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THE PIG INDUSTRY.

(*Continued from page* 255, *Vol.* X.)

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IV.—FATTENING PIGS.

The system of feeding the sow has already been dealt with.* We have now to consider the best method of producing pork or bacon of a quality that will command the best class of trade, at the same time having due regard to the economical aspect of the business which alone will enable us to derive profit from the undertaking.

The object of feeding pigs is to convert forage into palatable and nourishing food of the highest quality for man in the most economical manner. The quality must be such that it will suit the highest class of trade, where the highest prices are paid for a suitable article. This alone will make the industry remunerative. Formerly, the popular taste was for a heavy weight fat bacon, but during the last twenty years the taste has undergone a considerable change, as at the present time what is in greatest demand is a young, lean, juicy, sweet, mild-cured bacon. Fortunately for the producer also this class of product is the most economical and remunerative to provide, for the young pig has greater powers of digestion and assimilation; and while a young pig will be able to produce a pound of green pork out of about 4 lbs. of food, a fully-matured animal or backfatter may take 6 lbs. or more. So that, taking pollard at 1s. per bushel, or .6 of a penny per lb., in a young pig the pork would cost for feed 2½d. per lb; while a backfatter, taking 6 lbs. of pollard to 1 lb. of meat, would cost 3½d. In the former case it may be safely reckoned that 4d. per lb. on an average will be realized, while for the latter only 2½d. to 3d. will be returned.

In addition to cost of food there are other expenses to be considered, which may be put at ½d. per lb.

* *Journal of Agriculture*, Vict., April, 1912.

FEEDING.

The pig is the most economical meat producer of all farm stock. i.e., it produces more meat for the amount of food consumed than any other animal. This is illustrated by the following figures:—

GRAIN REQUIRED FOR 100 LBS. OF LIVE WEIGHT GAINED.

—	Barley.	Maize.	Oats.	Pease.	Wheat.
Pigs	418	485	472	439	452
Sheep	453	502	518	522	582
Cattle	914	1,028	1,032	911	1,090

AMOUNT OF PORK PRODUCED PER ACRE FROM VARIOUS CROPS.

—	Bushels per acre.	Pounds of Grain.	Grain per lb. of Meat.	Pork per Acre.	—
					£ s. d.
Wheat	15 (60 lbs.)	900	5	180 @ 4d.	= 3 0 0
Barley	35 (50 lbs.)	1,750	5	350 ,,	= 5 16 0
Oats	40 (40 lbs.)	1,600	5	320 ,,	= 5 6 8
Maize	40 (56 lbs.)	2,240	5	440 ,,	= 7 9 4
Pease	25 (60 lbs.)	1,500	5	300 ,,	= 5 0 0
Green clover ..	5½ tons	= 12,320	15	821 ,,	=13 13 8
Green lucerne ..	3 ,,	= 6,720	15	448 ,,	—
Green lucerne (4 cuts) =	12 ,,	= 26,880	15	1,792 ,,	29 14 0

AVERAGE BIRTH WEIGHT AND WEEKLY GAINS OF PIGS BEFORE AND AFTER WEANING.

Before Weaning, 10 weeks, average of 12 Litters, 86 pigs.			After Weaning, 7 weeks, average of 8 Litters, 62 pigs.		
Week.	Average Weight.	Gain.	Week.	Average Weight.	Gain.
	lbs.	lbs.		lbs.	lbs.
At birth	2·5	..	..	..	..
1	4·4	1·9	10	41·5	..
2	7·0	2·6	11	46·7	5·2
3	9·8	2·8	12	52·0	5·3
4	12·5	2·7	13	58·3	6·3
5	15·6	3·1	14	64·2	5·9
6	18·6	3·0	15	69·8	5·6
7	22·6	4·0	16	76·5	6·7
8	27·8	5·0	17	84·1	7·6
9	33·1	5·3	..	..	..
10	38·5	5·4	..	..	..

The heaviest pig in these litters weighed 3.6 lbs. at birth, and the lightest 1.6 lb.; the average for the lot being 2.5 lbs. During the first week after birth the pigs made a gain of 1.9, or an increase of 76 per cent. The tenth week showed a gain of 5.4 lbs., equal to 14 per cent. For the seventeenth week there was a gain of 7.6 lbs.

WEEKLY GAINS OF PIGS FROM BIRTH TO MATURITY.—WISCONSIN STATION.

Age or Weight of Pigs.	Weight of Pigs.	Gain in 7 Days.
	lbs.	Per cent.
At birth	2·5	..
First week	4·4	76
Second week	7·0	59
Third week	9·8	40
Fourth week	12·5	28
Fifth week	15·6	25
Sixth week	18·6	19
Seventh week	22·6	22
Eighth week	27·8	23
Ninth week	33·1	19
Tenth week	38·5	16
Under 100 pounds	78	7·0
,, 150 ,, ...	128	6·0
,, 200 ,, ...	174	5·0
,, 250 ,, ...	226	4·1
,, 300 ,, ...	271	3·8
,, 350 ,, ...	320	3·1

As showing the increased cost per pound of gain with the increase of weight, Professor Henry gives the following table, which is the result of feeding over 2,200 pigs:—

Weight of Pigs.	Average Feed per Day.	Feed eaten Daily per 100 lb. Live Weight.	Average Gain per Day.	Feed eaten for each 100 lbs. of Gain.	Cost per lb. with Pollard at 1s. per Bushel.	
					Live Weight.	Carcase.
lbs.	lbs.	lbs.	lbs.	lbs.	Pence per lb.	Pence per lb.
15–50 ..	0·223	5·95	0·76	293	1·758	2·197
50–100 ..	3·30	4·32	·83	400	2·40	3·0
100–150 ..	4·79	3·75	1·10	437	2·62	3·37
150–200 ..	5·91	3·43	1·24	482	2·89	3·61
200–250 ..	6·57	2·91	1·33	498	2·98	3·73
250–300 ..	7·40	2·74	1·46	511	3·06	3·82
300–350 ..	7·50	2·35	1·40	536	3·21	4·01

PREPARATION OF THE FOOD.

Cooking Feed for Pigs.

Henry says:—"While the practice of steaming roughage for cattle has been universally abandoned wherever undertaken, much is still said concerning the advantages of cooking feed for swine. This subject has been carefully investigated at our stations with practically concordant results, so that we are not without definite help on an important topic."

A great number of experiments have been conducted to determine the value of cooking the feed for pigs, the results being almost without exception in favour of not cooking. Including all the tests, so far as

known, the average shows that 476 lbs. of uncooked meal or grain were required for 100 lbs. of pork; while after it was cooked 505 lbs. were required. This shows a loss of 6 per cent. of the feeding value through cooking.

Soaking Meal versus *Dry Meal.*

Comparing the value of feeding meal or grain soaked with water as against the same feed dry, 451 lbs. of soaked food was equal in feeding value to 483 lbs. of dry grain or meal; a difference of 7 per cent. in favour of soaking. That will show 13 per cent. in favour of soaking over cooking.

Mixing the Feed.

It has been found that by mixing two or more grain feeds, the amount required for pork production is reduced by 20 per cent. The greater the variety the better the result.

THE VALUE OF SHELTER.

In testing the value of shelter in pig feeding it was found that those kept in an open yard required 317 lbs., or 25 per cent. more corn for every 100 lbs. gain, than those given shelter.

It is estimated that the maintenance requirement of the pig is about 2 lbs. of feed equal to pollard for every 100 lbs. live weight, and it is only what they eat above that amount that they can convert into meat. Provided they are properly bred, the more they can be persuaded to eat in 24 hours the more profitable they are.

EXERCISE.

The results of tests extending over four years, comparing the feeding of pigs kept in small pens and allowing exercise in yards or run of pastures show that those in pens or sties averaged a daily increase of weight of .9 lb., requiring 512 lbs. of feed for every 100 lbs. of increase; while those allowed a run increased at the rate of 1.1 lb. daily at a cost of only 420 lbs. of feed for 100 lbs. increase.

This shows .2 of a lb. greater daily gain, and a saving of 92 lbs. of grain or 18 per cent. of the feed in making 100 lbs. of pork in favour of yard or pasture over close confinement.

The Canadian system is generally to let them run on grass while fattening. Experiments recently conducted on an extensive scale at the Illinois Experiment Station—thirteen experiments with 618 pigs—prove that young and growing pigs require plenty of exercise. This appears to have its chief value in its influence over the respiratory and digestive organs. When changed from a place where they have plenty of exercise to where they have little room, they eat less, and the result is smaller and usually more expensive gains.

WATER.

It has been mentioned that the food for fattening pigs should not be fed in a sloppy condition, but about the consistency of oatmeal porridge. Careful investigation goes to show that the proper proportion of water to feed is about 3 to 1.

At the Yorkshire College Farm two pens of six each were fed equal parts of barley-meal and pollard. In one case the mixture was

soaked with four times its weight of water, while in the other only twice its weight of water was used. The former was fed in a sloppy condition, the latter was of the consistency of oatmeal porridge. Both lots were allowed as much food as they would eat, and those having the drier food had access to a water trough. In eight weeks the pigs getting the wetter feed increased by 334 lbs., while the other gained 458 lbs. (live weight). The pigs of the former consumed 1,904 lbs. of food, while those of the latter ate 2,254 lbs. The proportions of food consumed to weight gained were—

In those getting much water	5·7
In those getting less water	4·9

The pigs fed on the drier food thus made 124 lbs. more increase in live weight, and yielded about 102 lbs. more pork; while each 1 lb. of increase in live weight was obtained by the expenditure of .8 of 1 lb. of feed less than with the other animals, equal to ½d. per lb. The extra cost of food was about 19s., but the value of the increased quantity of pork was about 42s. 6d., leaving a net gain of 23s. 6d. for the pen receiving the drier food. The extensive feeding experiments conducted by Harris for the Wiltshire County Council prove also that 3 lbs. of water or 3 lbs. of skim milk to 1 lb. of meal are the best proportions.

A plentiful supply of water should always be provided for pigs to drink; and also, where possible, to wallow in, particularly in hot weather. These animals are often severely affected by heat, and on hot days a careful watch should be kept to see that they are not suffering. If they are, they should be well doused with water.

FEED.

Peas.—This feed is rich in protein, and consequently good for young pigs and production of lean bacon. If fed whole, they are very palatable, but a big percentage is wasted, passing through the system undigested. Pea-meal is a valuable feed but should never be fed alone; its close heavy nature renders it difficult to digest, and the pigs are apt to sicken. It combines well with barley or barley and pollard. A few well-ground oats may also be added.

Beans.—*While this grain is rich in protein,* and will be valuable in enriching the ration in this requirement, if fed in any considerable quantity has the undesirable result in producing soft bacon—one of the worst of faults. *When available, it should be fed in conjunction* with other grain. It is a valuable crop to grow, however, as very heavy yields can be obtained.

Barley.—It may be safely said that this is the best of all the grain feeds for the production of bacon, taking into consideration both quantity and quality. It should always be crushed, and for young pigs should be mixed with pollard, a little barley meal to commence with, and gradually increasing the proportion.

Wheat.—This is a valuable feed for bacon, and would often give better returns when converted into pork than sold in its natural condition. As 5 lbs. of wheat will produce 1 lb. of pork, on an average, 1 bushel of 60 lbs. will produce 12 lbs. of pork, at 4d. gives 4s. per bushel for the wheat; or, deducting ½d. per 1 lb. for working expenses, would return 3s. 6d. net for wheat. Split or damaged wheat may be

turned into profit in this way; and when market rates are below the price indicated, the above profit may be derived by converting it into pigs.

Rye.—This has a little lower feeding value than wheat. When compared with barley, it will produce about the same quantity, but the quality will be inferior, and it should be fed in conjunction with other food.

Oats.—Where oats are largely used for pigs the husks are removed, and then they are excellent feed both for quality and quantity. They are of too fibrous a nature for young and fattening pigs, although a little crushed fine may be mixed with other food. The famous York hams are supposed to owe much of their excellent flavour to the fact that the pigs are largely fed on oatmeal.

Oat Branning is generally cheap, and, being palatable and rich in protein, may be used with advantage.

Pollard.—This is an excellent food for pigs of all ages and for all purposes. It has the reputation of producing bacon of rather a soft nature, and consequently should be fed with some other grain. When fed with skim milk it gives very satisfactory returns.

Oil Cakes are expensive, and have not been found very satisfactory for pig feeding, so we may leave them out of consideration.

Bran, although rich in protein, must not be looked upon as a fattening food, while it is a very good milk producer, fed to the suckling sow. The principal value of bran is medicinal, helping to keep the bowels regular. A careful watch must be kept to see that pigs do not become constipated, as this quickly leads to or is indicative of serious trouble if not corrected. Bran in the food is very valuable for this purpose.

Maize.—In America, where maize is very cheap, it is largely fed to pigs, and produces a large weight of meat for the amount consumed. In this country also in those districts where maize is grown extensively, and owing to distance from railway communication, and consequent difficulty in getting it to market, it is very largely converted into pork. When fed in large quantities the quality of the flesh is inferior, being soft, oily, and not a good colour. When fed sparingly, however, together with other grain, such as barley, pollard, and skim milk and potatoes, the results are satisfactory. Maize on the market is seldom very low in this country, and generally other grain foods are more economical. In the East Gippsland river flats, where usually from 80 to 100 bushels per acre of maize is grown, and it takes about 5 lbs. to produce 1 lb. of pork, about 1,000 lbs. per acre would be produced, which at 4d. per lb. amounts to £16 13s. per acre.

Maize is not good food for young pigs if fed by itself or in any quantity. It is very deficient in mineral matter, of which young pigs are not able to extract sufficient to build up the necessary bone structure. Henry gives results of tests illustrating this where pigs fed on maize lacked density of bone to such an extent that the breaking strength of the thigh bone was only 380 lbs., while at the same time that of pigs fed on milk, blood, and pollard was 503, a difference of 32 per cent. Maize-meal fed by itself is close, heavy, and difficult to digest.

Maize Corn and Cob Meal.—While the maize cob itself is highly fibrous and innutritious, it becomes a valuable food when ground into

meal together with the grain, and owing to its mechanical effect in lightening the maize meal it increases its digestibility. This is a method of converting a waste product into a valuable food. In the maize-growing districts tons of cobs may be seen either burning or left to rot. Machines for grinding the corn and cob are now on the market.

Malt Coombs, or the sprouts from malt, is very rich in protein, and sweet. It may be mixed with other feed, and as it is generally cheap will have the effect of both enriching and reducing the cost of feed.

Rice Meal is a feed largely used in Britain, but seldom heard of here. It is fairly rich in protein and phosphoric acid, and may be considered equal to barley. It should be mixed with some other food.

Separator Skim Milk.—The pig will give the best returns for the by-products of the dairy if these are fed in a proper manner. To obtain full returns, however, it should be fed in conjunction with grain, &c. The tables given below illustrate clearly how milk should be fed to secure the best results.

At the Wisconsin Experiment Station, Professor Henry conducted nineteen trials with 88 pigs of all ages, to determine the value of separator milk in combination with maize meal. The proportion of milk to meal varied from 1 lb. to 9 lbs. of milk for each 1 lb. of meal fed, and the following table clearly shows the result:—

SEPARATOR SKIM MILK AND MAIZE MEAL REQUIRED FOR 100 LBS. OF GAIN.

When Feeding.	Number of Trials.	Feed for 100 lbs. of Gain.	
		Meal.	Milk.
1 lb. of Corn-meal to 1 to 3 lbs. skim milk ..	3	321	585
1 lb. ,, 3 to 5 lbs. ,, ..	8	265	1·048
1 lb. ,, 5 to 7 lbs. ,, ..	5	250	1·434
1 lb. ,, 7 to 9 lbs. ,, ..	3	207	1·616

Assuming that 500 lbs. of maize-meal fed alone would have produced 100 lbs. of pork (*the average of a number of trials was* 532), we find that with the first group 585 lbs. of skim milk effected a saving of 179 lbs. of maize-meal. On this basis, 327 lbs. of skim milk is equal to 100 lbs. of maize-meal, when fed in the proportion of not exceeding 3 lbs. of milk to 1 lb. of meal. Taking maize-meal as a standard, we find the values of skim milk, when fed with maize-meal, in the varying proportion as follow:—

MEAL SAVED BY MILK FED IN VARYING PROPORTIONS.

When Fed in Proportion of—	lbs. Milk.	Saves lbs. Meal.
1 lb. Maize-meal to 1 to 3 lbs. separator milk	327	100
1 lb. ,, 3 to 5 lbs. ,, ...	440	100
1 lb. ,, 5 to 7 lbs. ,, ...	574	100
1 lb. ,, 7 to 9 lbs. ,, ...	552	100

The average of all:—475 lbs. skim milk equals 100 lbs. maize-meal. This places a money value on separator skim milk. The following table shows at a glance the comparative value of separator milk when fed to pigs, combined with meal, in different proportions and prices:—

Price of Maize	Value of 100 lbs. of Skim Milk.		Average of all Trials.
	When Feeding—1–3 lbs. of *Milk* to 1lb. of Maize-meal.	When Feeding—7–9 lbs. of *Milk* to 1lb. of Maize-meal.	
s. d.	*s. d.*	*s. d.*	*s. d.*
1 2 per bushel	0 $7\frac{1}{2}$	0 $4\frac{1}{2}$	0 $5\frac{1}{2}$
1 $4\frac{3}{4}$	0 9	0 $5\frac{1}{2}$	0 $6\frac{1}{2}$
1 $7\frac{1}{2}$	0 $10\frac{1}{2}$	0 $6\frac{1}{2}$	0 $7\frac{1}{2}$
1 $10\frac{1}{4}$	1 0	0 $7\frac{1}{2}$	0 $8\frac{1}{2}$
2 $1\frac{3}{4}$	1 2	0 8	0 $9\frac{1}{2}$
2 4	1 $3\frac{1}{2}$	0 9	0 $10\frac{1}{2}$
3 6	1 11	1 $1\frac{1}{2}$	1 4

This table shows that when maize is worth 1s. 2d. per bushel, separator milk is worth, for pig feeding, $7\frac{1}{2}$d. per 100 lbs., provided that not more than 3 lbs. of skim milk are fed with each 1 lb. of meal. If, however, 9 lbs. of milk be fed with each 1 lb. of meal, the milk is worth only $4\frac{1}{2}$d. per 100 lbs., and the average value is $5\frac{1}{2}$d. Again, the value of the milk increases in proportion as does the price of meal. So that when maize is worth 3s. 6d. per bushel, 10 gallons of skim milk is worth 1s. 11d., if fed in proportion of not exceeding 3 lbs. of milk to 1 lb. of meal. This shows the value of separator skim milk for production of pork or bacon. The Danes place the value at 6 lbs. of milk equal to 1 lb. of meal. Separator milk is all digestible, it is rich in protein or nitrogenous matter, which is responsible for the production of lean meat and also bone, so being particularly valuable for young pigs, and the quality of the meat is high.

Butter-milk.—Provided no water is added, this is of equal value to skim milk. It must be borne in mind that butter-milk from factories almost always contains a considerable amount of added water, sometimes as much as 50 per cent., and consequently by itself is not a sufficient food for pigs. Many instances can be given of considerable mortality among pigs fed solely on butter-milk, practically from starvation, because they were not able to consume enough butter-milk plus water to derive sufficient nutriment to satisfy the demands of nature. But when the deficiency in solids is made up by adding meal, or even grass, roots, or other fodder, pigs are found to thrive on butter-milk.

We have to remember that a pig requires about 2 lbs. of feed equal to pollard per day per 100 lbs. live weight for the purpose of keeping up the system; that is, to keep up the temperature, repair, waste of tissue, &c., and that butter-milk contains 90 per cent. water and 10 per cent. solids. From the results of trials with some hundreds of pigs, it is found that pigs of 50 to 100 lbs. live weight consume on

an average 3.35 lbs. of feed equal to pollard per day. Pigs of 100-150 lbs. live weight will eat 4.79 lbs., and those of 150-200 lbs. consume 5.9 lbs. per day. It will be seen from this that it would be necessary that they should consume in the last case 59 lbs., or practically 6 gallons of butter-milk, for the same result; and should the butter-milk be diluted by half, as is often the case, it would require half as much again, or 9 gallons, to produce this result.

Whey.—This has not nearly the feeding value that separator milk or butter-milk has, especially for young animals, nor will it produce as good quality bacon, unless food rich in protein be used in conjunction with it. This is due to the fact that only a small percentage of protein remains in the whey, the bulk of it being removed in the form of curd. A high percentage of sugar, however, remains, and when mixed with food rich in protein, such as peas, beans, &c., is a valuable food, particularly as it is easily digested and there is no waste. Whey has been found to have a higher feeding value than turnips 1 lb. for 1 lb. when fed with meal. The Danes find 12 lbs. of whey equal to 1 lb. of barley-meal, so that 2 lbs. of whey are equal to 1 lb. skim milk. This value can only be obtained by feeding it with a good proportion of meal, say 3 lbs. whey to 1 lb. of meal.

Root Crops for Feeding.

All the root crops provide valuable pig food when fed in conjunction with grain, and, unlike grain feeds, the roots are better cooked after having the earth removed by washing. If this is not done, the effect will probably be that it will scour the pigs too much. In the case of potatoes, the water must be thrown away, not mixed with the food, as there is a substance in the skin that has a prejudicial effect on the health of the pig if allowed to consume it. Artichokes, potatoes, mangels, beet, carrots, turnips, parsnips, pumpkins, cabbage —all are good. With regard to cabbage, Sanders Spencer says they are liable to cause constipation, which if not removed will frequently be followed by fever more or less dangerous. Some hold that turnips fed to pregnant sows are liable to produce abortion. Mangels and turnips are not conducive to prime quality pork.

Potatoes have been proved to be valuable as a food for production of pork when fed in combination with grain, and more especially with the addition of skim milk or whey. The most satisfactory of all being 1 lb. grain to 3 lbs. skim milk and 3 lbs. potatoes. Four lbs. of potatoes are equal to 1 lb. of grain.

Sugar-beets.—Pigs seem to prefer sugar-beet to almost any other kind of roots. Only limited quantities of roots should be fed to fattening or very young pigs.

Artichokes (Jerusalem).—Of this plant, Mr. Potts, Principal of Hawkesbury College, writes:—"This is a flowering perennial plant which has in the past been overlooked as a valuable food for pigs. It grows from 6 to 9 feet high, and, when in bloom, seen from a distance the crop looks like one of miniature sunflowers. The stalks are frequently used for feeding sheep, or conversion into silage, and the tubers afford a palatable and succulent food for pigs. The plant is very persistent in growth, and if raised in suitable soil is difficult

to eradicate. Enough tubers, as a rule, are left each year to continue the crop, hence it is wise to set apart a permanent paddock for it, or the odd corners of a farm or waste places of little value for other crops may be used for growing artichokes.

The plant is extremely hardy; it resists frost and drought. Whilst the best crops are raised on good mellow loams, profitable yields are secured on stiff clay lands, light sandy or gravelly soils.

The land is best suited where the drainage is good; in fact, any *soil suitable for potatoes will answer for artichokes. It is a crop that* requires little attention when it is established. The soil needs thorough cultivation. It should be deeply ploughed about May or June. During the winter it may be harrowed occasionally, lightly re-ploughed about September, and well manured. The tubers are then planted by dropping them into furrows 3 feet apart with a space 2 feet between the tubers. If the sets are small, plant whole, while large ones may be *cut. Cover by turning a furrow over them. About 4 cwt. of tubers* will plant an acre. The crop matures in five months. Should rain fall immediately after planting, the harrow may be run over the land to fine the surface. This should be repeated when the plants are 4 inches high. It checks evaporation, destroys weeds, and will not injure the crop. Later on the cultivator should be kept moving between the rows about once a month.

When the crop flowers and the tops droop and die, about April or *May, it is ready for harvesting. The average yield will be from* 7 to 8 tons per acre.

Two varieties have been tested here, and gave the following results:—

Jerusalem, White, 9 tons 1 cwt. per acre.
Jerusalem, Pink, 6 tons 16 cwt. per acre.

For feeding pigs, it is best to turn them into the crop to root out the tubers. It must be remembered that, where it is desired to con*tinue the crop, the pigs should be removed before all the tubers are* eaten.

Few foods are more relished by pigs. The tuber in the raw state is very nutritious, more especially for pregnant sows, and also sows *reduced in weight and condition after suckling and weaning big* litters. This class of food acts as a diuretic, or promotes a healthy action of the kidneys in secreting urine; it relieves constipation and *stimulates liver functions. One acre will support twenty sows from* four to six months.

Young growing pigs evidence considerable growth on being fed with them for a short period. The exercise obtained in harvesting or rooting up the tubers has a beneficial influence. It is especially notable that artichokes are very digestible. The outcome of a number of tests go to show that for fattening purposes these tubers must be given with grain, and have a similar result to feeding with ordinary *potatoes. 325 lbs. wheat fed with 820 lbs. artichokes gave 100 lbs.* increase."

This crop was extensively grown for pigs by Mr. Syme, at Dalry, near Healesville.

The average composition of artichoke is shown here in contrast with the potato:—

—	Water.	Ash.	Protein.	Carbo-hydrates.	Fat.	Nutritive Ratio.
Artichoke	79·5	1·0	2·5	16·7	·2	1·7
Potato ..	78·9	1·0	2·1	17·9	·1	1·86

It is found that about 30 lbs. of artichokes will produce 1 lb. pork, which at 4d. amounts to approximately £10 per acre.

Tares, Clovers, and *Lucerne* are all valuable feeds when fed in conjunction with more concentrated grain or mill offal.

Rape is a very valuable food, and can be either pastured or cut and fed to them in the pen.

Molasses may be added to the food in small quantities, but must not be looked upon as a food, but more as an appetiser. It will also act as a laxative.

Fruit.—The waste of the orchard may be turned to profitable account by combining with grain, and for this purpose may replace roots.

Salt.—A little salt is necessary for pigs for promotion of digestion, but it is best supplied in the form of a condiment, as advised in a previous article.* Recent experiments have proved the value of this mixture when added to the food daily.

Bone-meal.—Growing pigs require to draw extensively on the protein of the food for bone-forming material to such an extent that other ingredients in the food are often to a large extent wasted. When one tablespoonful of bone-meal per pig has been added daily to the feed, it has been found to save 25 per cent. of the food required when no bone-meal was fed.

A summary of the results of the different methods of feeding, when presented in concrete form, are sufficiently striking:—

Assuming that it costs 3d. per lb. for production—

Cooking the food increases amount required 6 per cent., increasing cost .18 of a penny.

Crushing against feeding whole reduces amount required 7 per cent., reducing cost .21 of a penny.

Soaking thoroughly reduces amount required 7 per cent., reducing cost .21 of a penny.

Grinding and soaking as against cooking reduces amount required 13 per cent., reducing cost .39 of a penny.

Shelter as against exposure reduces amount required 25 per cent., reducing cost .75 of a penny.

Mixing two or more grain feeds reduces amount required 20 per cent., reducing cost .6 of a penny.

Clover or lucerne hay soaked reduces amount required 30 per cent., reducing cost .9 of a penny.

A mature pig requires more than young—reduces amount required 33 per cent., reducing cost one penny.

* *Journal of Agriculture,* Vict., April, 1912, p. 255.

It is not inferred that the whole of these savings can be effected, but it indicates the lines on which feeding should be conducted, and the reasons therefor.

It must be borne in mind that the pig, like the horse, has comparatively small intestinal capacity, and consequently requires its food in a concentrated form, unlike the cow or sheep, which require bulky food.

When increase in weight is spoken of, live weight is generally meant; the difference between that and carcass may be taken as 25 per *cent., or one-fourth.*

PIG MANURE.

Few farmers appear to realize the value of pigs' manure, or we would not see so much going to waste as is the case on the majority of the farms in this State. Most farmers have proved that increased returns are obtainable by manuring crops with some purchased artificial manure, but do not trouble to conserve the more valuable material they have in the piggeries, for besides this containing all the chemical *elements required by growing crops, it is teeming with myriads of* micro-organisms which are necessary to enable the plants to make use of plant food supplied. It should be understood by pig feeders that every ton of food bought and fed represents so much manure made available in a more valuable form than it was originally. The following table gives the *approximate* value of the manure *from every* ton of food given to pigs, and should show the necessity of making provision for properly conserving the manure, and that purchasing food for pigs is an indirect way of manuring the land:—

VALUE OF MANURE FROM 1 TON OF FOOD FED TO PIGS.

	£	s.	d.
Beans	2	13	0
Peas	2	5	6
Pollard	2	2	3
Bran	2	1	5
Oat branning	2	0	0
Oats	1	5	0
Wheat	1	4	2
Barley	1	2	0
Maize	1	1	0
Malt coombs	3	10	0
Clover hay	1	16	10
Lucerne hay	1	15	7
Dried blood	8	0	3
Skim milk	0	7	8
Whey	0	3	0

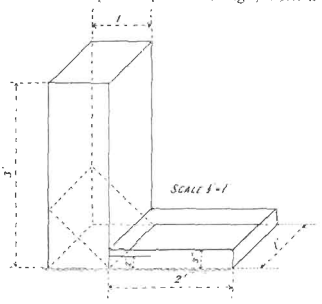
Boussingalt's experiments give the following results:—

	£	s.	d
Value of manure in producing 100 lbs. of pork from skim milk ...	1	0	10
Value of manure in producing 100 lbs. of pork from maize ...	0	7	5
Value of manure in producing 100 lbs. of pork from peas ...	0	14	10
Value of manure in producing 100 lbs. of pork from clover ...	1	0	1
Average	0	15	9½

Or, in other words, where pigs are fed on clover and skim milk through summer, and topped off with half peas and half maize, each 1 lb. of pork leaves manure to the value of 1.875d.

THE FEED HOPPER.

This system of feeding has given good results, and has the great advantage in saving of labour. The illustration given below sufficiently explains the system. This hopper is made of inch boards, and consists of an upright box 1 foot square by 3 feet high, with a horizontal box 1 foot by 2 feet by 3 inches at the bottom. The upright box holds the supply of feed, and the horizontal box is made so as to catch the feed as the pig roots it down. The bottom of the upright box is a smooth slanting board, which guides all the feed to the outlet. The outlet extends entirely across one side of the upright box, and is about 1½ inch wide, varying slightly with the kind of feed used. The different kinds of feed are supplied in separate hoppers, so that the pigs can select which they require. Where there is a scarcity of labour this will be a good system, otherwise it will not give so good results as when the pigs are fed as before recommended.



FEED HOPPER.

TO ESTIMATE THE WEIGHT OF A PIG BY MEASURE.

It requires considerable experience to judge the weight of a pig, and it almost necessitates being connected with slaughtering. Where a large number of pigs are fattened, platform scales should be fixed in the race, so that they can be run on and weighed with very little trouble.

Their weight may be estimated very closely by measuring in the following manner:—

Take the girth just behind the shoulder in feet and inches. The length from that point on top, along the curve of the back to the root of the tail. The head and neck weighs about one-sixth the weight of the four quarters, and is estimated at about one-eighth the value. The girth and length as above, calculated by the rule to find the solid content of a cylinder, each cubic foot equals three stones of 14 lbs. (42 lbs.), and one-third of a foot, or 576 inches, equals 1 stone. So if the contents in cubic inches is divided by 576 it equals imperial stones, and 8 stones 1 cwt.

Rule 1. Square the girth and multiply by the length, both in inches, and the product, multiplied by the decimal .07958, will give the content in cubic inches, which divide by 576 and the result is the weight of the animal in imperial stones of 14 lbs.; or divide by 41 and the answer is in lbs.

Rule 2. Multiply the square of the girth by the length, both in inches, and divide the product by 7238, and the quotient is the weight in imperial stones.

TOMATO CULTURE IN VICTORIA.

By S. A. Cock, Orchard Supervisor, Bendigo and Northern District.

The cultivation of the tomato in Victoria is steadily growing into an important industry. During the last thirty years great progress has been made in its production, and to-day the culture of this excellent fruit is almost general. Tomatoes, to-day are extensively used either whole or in the making of salads and sandwiches for dessert. In the past the tomato was almost exclusively used for sauce. The uses of this delectable conserve are very varied, and are rapidly increasing as an adjunct to the culinary art. Tomatoes are also used largely for chutney, and in their green state for pickles.

MARKET PROSPECTS.

The prospects of the market are excellent. Locally the demand is a growing one, both from the stand-point of the fresh and preserved

Plate. 1.—General View of Tomato Plantation, Chinese System, Echuca.

fruit trade. For the Inter-State markets, Victoria is producing sauce, pulp, canned tomatoes, and pickles, with a great certainty of large expansion in trade, and the oversea markets, Canada, Africa, Ceylon, and parts of Asia, are opening up for sauce and canned fruit.

There are no statistical data available as to the actual annual production of tomatoes in Victoria, but probably the annual production is about 600,000 bushels from all sources. The area producing this in kitchen gardens and on commercial plantations is not less than 1,000 acres. Tomatoes produce as much as 1,500 bushels to the acre, but the average yield can be placed at between 500 to 600 bushels. In the warm northern areas the objective is the production of early market fruit; this entails much labour and care

in protection against frosts. Early fruits command as high as £1 per bushel case in November and December, and when prices fall to below 3s. a case, about February, production ceases along the Murray and north of Bendigo, as factory prices are unremunerative when freight has to be paid over long distances. At Bendigo the season is a longer one, as when market prices fall the factories are locally available, and this also applies around Melbourne and other factory centres. Factory prices for the last three years are as follow:—

1911	...	...	...	0	9	per bushel case
1912	...	...	...	2	6	,, ,,
1913	...	...	...	1	3	,, ,, ,,
Total	...	...	...	4	6	,, ,, ,,
Average for three years	...	...	...	1	6	,, ,, ,,

Plate 2.—Large Red Tomato, Staked and Trellised, Bendigo

Both in market and factory, fluctuations in prices, according to season and demand, are sure to occur, and there is no attempt to regulate factory prices at present. The cultivation of tomatoes on a commercial scale is a business that requires constant care and attention from the time the seeds are planted until the crop is gathered. It is a highly profitable crop, but requires intelligence to insure success.

VARIETIES.

Tomato—*Lycopersicum esculentum* (Tournefoot). Natural order, *Solanaceæ*. A native of tropical South America. General characteristics—Annual; height, 2 feet to 6 feet; leaves, unequally pinnate; leaflets, cut; flowers, yellow, numerous; fruit varies in size and shape, red or yellow in colour in different varieties. The cultivated list of

varieties is very numerous, and many new and excellent varieties are annually added. The following are the requisites for a market tomato:—Early ripening, smooth skin, solid flesh, size large to medium, productiveness and freedom from surface cracks in wet weather; colour should be bright red. In planting for market it is desirable to plant three or four of the best varieties rather than to depend on one. Different seasons may affect different varieties, and a variety giving satisfactory results one year may not do as well as another variety the succeeding year. Another important factor is that with several varieties the daily average picking is more equal, earlier and later varieties distributing the rush in picking over a greater number of days.

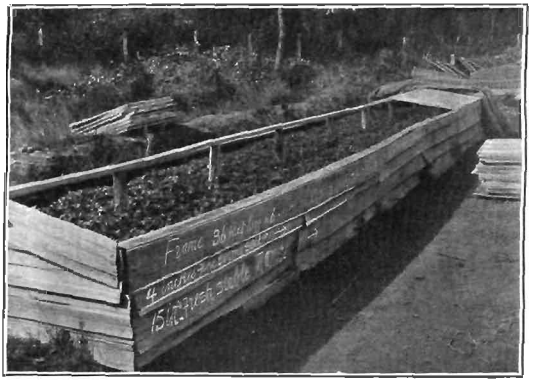


Plate 3.—Hot-bed, Bendigo, showing Glass and Calico Covering.

Varieties recommended and chiefly grown:—

Large Red.—Probably a cross from Ponderosa and Earliana, heavy bearer and early; fruit, very large; flesh, solid, fine flavour; skin, almost smooth; colour, bright red. The most generally cultivated variety.

Earliana.—Heavy bearer and very early; fruit, medium to large; flesh, solid, fine flavour; skin, very smooth; colour, bright red.

Vila Seca (Spanish).—Good early variety; fruit ripens all together; fruit, large; flesh, solid, good flavour; skin, smooth; colour, bright red.

Chalk's Early Jewel.—Early, and good bearer; fruit, large; flesh, solid, good flavour; skin, smooth; colour, bright red, almost scarlet.

Wilding's Early Prolific.—Very heavy bearer, and early; fruit, medium; flesh, solid, good flavour; skin, fairly smooth; colour, bright red.

Key's Early Prolific.—Best dessert variety; dwarf, and bushy in habit of growth; heavy bearer; fruit, medium; flesh, solid, delicious flavour; skin, smooth; colour, bright red.

Other red varieties of excellence—

Stone, Atlantic Prize, Johnson's "Jack Rose," Queen, Burpees' Earliest Pink.

Yellow varieties of excellence used as dessert or for garnishing in salads—

Golden Queen, Lemon Blush, Golden Sunrise, Yellow Plum, Yellow Cherry, Large Yellow.

RAISING PLANTS.

A hot bed is necessary for the raising of the young plants. The usual type of hot bed is shown in Plate 3. The hot bed may also be

Plate 4.—Cold Frame, Bendigo, showing Glass, Calico Covering, and Tomato Plants in Tins.

constructed by digging out the earth to a depth of 1 foot and building a frame over it. The manure to be placed in the bottom of the frame should be perfectly fresh stable manure, and during the course of a few days should be turned once or twice before placing in the frame. When placed in the frame it should be tightly packed, about 15 inches in depth is necessary. On this is placed a 4-inch layer of well-rotted stable manure or, preferably, good loamy soil free from weeds, and on this the seeds are sown broadcast. The seeds are lightly covered over with fine soil to a depth of not more than ½ inch. Should the soil or rotted manure on which the seeds are sown be very dry, it is advisable to lightly sprinkle the surface with water before sowing the seeds; this is, however, rarely necessary. When the seeds are sown and covered with soil, the glass is placed on the frame, and not removed until the seeds have germinated. The plants should be allowed to

grow for about two or three weeks, and during that time the glass can be gradually removed on sunny days. This will prevent the young plants from growing too spindly. The proper type of plant to aim for, both in the hot bed and the cold frame, is a stocky plant with a bluish-green tint on the stem. This is only achieved by hardening according to weather conditions; an even temperature of 70 to 75 degrees will be found a good guide to work by in the hot frame. When the plants are sufficiently large, say fourteen to twenty-one days old, they should be pricked out singly, with a little earth attached to the root of each plant, and then, with more earth, placed in a circle of zinc or tin of about 3 inches diameter, as shown, Plate 4 by +. If tins or zinc are not procurable, paper funnels can be made, and this system is largely in use with the Chinese, and serves the purpose equally well. The young plants are then placed side by side in the cold, or hardening-off frame, as shown in Plate 4, the interstices between each tin or paper bag being filled with soil. A cold frame has no bottom heat, the regulating of temperature necessary during the hardening-off period being with glass. Calico or hessian covers are also used on the hot and cold frames, as shown in Plates 3, 4. These are made the full length of the frame, and can be drawn over the whole length of glass if necessary, or the glass may be removed and the calico or hessian covering used instead on the cold frame. Plants may also be transferred from the hot to the cold frame without tins or paper, and be put out in lines 4 inches apart each way in 6 inches of good soil, and, when removing to the open, the soil is cut between each row to 6 inches deep and divided at every 4 inches so as not to disturb the earth from the root of the young plant. The plants remain in the cold frame until required to be planted in the open. The young plants will require watering. In the hot frame great care is necesary to guard against overwatering, as it may induce damping off. Should watering be necessary, it should be given only on warm days, or very sparingly during cold and cloudy weather. In the cold frame the young plants should be watered lightly after transference from the hot bed, and should be shaded for two or three days by rolling the calico or hessian coverings over the glass. When the transferred plants have struck root the coverings should be kept off the glass in the day time, and the plants ventilated and watered according to the judgment of the grower. Watering and ventilation are two very important factors, and require much attention.

Seed is sown in June in the Northern and Murray districts, and the young plants removed to the open in August. In Bendigo, late June and July are the months in which seeds are sown, and the plants removed to the open in September and October. In the Midlands and the South, the time of sowing is July and August, and planting in September, October, and November.

(To be continued.)

Chlorophyll or leaf-green is a compound of nitrogen. When a crop does not get enough nitrogen from the soil, its colour is bad, and nitrogenous manures on worn-out or poor soils improve the yield. But the lack of colour may also be due to water troubles—either too much water or too little.

SUCCESSFUL POULTRY-KEEPING.

Valuable Adjunct to the Farm.

By A. Hart, Poultry Expert.

Hints to Beginners.

The value of the poultry industry in our State has increased to a great extent during the last five years, but it may still be regarded as being capable of much improvement. The possibilities of poultry-keeping offer great advantages to those who embark in the industry on correct lines. No other business will produce a return quicker; no other stock will return as much per acre, and nothing else on the farm will multiply so quick as fowls. Combined with this is also the fact

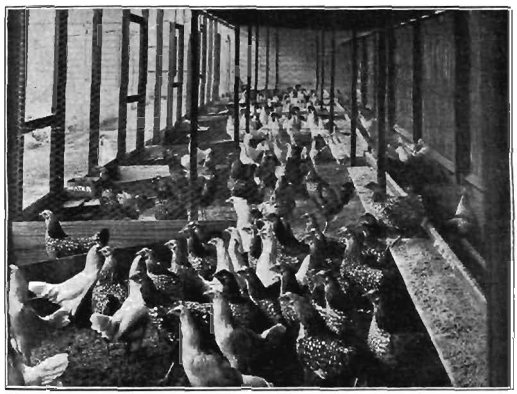


Fig. 1.—Poultry Shed System, 15 birds or more in a pen 10 ft. x 10 ft.

that no country in the world is more suitable for the development of the poultry industry than our Commonwealth. We have only to look at the marvellous figures attained by strains of Leghorns that have been built up here by judicious mating and breeding, combined with the valuable climatic conditions of Australia. Egg producing records that beat the world have been made by these birds on several occasions. Another point is that even when Australian Leghorns are kept in cold climates, and under conditions distinctly unfavorable to egg production, they still retain their excellent laying qualities. An example of this is given by the fact that three Leghorn hens sent from Australia to a poultry-keeper in England were tested for twelve months, and they produced 299, 252, and 234 eggs respectively. This average has been exceeded here by birds bred in our State, but under the severe

climatic conditions of England, coupled with the effect of a sudden change of climate, the figures must be taken as good, being far ahead of any previous English records. These facts must convince even the most sceptical that the poultry industry has a brilliant future before it. The 200-egg hen per year was—a few years ago—regarded as a wonder. But when, under the strictest Government supervision, a pen of six Victorian Leghorn pullets put up an average of 264 eggs each for twelve months, the former figures are small in comparison. *That all of our laying stock are not capable of reaching these figures I am quite prepared to admit. If a flock of hens would return an* average of 180 eggs each per year, at the ruling price for 1911 and 1912 that would mean a gross return of 17s. 6d. per bird, which, when the expense of feeding and attention is deducted, would leave a profit of 7s. or 8s. from each hen. As 600 or more hens can be kept on an acre, the profit per acre would work out about £200.

One valuable point in poultry-keeping is that it can be made a very suitable adjunct to farming, dairying, or fruit-growing. It will accommodate itself well with all or either of these industries, lessening the cost of production in various ways, allowing the produce to be sent to market in a concentrated form, and also providing a regular source of return to the owner. Grain, fruit, and vegetables can all be utilized *to advantage by the poultry-keeper. On the principle that it is not always wise to carry too many eggs in one basket, the combination of* poultry-keeping with other industries is to be advised.

Several instances could be quoted where poultry-keeping is made the principle source of revenue, dairying and *fruit-growing being the* adjuncts. Other cases may be mentioned where poultry farming by itself is returning a satisfactory profit. But experience, as well as suitable surroundings, are essential in these cases, and it would be well for the beginner to start the business in connexion with another industry. Experience is a qualification that leads to successful poultry-keeping, and the only reliable method of securing it is to embark in the industry on moderate lines, *gaining experience as you go on and increasing your stock gradually. The bulk of the failures in poultry-keeping can be traced to starting on a large scale without any previous* experience. Poultry-keeping appears very simple, and so it is, but people make a mistake when they think all that is necessary to make money out of poultry is to put up a few fowl-houses and runs, stock them with fowls, throw a little food to them twice a day, and collect enough eggs a day to make a handsome profit. The business is not hard to learn, but still it requires several qualifications. An interest in the birds themselves is one of the most important points, and if that is present the poultry-keeper will soon gain sufficient knowledge to *manage successfully. But he must not imagine that there is nothing more to learn.* In this age of advancement there is bound to be *many* changes in the feeding, housing, &c., of poultry. Shedding systems in the way of housing and dry food in feeding are two of the latest changes in this respect. It is quite possible that other improvements may be made later on, and the poultry-keeper must advance with the times if he wishes to be successful. Reducing the expenditure in connexion with poultry-keeping is an essential point. But this must be practised in a systematic manner, and, while doing so, it must always

Fig. 2.—Poultry Shed, accommodating 500 birds.

be remembered that the poultry must not suffer in any way through cutting down expense. Up-to-date methods of housing and feeding may save a lot of labour, and in the same way the supply of water may also be provided with practically no loss of time.

How to Start.

When the beginner has selected the breed or breeds he intends to keep it is advisable for him to start with a couple of pens of each variety chosen. In light breeds, six to eight hens can be placed in each breeding pen, and in the heavy breeds about six will be enough. Second season birds are preferable, and always bear in mind that a good laying strain is indispensable. Birds for egg production pay best, and the best breed for that purpose is the White Leghorn. Minorcas, Brown Leghorns, and Andalusians are also good layers. In the heavy breeds, Wyandottes, Orpingtons, and Plymouth Rocks are best, and are also good winter layers, although not up to the standard of the first-named. The beginner should breed about 300 pullets to start with in the first year, increasing this number as he gains experience. Three hundred pullets, if hatched from the 1st of September to the middle of October, should bring in a net return of £100 a year. If egg production is combined with rearing poultry for table purposes, it is advisable to keep Wyandottes, Orpingtons, or Plymouth Rocks.

In mating birds for breeding pens, second season hens are preferable, mated with well grown cockerels of from ten to twelve months old. By this mating you should insure strong and healthy chickens. If pullets are well developed, and over ten months old, they may be used instead of hens, but only when the latter are not available. Beginners should never make the mistake of hatching too many chickens. This generally results in overcrowding the young stock, and death claims a heavy percentage of the birds. In feeding the stock different methods may be adopted. The best morning meal for laying hens is two parts pollard, one part bran, and one part lucerne chaff, or green lucerne, clover, rape, thousand-headed kale, or silver beet, chaffed or cut fine.

When lucerne chaff is used, it should be steamed over-night. Warm water or milk should be used to moisten the mixture. When skimmed or separated milk is used, it should be first mixed with the bran, then add the pollard and green stuff, mixing the whole thoroughly. About 3 ozs. of this mixture is sufficient for each laying hen. The meal should be fed in troughs, so that no waste occurs, and the food is also kept clean. Animal food is good for laying stock. Blood meal, meat meal, livers, or other butcher's offal are very suitable (the latter being well cooked before using), and about 1 lb. may be given three or four times a week to every twenty laying fowls.

Blood meal may be obtained at the City Surveyor's Office, Town Hall, Melbourne. For the evening meal the best grain is wheat, heavy oats, maize, and peas come next as they are written. About 1¾ ozs. is sufficient for each bird. But the weights mentioned need not be accepted as a hard-and-fast rule. It is always advisable to give them as much as they will eat readily, and the quantity given may be safely regulated by the interested attendant. It is advisable to throw the grain among the litter with straw, chaff, or other short material, as it

provides the fowls with good exercise in scratching for the grain. During the hatching season, birds in the breeding pen may be fed in a slightly different manner. Give meat scraps regularly every day in small quantities, and at midday a supply of green food should be

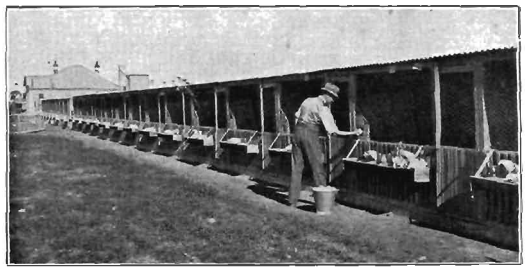


Fig. 3.—Economy in Feeding and Labour Saving in Collecting Eggs.

provided. A change of grain is also useful, as birds sometimes tire of one kind. Wheat can be given four times a week, and oats, maize, and peas may be substituted for the other three days. The male bird should be examined for vermin, and watched closely, and, if he does

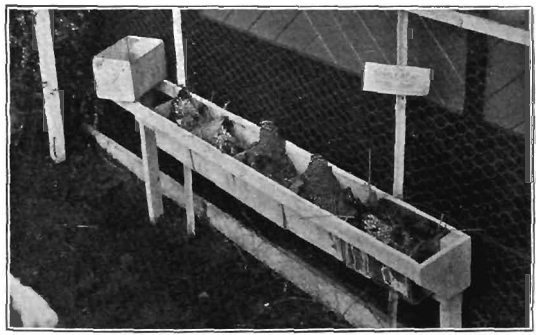


Fig. 4.—Vermin-proof Nest, simple and effective.

not feed well with the hens, he should be fed in a pen by himself. Two male birds for each pen may be recommended, one to be used every alternate week. *This is the best method of securing a large percentage* of fertile eggs. Shell and sharp grit must also be provided, and a

liberal supply of each should be always available. Charcoal is also an excellent thing for poultry. A regular supply of drinking water must be provided. The drinking vessel should be placed from 9 inches to 1 foot above the level of the floor, so that the water will be kept clean. The best method of watering is to have it laid on in pipes, when

Fig. 5.—Successful Egg-farming, Goulburn Valley.

the drip system may be practised, so that the water is always fresh. It should also be shaded from the sun and wind.

Fowl-houses.

A useful style of a double fowl-house is illustrated. It is 7 feet in length, 5 feet wide, 6 feet high at the front, and 6 feet 6 inches at

Fig. 6.—A Complete Plant in connexion with a Poultry Farm, all grain utilized for stock.

the back, with nest boxes placed at the side of the house. Good serviceable material should be used in its construction. Palings and lining boards will form the covering, and hardwood should be used in the frame. By raising the floor of the house 2 feet from the ground it will provide a shelter and dust bath for the birds underneath the

floor. The material used for the dust baths is two parts wood ashes and four parts sand, to which may be added 1 lb. of powdered sulphur. The size of the yard or run varies according to the number of birds

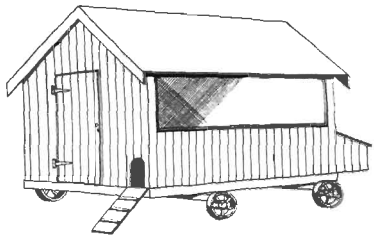


Fig. 7.—Portable Fowl-house for the Stubble Fields.

kept. About 40 feet by 10 feet is enough for fifteen to eighteen birds, and as they always give the best results when kept in small flocks, this size of yard and house is preferable.

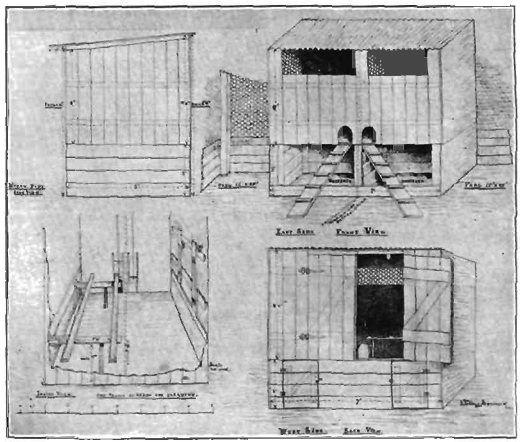


Fig. 8.—Plan of Double Fowl-house.

The shed system of keeping poultry is now becoming popular, and good result have been obtained in egg production where it has been used. Where flocks of 500 are running together, a shed 100 feet long

by 20 feet wide, as illustrated, is suitable. This will give plenty of room for accommodation, and also allow of a scratching space 100 feet long by 10 feet wide. The birds are kept in these sheds, except when the weather is very fine, when they are let out for a few hours. A shed 10 feet by 10 feet will hold fifteen birds all the year round. All fowl-houses and sheds should, where practicable, be built on a slope towards the east. Where the shed system is adopted, the floor should be prepared by ramming down moist clay to a depth of 3 inches above the top of the ground. Then put a coating of boiling tar evenly over the surface. Sand may then be sprinkled, and the floor allowed to dry and set properly. All perches should be movable. They should be at least 2 inches wide, and set on hardwood cross pieces. The perches and cross pieces should be regularly dressed with a solution of carbolic acid, or pure kerosene, so as to keep down the "Red Mite."

Incubation.

Where a large quantity of chickens is hatched, or where early young stock is required, incubators are indispensable. The hatching and rearing of chickens is one of the most important points in poultry rearing. To insure success in this respect, strong and vigorous breeding stock is the first requirement. In regard to the time of hatching, it is advisable that the correct time should be observed. The most favorable time to hatch chickens from White Leghorns for winter eggs is from the 1st of September to the middle of October. If the stock is for breeding purposes, they may be hatched in June, July, and August.

Incubators have now been brought to such a stage of perfection that an amateur, observing the conditions sent out with the machine, can manage it easily.

Eggs selected for incubation should be as fresh as possible, of good shape, even and smooth in shell, and of fair size.

The shells of tinted eggs are generally thicker than the whites, and take a day longer to hatch. To obtain the best results, fill your machine at the start. The incubator should be heated up to 102 degrees before the eggs are placed in the drawer. It should then be kept as near that temperature as possible for the first week of incubation, and for the remainder of the time at 103 degrees. Tested thermometers should be used, and two may be placed in one drawer. Eggs should be allowed to cool down as follows:—On the 4th day, to 90 degrees; and up till the 19th day, to 85 degrees. The bulb of the thermometer should be placed between two eggs in the tray when they are out-cooling.

Treatment of Chickens.

After twenty-four hours, the chickens should be removed to the brooder, and fed on biscuit meal, stale bread crumbs, and flaked oatmeal, moistened with raw eggs or new milk. A little of this may be given every two hours. After five or six days the above mixture

should be discontinued and the following dry mash should be given in hoppers for the first month:—

Bran	25 parts
Flaked oatmeal	25 ,,
Biscuit meal	25 ,,
Millet white	15 ,,
Fine shell grit	5 ,,
Dry bone meal	5 ,,

A good mixture for chickens is as follows:—

Cracked wheat	25 parts
Hulled oats	25 ,,
Peas, cracked	10 ,,
Maize, cracked	5 ,,
Sand, coarse	5 ,,

This mixture should be given to the chickens in the litter, to make them scratch for it. The best litter is chaff—lucerne chaff preferred.

Animal food such as boiled liver, sheep's head, or rabbit, should be put through the mincer and given to the chickens once or twice a week. All green stuff, such as lucerne or milk thistles, should be cut fine and given to the chickens in the middle of the day. After two months chickens may be fed the same as adult birds.

All pullets should be separated from the cockerels when they can be distinguished properly, as it gives both sexes a better chance of improvement. When birds are intended for table purposes, they should be kept in flocks of nearly the same age and size if possible, the same rule applying in other cases of growing stock.

In conclusion, I would again remind my readers of the great possibilities of the poultry industry and the vast increase that could be made in this respect. In the hands of experts, combined with the assistance from the Department of Agriculture, much has already been done, and, with the foundation already laid, a vast trade could be built up. The egg production of our State is not at present enough for our own requirements. There is every prospect of being able to send our surplus eggs to England to compete against the world's supplies, and in the near future there should be a valuable trade opened up in this respect. England imported from foreign countries in 1911 eggs to the value of £7,965,800. The market is there, and what has been already done in meat, butter, and other products of our State should be successfully followed by the export of eggs and poultry to the London markets, where there is practically an unlimited demand for high class products.

PROCESSES IN THE SOIL—

There are two great processes going on continually in the soil which are known to be due to the activities of bacteria:—(*a*) The conversion of ammonia and other compounds containing nitrogen, derived from decaying organic matter and nitrogenous fertilizers, into nitrates, the only form in which, so far as we know, plants can utilize the nitrogen. (*b*) The utilization of free nitrogen of the atmosphere by leguminous plants. Both these processes are greatly facilitated by the presence in the soil of a sufficiency of lime.—*Mark Lane Express.*

GENERAL NOTES.

REASONS FOR DRAINING—

The chief object in draining wet land is not to remove the extra water. A wet soil is, of course, a colder soil, but in Victoria this would seldom be a sufficient reason for draining. The main object in *draining land is to admit fresh air, and this can only be accomplished* by getting the water out. Plant roots must breath, and nitrification in soils needs fresh air, and in water-logged soils these results can only be attained by first removing the water. In an article contributed to the *Deut. Landw Presse* 39 1912), the results of several years' observations on the effect of drainage are recorded. It is concluded that the most important factor concerned in the increased productivity of a soil from tile draining is the improvement in aeration. In order to increase the aerating effect, the tiles were sometimes connected with the upper air by placing vertical flues, but the results of this departure from ordinary practice are as yet inconclusive. The experiments are being continued. Probably the air drawn into the soil as the water soaks into drains in the usual way gives sufficient aeration in ordinary cases, and circumstances are conceivable which would even render the upright flues an impediment to aeration. The foul air or carbonic acid gas, produced in soils is itself heavier than air and subject to diffusion, will slowly find its way down the drains when *these are not carrying water. This flow of gases will be faster the* greater the fall in the pipes, and particularly when the subsoil is much colder than the upper air. But the most important action of drains *is to promote aeration by first taking the water out.*

FINE WOOL—

Professor Barker, of the Bradford Technical College, in the course of a recent lecture before the Bradford Textile Society, declared that *Bradford to-day was in many cases demanding a finer wool* simply because it was found that the finer wool could be manufactured into fabrics which commanded a more regular market than fabrics manufactured from coarser wool. He predicted a big shortage of fine wools in the near future. Commenting on these remarks, the *Farmers' Advocate* (N.Z.) states that the demand for fine wools has been a marked feature of the local wool sales for several seasons past, and appeals to pastoralists, especially small holders, to give consideration to this demand of the trade.

IMPROVED SEED GRAIN—

In a report recently issued by the United States Department of Agriculture attention is drawn to a new movement in the seed trade. A number of "experimental associations" and "crop-breeders' associations" have been formed in different States. The objects and methods of the two kinds of association appear to be somewhat similar. Of the first kind, the Wisconsin Experimental Association furnishes an example. It is composed of persons who have attended the State Agricultural College. The experiment station attached to the college supplies members of this association with seed of new varieties of grain

produced at the station, or obtained from other growers, and the members thus become distributors in their respective communities. When inquiries for seed come to the station the inquirers are referred to the member of the association who lives nearest them. "The neighbours of the association members are usually quick to realize the value of *new and improved varieties grown by the association men, and are* ready to purchase seed from them at good prices." In other States the organization takes the form of crop-breeders' associations. The secretary here is usually a member of the State experiment station, and inquiries coming to the station and college are referred to him. He also publishes lists of members who have seed for sale, giving details of varieties, quantities, and prices asked. With a sale, some *guaranty as to quality, purity, and germination* is *generally* supplied. This organization of seed-growers under expert guidance is regarded by the Washington Department as a policy which "it is desirable to encourage as far as possible."

THE VICTORIAN RAILWAYS—

According to the latest *Monthly Summary of Australian Statistics,* Victoria in the past financial year had 3,622 miles of railway open for traffic. The number of train miles run was 13,837,000, which constituted a record for the State. The gross earnings for the year totalled £5,218,967, and the working expenses for the same time £3,441,803. This left a credit balance of £1,777,164, representing the net earnings of the railways. The net earnings work out at 2s. 7d. per train mile run, and return 3.88 per cent. on the capital cost of construction and equipment, which is stated at £45,837,000. As compared to the other States, Victoria leads slightly in the matter of net earnings per train mile, but with 3.88 per cent. it falls just slightly below most of them in the return for capital sunk. Thus New South Wales returned 4.34 per cent., Queensland 3.95, South Australia 5.09, Western Australia 4.09, and Tasmania 2.15 per cent. Alike in the rate of interest obtained, and its position in this matter relatively to the other States, the Victorian railways have been very consistent during each of the past five years.

Experiments show that sheep require about 2 lbs. of water for 1 of dry food, horses 2 or 3 to 1, and cattle 4 to 1. Pasture grass in the green state contains 70 to 80 per cent. of water.

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*SOME BUTTER MAKING EXPERIMENTS AND ANALYSES.

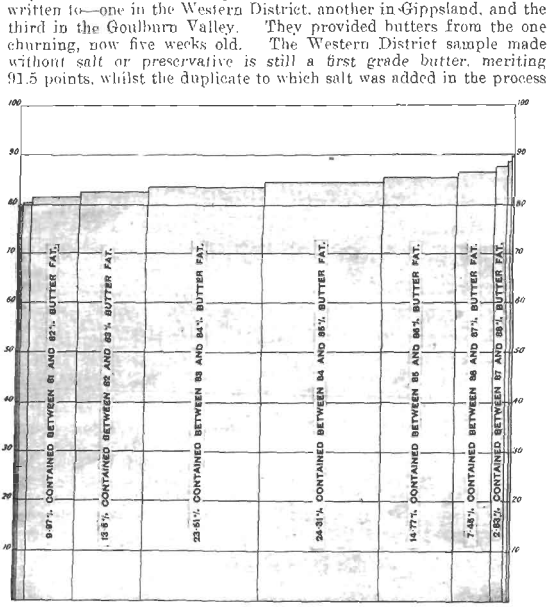
By R. Crowe, Exports Superintendent.

IS SALT A BUTTER PRESERVATIVE.

From time to time doubts have arisen and have been expressed as to whether salt in butter had any preserving effect, or if it was only a flavouring agent. An experiment which was concluded early in

* Paper read at the Melbourne Meeting (1913) of the Australasian Association for the Advancement of Science.

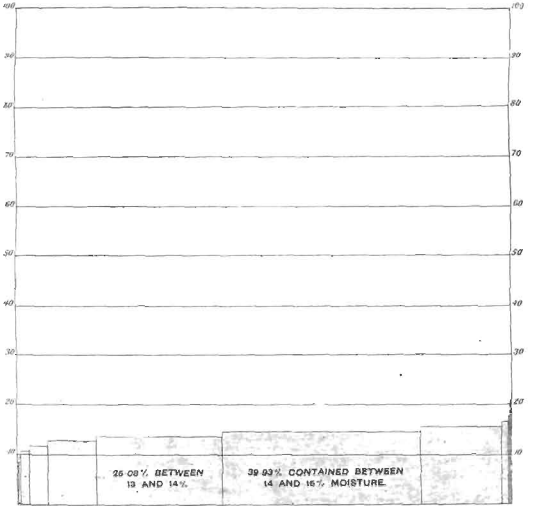
November last with one parcel of butter from the same churning showed that the sample which had no salt or preservative in it was better after keeping for some months than the duplicate sample with only salt added. On noting this result, three factory managers were written to—one in the Western District, another in Gippsland, and the third in the Goulburn Valley. They provided butters from the one churning, now five weeks old. The Western District sample made without salt or preservative is still a first grade butter, meriting 91.5 points, whilst the duplicate to which salt was added in the process



PERCENTAGES OF BUTTER FAT IN BUTTER.

of manufacture is now distinctly a second grade butter, worth only 86.6 points, so that there is a difference in grade separated by 4.9 points. The Gippsland butter made without salt or preservative merits 91.66 points, whilst the duplicate sample containing salt is worth 89.16 points. There is therefore a difference of 2.5 points between the two in favour of the saltless sample. The Goulburn Valley samples are much the poorest in quality; that without salt scores 85 points, whilst the duplicate with salt is marked down to 83.6 points, showing a difference of 1.4 points. These results show distinctly that butter without salt keeps better over a lengthened period in cool storage than salted butter.

Naturally, quite a number of questions are suggested as the outcome of this result. What is the reason Why is the difference in favour of saltless butter greater in one instance than another? Was all the salt used contaminated each to a different degree? Has the presence of salt favored the development of putrefactive organisms, and was this change hindered through the absence of salt, or does salt assist in the chemical change known to take place in butter by long keeping? Each one of these suggestions will receive further attention during the present year, and of all of them it is more likely that the presence of salt facilitates bacterial development in butter than



PERCENTAGES OF MOISTURE IN BUTTER.

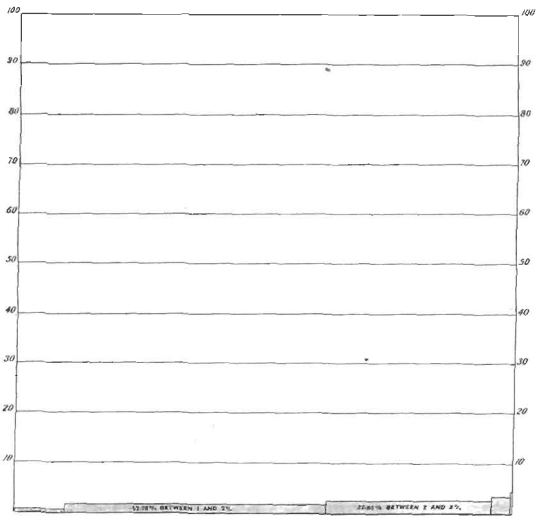
that the salt was contaminated or that it was instrumental in bringing about a chemical alteration.

The percentage of the total butter exported yearly without any salt is 35, and unsalted butter usually commands a higher price by 2s. per cwt. than that which is salted, the reason given being that butter in that form is more suitable for blending purposes or for sale as Normandy, or in competition with Normandy unsalted butter. It has been generally known, however, for many years past that unsalted butter keeps better, and is much less liable to develop the fault known as "fishiness." In connexion with the question of price, it should

be remembered that unsalted butter contains, on the average, slightly more butter fat than salted butter, and also a greater percentage of moisture.

BUTTER ANALYSES.

Butter Fat (including Casein).—During the last six years the analyses for butter fat (including casein) of 1,625 samples of butter have been recorded. (*Vide* Appendix A.) The average result is 84.23 per cent. Three samples, or 0.18 per cent., contained over 89 per cent., whilst one, or 0.06 per cent., was found to contain under 79 per



PERCENTAGES OF SALT IN BUTTER (NOT INCLUDING UNSALTED BUTTERS).

cent. of butter fat (including casein). As the average casein content may be stated at 0.73 per cent., the butter fat contents of the 1,625 samples would therefore average 83.5 per cent.

Moisture.—During the last seven years the analyses for moisture of 13,193 samples of export butter have been recorded, and these average 13.84 per cent. (*Vide* Appendix B.) Four samples, or 0.03 per cent., were found to contain over 20 per cent. moisture; 337 samples, or 2.55 per cent., were found to contain over 16 per cent. moisture; whilst 13 samples, or 0.1 per. cent., showed under 8 per cent.

There has been a great deal of controversy from time to time as to the maximum moisture contents which should be allowed in butter. Whilst the maximum allowed was 16 per cent., the average moisture contents varied from 13.44 per cent. in 1907-08 to 13.97 per cent. in 1909-10. It is worth noting that the average for 1910-11 season was 13.82 per cent., when the maximum allowed was 16 per cent., whilst for 1911-12 the average rose to 13.91 per cent., when the maximum permitted had been reduced to 15 per cent.

Curd.—In the course of the last six years the analyses of 627 samples have been registered, which (*vide* Appendix C) give an average of 0.76 per cent. Some 40 samples, or 6.38 per cent., were found to contain over 1 per cent. of curd, whilst 5, or 0.8 per cent., yielded under 0.3 per cent. It must be mentioned that attention was directed chiefly to butters suspected of containing a high curd content, so that it would be misleading to assume that the average of all butter produced in the State was 0.76 per cent. of curd; the real average would be lower than these figures indicate.

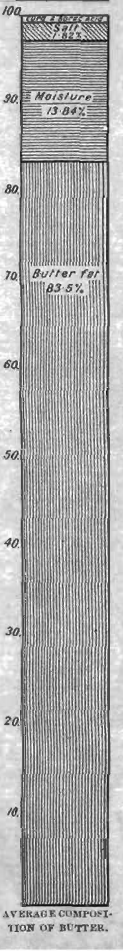
Salt.—The analyses for salt of 1,385 samples of butter have been placed on record during the past six years, with the result that the average comes out at 1.82 per cent. (*Vide* Appendix D.) Four samples, or 0.29 per cent., were found to contain over 4 per cent. of salt, whilst 140, or 10.11 per cent., yielded less than 1 per cent.

Boric Acid.—During the last seven years the analyses of 2,640 samples for boric acid contents have been recorded, and these give an average of 0.2 per cent. (*Vide* Appendix E.) Forty-seven, or 1.59 per cent., were found with over 0.5 per cent., whilst 606 samples, or 20.61 per cent., had less than 0.1 per cent.

SUMMARY.

From these 19,470 results, the average composition of Victorian butter may be stated at 83.5 per cent. butter fat, 13.8 per cent. moisture, 0.7 per cent. curd, 1.8 per cent. salt, and 0.2 per cent. boric acid. It should be noted that the same butters were not analyzed for the different component parts, and hence the only alteration from the previous quoted results, and referred to in appendices, is the dropping of the second decimal place in the case of moisture, curd, and salt.

The great majority of these samples were analyzed by the Federal Analyst, whilst the remainder were analyzed by the State Analyst.



AVERAGE COMPOSITION OF BUTTER.

APPENDIX A.

SUMMARY OF ALL ANALYSES OF BUTTER MADE BY THE FEDERAL AND STATE GOVERNMENT ANALYSTS FOR THE EXPORTS DIVISION OF THE DEPARTMENT OF AGRICULTURE, VICTORIA, FOR THE PAST SEVEN YEARS:—

BUTTER-FAT.

Season.	Under 79 per cent.	Between— 79–80 per cent.	80–81 per cent.	81–82 per cent.	82–83 per cent.	83–84 per cent.	84–85 per cent.	85–86 per cent.	86–87 per cent.	87–88 per cent.	88–89 per cent.	Over 89 per cent.	Total Samples.	Mean Average.
1906–07	..	..	..	..	..	1	..	1	..	..	..	..	2	83·87
1907–08	..	3	6	19	71	136	110	55	30	5	..	..	435	84·88
1908–09	1	4	11	41	48	84	135	112	51	22	5	2	516	84·65
1909–10	..	1	9	52	79	154	143	72	39	19	10	1	579	83·77
1910–11	..	..	4	44	23	5	4	..	..	..	1	..	81	82·09
1911–12	..	..	..	6	..	2	3	..	1	..	..	..	12	83·13
Totals ..	1	8	30	162	221	382	395	240	121	46	16	3	1,625	..
Per cent. to Total	·06	·49	1·85	9·97	13·60	23·51	24·31	14·77	7·45	2·83	·98	·18	..	..
Percentage to Total Samples.														
1906–07	..	..	..	..	..	50·00	..	50·00	..	..	..	..	2	
1907–08	..	·69	1·38	4·37	16·32	31·27	25·29	12·64	6·89	1·15	..	..	435	
1908–09	·19	·78	2·13	7·95	9·30	16·28	26·16	21·71	9·88	4·26	·97	·39	516	
1909–10	..	·17	1·55	8·98	13·64	26·60	24·70	12·44	6·74	3·28	1·73	·17	579	
1910–11	..	..	4·94	54·33	28·39	6·17	4·94	..	..	..	1·23	..	81	
1911–12	..	..	..	50.00	..	16·67	25·00	..	8·33	..	..	..	12	
Per cent. to Total Samples ..	·06	·49	1·85	9·97	13·60	23·51	24·31	14·77	7·45	2·83	·98	·18	1,625	

Mean average for the 1,625 samples analyzed = 84·23 per cent. (including Casein).

APPENDIX B.

MOISTURE.

Season.	Under 8 per cent.	Between— 8–9 per cent.	9–10 per cent.	10–11 per cent.	11–12 per cent.	12–13 per cent.	13–14 per cent.	14–15 per cent.	15–16 per cent.	16–17 per cent.	17–18 per cent.	18–19 per cent.	19–20 per cent.	Over 20 per cent.	Total Samples.	Mean Average.
1905–06	..	..	..	7	36	52	150	127	29	..	..	..	..	..	401	13·72
1906–07	..	..	..	6	11	31	42	78	27	..	..	..	..	..	195	13·92
1907–08	..	..	..	11	23	58	159	107	39	7	1	..	1	..	406	13·44
1908–09	1	1	4	20	40	92	175	90	50	17	13	6	1	2	512	13·69
1909–10	..	1	10	26	72	160	305	326	220	67	21	7	..	..	1,215	13·97
1910–11	12	26	58	117	197	545	1,245	3,079	1,634	124	19	2	4	1	7,063	13·82
1911–12	..	..	8	37	105	358	1,233	1,461	155	33	5	5	..	1	3,401	13·91
Totals	13	28	80	224	484	1,296	3,309	5,268	2,154	248	59	20	6	4	13,193	..
Per cent. to Total	·10	·21	·61	1·69	3·67	9·83	25·08	39·93	16·33	1·88	·45	·15	·04	·03	..	..

Percentage to Total Samples.

1905–06	..	..	..	1·74	8·98	12·97	37·41	31·67	7·23	..	..	..	..	..	401
1906–07	..	..	..	3·08	5·64	15·89	21·54	40·00	13·85	..	..	..	..	..	195
1907–08	..	..	..	2·71	5·66	14·29	39·16	26·35	9·61	1·72	·25	..	·25	..	406
1908–09	·19	·19	·78	3·92	7·81	17·97	34·19	17·58	9·76	3·32	2·54	1·17	·19	·39	512
1909–10	..	·08	·82	2·14	5·93	13·17	25·10	26·83	18·11	5·51	1·73	·58	..	..	1,215
1910–11	·17	·37	·82	1·66	2·79	7·72	17·63	43·59	23·13	1·75	·27	·03	·05	·01	7,063
1911–2	..	..	·23	1·09	3·09	10·52	36·25	42·96	4·56	·97	·15	·15	..	·03	3,401
Total per cent. to Samples ..	·10	·21	·61	1·69	3·67	9·83	25·08	39.93	16·33	1·88	·45	.15	·04	·03	13·93

Mean average for the 13,193 samples analyzed = 13·84 per cent.

APPENDIX C.

CURD.

Season.	Under ·3 per cent.	Between— ·3–·4 per cent.	·4–·5 per cent.	·5–·6 per cent.	·6–·7 per cent.	·7–·8 per cent.	·8–·9 per cent.	·9–1·00 per cent.	Over 1 per cent.	Total Samples.	Mean Average.
1906–07	..	..	..	..	..	1	1	1	..	3	·84
1907–08	1	2	21	39	89	105	83	92	21	453	·78
1908–09	..	5	16	23	28	11	14	2	10	109	·68
1909–10	3	4	6	9	6	4	4	4	5	45	·66
1910–11	1	..	1	1	..	3	2	1	2	11	·86
1911–12	..	..	..	2	2	..	..	..	2	6	·88
Totals	5	11	44	74	125	124	104	100	40	627	..
Per cent. to Total ..	·80	1·76	7·00	11·80	19·94	19·78	16·59	15·95	6·38	..	..
Percentage to Total Samples.											
1906–07	..	..	..	..	..	33·33	33·33	33·33	..	3	
1907–08	·22	·44	4·64	8·60	19·65	23·18	18·32	20·31	4·64	453	
1908–09	..	4·59	14·68	21·10	25·69	10·09	12·84	1·84	9·17	109	
1909–10	6·67	8·89	13·33	20·00	13·33	8·89	8·89	8·89	11·11	45	
1910–11	9·09	..	9·09	9·09	..	27·28	18·18	9·09	18·18	11	
1911–12	..	..	..	33·33	33·33	..	..	..	33·33	6	
Per cent. to Total Samples	·80	1·76	7·00	11·80	19·94	19·78	16·59	15·95	6·38	627	

Mean average of the 627 samples analyzed= ·76 per cent.

APPENDIX D

SALT.

Season.	Under 1 per cent.	Between— 1–2 per cent.	2–3 per cent.	3–4 per cent.	4–5 per cent.	Total Samples.	Mean Average.
1906–07	..	..	2	..	..	2	2·32
1907–08	34	151	142	6	2	335	1·91
1908–09	36	228	150	15	..	429	1·84
1909–10	65	320	142	28	1	556	1·74
1910–11	5	27	17	5	..	54	1·92
1911–12	..	5	2	1	1	9	2·29
Totals	140	731	455	55	4	1,385	..
Per cent. to Total	10·11	52·78	32·85	3·97	·29	..	..

Percentage to Total Samples.

1906–07	..	..	100·00	..	..	2
1907–08	10·15	45·08	42·39	1·79	·59	335
1908–09	8·39	53·15	34·97	3·49	..	429
1909–10	11·69	57·55	25·54	5·04	·18	556
1910–11	9·26	50·00	31·48	9·26	..	54
1911–12	..	55·56	22·22	11·11	11·11	9
Per cent. to Total Samples ..	10·11	52·78	32·85	3·97	·29	1,385

Mean average for the 1,385 samples analyzed= 1·82 per cent.

APPENDIX E.

Boric Acid.

Season.	Under ·10 per cent.	Between—				Over ·5 Per cent.	Total Samples.	Mean Average.
		·10–·20 per cent.	·20–·30 per cent.	·30–·40 per cent.	·40–·50 per cent.			
1905–06	13	56	94	85	52	..	300	..
1906–07	49	60	57	23	6	..	195	0·25
1907–08	72	104	124	74	38	3	415	0·23
1908–09	170	121	123	42	11	1	468	0·17
1909–10	201	442	234	132	44	14	1,067	0·18
1910–11	94	171	96	61	16	17	455	0·19
1911–12	7	5	9	3	4	12	40	0·40
Totals	606	959	737	420	171	47	2,940	..
Per cent. to Totals ..	20·61	32·62	25·07	14·29	5·82	1·59	..	..
Percentage to Total Samples.								
1905–06	4·33	18·67	31·34	28·33	17·33	..	300	
1906–07	25·13	30·77	29·23	11·79	3·08	..	195	
1907–08	17·35	25·00	29·88	17·83	9·16	·72	415	
1908–09	36·33	25·86	26·28	8·97	2·35	·21	468	
1909–10	18·84	41·43	21·93	12·37	4·12	1·31	1,067	
1910–11	20·66	37·58	21·10	13·40	3·52	3·74	455	
1911–12	17·50	12·50	22·50	7·50	10·00	30·00	40	
Per cent. to Total Samples ..	20·61	32·62	25·07	14·29	5·82	1·59	2.940	

Mean average of 2,640 samples analyzed = ·20 per cent.

BEE-KEEPING IN VICTORIA.

(*Continued from page* 305.)

By F. R. Beuhne, Bee Expert.

XIV.—DISEASES OF BEES.

The diseases affecting bees may be grouped under two headings, viz., diseases of the adult bee and diseases of the larvæ, or brood. The latter diseases are the more generally distributed and serious, and the principal ones are known under the general term of foul-brood of bees.

FOUL-BROOD.

This is a contagious disease which kills the young larval bee in the cell. By contact with the remains of the dead grub the disease is transmitted by the adult bees to other cells, thus causing the death of the larvæ from eggs deposited in such cells or the contamination of any honey stored in them.

As the average life of the worker bee during summer is only six weeks, it follows that the number of young bees hatching decreases as the disease advances, the colony soon dwindles in numbers until it finally dies right out or becomes so weakened as to be unable to defend itself against robber bees from other hives. The honey is carried away by bees from other colonies, which in turn become infected, thus propagating the disease indefinitely.

The methods of box-hive bee-keepers, however, have done more to spread disease than anything else. The usual way is to drum the bees out of the upturned hive into an empty box, to cut out the combs, and, after crushing them and straining the honey off, to throw out the residue, and any combs too black for straining, for the bees to clean up. If any of the hives were diseased, the germs are at once re-introduced into the newly-built combs of the robbed hives, while the contaminated honey, when marketed, carries infection to distant localities by means of bees getting access to retail packages after they have been emptied and thrown away.

The cause of foul-brood is a micro-organism growing in the tissue of the larvæ of the bee and sometimes also in the adult insect. It was named *Bacillus alvei* by Cheshire and W. Cheyne in 1885. Since then American investigators have discovered that there are two types of foul-brood, European Foul-brood caused by *Bacillus alvei* and American Foul-brood caused by a micro-organism differing from the former and named *Bacillus larvæ* by Dr. G. F. White, of United States Department of Agriculture, in 1907. The general appearance of the diseased brood is, however, the same in both, and the same treatment is necessary to effect a cure. Whether foul-brood in Australia is caused by *B. alvei* or *B. larvæ* has up to the present not been scientifically tested; probably both are present.

To describe diseased brood to any one not well acquainted with the subject it is best to contrast its appearance to the eye with that of brood in a healthy state. Normal healthy brood shows in compact masses in the comb, that is to say, considerable numbers of adjoining

cells contain larvæ of the same age (Fig. 1). In a diseased comb the brood appears irregular and scattered. Healthy larvæ are of pearly whiteness, plump, and lie curled up on the cell bottom almost in the shape of the letter C. Diseased larvæ are pale yellow, and, further on, turn brown; the grubs appear flabby, and are not so much curled up as healthy larvæ of the same size.

When the larvæ do not die till after the cells have been capped over, cells will be found here and there darker in colour than healthy ones alongside; the cappings usually will be indented instead of convex, and will frequently show irregular holes. (Fig. 2). If these cells are opened, a brown mass is visible which, when touched with a match or straw, draws out stringy or ropy. The ropiness is the surest practical way of identifying the disease, and the test should be applied to any suspicious-looking cells which may appear amongst the brood. I would here point out that, although the cappings of brood, particularly

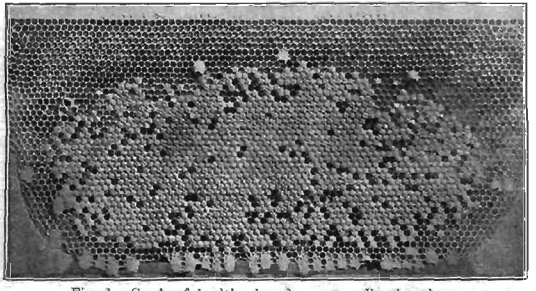


Fig. 1.—Comb of healthy brood; queen cells also shown.

those of black bees, have, when healthy, the appearance shown in Fig. 1, there are some bees of the yellow races which cap the cells quite flat; also, that the scattering of the brood is by itself not necessarily an indication of disease, and may be due to the irregular laying of an inferior queen.

In view of the heavy losses resulting from foul-brood, when once it has obtained a good start in an apiary, and the great amount of labour involved in its eradication, as well as to the fact that it has now been proclaimed a disease under the *Bees Act* 1910,* it is desirable that every owner of bees should be able to recognise this disease when it appears in one or more of his hives. He will then be able to deal with it before it has made any great headway.

* Under the *Bees Diseases Act* 1910 it is provided that the Governor in Council may by proclamation, declare as disease any pest, &c., for the purposes of the Act. In this respect Foul Brood *Bacillus alvei*, Brood Pest *Bacillus larvæ*, and Sour Brood *Streptococcus apis* have been so proclaimed. By the Act an inspector is empowered to enter and inspect any premises where bees are kept, and take such action as is necessary to arrest the spread of disease by cleansing or disinfecting or destroying such articles or appliances, or bees, hives, comb, or honey as are likely to spread disease; and any owner neglecting to carry out the directions of an inspector is liable to a penalty for an offence against the Act. On and after 1st January, 1913, any district may be proclaimed a district in which no bees shall be kept except in certain prescribed hives.

Unfortunately, there are still many bee-keepers who do not discover the presence of this disease amongst their bees till the small number of bees in several of the hives indicates that there is something wrong. When hives have been affected sufficiently long to show marked decline in the number of bees, the disease is likely to spread rapidly; the remaining bees are usually inactive, and do not defend their hives against robber bees from strong healthy colonies, which in turn fall victims to foul-brood. It is, therefore, important that vigilance should be exercised whenever combs are handled, so that the disease may be discovered and treated when still in its first stage.

When foul-brood is discovered, the affected hive should be at once covered up again to prevent attracting robber bees from other hives; and unless the colony is still strong in bees the entrance should be contracted to from 1 to 3 inches in width, so that the diseased colony may be better able to defend itself against robbers. The brood in the other hives of the apiary should be carefully examined, taking care not to attract robbers by leaving a hive open too long or performing

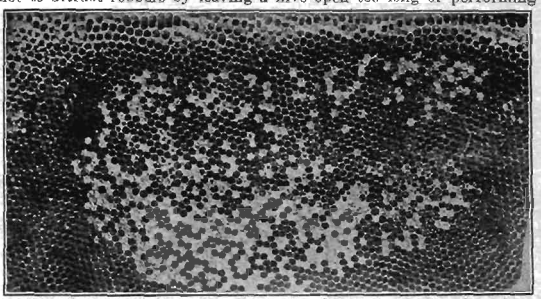


Fig. 2.—Comb of diseased brood, showing flat, sunken, and perforated cappings.

the examination at unsuitable times. If more cases are found, the hives should be marked and treated at the first favorable opportunity.

To successfully cure a colony of foul-brood three conditions are necessary, viz., first, there should be sufficient bees in the diseased colony to form a small swarm; second, the weather should be mild or warm; and third, honey should be coming in. If sufficient bees are not left in a diseased colony to build combs and to raise sufficient brood to increase the worker force, no cure should be attempted; it will be found more profitable to at once destroy by fire the bees, combs, and frames.

Warm weather is required to enable the bees to secrete wax and rear brood, and therefore bees cannot be treated before September or after March. A honey flow is essential, so that bees treated may not be robbed during or after treatment.

The only reliable method of getting rid of foul-brood without destroying the entire diseased colony is to remove the bees from their infected surroundings and start them afresh in a clean hive.

This is done by putting a clean hive with frames supplied with starters of comb foundation on the spot occupied by the diseased hive, removing the latter to a little behind the former. A cloth or bag is placed in front of the clean hive, on to this the bees are rapidly shaken and brushed from the diseased combs. If they do not readily enter the new hive, a little smoke may be used to drive them in. The bees will now start comb-building; the honey which they brought from the diseased combs in their honey sacs will be consumed in the secretion of wax, and the colony will now be free from disease, unless it is re-introduced into the hive from outside. To prevent the bees swarming out and absconding, as they will sometimes do when suddenly deprived of their brood, queen-excluding zinc may be fastened over the entrance, so that when the bees swarm out the queen cannot follow, and the swarm will return to the hive. This obstruction should, however, be removed in four or five days, when the bees will have settled down.

The diseased hive, floor, cover, and frames of comb, should be taken indoors as soon as the operation of shaking down is finished, and effectively secured against access by bees. The combs and frames should be at once destroyed by burning. The hive, hive floor, and roof should be thoroughly cleansed by immersing and scrubbing in boiling water containing washing soda and soap. When clean, the hive should be exposed to the atmosphere to dry thoroughly, after which it may again be used for housing bees.

When only a few diseased cells are found in a number of hives, the strongest of them may be treated first, and the brood combs given to the other affected colonies in a super over a queen-excluding honey board. In ten days most of the healthy sealed brood will have hatched, increasing the worker-force of the remaining diseased colonies, which may now also be cured by the shaking-down method described before.

To completely destroy a diseased colony which is too weak to be cured, close the entrance of the hive when the bees have ceased flying towards evening. Put sufficient wood, ready for lighting, into a hole dug for the purpose, place the hive on the fuel and set fire to it. When burned down, fill up the hole with earth. The combs removed from hives shaken down should be destroyed in the same way, otherwise there may be difficulty with bees getting access to honey which remained unconsumed by fire.

Observance of the following rules will greatly assist bee-keepers in the prevention of foul-brood and its eradication when present in the apiary:—

1. Have no queenless colonies; they will not defend their hives, and will thus establish robbing habits in the apiary.

2. Do not allow bees to have access to honey, combs, wax, or hive refuse, even when quite free from disease; bees should know of no other source than the nectar of flowers.

3. Never feed honey to bees; it may contain disease germs; it excites them and induces robbing. Sugar syrup is safer, cheaper, and just as good for feeding.

4. Do not try to cure foul-brood by requeening alone, or by doctoring diseased cells, or cutting them out. It will only delay the course of the disease, but will not cure it.

5. When examining combs for disease, do not use your finger nail to open the cells, but a match, toothpick, or straw. Use a fresh one for each hive, and burn those used.

6. Do not try to cure the disease by giving the bees medicated food. Any drug given strong enough to destroy the germs of foul-brood would kill the bees.

7. Do not interchange combs between different hives while there is disease in the apiary.

8. If bad weather should set in after a diseased colony has been treated, feed sugar or syrup (1½ sugar to 1 water) inside the hive.

(To be continued.)

INDIAN RUNNER DUCKS AND EGG PRODUCTION.

A correspondent forwards some interesting facts about his Indian Runner ducks and egg production. For the twelve months ending 31st March last, one pen of twenty-five birds laid 5,561 eggs, of the wholesale value of £30 2s. 6d. The record was kept of only one of the pens, probably the other pens did equally as well. The birds were hatched early in October, 1911, and began to lay early in March, 1912. The monthly record is as follows:—

				£	s.	d.
1912.—April	612	eggs, wholesale	value	4	9	3
May	652	,,	,,	5	0	0
June	483	,,	,,	3	10	0
July	301	,,	,,	1	18	0
August	315	,,	,,	1	7	7
September	535	,,	,,	2	2	2
October	651	,,	,,	2	13	0
November	594	,,	,,	2	9	6
December	463	,,	,,	2	3	2
1913.—January	432	,,	,,	1	15	7
February	342	,,	,,	1	13	7
March	181	,,	,,	1	0	8
				£30	2	6

EDITOR'S NOTE.

GROWING LUCERNE FOR SEED—

Owing to its high price, a good crop of seed lucerne yields splendid returns to the grower, but in ordinary cases the crop is an uncertain one. American experience in this regard is interesting, and the subject is discussed in *Farmers' Bul.* 495, issued by the U.S. Department of Agriculture. It has been found that the most successful crops of seed are obtained when a relative shortage of soil moisture accompanies comparatively high temperatures while the seed is maturing. The soil moisture must be sufficient to permit the setting of seed, but not great enough to start new vegetation for the succeeding crop. "This narrow margin is the principal cause of the great uncertainty in the lucerne seed crop." The best time to harvest was when the pods ranged from straw colour to brown.

CITRUS CULTURE IN VICTORIA.

(*Continued from page* 239.)

By S. A. Cock, Orchard Supervisor, Bendigo.

PART III.—STOCKS.

The unsuitability of a stock to local conditions of soil and drainage has been a great factor in the loss of a large number of trees. In the past the common lemon has been chiefly used. Seedlings, layers, and cuttings, the last two have been failures; the seedling will thrive and produce a good tree with heavy crops; but at an age of ten to fourteen years root-rot will overtake the majority of trees planted on the lemon stock, *even under the most favorable conditions of soil and drainage.* The stock is unsuitable. The orchard costs a lot of money to establish,

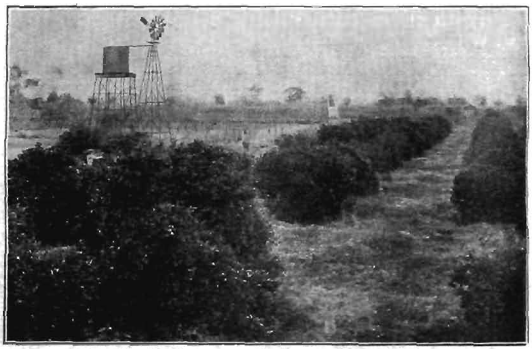


Plate 12.—Twelve years old Orange Grove, Kyabram.

therefore it is necessary that the trees shall last and remain profitable, consequently suitable stock must be obtained.

Planters should secure trees worked on the Seville (*Citrus bigaradia*) or the sweet orange (*Citrus dulcis*) stock. The sweet orange is an admirable stock on which to work, and gives great satisfaction in perfectly drained soils; it is subject to root-rot, but in a far lesser degree than the lemon. Oranges and lemons worked on the sweet orange stock make large trees, bear prolific crops, and excellent quality fruit under congenial soil conditions. The Seville orange is undoubtedly the most suitable stock, adapting itself to all classes of soils, and withstanding irrigation conditions extremely well in all situations. Oranges and lemons worked on this stock are thrifty in their habit, prolific in bearing, and the stock is almost immune from root-rot. Plate 14 represents three-year-old Washington Navels on Seville stock at White Hills, Bendigo.

Citrus trifoliata is also used for stock in very wet situations. Commercially it is a failure: the trees are too slow in growth; it also has a very dwarfing effect on the scion, and is generally unsuitable.

The Echuca seedling, Plate II., raised at Echuca by Mrs. Lilian Johnson, promises to become a good stock. Trees thirty years of age *show no sign of root-rot at Echuca.*

PROPAGATION.

Seeds should be planted in September and October. Seeds are obtained by allowing the fruit to rot in heaps or in barrels, and when decayed sufficiently to break easily by handling should be thoroughly washed through a coarse sieve. The decaying substance of the fruit is passed through the sieve and the seed left behind. The seed should then, before drying, be placed in moist sand; this can be done by making a box 2 feet square and 6 inches deep, fill it half-full of sand, and on this place a layer of seeds 2 inches deep, and fill up the box on the seed layer with more sand, then thoroughly mix the seed and

Plate 13.—Five years old Washington Navel Trees; average yield for orchard, 3 cases to the tree (1911).

sand together by stirring with hand; this is done to cover the seeds with sand and prevent them from sticking together. When the seed and sand have been thoroughly mixed, the box can be filled up with sand and stacked. When ready to plant, the seeds and sand are passed through a sieve, and the seed recovered. The seed bed should be made under cover of lattice work or wooden screen. The soil should be deep, rich loam, well drained. The seed should be sown in drills 2 inches deep and 9 inches apart, with about 3 inches between each seed. The seed should then be covered to 1 inch deep, and care taken through the growing season to keep young plants continually growing; this is done by frequent watering, and cultivation between the young seedlings, and proper protection from cold winds and scorching sun. At the age of one year the forward young seedlings can be transplanted to the nursery rows, 5 feet apart and 15 inches apart in the row. Backward or small delicate seedlings should be transplanted into very sheltered nursery rows, or allowed to remain for another year before transplanting. The seedlings should be allowed to remain

at least one year in the nursery bed, and allowed to grow at will, and in November, December, January, or February, when the sap is running free, budding takes place. Buds should be selected from round matured wood, with as few thorns as possible. The leaves should be removed by cutting, and the bud inserted for oranges not less than 4 inches above the ordinary soil level; and for lemons not less than 6 inches. The reason for this is to preserve the scion against any possibility of collar-rot, which is nearly always brought about by wet

Plate 14.—Three years old Washington Navel on Seville Stock, White Hills, *Bendigo.*

earth, or water lying against, or coming in contact with the susceptible lemon and sweet orange; also to prevent roots being thrown out by the scion and thereby inducing root-rot.

Budding is done as follows:—A vertical cut with a sharp budding knife is made in the bark of the stock at the desired height 1 inch long (Fig. 1, Plate 15) into the cambium layer; a transverse cut is then made at the top of the vertical one (Fig. 2, Plate 15); the point of the knife is then inserted and the bark held back, as at Fig. 3, Plate 15, and the bud carefully pushed down, and the lifted edges of the

bark brought back again over the inserted bud, as at Fig. 4, Plate 15, and then tied with raffia or binding twine, as at Fig. 5, Plate 15. The wood from which the buds are taken should be held with the point of the bud looking toward the body, and the bud cut from behind, as at Fig. 6, Plate 15; the bud should be cut 1 inch long, starting ½ inch above the bud, and finishing ½ inch below, as shown. Cut with a sharp knife, cutting deep enough to remove a very thin and smooth piece of wood on the underside of the bud, as shown at Fig. 7, Plate 15, back view of bud. Fig. 8, Plate 15, shows front view of prepared bud. When inserting the bud be careful not to injure it; hold the bud between the thumb and forefinger, and gently press it into the prepared incision. When the bud has taken, the stock should be shortened, as at A.A., Fig. 9, Plate 15. This is to prevent a check in sap flow, which may injure the bud. Later on, when the bud is growing, the head of the stock is further removed, as at Fig. 10, Plate 15, and the delicate growing shoot tied to it to protect it, as at A.B., Fig. 10, Plate 15, and, when strong enough, the remaining portion of the stock is cut off, as at C., Fig. 10, Plate 15, and the cut waxed over.

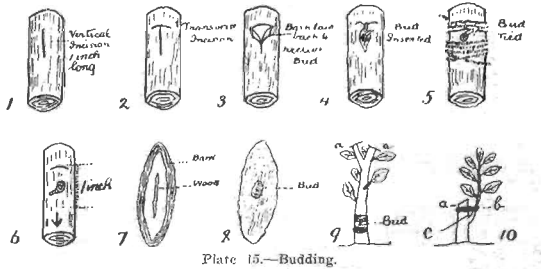


Plate 15.—Budding.

When the buds begin to move about three or four weeks' growth should be allowed before the string tying the bud should be cut. The buds are allowed to grow until they show signs of bending at the top; they are then pinched at the top; this arrests growth, and starts new growth from lower buds. The strongest is selected, and the others removed with a sharp knife. This growth is again pinched in turn, when drooping or bending of the head takes place; and if the tree is advanced sufficiently in height, pinching again takes place to form the head at the desired height. From the resultant growth the vertical is removed, and the tree shaped to three or four horizontalized branches.

In budding old trees it is best to cut back a portion of the tree, start a new growth, and bud on to it. When the buds are started, the remaining portion of the tree can be removed, and on further new growths more buds inserted if necessary.

Buds inserted in the autumn remain dormant until the spring, and become active with the new growth of the tree. Budding may also be carried out in spring.

Growers should insist that none but strong, healthy, well-grown trees should be supplied to them. Too many weaklings and culls are sent out from the nurseries. A grower by producing his own trees will have many advantages in selecting scions from his most fruitful and strongest trees, and working on to selected suitable stocks.

PLANTING.

There are two systems of planting in Victoria—the square and the septuple, the square being the more generally adopted. The three general distances for planting are 20 feet, 22 feet, and 24 feet. Citrus trees require plenty of room for growth and cultivation, and the square system, 24 feet x 24 feet, will be found the most advantageous. If planting alongside deciduous trees, which are generally planted 20 feet x 20 feet, it would be advisable, in order to avoid a break in the continuity of the lines of trees, to adopt a general distance for citrus and deciduous of 22 feet x 22 feet. The following table will give the number of trees to the acre for the three distances named on the square and septuple systems:—

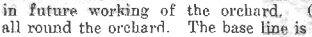
Distance apart.	Number of Trees Square System.	Number of Trees Septuple System.	Distance in check row Septuple.
			feet inches.
20	109	125	17 $3\frac{3}{4}$
22	90	103	19 $0\frac{3}{4}$
24	76	86	20 $9\frac{3}{4}$

To find the number of trees to the acre on the square system, multiply the distance apart and divide the result into 43,560, the number of square feet in an acre, thus 20 feet x 20 feet $= \frac{43,560}{20 \times 20} = 109$. To find the number of trees on the septuple system, find the number to the acre on the square system, and add 15 per cent.

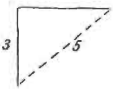
In laying out the orchard on the square system, and assuming (Plate 4) the block to be a rectangle, as shown, the first work to be done is to thoroughly and deeply plough the area to be planted. The ground should then be harrowed down thoroughly, and rolled and graded. After this preparation, which should be carried out in early autumn, the situation for the head ditch should be determined and the ditch prepared, also other distributary channels of a permanent character. Furrows should then be struck out, and water run in them to find out any irregularities in surface grading. A trial run of water over any surface after grading is work well repaid. The success of culture under irrigation lies in the equal distribution of water over any surface.

Deep thorough cultivation of any ground is essential for the successful growth of orchard trees, specially citrus. A good healthy start generally insures a prosperous career. Trees require all the essentials so necessary to the successful cultivation of any plant—a properly prepared soil. After any trial run of water and subsequent rectifying of surfaces, a good cultivation is necessary, and in August the rows to be planted should be marked out. Having determined the

distance the trees are to stand apart, strike out a base line, leaving a distance of at least 20 feet for a headland. This will be found of great benefit in future working of the orchard. Good headlands should be left all round the orchard. The base line is best struck out by a length of No. 10 fencing wire, looped or ringed at each end and notched with solder at the distances the trees are to stand apart, thus—



The base line should run parallel with any known straight line, such as a fence, road, or channel. The wire should be securely fixed by using two crowbars, one at each end *a*——————*b*, by passing the bar through the loops; securely fix one bar in the ground, and when the wire is drawn tight, securely fix the other. If it is necessary to find the right angles, use the process of 3—4—5, or any multiple of it, thus:—



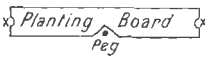
3—4 form the right angle lines; 5 the diagonal line. When the base line is struck and the wire drawn tight, pegs should be placed in the ground at the notches on the wire; pegs should be 1 foot long, and driven into the ground 6 inches; when the right angle line is found, the line should be similarly pegged. It will be found advantageous to peg the square, and then proceed with the filling lines, pegging out the whole orchard. The marking out wire should be the length of the longest line. By this process trees should be in perfect line in any direction. The square system is the best system for working under irrigation conditions, and should be generally adopted.

When the trees are received from the nurseryman at planting time, they are generally sent as shown in Plate 16. The trees are removed from the nursery after the winter's growth has hardened, and been balanced by a subsequent root growth. This is the condition for new head growth. Just before this starts, the fine roots on one side of the tree, and the tap root, at a fair depth below the surface, are cut with a sharp spade; the earth is then returned to the cut surface, and the trees allowed to form crown growth on the cut rootlets and tap root. This usually takes a fortnight; then the remaining roots can be cut, and the tree removed. This treatment prevents shock to the young trees in removal. The soil is then shaken from the roots, and the roots dipped immediately into thin mud puddle, and then the roots of the trees packed tightly in the boxes in moist sawdust and despatched without delay to the grower. The grower, on receiving the package, should remove the hessian covering, and keep the packed trees in a cool shaded situation, occasionally sprinkling the trees, to keep the package moist, until ready for planting.

When planting is to take place the trees should be removed from the package as required, and the roots thoroughly washed of mud puddle; all broken roots should be removed by cutting with a sharp

knife, and the roots thrown into balance as much as possible. Figs. 1, 2, Plate 17, represent the treatment of roots. In Figs. 1, 2, Plate 18, there were large broken roots; they have been removed, and balance made, as shown (Plate 17). The trees should then be wrapped in a wet sack, and each tree kept covered until planted.

In planting, a board is used, made thus—



3 feet long, 6 inches wide, and 1 inch thick, and notched in the centre. The board is placed on the ground, with the peg already in the ground fitting exactly in the extreme angle of the notch, as shown, and then two pegs are driven at either end of the board, as shown by X, and the board and centre peg removed, and the hole excavated inside the pegs

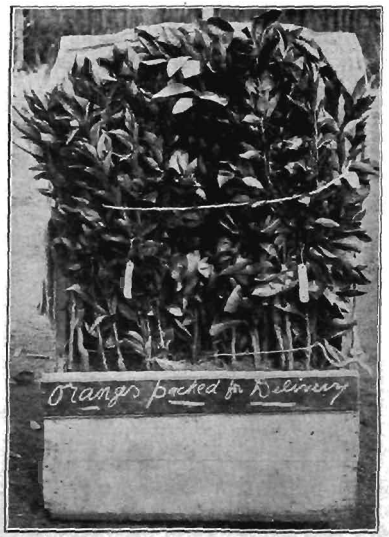


Plate 16.—Orange Trees packed for transport.

marked X; the hole for the reception of the tree should be large and fairly deep, 3 feet nearly in diameter and 10 to 12 inches deep. The soil is then returned to the centre of the hole in the form of a mound, and on this the tree is planted. The planting board is now brought into use again, being fixed, as before, inside the two pegs marked X,

on the ordinary soil level, and the tree should then be fixed in the notch occupying the same position the original marking-out peg held. The tap root of the tree should then be placed in the mound and earth returned, the small roots carefully placed, as equally spaced as possible, and more soil returned, until the roots are covered. If the tree is standing too low it should be gently worked up through the soil, returning more earth until the roots are covered. Planting a little

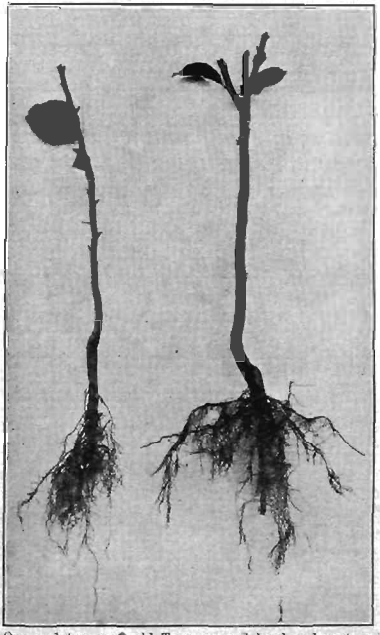


Plate 17.—One and two year old Trees pruned head and root and prepared.

deep and working the roots up through the returned soils is a system generally adopted in planting. The tree should stand in the hole, when planted, with the surface soil mark on the stock (indicating the depth it stood at in the nursery) standing 6 inches above the ordinary soil level. The tree should then be staked and tied; the stake should be made of redgum 3 feet long and 1½ inches square. If hardwood stakes are used, they should be dipped in tar, for a depth of 1 foot,

before driving in the ground. The stakes are placed on the south-west. the windward side of the tree, about 6 inches away, and the tree tied to the stake with raffia or hayband, at a height of 1 foot from the ground, tying tight on the stake and loose around the tree. The hole should then be filled up with water, and when the water has drained away, the remainder of the soil should be returned: the soil will then

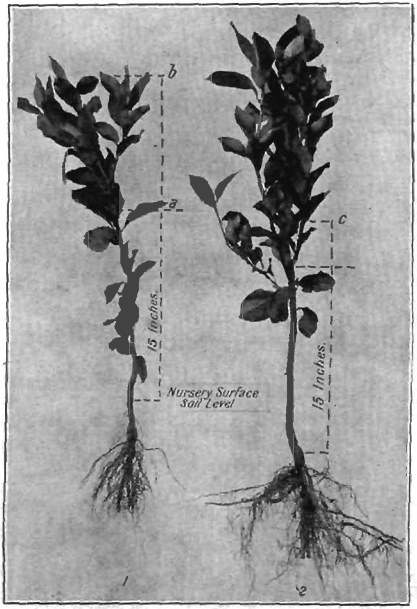


Plate 18.—One and two year old Trees before head and root pruning for planting.

assume the shape of a mound 6 inches high. This will compact to about 3 inches above the ordinary soil level, and will keep the scion well above any wet soil surface. The water placed in the hole at planting time consolidates the earth around the roots, and does away with the harmful practice of tramping with the feet, and the stake holds the tree firm in its position. Fig. 1, Plate 19, shews the planting

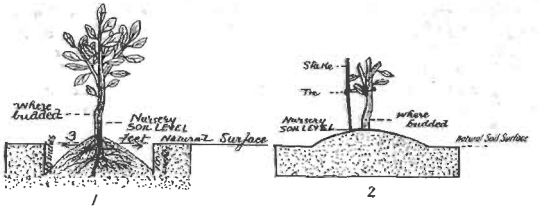


Plate 19.—Planting.

Plate 20.—Planting.

and placing of roots. Fig. 2, Plate 19, the tree planted, mounded, and staked.

It requires two men to plant trees properly—one to hold the tree and fix the roots, the other to return the earth as required. Two men should dig the holes, plant, stake, and water, also return the earth on 1 acre of trees per day. Planting is work that requires care and attention, and it does not pay to rush.

Other methods of planting are the ball and pot system. The balled trees are removed with the earth undisturbed around the roots of the trees, and the ball of earth is tied in a piece of hessian, as shown in Fig. 2, Plate 20, and requires to have only the string cut at the time of planting; the hessian soon rots in the ground. These trees, if properly lifted, require no pruning at planting, as the roots previously cut and crowned with callus, receive no check. The potted tree, as shown in Fig. 1, Plate 20, is the ordinary tree lifted from the nursery with bare roots, placed in a pot, packed with new earth, and new root growth forced by bottom heat under glass for about three weeks, and then the growth hardened off under ordinary glass conditions for six or eight weeks, and still further hardened under ordinary cover, and sent out for planting, as illustrated. In planting *out, the tree is simply removed from the pot and planted in the soil.* These trees generally require no head pruning at planting, as they receive no root check. In commercial orcharding nothing is gained *by balling or potting. If the conditions of planting out bare-rooted* trees are carried out as described and all wasty and weakling trees discarded at planting, there should be no failures. Lemons are more *delicate than oranges, but both require equally careful treatment.* Bandaging the butts of the trees with hessian or paper is not a necessity, and wire netting renders the orchard proof against rabbits. *Potted and balled trees are suitable for persons growing only one or* two trees, and who do not understand pruning methods.

(*To be continued.*)

THE TUBERCULOSIS INQUIRY—

The British Royal Commission on Tuberculosis which has been sitting for nearly twelve years, has now issued its final report. The commission was appointed after a declaration in 1901 by Dr. Koch that "human tuberculosis differed from bovine, and cannot be transmitted to cattle"—a statement which, if proved, had an obvious bearing upon legislation calculated to prevent the spread of the disease. The commissioners deal with this and the other points referred to them. In a first interim report, dated June, 1904, they found that tubercle of human origin can give rise in the bovine animal to tuberculosis identical with ordinary bovine tuberculosis. In a second interim report of February, 1907, they state that cows' milk containing bovine tubercle is clearly a cause of tuberculosis and of fatal tuberculosis in man. In the final report now issued, the commissioners recommend drastic action to prevent meat and milk affecting human beings, the isolation of highly-infectious cases, better housing and special separate treatment for children, and the appointment of an advisory council to assist the Government.

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Potash.	Price asked for the Manure per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	Insoluble.	Total.			
		%	%	%	%	%	%	£ s. d.	
Blood and Bone ..	Union Jack ..	6·11	..	2·51	5·00	7·51	..	6 5 0	N. Dale, Bentleigh
Bone and Blood, No. 1 ..	Hasell's ..	7·50	..	5·50	5·00	10·50	..	7 10 0	A. H. Hasell, Melbourne
"Blood and Bone Fertilizer"	G-D ..	6·27	..	3·90	4·35	8·25	..	6 5 0	Gippsland Co-Op. Bacon Curing Coy. Ltd., Dandenong
Bone and Superphosphate, No. 1	Elsworth's ..	1·00	8·00	3·00	7·00	18·00	..	5 7 6	The executors J. R. Elsworth, Ballarat East
Bone and Superphosphate, No. 2	,, ..	0·80	12·00	1·00	5·00	18·00	..	5 2 6	,, ,, ,, ,, ,,
Bone-Superphosphate ..	Gardiner's ..	1·25	8·00	3·20	5·80	17·00	..	5 0 0	Geo. Gardiner Coy. Pty. Ltd., Marshalltown, Geelong
Bone Fertilizer	Eagle	3·25	..	8·95	10·30	19·25	..	6 5 0	E. T. Hoskin, Eagle Point, Bairnsdale
Indian Ocean Natural Guano	Hasell's ..	0·50	..	6·00	23·00	29·00	..	4 0 0	A. H. Hasell, Melbourne

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked for Manure per ton.	Where Obtainable.
				Fine.	Coarse.		
		%	%	%	%	£ s. d.	
Bone Dust	J.N.D.B.	4·23	20·87	37·00	63·00	5 15 0	J. N. Day, Bendigo
Bone Dust	Lion	3·85	21·50	31·00	69·00	6 10 0	A. Wray, Sale

Agricultural Laboratory,
Melbourne, 9th April, 1913.

P. RANKIN SCOTT,
Chemist for Agriculture.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACT.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.						Potash.		Price asked for the Manure per ton.
						Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
			Found.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	£ s. d.
			%	%	%	%	%	%	%	%	%	%	%	%	%	
1039	*Nitrate of* Soda ..	Cuming, Smith and Co.	..	15·60	15·50	..	..	..	..	..	..	..	..	..	..	14 10 0
1076	Superphosphate, Federal	Australian Explosives and Chemical Co.	5·64	..	..	16·24	17·00	0·67	1·00	2·32	2·00	19·53	20·00	..	..	4 7 6
1051	Superphosphate, Florida ..	Cuming, Smith and Co.	6·09	..	..	17·09	17·00	0·61	1·00	2·15	2·00	19·85	20·00	..	..	4 7 6
1064	" "	" " "	7·71	..	..	17·05	17·00	0·77	1·00	1·60	2·00	19·42	20·00	..	..	4 7 6
1068	" "	" " "	7·06	..	..	19·10	17·00	0·75	1·00	0·79	2·00	20·64	20·00	..	..	4 7 6
1072	" "	" " "	5·96	..	..	18·57	17·00	0·79	1·00	0·96	2·00	20·32	20·00	..	..	4 7 6
1077	" "	" " "	7·51	..	..	18·00	17·00	0·71	1·00	1·14	2·00	19·85	20·00	..	..	4 7 6
1080	" "	" " "	6·38	..	..	18·55	17·00	0·56	1·00	0·76	2·00	19·87	20·00	..	..	4 7 6
1067	Superphosphate, M.L. ..	Mt. Lyell M. and R. Co.	8·38	..	..	20·19	17·00	0·50	1·00	0·27	2·00	20·96	20·00	..	..	4 7 6
1071	Superphosphate, No. 1	" "	5·35	..	..	18·66	17·00	0·33	1·00	1·51	2·00	20·50	20·00	..	..	4 7 6
1075	" "	" "	8·34	..	..	19·49	17·00	0·97	1·00	0·26	2·00	20·72	20·00	..	..	4 7 6
1078	Superphosphate, M.L. ..	" "	6·90	..	..	19·68	17·00	0·88	1·00	0·44	2·00	21·00	20·00	..	..	4 7 6
1084	" "	" "	8·22	..	..	20·05	17·00	0·25	1·00	0·30	2·00	20·60	20·00	..	..	4 7 6
1062	Superphosphate, No. 1 ..	Wischer and Co. ..	5·91	..	..	18·22	17·00	1·89	1·00	1·49	2·00	21·60	20·00	..	..	4 7 6
1066	" " "	" " ..	6·09	..	..	18·28	17·00	0·75	1·00	1·63	2·00	20·66	20·00	..	..	4 7 6
1073	" " "	" " ..	6·41	..	..	18·41	17·00	0·49	1·00	1·72	2·00	20·62	20·00	..	..	4 7 6
1074	" " "	" " ..	9·24	..	..	18·06	17·00	0·49	1·00	1·84	2·00	20·39	20·00	..	..	4 7 6
1069	Bone and Superphosphate (Federal)	Australian Explosives and Chemical Co.	3·71	0·65	0·75	12·72	12·75	1·20	0·75	6·24	5·50	20·16	19·00	..	..	5 5 0
1057	Bone and Superphosphate	J. Cockbill	6·51	1·79	1·50	13·30	12·76	0·15	1·50	5·62	4·75	19·07	19·00	..	..	5 5 0
1082	Bone and Superphosphate, C.	Cuming, Smith and Co.	7·70	1·05	0·75	12·36	12·75	2·00	0·75	5·56	5·50	19·92	19·00	..	..	5 5 0
1048	Bone and Superphosphate	A. H. Hassell ..	6·51	1·18	0·80	12·78	12·75	1·40	1·25	5·62	5·50	19·80	19·50	..	..	5 4 0
1083	Bone and Superphosphate, No. 1	Wischer and Co. ..	5·36	1·82	1·50	8·38	8·50	4·01	0·50	8·81	10·00	21·20	19·00	..	..	5 7 8
1070	" " "	" " ..	7·37	1·77	1·50	8·65	8·50	2·36	0·50	8·49	9·00	19·50	18·00	..	..	5 12 6
1081	" " "	" " ..	5·81	1·64	1·50	8·50	8·50	2·31	0·50	8·56	9·00	19·37	18·00	..	..	5 12 6
1050	Nitro Superphosphate ..	Cuming, Smith and Co.	5·36	1·50	1·39	16·59	14·28	0·64	0·84	4·33	2·22	20·56	17·34	..	..	5 0 0
1079	Blood Manure	" "	15·29	8·40	7·50	..	..	..	..	1·16	1·00	1·16	1·00	..	..	6 10 0
1065	Bone Fertilizer ..	J. Cockbill .. " ..	4·65	4·04	3·50	..	..	3·80	3·50	14·04	14·75	17·93	18·25	..	..	5 10 0
1052	" "	Cuming, Smith and Co.	5·36	2·93	3·00	..	..	7·31	3·50	10·19	14·50	17·60	18·00	..	..	5 17 6
1061	" "	Wischer and Co. ..	4·35	3·42	3·00	..	..	7·76	3·50	10·88	14·50	18·44	18·00	..	..	5 17 6
1056	Fodder Crop Manure ..	Mt. Lyell M. and R. Co.	12·17	2·73	3·00	12·79	11·00	0·24	1·25	0·85	1·75	13·88	14·00	2·00	1·00	6 7 6
1058	*Maize Manure* ..	*Cuming, Smith and Co.*	9·72	2·18	2·38	14·63	13·94	0·77	0·82	2·67	1·64	18·07	16·40	1·84	1·80	6 0 0
1059	Potato Manure ..		10·05	1·21	1·20	15·24	14·62	0·65	0·86	2·61	1·72	18·50	17·20	4·70	4·16	6 7 6

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACT—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Price asked for the Manure per Ton.
								Fine.		Coarse.		
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	
108	Bonedust	Richards, F. W.	% 4·12	% 2·50	% 2·83	% 24·30	% 24·86	% 60·0	% 63·0	% 40·0	% 37·0	£ s. d. 5 0 0

Agricultural Laboratory,
Melbourne, 9th April, 1913.

P. RANKIN SCOTT,
Chemist for Agriculture.

Wool contains suint, fat, and pure wool hair. The suint consists chiefly of a potash compound, and is mostly removed when sheep are washed. The suint may form more than half the weight of the fleece, or may be only 15 per cent. The fat is not removed by washing, and may vary from 30 to 8 per cent. of the washed fleece.

STATISTICS.

AGRICULTURE IN VICTORIA.

AREA AND PRODUCE, 1911–12 AND 1912–13.

The following returns for the State of Victoria have been issued by the Government Statist (Mr. A. M. Laughton) :—

Name of Crop.	Area.		Produce.		Average per acre.	
	1911–12.	1912–13.	1911–12.	1912–13.	1911–12.	1912–13.
	Acres.	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Wheat	2,164,066	2,085,216	20,891,877	20,323,104	9·65	12·58
Oats	302,238	439,242	4,585,326	8,323,639	15·17	18·95
Barley (malting)	36,748	52,311	725,803	1,260,634	19·75	24·27
Barley (other)	16,793	19,320	298,781	474,893	17·79	24·58
Maize	18,223	19,986	792,660	*	43·50	*
Rye	1,098	1,428	9,981	17,141	9·09	12·00
Peas and beans	11,535	11,875	181,113	232,856	15·70	19·61
			Tons.	Tons.	Tons.	Tons.
Potatoes (early crop)	†5,142	5,164	17,498	19,083	3·40	3·70
Potatoes (general crop)	42,650	42,411	101,694	*	2·39	*
Mangel-wurzel	797	1,121	9,568	14,615	12·01	13·04
Beet, carrots, parsnips, turnips for fodder	658	627	4,953	*	7·53	*
Onions	3,652	4,977	20,911	28,641	5·73	5·75
Hay (wheaten)	304,388	386,370	357,370	438,829	1·17	1·14
Hay (oaten)	535,146	790,268	648,846	1,099,436	1·21	1·39
Hay (lucerne, &c.)	20,671	27,090	26,072	34,668	1·26	1·28
			Cwt.	Cwt.	Cwt.	Cwt.
Grass cut for seed	1,188	2,429	1,697	4,144	1·43	1·71
Green fodder	75,177	84,460	..	..	..	..
Vines	24,193	24,579	..	..	..	..
Orchards and gardens	59,985	63,209	..	..	..	..
Market-gardens	10,331	10,414	..	..	..	..
Other tillage	5,662	6,859	..	..	..	..
Total area under crop	3,640,241	4,079,356	..	..	..	..
Land in fallow	1,469,608	1,627,223	..	..	..	..
Total cultivation	5,109,849	5,706,579	..	..	..	..

* *Not yet available.* † *The early crop relates to potatoes dug before March 1.*

AREA UNDER POTATOES IN PRINCIPAL COUNTIES, 1911–12 AND 1912–13.

Principal Counties.	Area in Acres.	
	1911–12.	1912–13.
Bourke	5,228	6,187
Grant	8,205	8,010
Mornington	5,618	5,037
Dalhousie	2,687	2,752
Talbot	6,870	6,370
Villiers	3,753	3,198
Buln Buln	3,612	4,383
Remainder of State	11,714	11,638
Total	47,892	47,575

THIRD VICTORIAN EGG-LAYING COMPETITION, 1913–14.

Commencing 15th April, 1913.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

No. of Pen.	Breed.	Name of Owner.	Eggs laid, April 15 to May 14.	Position in Competition.
6	White Leghorns ..	J. S. Spotswood ..	126	1
46	Black Orpingtons	T. W. Cote.. ..	109	2
61	White Leghorns ..	Jno. Campbell ..	108	3
2	.. ..	R. W. Pope ..	108	
21	.. ..	A. Ross	107	5
65	.. ..	E. A. Lawson ..	104	6
31	.. ..	W. G. Swift ..	99	7
50	.. ..	A. H. Mould ..	98	8
23	.. ..	J. E. Gill	95	9
66	.. ..	Featherstone, Wm ..	94	10
8	.. ..	E. K. Bridge ..	93	11
68	.. ..	Jones and Curtis ..	93	
34	.. ..	J. E. Bradley ..	86	13
49	.. ..	M. H. Noye	86	14
45	.. ..	D. Goudie	85	15
62	.. ..	A. Sellers	80	16
37	.. ..	C. H. Buset ..	79	17
13	Black Orpingtons ..	T. S. Dallimore ..	79	
11	White Leghorns ..	C. J. Beatty ..	78	19
59	S.C. White Leghorns	Cowan Bros. ..	78	
53	Black Orpingtons ..	A. Greenhalgh ..	77	21
16	.. ..	*D. Fisher*	76	22
32	White Leghorns ..	H. Hanbury ..	76	
14	.. ..	F. Hannaford ..	75	24
47	.. ..	Wm. McLister ..	75	
40	.. ..	Geo. Edwards ..	74	26
63	.. ..	G. A. Gent	74	
48	.. ..	Thirkell and Smith ..	72	28
18	.. ..	R. Rowlinson ..	68	29
41	.. ..	Percy Walker ..	68	
27	.. ..	J. Sinclair	66	31
38	.. ..	M. A. Meak	65	32
7	.. ..	*H. McKenzie* ..	62	
10	.. ..	T. A. Pettigrove ..	62	33
39	.. ..	W. Parvis	62	
3	.. ..	W. L. Baseumb ..	60	36
67	.. ..	C. Hepburn	58	37
35	.. ..	Moritz Bros. ..	56	38
25	Black Orpingtons ..	King and Watson ..	52	
43	White Leghorns ..	Morgan and Watson..	52	39
44	.. ..	W. A. Rennie ..	52	
19	.. ..	W. Dunlop	49	42
28	.. ..	E. Waldon	47	43
24	.. ..	Redfern Poultry Farm	46	44
58	.. ..	Stranks Bros. ..	45	
26	.. ..	B. Rolls	44	46
22	.. ..	B. Mitchell	43	47
52	.. ..	W. G. Osborne ..	42	48
55	.. ..	P. H. Killeen ..	40	49
12	.. ..	A. H. Padman ..	35	50
17	R.C.Brown Leghorns	S. P. Giles	34	51
57	White Leghorns ..	Gliadell Bros. ..	32	52
20	.. ..	C. B. Bertelsmeier ..	29	53
5	.. ..	G. W. Robbins ..	27	54
54	.. ..	Jas. McAllan ..	26	55
36	.. ..	A. J. Jones.. ..	24	56
15	.. ..	J. Shaw	24	
29	.. ..	S. Brundrett ..	19	58
30	Black Orpingtons ..	Jas. Ogden	15	59
56	White Leghorns ..	Schaefer Bros. ..	15	
42	.. ..	A. Stringer	15	
33	.. ..	South Yan Yean Poultry Farm ..	13	62
51	Black Spanish ..	W. H. Steer ..	13	
4	White Leghorns ..	Jas. Brigden ..	12	64
9	.. ..	Sylvania Stud Farm..	10	65
64	Golden Wyandottes	C. L. Sharman ..	2	66
60	Black Spanish ..	Watson and Rushworth ..	..	67
		Total	3,987	

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.R.H.S., Principal, School of Horticulture, Burnley.

The Orchard.

PLANTING.

June is the month usually favored for the planting of all deciduous orchard trees, and this work should now be carried out. The ground should have been previously ploughed, subsoiled, and drained, in anticipation of the planting of the young trees. The young trees should be planted to the same depth as they were growing in the nursery beds, and the holes for their reception should not be any deeper than is necessary to contain the roots. A deeper hole only provides soakage room for the soil moisture, and the hair roots are rotted as soon as they are formed. In order to keep the tree holes at an even depth, a plough furrow may be run along the whole length of the row, and each tree could then be planted to the depth of the furrow, and no deeper. By this means any soil moisture, or an excess of moisture, is evenly distributed, and is not likely to settle round the growing roots.

Before planting, the roots of the young tree should be well pruned, cutting them back hard, leaving a very small root system; generally only about one-third of the original roots being left.

It is rarely necessary to manure newly-planted trees when they are being planted. If manure is required, it should either have been well worked through the soil previously, or else it should be used as a surface mulch some considerable time after planting.

In planting, growers will do well to study such varieties as are valuable as export fruit in apples and pears; and other classes are generally profitable if planted for a succession. A great deal of attention is paid to new varieties, and it is to be regretted that, in the search for newer varieties, which are so often a failure, the older and more valuable varieties may be lost sight of altogether.

An up-to-date orchard should contain a very few varieties; the fewer varieties simplify many orchard operations considerably, and the crop is far more easily handled. In planting, it is also essential that the question of cross fertilization should be studied, so that the blossoming of each variety shall help the other in the setting of the fruit.

The recent Pomological Congress drew up a list of apples and pears suitable for planting in Victoria, and growers are recommended to select such as may be suitable to them from this list. The varieties are here given, and in order of preference for planting purposes.

List of apples suitable for Northern districts—

(E), early; (M), medium; (L), late; (V.L), very late.

(1) Cleopatra (M.).
(2) Dunn's Favorite (M.); Syn. Munroe's Favorite
(3) Jonathan, Gravenstein (M.).
(4) Rome Beauty (L.).
(5) Esopus Spitzenberg (L.M.), Cox's Orange Pippin (M.) (in special districts), London Pippin (M.).
(6) Peasgood's Nonsuch (E.), Wealthy (M.), Stewart's (L.), Shepherd's Perfection (M.), Scarlet Nonpareil (L.).

(7) Stone Pippin (L.).
(8) Rymer (L.), Schroeder (L.), Winter Strawberry (L.).
(9) Rokewood (V.L.).

Southern districts—

APPLES (*in order of preference*).

(1) Jonathan.
(2) Gravenstein.
(3) Yates.
(4) Rome Beauty.
(5) London Pippin.
(6) Shorland Queen (E.), Reinette de Canada (M.).
(7) Alexander, Wealthy (E.), Pomme de Neige (M.), Statesman (L.), Rokewood, Newman's Seedling (L.), Stone Pippin, Stewart's.
(8) Sturmer Pippin, Esopus Spitzenberg (L.), Lord Wolseley (L.), Green Alfriston (E.).

PEARS—

(1) Williams (E.).
(2) Beurre Bosc (M.), Winter Nelis (L.), Josephine de Malines (L.), Packham's Triumph (M.), Beurre d'Anjou (M.), Urbaniste (M.).
(3) Conference (M.), Winter Cole (L.), Howell (M.), Madam Cole (L.), Glou Morceau (M.L.).
(4) Kieffer (M.), Broompark (L.), Beurre Capiaumont (M.).
(5) Vicar of Winkfield (M.L.).

SPRAYING.

All the winter pests will now come in for attention, and trees should be freed, as far as possible, from all classes of scale insects, bryobia mite, woolly aphis, &c. The red oil or crude petroleum emulsion is most suitable for the eradication of these pests.

Spraying before pruning is not the general rule, and yet it seems to be the safest, especially where scales or woolly aphis are prevalent. Certainly, a much larger amount of spray material will be required, but much better work will be done. There will be no danger whatever from future contamination from any of these pests on the undestroyed prunings, or from any small clippings that may be lying ungathered around the tree. Another point in favour of this is that, if by any means, whether by careless spraying or by the use of bad materials, any part of the tree is left, so that the pest is not destroyed, and so continues to increase, then a second spraying can be given while the tree is still dormant.

DRAINING.

In old established orchards a thorough scheme of drainage does more to invigorate and resuscitate the trees than any amount of surface cultivation or manuring. The work is easier done in June and July, and, where necessary, it should be started at once. Drainage pipes are more generally used, but stones, logs, waste timber, brushwood, and charcoal are all valuable as drainage mediums. The benefits of soil drainage have been so frequently urged that it is hardly necessary to repeat them again.

POMOLOGY.

The recent session of the Pomological Congress has decided to recommend certain changes in the names of various apples and pears,

mainly for the reasons that some names are unsuitable, that some are too long, and that some contain unnecessary words.

The Congress, in considering the question of nomenclature of fruits, made no definite rules this year, but the following tentative agreements were adhered to:—

(1) That priority of name, naming, and of origin, have preference wherever possible.
(2) That such words as "Seedling" and "Hybrid" be abolished from Australian Pomology as far as possible.
(3) That simplicity of naming be followed wherever possible.

The following alterations of fruit names were recommended for the various reasons given. The new names are given first.

APPLES.

Cleopatra	Synonyms Ortley, Porter, New York Pippin of Lindley, but not of Downing.
London Pippin ..	*The term Five Crown Pippin is too general, as there are* many apples with such a crown, and more noticeable than this one, especially Delicious and Colville Blanche d'Hiver.
Scarlet Nonpareil ..	Synonyms Winter Pearmain and Scarlet Pearmain in Tasmania.
Adam's Pearmain ..	Erroneously called Golden Reinette and Dutch Mignonne in Tasmania.
King of Pippins ..	Synonym King of the Pippins. Erroneously known as Golden Reinette, Adam's Pearmain, and Summer Pearmain in Tasmania.
Dumelow	*Synonyms Dumelow's Seedling, Wellington, Wellington* Pippin.
Tasma	Synonym Democrat. A new Tasmanian apple; the name has been changed because of the existence of two American apples called Democrat.
Statesman	Synonyms Chandler's Statesman, Chandler. This is the round apple sent out by Chandler, and not the ribbed one, which he distributed earlier.
Dunn's Favorite ..	Synonyms *Dunn's Seedling, Munroe's Favorite, Garibaldi, Ohinemuri. The apple being raised by Mr.* Dunn, of South Australia, priority was given to his *name instead of the Victorian claimant, Mr. Munroe.*
Schroeder	Synonym Schroeder's Apfel. Grown in Harcourt, Vic., as Dunn's Seedling.
Stewart's	Synonym Stewart's Seedling, a Victorian seedling of Dunn's Favorite.
Reinette de Canada ..	Known as Luxembourg in Cumberland, N.S.W., and as Blenheim Orange in Tasmania.
Alexander	Synonym Emperor Alexander.
Esopus Spitzenberg ..	Synonym Esopus Spitzenburgh.
Trivett	*Synonym Trivett's Seedling (N.S.W.).*
Bismarck	Synonym Prince Bismarck. This is a Victorian-raised apple, and not a New Zealand variety, as stated by Hogg.

PEARS.

Williams	Synonyms Williams' Bon Chretien, Bartlett, Duchess (S.A.).
Giblin's Nelis ..	Synonym *Giblin's Seedling* (a Tasmanian seedling of Winter Nelis).
Kieffer	*Known as Keiffer's, or Kieffer's Hybrid.*

Vegetable Garden.

The principal work in this section during June is the preparation of beds for the main crop of vegetables. Most vegetables require, and thrive best in, a thoroughly well-worked soil, the soil being as friable as possible. The beds should be deeply worked; all manures should be well rotted, and evenly distributed throughout the soil.

One point to be emphasized is a good system of rotation whereby a continual succession of the different classes of vegetables is grown in the beds. This is not only valuable as a method of soil restoration and improvement, but it helps to reduce and weaken any insect or fungus disease that may have been present.

Asparagus beds may now be renovated, and new beds planted according to directions given in the April number of the *Journal*. Onions and any other seedlings that are sufficiently far advanced may now be planted out, and succession crops of spinach, radish, peas, broad beans, leek, lettuce, carrot, &c., should be planted. The planting of rhubarb beds should now be completed.

Flower Garden.

General cleaning up and digging will be the work for this month in the flower section and shrubbery. Where the soil is heavy or sour, or where sorrel is plentiful, the garden should be given a heavy dressing of fresh lime, giving a fair dusting all over the surface. Lime should not be used in conjunction with leaves, garden *debris*, leaf-mould, stable manure, or any other organic matter used for humus. These should be first disposed of by digging well into the soil; then shortly afterwards a top dressing of lime may be given. Should no humic material be used, the lime may be dug in with the autumn digging.

In cleaning up the gardens, all light litter and dead foliage should either be dug in, or, better still, should be placed in an out-of-the-way corner to form a compost heap. Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves, unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

Any hardy annuals may be planted out, such as stocks, pansies, wallflowers, &c., and cuttings of roses and hard-wooded shrubs may also be planted.

REMINDERS FOR JULY.

LIVE STOCK.

HORSES.—Those stabled can be fed liberally. Those doing fast or heavy work *should be clipped; if not wholly, then trace high. Those not rugged on* coming into the stable at night should be wiped down, and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm, dry shed. The bull may run with the cows.

PIGS.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run. Young pigs over two months old *should be removed from lucerne run*

SHEEP.—The general classing of merino and lamb-raising ewe flocks should be commenced; none but roomy thick ewes, carrying a bulky fleece, should be kept. Class rams; keep only the best in shape and fleece, castrate all others; do not allow them to go entire to be used by those who think any ram good enough. Deep and narrow forequartered rams are responsible for many carcasses dressing and freezing plainly, although often good sheep from a wool point. Sell aged or barren fat ewes from breeding flocks. *Clean filth* from breech of ewes of British breeds now commencing to lamb. Wherever possible, *send lambs weighing 60 lbs. live weight to market. Early prices are always* best; avoid waiting until the rush of the season.

POULTRY.—Mating of heavy breeds for table purposes and winter eggs should receive immediate attention. Six to eight second-season hens may be mated to a cockerel ten to twelve months old to insure fertility and strong chickens. Hatch all breeds in July and August for stock purposes. Hatch light breeds in September for winter eggs. Ten hens may be mated to one cockerel to *obtain best results.*

CULTIVATION.

FARM.—Finish sowing barley, peas and beans, and late white oats in backward districts. Trim hedges. Fallow for potatoes, maize, and other summer crops; in early districts, plant potatoes. Graze off early crops where possible.

ORCHARD.—*Continue to plant deciduous fruit trees, bush fruits, and straw*berries. Continue cultivating and pruning. Spray for mites, aphides, and scales.

FLOWER GARDEN.—Plant shrubs, climbers, and permanent plants, including roses; also annuals and herbaceous perennials, Gladioli, Liliums, Iris, and similar plants. Continue digging, manuring, trenching and liming.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds of carrots, parsnips, *cauliflowers, onions, peas, broad beans, and tomatoes. Dig all vacant plots.*

VINEYARD.—Proceed with pruning, burning off, and ploughing. Complete, as *early as possible,* the application of manures other than *nitrates and sulphate* of ammonia if not already done. Mark out land for new plantations. If ground is in good order and not too wet, proceed with plantations of young vines (unpruned). Remove cuttings or scions from vines previously marked, and keep fresh by burying horizontally in almost dry sand in cool, sheltered place. Permanently stake or trellis last year's plantations.

Cellars.—Rack all young wines, whether previously racked or not. Rack *older wines also. For this work choose, as much as possible, fine weather and* high barometer. Fill up regularly all unfortified wines. This is a good time for bottling wine.