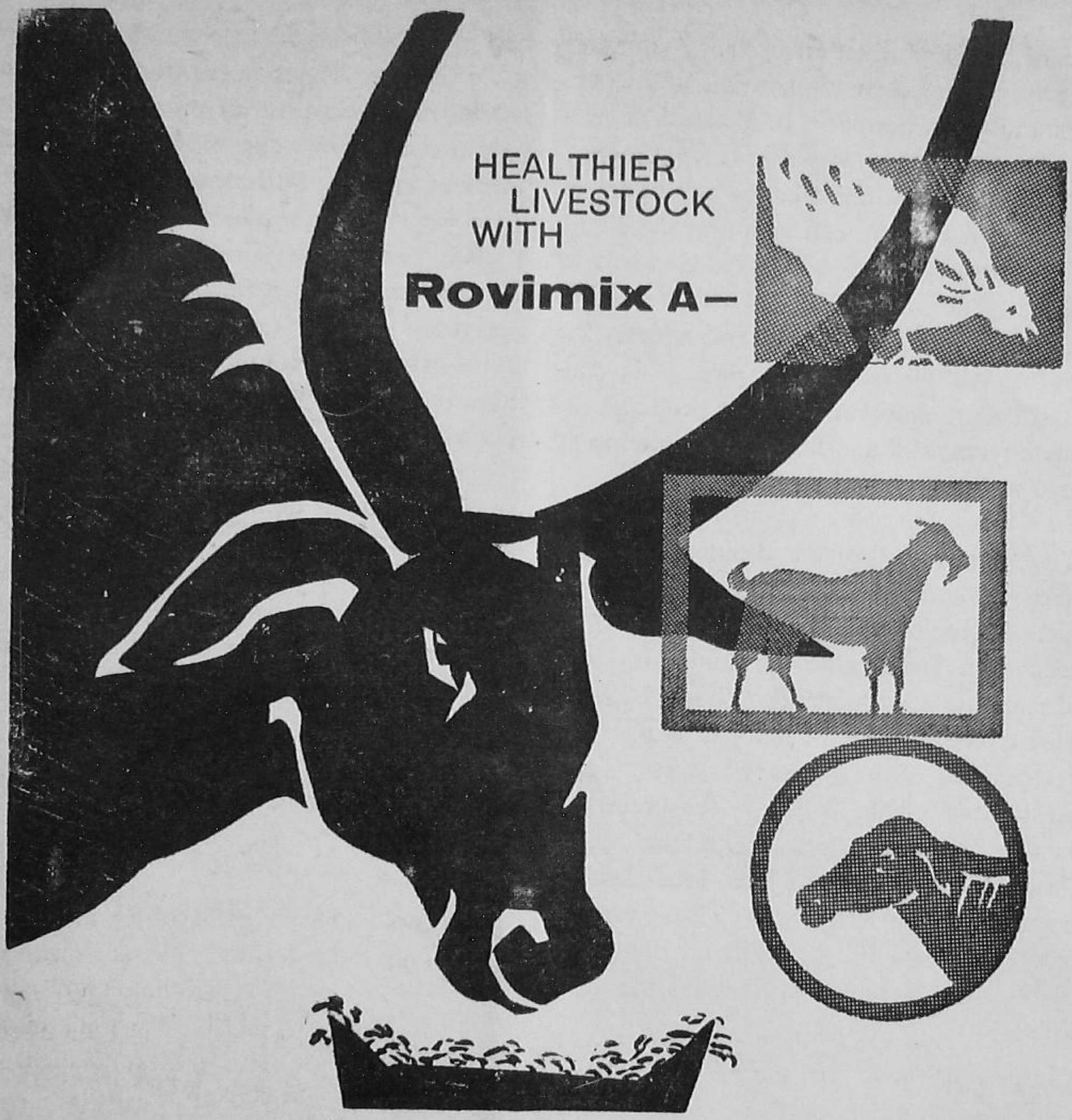
There are certain essentials that must be observed in a good milking programme.

(1) **Cows must be treated well :** Avoid cows getting excited or frightened before or during process, because cows in that stage cannot "let down" their milk normally or completely.

(2) **Cows should be prepared for milking :** It is advisable to wash the udder with warm water to which a small amount of chlorine disinfectant is added. Start milking when the udder and teats indicate that the milk has been'let down'into the teats.

(3) **Mastitis cows must be milked last :** One of the most important considerations in milking is to prevent the spread of disease. It is, therefore, a worth-while precaution to milk the healthy cows first, and then to milk any cow that has any infection or that react to tests of mastitis.

If milking is properly done, yields will be incresed, time and labour will be saved, infection to mastitis will be lessened, cleaner milk will be produced, and more profit will result.



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WITH GRASSES

by

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and

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GRASS is the boon of nature and her constant blessing to mankind. Grasses form a large part of our food directly or indirectly. Important food crops like Wheat, Bajra, Jowar, Maize and even sugarcane belong to the grass family (Gramineae). Nourishing foods like milk, butter and ghee come from cows and meat from sheep and goats, which all feed on grasses.

In Western Rajasthan the "cultivators" depend more on their animals than on agriculture, and the name attributed by them to their cattle herds is "*Dhan*" (wealth). Rajasthan is really proud of its cattle "wealth". In West Rajasthan there are a number of well-defined breeds of cattle of all-India fame like Tharparker or Malani, Nagore, Sanchore or Kankrej, Hariana and Rathi. These breeds of cattle have been of great service to the people since times immemorial. If concentrated efforts for their scientific improvement and upgrading are made, they can play much greater role in sustaining and strengthening the economy of the peasantry.

"Feeding" Neglected

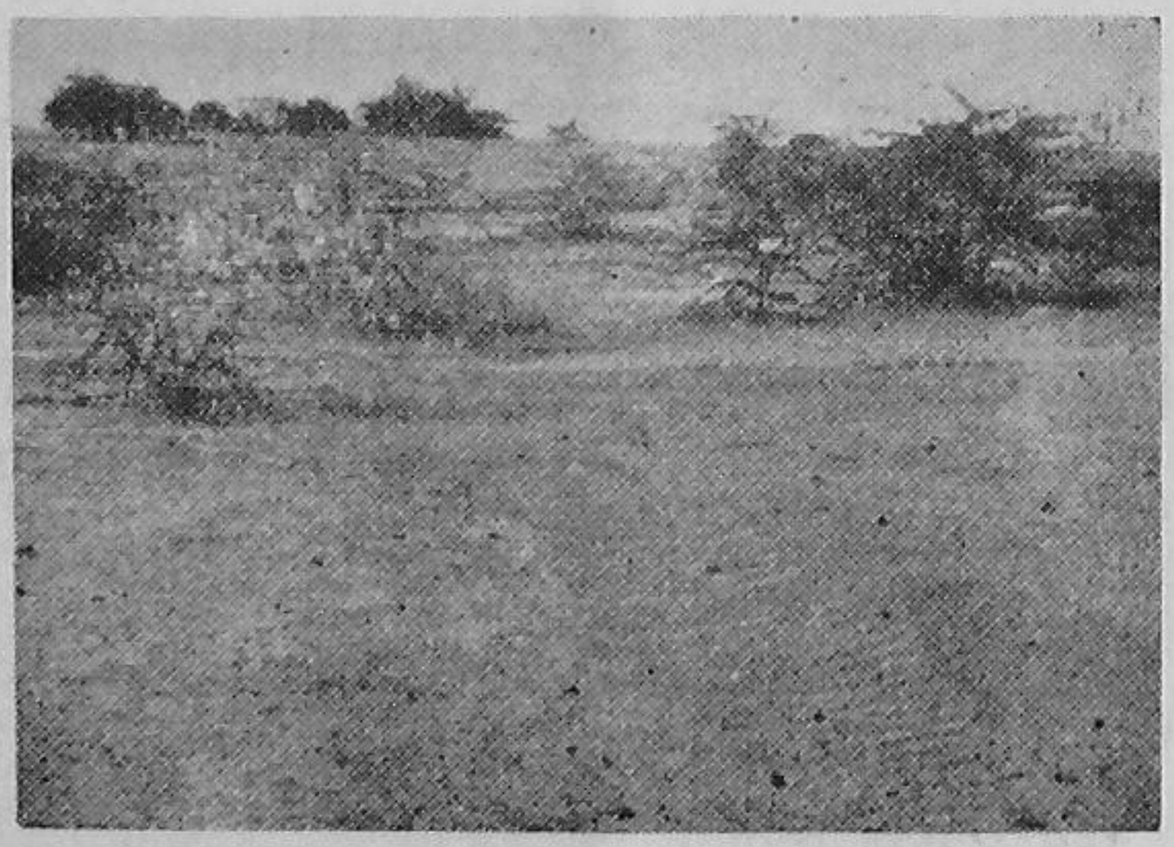
Almost all the work on livestock improvement in our country has been directed towards improvement of the breed through better breeding and disease control. Very little or no attention has been paid to the improvement of glasslands and pastures. Uplift of cattle wealth based only on breeding and health without taking the 'feeding' part into consideration is topsy-turvey planning.

Grassland, locally known as 'Birs' 'Orans' or 'Gochars' occupy considerable areas in arid and semiarid parts of Rajasthan. These grazing lands have been overgrazed and brought down to the last stages of degradation.

It is not yet fully realised by the pastoral and agricultural population in this tract that soil and water losses, large scale migration and subsequent deterioration of their animal wealth are the result of ruthless and indiscriminate exploitation of vegetation and overgrazing of natural grasslands. To make good these losses and to stabilize animal husbandry, there is a pressing need for a programme of rehabilitation of these depleted grasslands which have a high potential of palatable and high-yielding grasses.

Work on Grassland Improvement

A demonstration-cum-research project on "Range Management and Soil Conservation" (popularly known as the Grassland Improvement Scheme) has been in progress at the Central Arid Zone Research Institute, Jodhpur since 1958. Under this project, fifty-two areas of nearly 150-200 acres each and distributed in different soil and rainfall zones in 10 districts of Western Rajasthan have been taken up for grassland improvement and management so as to demonstrate to the people the methods of pasture regeneration and management practices in Western Rajastan. In addition to serving as demonstration plots, these experiments are also providing research data on different technical aspects of range-management and soil conservation, like botanical composition, forage production of pasture, performance of sheep and cattle under different management practices ; seeding and fertilizer application in



Loose Sand now cover in soil on which once grass grew (Over grazed area)

Lasiurus sindicus (Sawan)

A Cultivated Pasture of Sawan (in the month of May)

THE ANIMALS DEPEND ON NATURAL GRASSLANDS FOR THEIR FOOD. AS A RESULT OF UNPLANNED UTILISATION AND HEAVY STOCKING THESE LARGE GLASSLANDS HAVE BEEN PRACTICALLY OVER-GRAZED AND DENUDED OF GOOD FODDER GRASSES. THE POTENTIAL VALUE OF THESE DERELICT GRASSLANDS IN SANDY PLAINS IS ENORMOUS SUITABLE GRASSES FOR SUCH SANDY AREAS HAVE BEEN RECOMMENDED IN THIS ARTICLE .....

pastures and effects of various engineering practices like contour furrowing, trenching. water spreading on forage production and pasture regeneration.

Grasses for Sandy Plains, Dunes & Shifting Sands

A major part of the arid and semiarid Rajasthan is characterised by the presence of deep sandy plains with shifting sands, stabilised or unstable dunes subjected to wind action and gravelly lands which have been eroded by wind erosion. Soil texture is generally coarse sand to sand loam with poor water-holding capacity. Whatever precipitation occurs in this region quickly passes underground. For areas falling in this zone such grasses are needed that can stand a fair degree of grazing and drought and which do not require much soil moisture or are capable of producing a dense or wiry deep root system to conserve moisture during periods of drought. The most important natural grasses in sandy arid parts from point of view of fodder, soil and moisture conservation are *Lasiurus sindicus* (Sewan), *Cenchrus ciliaris* (Safed Dhaman) and *C. setigerus* (Kala Dhaman).

Lasiurus sindicus Henr (Sewan)

This grass, locally known as *Sewan* is a tussocky perennial with a branching woody rootstock as long as 2.5 to 4 meters. The thick deep wiry rootstock enables this grass to conserve its moisture against drought. The stems are stout, smooth, upright, ascending, 50-150 cms. in height from a branching base.

The linear finely acuminate leaves vary from 8-15 cms. in length with glabrous terete sheath and are palatable to cattle, sheep and goats. Being a fast growing, deep rooted perennial grass it can stand a fair degree of over-grazing.

Habitat

Sewan grass is specially suited for the arid sandy soils with sandy to sandy loam texture. In areas with impeded drainage due to the presence of a pan of continuous hard kankar or concretionary limestone below the surface of the soil or as scattered nodules in the hard clay matrix it is not desirable to introduce this grass.

Seed Formation and Rate of Germination :

From preliminary studies carried out by Dr. Lahiri and Kharabanda at the Physiology section of the Central Arid Zone Research

Institute, Jodhpur, it has been found that there are two types of seeds in the spikelets, viz. large (3 to 3.3 mm long and weighing 1.9 to 2.1 mgms. in weight) and small (2 to 2.1 mm long and weighing 0.6 to 0.7 mgm in weight). The rate of germination in smaller seeds is 14 to 18% whereas in larger seeds it is 64 to 66%.

For the purpose of successful establishment of this grass from seeds it will be desirable to evolve some method of selecting larger seeds, which will assure a higher percentage of germination with smaller quantities of seeds. Further the use of spikelets as such for reseeding the grasslands may not prove very dependable both for reseeding natural grasslands and cultivated pastures.

Propagation

This grass can be propagated both from seeds and from rooted slips. But for mass scale planting of this grass singly or in mixture for grassland improvement it has been found that regrassing through seed is more economical.

Cenchrus ciliaris, Linn (Anjan or safed dhaman).

The most valued fodder grass of arid and semiarid parts, it is a tussocky perennial with leafy tufted stems, 20-25 cms. long. The dense rootstock is branched, often nodose. Leaves are 10-25 cms. by 3-6 mm., linear, tapering to a fine point, glabrous or hairy from tubercle base. Ligule is a narrow ciliate membrane. The leaves and stems are palatable to herbivorus animals in all stages of growth. *Cenchrus ciliaris* with long fibrous root system can stand a fair degree of overgrazing.

Habitat

'Safed Dhaman' is specially suited for arid and semi-arid parts of India particularly where soils are calcium rich. Being highly drought resistant and fairly salt tolerant it can safely be planted singly or in mixture with *C. setigerus* (Kala Dhaman) in soils with impeded drainage, particularly because of the presence of a pan of concretionary lime-stone below the surface of soil after leaching excess soluble salts, if present, by laying suitable drains.

It grows luxuriantly in association with *Lasiurus sindicus* in deep sandy soils in protected grasslands of Western Rajasthan.

Seed Formation and Rate of Germination

From studies carried out at the Physiology section of the Jodhpur Institute by Dr. Lahiri and Kharbanda it is found that in this grass there are large and small seeds in the spikelets (large seeds being 1.65 to 1.91 mm long and 1.27 to 1.57 mgm in weight and small seeds 0.96 to 1.24 mm long and 0.34 to 0.66 mgm in weight). Spikelets with more than one large or more than one small seed are common. The rate of germination in large and small seeds was found to be 94-96% and 50-51% respectively. Seeds with two embryos are also found to occur frequently. Thus for the purpose of successful establishment of this grass from seeds it will be desirable to select large seed instead of using mixed seed.

Propagation

'Safed Dhaman' can be propagated both from seeds and from rooted slips. Being a rich seeder with high rate of germination, it is advisable to propagate it through seed for mass scale regrassing programme, either pure at a rate of 5.5 Kgm. per hectare (5 lb. per acre), or mixed with *L. Sindicus* (Sewan) and *C. setigerus*.

Kala Dhaman (Cenchrus setigerus Vahl Syn Cenchrus biflorus Roxb)

'Kala Dhaman', a very valuable fodder grass of arid and semiarid parts of India is practically similar in habit and habitat to safed Dhaman (*C. ciliaris*). It is a tussocky perennial with simple stems 15-60 cms. long. Leaves are 8-25 cms. by 3-10 mm. Linear-lanceolate, finally acuminate, glabrous or hairy with sheaths glabrous or nearly so, ciliate near the mouth, the leaves and the stems are palatable to animals in all stages of their growth. This grass with its long fibrous root system can withstand a fair degree of overgrazing.

Habitat

This grass is specially suited for arid and semiarid parts of India particularly where soils are calcium rich. It is fairly drought and salt resistant. It can safely be planted either pure or in mixture with *C. ciliaris* and *L. sindicus* (sewan), on soils with impeded drainage in arid Rajasthan particularly because of the presence of a pan of concretionary lime stone below the surface of soil in low rainfall or in areas with deep sandy soils.

Seed Formation and Rate of Germination

There are large and small seeds in the spikelets (1.9 to 2.17 mm long, 1.2 to 1.8 mgm in weight and 0.95 to 1.45 mm long, 0.5 to 0.52 mgm in weight respectively). Spikelets with more than one large or more than one small seed are highest in this grass as compared with *Cenchrus ciliaris* and *Lasiurus sindicus*. The rate of germination in large and small seeds has been found to be 85-88% and 35-37% respectively. Seeds with two embryos also occur frequently. For the purpose of successful establishment of this grass from seeds it will be desirable to select larger seeds instead of using mixed seed. Further the use of spikelets as such for reseeding the grasslands (which is the normal practice followed in different parts of the country) may not prove very dependable for either raising cultivated pastures or regrassing the sandy plains.

Propagation

This grass can be propagated both from seeds and rooted slips. But for mass scale operations, sowing of seed is more economical.

Rehabilitation of Degraded Pastures

At present, the grasslands are heavily stocked and these economically important species, which are grazed in all stages of their growth, contribute very little to the general composition and ground cover. If these grasses are encouraged only by closure, they take a very long time to cover the area because of the limited seed or root-stock available. Thus in order to hasten the development of these areas it is essential to provide nucleus seeding belts which may provide adequate supply of seed of the required species, singly or in mixture, depending upon soil profile and rainfall conditions of the locality.

LAND-PREPARATION AND SOWING TECHNIQUE

Clearing of Bushes and Weeds

In area where shrubs and bushes like 'Khimp' (*Leptadenia spartium*) ; 'Bui' (*Aerua tomentosa*), 'Kair' (*Capparis aphylla*), 'Murali' (*Mimosa hamata*) ; 'Dhamasa' (*Tephrosia purpurea*), 'Ak' (*Calotropis procera*) abound it is necessary to do the clearing or uprooting of these bushes with the help of manual labour or even mechanically with a tractor.

Land Preparation

After the clearing is done the area to be planted should be ploughed up with a mould board plow or even with a disc harrow and

levelled up by planking. The furrows for sowing in lines 1.2 to 1.5 meters (4-5 ft.) apart can be made either by a country plough or with a tractor or even by manual labour.

Time of Sowing and Seed Rate

It has been found by experience that pre-monsoon (dry) sowing is more practical and useful. The advantages are :—

(1) The first shower of rain is utilized, which is an important factor in the arid zone.

(2) Soon after rains come, ploughs, bullocks and labourers are difficult to get because they get busy with the sowing of Bajra and legumes like moong, moth and guar on vast sandy tracts.

The seed rate recommended for light soils either pure or in mixture is 5.5 Kgm/hectare (5 lb. per acre). For deep sandy soils the following mixture has been found promising:—

Lasiurus sindicus (Sewan) 2.2 Kg/Hect (2 lb/acre)

Cenchrus ciliaris (Safed Dhaman) 2.2 Kg/Hect (2 lb/acre).

C. setigerus (Kala Dhaman) 1.12 Kg/Hect (1 lb/acre)

Total mixture 5.5 Kg/Hect (5 lb/acre).

Before sowing, the seeds should be mixed with an equal amount of wet sand so that it is spread evenly in the furrows and does not get blown away by wind. While sowing, care must be taken that the seed is not covered with more than half an inch of soil.

Patch Sowing

In this method the sowing is done by using 'Khurpies' and working up the soil in a space about 1 foot in diameter at every 2 steps (paces), and dibbling in a few seeds (about 5-10) and covering them with ½ inch of earth by hand. This system is quicker and more economical, and there is less wastage of seeds. In patches where the seeds do not get established, resowing should be resorted to. In the line-sowing method, more seeds are needed and sowing tends to become thick. The other advantage in 'patch sowing' is that it is economical and large areas can be covered in a short time, and areas with soils or areas in between trees and bushes where ploughing cannot be done, can also be sown.

Production

From sown areas of *Lasiurus sindicus* (sewan), the forage production to the tune of 11,200 Kg/Hectare (10,000 lb/acre) of green weight was recorded as against an average of 3,330 Kg/Hectare (2972 lb/acre) from the unsown grasslands areas with *sewan* as a dominant.

From sown and well established areas of *Cenchrus ciliaris* (safed dhaman) and *Cenchrus setigerus* (kala Dhaman) nearly 7,000 Kg/Hectare (6258 lb/acre) of green forage has been recorded.

Acknowledgement

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SUMMARY

Animal husbandry plays a very important role in the economy of pastoral and Agricultural population of Western Rajasthan. The animals mainly depend on natural grasslands for their food. As a result of unplanned utilization and heavy stocking these large grassland areas locally known as 'Birs', 'Gochars' and 'Orans' have been practically

overgrazed and denuded of good fodder grasses. However, the potential value of these derelict grasslands in sandy plains is enormous which can carry such useful palatable and nutritious grasses as 'Sewan' (*Lasiurus sindicus*), Safed Dhaman (*Cenchrus ciliaris*) ; Kala Dhaman (*Cenchrus setigerus*).

To create consciousness among the people regarding the importance of grasslands, and to collect valuable scientific data for improvement of Grasslands in Western Rajasthan a demonstration-cum-Research project on "Range management and Soil conservation" has been in progress since 1958 at the Central Arid Zone Research Institute, Jodhpur. Under this project fifty-two areas of nearly 150-200 acres each distributed in ten districts of Western Rajasthan in different soil and rainfall zones, have been taken for grassland improvement and management so as to demonstrate to the people the method of pasture improvement and management. Scientific data also is being collected on various aspects of grassland improvement like effects of rotational and deferred-rotational grazing ; on forage production ; Botanical composition, effects of seeding and fertilization of pastures, and the effect of various engineering practices like contour furrowing, trenching, water spreading on grassland rehabilitation.

For sandy areas, the most suitable grasses recommended are *Lasiurus sindicus* (Sewan), *Cenchrus ciliaris* (Safed dhaman) and *Cenchrus setigerus* (Kala Dhaman).

Botanical characters, habit of growth, habitat requirements, seed formation, rate of germination and mode of propagation in each of these three grasses has been discussed.

For rehabilitation of degraded grasslands, land preparation consists of :—

1. Clearing of bushes and weeds.
2. Ploughing with a mould board plough or even with a disc harrow and levelling up by planking.
3. Making furrows for sowing in lines 1.2 to 1.5 meters apart either by a country plough or with a tractor.

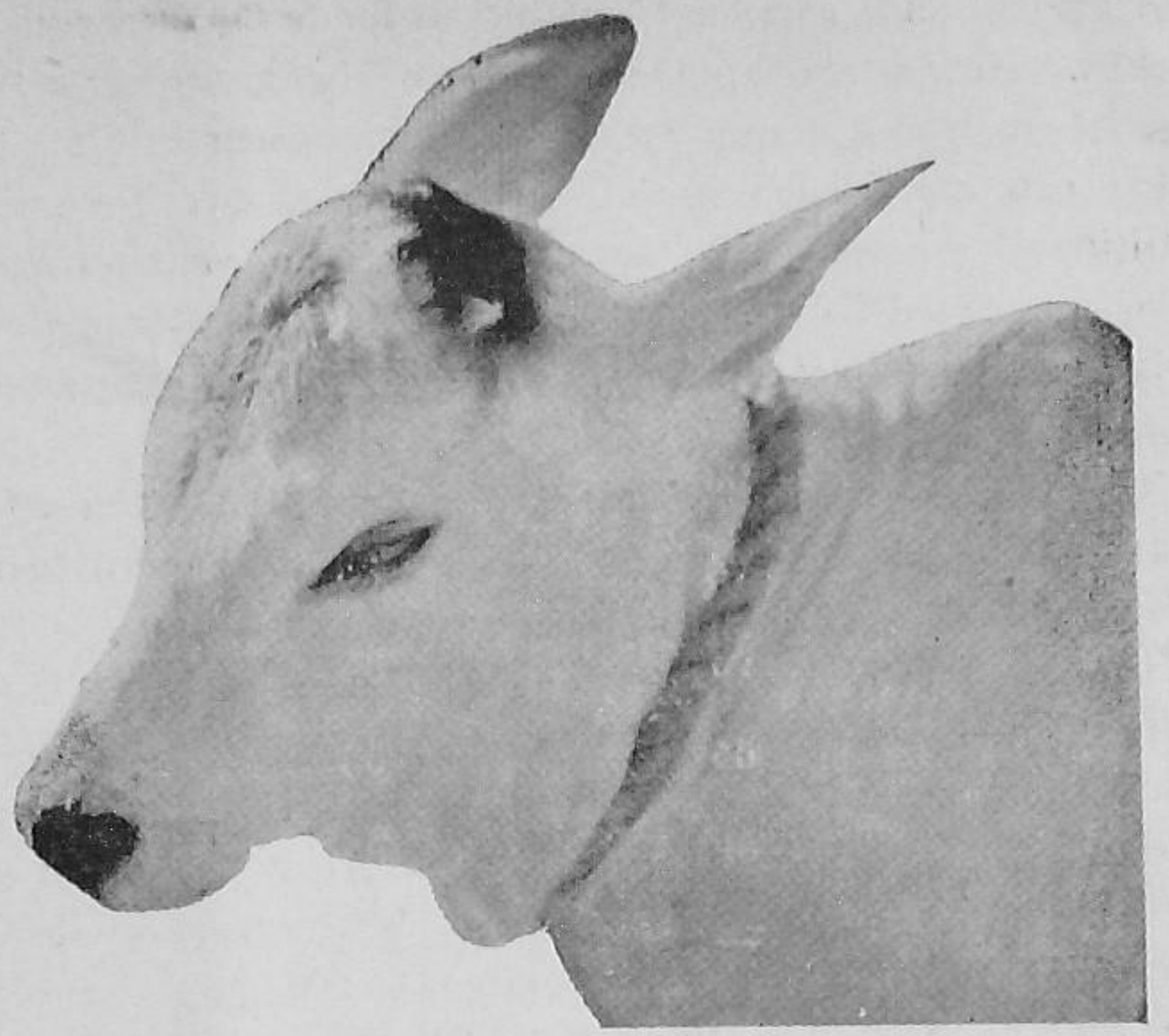
It has been found by experience that pre-monsoon (dry) sowing is more practical and useful. The seed rate of 5.5 Kg/Hect (5 lbs. per acre) of these grasses either pure or in mixture has been found promising. Technique of patch sowing has also been discussed.

From sown areas of *Lasiurus sindicus* (Sewan) the forage production of 11,200 Kg/hectare of green weight has been recorded as against 3,330 Kg/Hect from natural grasslands with Sewan as dominant grass. From sown and well established areas of *Cenchrus ciliaris* and *Cenchrus setigerus* nearly 7,000 Kg/Hect green forage has been recorded.●

PREPARING CATTLE FOR CATTLE SHOWS

WHY LEAVE PRIZES TO CHANCE

• WIN BY **CHOICE**



CATTLE fairs and shows provide encouragement, incentive, and instil a healthy spirit of competition amongst cattle breeders ; and all this results in the breeding and rearing cattle of good quality and of a type that would ensure annexing good positions and prizes in cattle shows.

Breeders, all the world over, unanimously agree that there are certain influencing factors, if taken care of may in all probabilities beg prize to the cattle-owner. The principal factors that count are fine-appearance, good performance and behaviour in the show rings of the competing cattle.

How to be sure of the cattle fulfilling, on the day it is judged, these conditions would depend upon the degree to which extent the animals have been trained. Cattle are a creature of habits and whatever habits useful from the point of view of shows, are inculcated in the animals, would turn them into assets.

The training

Progressive breeders are increasingly realising that training, well before in advance, under conditions similar to those that obtain at the time of the cattle shows is an essential prerequisite to success in the show. Near the shelter or shed, a box be eracted. The animal proposed to be entered in the competition, should be placed in the said box and allowed to remain there for two or three hours in a day. Further, it would be more useful if the members of the family make it a point to stand round the box and frequently pat the animals, as is done in the judging rings by the judges. All this is aimed at making the animal adjusted or acclimatised with a treatment of a type similar to the one the animal receives in the cattle shows. But important in this sort of training or acclimatising period is that almost all the conditions that prevail in the shows are created and the animal trained under these, e.g. no grazing is allowed, the animal is tied with a

rope day and night, daily specific exercises are given, water is made available to the animal through buckets etc.,

Needless to emphasise, such of the practices enumerated above and similar others are required to be followed for a month before the actual day of exhibition or judging.

Improving the Appearance

As stated earlier, appearance is one of the deciding factors in respect of adjudging the cattle; special care is needed to be taken in effecting improvement in the general appearance of the animals. Well trimmed, brushed, cleaned animals have naturally comparatively better chances of being declared best than those that remain uncared for. Thus, it enjoins on the breeder to regularly clean with water the body of the animals, taking special care of the eyes, ears, tail, joints etc in the body that merit extra care at the time of washing, brushing, grooming, rubbing etc. The loose hair on the body be removed. The horns should be made attractive by cleaning and scraping. The sharp points of the horns should be removed. An oiled cloth should be maintained by the breeder for polishing horns and hair ; and thus making the animal clean, smart and attractive in appearance.

The journey to the show

Since cattle shows attract breeders and their exhibits i.e. the animals competing in the show, from far and near, the breeders accompanying the cattle from long distances have to be cautious of the hazards involved in journey and the hardships inherent in the transportation of animals from one place to an another one quite far off. The ration constitutting the daily quota of the animal should be at the disposal of the breeder or the attendant deputed with the animal, in sufficient quantity. Water arrangements should be well-planned. The attendent carrying the animal, should be properly briefed and practical hints provided before undertaking the journey. No doubt, this aspect is simple ; but at the same time it should not be forgotten that this aspect is so simple that the breeders are prone to overlook which in the ultimate analysis leads to untold damage caused to the animal during the period of transportation.

Cattle in the show

Then comes the day when the animal is to be placed in the judging ring and presented to the judges. It is the time, when the training given to the animal will not go waste ; it would stand in good stead at this moment. Do'nt get nervous, neither get too much excited. Do not push the animal by force as by doing so it would get irritated. If the animal does not budge, pat it, rub steadily its body and gently lead it forward. In case of cow, calculate the approximate time when the cow is to be milked for competition, start encouraging her to let down her milk. Also do not tire the animal by excessive exercises. Rest be sufficiently affored to the competing animals. However, all the same, the animal should be subjected to all the practices of the training till the actual day of the competition. With the training already provided almost under similar conditions that obtain at the show grounds, the day when the animal is presented in the show will not appear unusual to the animal. The animal is expected to behave smartly, overcome the nervousness the animals normally suffer from at the judging time, respond well. Thus with all these favourable and advantageous points, annexing of the prize the cattle breeder longs for right from the time he conceives of his animal's participation in the show, may be ensured.

GREESH B. MATHUR

rational use of OILCAKES

by
Shri M. R. Panikkar

OILSEEDS play a vital role in Indian agricultural economy. They contribute to the fat fraction of the human diet, and form the main raw material for some of the industries (such as toilet soap, cosmetic, paints, varnishes, lubrication and medicine). The residue after the extraction of oil from the oilcakes, is utilised for industrial purposes, cattle feed and such other uses. India produces about two and a half million tons of oilcakes excluding cotton seed and coconut cake annually. (See Table I)

Till recently a bulk of this was exported to other countries where they were put to a variety of uses, if not for developing their livestock industry, leaving only a fraction of this valuable oilseed residue in the country.

Types and Uses

Though oilcakes are fundamentally the same, their composition depends not only upon the variety of seed of which it forms the residue, but also upon the process adopted in getting this residue. Oil is expressed in different ways and the cakes are commonly synonymous with the methods of extraction, such as ghani or country oilcake, rotary oilcake, hydrolic press cake, expeller cake and solvent extracted cake. The last, however, is not widely prevalent in India. The ghani, hydrolic pressed and expeller cakes contain progressively decreasing amount of oil (from about 15 to 7%) and the physical structure of the cakes also differ from comparatively bulky slabs to thin hard plates. On the other hand, in solvent extraction, in which oil is separated from the residues by chemical solvents (like benzene and naptha) the cake will have very little (1-2%) or no oil, and will be in a powdery form. Another difference in the constitution and composition of the cakes in due to the fact that some like cotton and safflower are crushed with their hulls on (undecorticated), while others are crushed after their removal (Decorticated).

In the absence of suitable industries for the better utilisation of the oilcakes, these are used in India either as livestock feed or as manure for crops. The proportional extent of the utilisation of various oilcakes for the two purposes depend upon its cheap availability. But, certain seed cakes (such as those of neem, castor, punna, which are broadly classified as non-edible) are not used for cattle feeding. Even some of the edible ones are not fed to animals, if they are not in an edible condition (as for example, non-decorticated, admixed with non-edible cakes, adulterated with unwholesome foreign matter or affected with mouldiness, rancidity, etc.) On the other hand, none of such defect limits its manurial utility.

Oilcake as Animal Feed

Except a few like Karanj and Mahua *Madhuca latifolia*) among the edible oilseed cakes all are good and safe feed for all kinds of farm animals. Cake left after pressure extraction (of various methods and gradations based upon the retention of the oil) has a higher content of fat than produced by solvent extraction. But, solvent extracted cake is richer in nitrogen and protein more easily assimilable. Decorticated cake meals are naturally more nutritious than the non-decorticated. Some (coconut, sesamum and groundnut) get rancid and mouldy or otherwise spoiled easily rendering them doubtful

feed; also adulterated cakes (with hulls of cakes and other foreign matter, etc.). The feeding of such material will do more harm than good to the animals. Depending upon the nature of the animal, they are given 1-5 lbs. of cakes daily. Highly protenacious cakes are used in minimum quantities as too much protein may strain their excretory system.

1. *Nutritive value:*—A list of the more commonly used oilcakes in India with their chemical composition given by Sen (1952) is given in Table II. This gives a broad idea about their nutritive value.

Oilcakes obviously contain sufficient fat in them ranging from 6.57% in linseed to 17.23% in Mahua which are essential for a good animal feed to maintain body heat and to convert into animal fat. They also contain considerable amount of crude protein ranging from 17.9% in Mahua to 51.75% in groundnut cake. These are also called albuminoids and consist of nitrogenous compound the chief function of which is to supply substances for muscle formation. Young growing animals as well as cows in calf or milk require it in greater quantity than others. Soluble carbohydrates (such as sugar and starch) supply heat and energy to the animals. If present in large quantities they will be converted into animal fat. Crude fibre is mainly composed of cellluse and form the indigestible matter. Oilcake contain mineral food like lime, phosphoric acid and potash, which are essential to the proper nutrition of the animals, for functions like bone formation. Almost all cakes are poor in lime but comparatively rich in phosphoric acid, some appreciably so. All these constituents are not, however, completely digestible. Oilseed cakes are poor in vitamin and none contain vitamin C, while A and 3 present are in very small quantities.

2. *Digestible Nutrients:*—A more correct idea of the nutritive value of these oilcakes is obtained by comparing the actual digestible nutrients in them. The amount of digestible nutrients (per 100 lbs. of raw materials) present in various oilseed cakes is given in Table III from Sen (1952). The starch equivalent (given in the last column) provides a measure of the relative values of the feeding stuffs for the production of growth, milk and work.

The table shows that oil cakes contain not only the essential elements conducive to animal nutrition, but their digestiblity is also very high as evident from the comparable data given about various hays, straws and concentrate (gram). Thus oilseed cakes is one of the most useful, and cheap concentrate feed for the diet of the livestock.

Oilcake as Manure

Oilcakes have been utilised for manurial purposes since ancient days and the practice is now widespread among the progressive farmers because of the sustained propaganda carried out in their favour by the Agricultural Departments. Animal husbandry men had often times emphasised on the necessity of preventing the misuse of edible oilcakes from animal feeding to manuring, and using only non-edible cakes for manurial purposes. But, it had little effect, at least in practice. About one million tons of oilcakes are used for manurial purposes. Oilcakes are rich in nitrogen (1.13—7.88%) and are considered as carriers of available nitrogen; also contain other essential plant food like phosphorous (0.8—2.89%) and potash (1.19—2.17%). Though quick acting they are conducive to humus formation also. The main plant nutrient contained in the oilseed cakes is, however, nitrogen in which it is far superior to most of the common organic manures. Though present in the cake in an unavailable form, they will be liberated for the utility of the crops, when the cakes undergo decomposition in the soil. Cake containing a greater amount of oil decompose rather slowly than those containing less. Nitrogen content of the cake is in inverse ratio to the oil content (in each cas.) and the more the oil, the less is nitrogen and poorer is the cake as manure. Even in the same kind, oilcake will be varying in quality according to the method of crushing, hulls and other foreign matter present, moisture percentage, etc. Groundnut and safflower cakes contain high amounts of N (over 7%) and over 1% P and K and K. Cotton, though contain only about 6.4% is richer in P and K (over 2%) than other cakes.

Daji (1943) gave the as given in Table IV data about the nutrients (NPK) contained in oilseed cakes.

Considerable amount of nitrogen (70-80%) present in the cakes is also made available to the crops to which they are applied. The rate of availability varies with the type of the cakes and the nature of the soil. Oilcakes give better results on clay than on sandy soils, since it requires a certain amount of water for its decomposition, its use is limited to irrigated

crops or to areas where water is not limiting in farming practices. Consequently, its use in dry areas of insufficient rainfall, particularly if the soil is not moisture retentive, and also in dry farming practices is limited. It is most profitably used as top-dressings, divided or otherwise or applied some time previous to the sowing of crop. But, it is a very quick acting manure (leaving almost no residual effect in the soil) the rate of action depending upon the case with which it nitrify in the soil. The various cake differ in the quickness of nitrification, among themselves, ranging from castor cake which is the quickest to mahua cake, the slowest. In the laboratory experiments using loamy soils (of Hebbal Farm, Bangalore), the different oilcakes nitrified as shown below in Table V (Y. Iyer, 1952).

In 8 weeks fully 80% of N in white castor cake was nitrified (showing its manurial utility), as against 57% in the best among the rest. Mahua cake did not nitrify at all within 8 weeks. Recently Iswaran *et al* (1961) has worked out a process at the I.A.R.I. for easy nitrification of Mahua cake. The cake is treated with a dilute solution of ammonia and converted into a sticky paste firstly. After drying this in the air, it is powdered and applied as manure. One pound of liquor ammonia was sufficient for treating 20 lbs. of cake. The nitrogen content of the cake was almost doubled by the treatment and its manurial efficacy was found to be equivalent to that of castor cake or amonium sulphate.

Apart from non-edible cakes, a considerable amount of edible cakes are also utilised for manurial purposes. Though one cannot object to the utilisation of non-edible cakes for this purpose, diversion of edible cakes from its normal function (as cattle feed) is not wise. The use of edible cakes for various purposes, however, is dependant on its price factor.

Oilcakes have been successfully tried in various research stations in different parts of the country and have been found to be one of the most useful manures (combining in them the best of both the inorganic and organic after eschewing their individual defects) for a variety of crops. These investigations have not made any distinction between edible and non-edible cakes and both are found to be equally good. The practice of oilcake manuring has been also adopted by most of the progressive farmers in India. Castor cakes is mostly used as manure (and sparingly for fuel which has half the value of steam coal) for sugarcane, in almost all the sugarcane tracts of the country for potato (in Madras, Bombay, Bihar and U.P.) for paddy (Madras, Mysore and Bombay), for cotton (in Bombay), for plantain (in Madras and Bombay), for tea (in Assam) and for vegetable growing (onion in Bombay, turmeric in Madras) and also for growing betelvine and fodder Jowar (in Bihar). Rape and Mustard cake is used as feed and for manuring sugarcane in Bihar and tea in Assam. Groundnut cake is used very profitably for rice and other cereals, sugarcane in (Bihar and U.P.) and for coffee and tea (in Assam). Undi is found very good for rice and cane in the Konkan areas. The most promising results have been given by almost all the common types of oilcakes, on sugarcane, in all principal sugarcane tracts, almost as effective as ammonium sulphate. The next table from the Report of the Expert Committee on Manures & fertilisers (pp. 21, 1953) shows the relative merit of oilseed cakes and other manures, in terms of response of various crops.

Oilseed cake is the best manure for rice crop compared to others giving about four times more yield than organic and inorganic mixture and about twice that N or P fertilisers. The difference with FYM and green manure is not so marked. Almost the same was the case for wheat cake is inferior to N and P combined and FYM for wheat, but is better than organic and inorganic mixtures, N, P individually and green manure. But, it is inferior to all treatments except green manure for pulses, while in the case of oilseeds, cake application is inferior only to the combined treatments of inorganic and organic and in the treatment with nitrogen only. The response of sugarcane to cake manuring was second only to those of combined organic and inorganic, though in cotton, more response was evident in all treatments except those with phosphate alone or with green manuring. Evidently, oilcakes are good manures for almost all crops. Also, it is the only manure which gives uniformly good yield for almost all crops.

Economic Utilisation of Oilcake

In the absence of suitable industries and other consumption avenues, the oilcakes are used primarily for animal feed and manure in India. Some cakes (coconut and sesamum) are also used as human food to a limited

extent. It is to be examined how far their utilisation is rational and economical. The problem is reduced to finding whether to feed oil cakes to livestock a better way of using them than applying them as manure to crops. Since non-edible cakes such as castor, neem and punna cannot obviously be used as livestock feed and has to be used for manuring, the economy of the edible cakes which are shared by both animals and plants at present, is worth examination.

From the point of view of animal feeding, the cakes are desirable because they contain certain primary food constituents such as protein, fat and carbohydrate. But it is the very same factors in the shape of primary nutrient elements for plant growth (NPK) that make the oilcake a desirable manure too. Likewise, if the nutritive elements in the cakes are easily digestible in the animal system, it becomes also rapidly available plant nutrients, conducive to their easy growth. Thus, those cakes which are good cattle feeds like gronndnut cake are also unfortunately, manure par excellence. On the other hand, those which are of low feeding value (such as Mahua cake) are manurially inferior to other cakes. Thus the feeding value of the oilcakes and its manurial value seem to be almost directly corelated. This makes the problem of deciding whether edible cake should be used one way or the other or both, difficult, especially when the available quantity is limited.

It is estimated by Animal Husbandry experts in India 11.53 million tons of oilcakes are required for the requirement of all the livestock in the country. But the supply amounts only to 2.88 million tons, out of which at least a half is diverted for manuring crops though animal husbandry experts estimated it up to be more.

Voelcker (1893) mada a comparative study of the economics of using cowdung for manure or for fuel purposes, and came to the conclusion that —

".....100 parts of the original cowdung containing over 59 parts of organic matter and 1.34 parts of nitrogen, loose, on burning, practically all the organic matter and nitrogen. The nitrogen is reduced from 1.34 to 0.034%, in other words, for every ton of cattle manure that is burnt, 29¼ lbs. out of a total of 30 lbs. of nitrogen (97.5%) are altogether lost.....". While the nitrogenous organic matters are lost in the process of burning, the mineral matters which include the lime, potash and phosphoric acid are retained in the ashes. If "these were returned to the land the only loss would be the 33 lbs. of nitrogen (the quantity is one ton of manure) equal to 155 lbs. of sulphate of ammonia for every ton of cattle manure so employed". This loss is a very heavy one especially when the entire value of the organic matter is lost in burning.

The diversion of edible oilcakes from animal feed to manurial purposes, is analogous. Though similar data on a comparative basis, on the use of oilcakes for these two different purposes are unavailable, Voelcker gives a passing mention to this problem, "Where the cattle are better cared for, earthnut, gingelly cake, gram and other foods having high manurial values are given to them frequently, but it is not borne in mind that with these more concentrated foods, it is only about 1/10th of the nitrogenous and mineral constituents of the foods that actually goes on to the body of the animal and repairs its waste, but that nearly 9/10th remain in the solid and liquid droppings. It is the knowledge of this fact which has made English Farmers careful to preserve the manure of cake fed cattle, and to keep their stock in covered yards instead of in the open",

This indicates that rather than putting the edible cake in the soil for the direct manuring of crops it would be more advantageous to feed the cake to the livestock and apply their droppings as manure for crops. Incidently though the normal FYM can be compared with cake to some extent, the cake fed manure is superior. The loss in the constituents (if there is any) by withholding cake for manure is more than made up by the increased produce of the animal (through work, dairy products, etc.) if the cake utilisation is routed through the livestock.

TABLE I

Production of major oilcakes in 1951-58

(in 1,000 tons)

Name of oilcake	Quantity of oilcake produced in India during						
	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58
Groundnut	1,030	931	1,271	1,410	1,269	1,432	1,520
Linseed	184	207	207	225	243	226	154
Rape/Mustard	554	493	492	620	505	624	544
Sesamum	206	207	248	276	215	206	169
Castor	62	60	64	72	73	74	57
Total	2,036	1,898	2,282	2,603	2,305	2,562	2,444

(Cotton seed cakes & coconut cakes are not included.)

TABLE II

Average percentage composition of Indian Feeding Stuffs

(On dry matter basis)

Name of cake	Place of origin	Organic Constituents				Minerals				
		Crude protein	Fibre	N. free extract	Ether extract	Ca0	$P_2 0_5$	Mg0	Na0	$K_2 0$
Coconut (Expeller)	Cochin	25.34	13.2	44.92	8.2	0.56	1.69	—	—	—
Cotton cake	Punjab	22.84	24.11	37.40	9.15	—	—	—	—	—
Groundnut cake	Bangalore	51.75	7.39	26.94	8.2	0.28	1.28	0.54	0.32	1.43
Linseed cake	Bengal	30.51	9.48	43.24	6.57	0.52	2.2	0.98	0.47	0.92
Toria cake	Punjab	33.79	11.2	32.08	12.49	—	—	—	—	—
Sarson cake	Punjab	36.00	10.05	32.76	11.11	—	—	—	—	—
Rape cake	Pusa	36.37	7.70	22.19	13.41	—	—	—	—	—
Til cake	Bangalore	46.3	4.92	27.85	9.91	—	—	—	—	—
Muhua	Karnal	17.9	5.62	50.22	17.23	—	—	—	—	—
Safflower	Bombay	42.8	15.25	26.62	6.53	—	—	—	—	—

TABLE III

Digestible nutrients in lbs. per 100 lb. of raw material

Cakes of	Source	Digestive crude protein lbs.	Total digestible nutrients lbs.	Starch equivalent
Coconut (expeller)	Cochin	20.53	75.4	69.1
Cotton seed	Punjab	17.48	71.6	59.3
Groundnut	Bangalore	41.75	71.0	67.4
Linseed	Bengal	23.27	64.6	60.6
Toria	Punjab	25.66	71.1	66.7
Sarson	Punjab	27.61	74.2	70.4
Rape	Pusa	27.83	78.1	75.7
Til	Bangalore	38.34	78.2	75.9
Ambala hay	Punjab	2.21	42.5	23.5
Lucerne hay	Bangalore	14.73	50.3	33.9
Wheat straw	Bangalore	0.26	14.5	8.7
Gram	Bangalore	12.99	78.5	76.1

TABLE IV

Average (%) composition of oilcakes manure

Cakes	Nitrogen	Phosphoric acid	Potash
Coconut	3.02	1.9	1.77
Groundnut	7.29	1.53	1.33
Sesamum	6.22	2.09	1.26
Linseed	5.56	1.44	1.28
Safflower (Undecort)	4.92	1.44	1.23
Safflower (Decort)	7.88	2.20	1.92
Cotton (Undecort)	3.99	1.89	1.62
Cotton (Decort)	6.41	2.89	2.17
Coconut	3.02	1.90	1.77
Rape	5.21	1.84	1.19
Niger	4.73	1.83	1.31
Jambo	4.95	1.65	1.90
Castor	4.37	1.85	1.39
Neem	5.22	1.08	1.48
Mahua	2.51	0.80	1.85
Karranj	3.97	0.94	1.27
Undi	3.63	1.52	2.05
Dhupaka	1.13	0.21	—

TABLE V

Percentage of oilseed cake nitrogen which nitrified after

Cakes	2 weeks	4 weeks	6 weeks	8 weeks
Castor white	23	40	60	80
Castor black	23	43	57	57
Groundnut	26	46	57	57
Honge	25	36	45	52
Neem	22	36	45	57
Mahua	—	—	—	—

TABLE VI

Average percentage increase in yields over no manure

Crops	Artificials			Organic			Organic + Inorganic
	Nitrogen	P 205	N+P 205	Oilcake	FYM	GM	
Paddy	23.2	20.4	30.0	42.3	39.9	31.5	10.3
Wheat	27.8	23.6	69.4	43.7	58.8	29.1	28.95
Pulses	—	99.8	128.0	57.7	120.5	15.2	179.0
Oilseeds	49.4	19.0	44.0	47.9	39.9	—	48.1
Sugarcane	47.4	30.3	43.6	62.7	22.3	18.0	144.0
Cotton	27.2	19.2	54.4	39.6	41.5	15.5	98.5

ANIMAL HUSBANDRY NEWS IN BRIEF

The material reproduced below has been abstracted from the daily newspapers

Cash Award for Nagori Cattle Breed

A cash prize of Rs 1001 donated by the Akhil Bharatiya Sarva Seva Sangh is to be awarded by the National Livestock Committee to the best breeder of the Nagori Breed of cattle. The prize will be awarded at the All India Cattle Show to be held early next year. Further details can be had from Secretary National Livestock Committee, Delhi 6.

Dairy Research in Karnal

THE United States has announced a five year (Rs 3.4 lakhs) grant to the National Dairy Research Institute Karnal, Punjab to finance a study of the properties of concentrated milk products. The grant is a step towards the development of concentrated milk foods which, when reconstituted, take on again the flavour, and texture of fresh milk. This will involve basic studies of proteosepetone proteins.

Milk Production Falls

MILK production in the country has declined from 3.5 ounces before partition to 3 ounces per head today, said Mr. Datar Singh, Adviser, Central Council of Gosamvardhana., Union Ministry of Food & Agriculture. Mr. Datar Singh told reporters recently at Patna that the better breeds of cattle like Tharparkar, Sahiwal and Nili buffaloes had largely gone to Pakistan. He said India had 287 million cattle taday, the largest number in the world. Twenty per cent of these were unproductive. There was also shortage of oxen for ploughing.

Vaccine to Fight Cattle Disease

BRITAIN is producing a live vaccine to fight a foot-and-mouth disease—cattle SAT-1 (South African Type One) against which no cattle in Europe are at present immune. The disease first made its apparance in Bahrein, in the Persian gulf last December. In March and April this year it was recognised in Syria, Israel and later in the Lebanon and Iraq. Now it has reached Turkey, Jordon and Iran. The vaccine has been developed at the Animal Virus Research Institute at Pirbright, in Southern England.

Big Veterinary Grant For Bhatinda

SPEAKING at the annual function of the Bhatinda District Cattle Breeders Association Dr. P.S. Brar, Director of Animal Husbandry, Punjab said the State had made rapid progress in the field of animal husbandry. There were 50 veterinary hospitals and dispensaries working in Bhatinda District which had been given the biggest aid by the State Government for improvement of cattle breed and equipment for the 11 civil veterinary hospitals of the district. The aid amounted to Rs 12,6000 for the improvement of the cattle breed and Rs 77,000 for hospital equipment. The function—first of its kind in Punjab—was presided over by S. Nazar Singh of Bhagta.

NINTH ALL-INDIA LIVESTOCK CENSUS (1961)

ABSTRACT STATEMENT

OF CATTLE AND BUFFALOES

(Provisional)

S. No.	Item	1961 Census (Numbers)	1956 Census (Numbers)	Percentage of increase (+) or decrease (−) of Col. 3 over Col. 4	
1	2	3	4	5	
1.	**CATTLE**				
(a)	Males over 3 years				
	(*i*) *Used for breeding only*	377,607	437,186	(−)	13.6
	(*ii*) *Used for breeding & work both*	1,978,079	—		—
	(*iii*) *Used for work only*	68,601,614	62,475,286	(+)	9.8
	(*iv*) *Others*	1,520,055	1,955,307	(−)	22.3
	Total	72,477,355	64,867,779	(+)	11.7
(b)	Females over 3 years				
	(*i*) *Breeding*				
	(*a*) *In milk*	20,721,080	20,095,334	(+)	3.1
	(*b*) *Dry & not calved even once*	30,294,530	27,152,935	(+)	11.6
	(*ii*) *Working*	2,177,169	1,837,196	(+)	18.5
	(*iii*) *Others*	1,130,680	807,742	(+)	40.0
	Total	54,323,459	49,893,207	(+)	8.8
(c)	*Young stock*	48,871,027	43,803,438	(+)	11.6
	Total Cattle	175,671,841	158,650,624	(+)	10.7
2.	**BUFFALOES**				
(a)	Males over 3 years				
	(*i*) *Used for breeding only*	288,704	330,600	(+)	12.7
	(*ii*) *Used for breeding and work both*	509,191	—		—
	(*iii*) *Used for work only*	6,605,150	5,953,457	(+)	10.9
	(*iv*) *Others*	255,062	222.527	(+)	14.6
	Total	7,658,107	6,506,584	(+)	17.7
(b)	Females over 3 years				
	(*i*) *Breeding*				
	(*a*) *In milk*	12,580,797	11,810,837	(+)	6.5
	(*b*) *Dry & not calved even once*	11,655,080	9,858,603	(+)	18.2
	(*ii*) *Working*	497,534	420,731	(+)	18.2
	(*iii*) *Others*	293,962	245,297	(+)	19.8
	Total	25,027,373	22,335,468	(+)	12.1
(c)	*Young stock*	18,451,799	16,071,946	(+)	14.8
	Total Buffaloes	51,137,279	44,915,758	(+)	13.9

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