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DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL

Looking over Terranora Lake from the Southern Queensland Border to the Sugar Cane and Dairy Lands beyond.

LEADING FEATURES

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Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

Vol. LIV. 1 OCTOBER, 1940. Part 4.

Event and Comment

The Year in Agriculture.

IN his annual report to the Minister (Hon. Frank W. Bulcock), the Under Secretary of the Department of Agriculture and Stock (Mr. R. P. M. Short) reviewed the agricultural position and the progress made by the rural industries during the year ended on 30th June last.

In the course of his review, Mr. Short said:—

The year in agriculture was a good one generally. An unusually wet winter succeeded by a good spring in most farming districts justified anticipations of heavy crop production, which, to a large extent, were realised.

The sugar output in Queensland during the 1939 harvesting season was easily an all-time record; 891,000 tons of sugar were manufactured from 6,040,000 tons of cane, as compared with the previous peak (1938), when 777,000 tons were made from 5,342,000 tons of cane. Notwithstanding the increased quantity of sugar exported, the average value per ton (£15 15s. 3d.) was even greater than that for 1938, and the gross value of the entire crop was over £14,000,000. The enhanced price obtained was due to the fixation of an export price by the British Ministry of Food, at which all available sugar was acquired after the outbreak of hostilities in September, 1939. The 1939-40 growing season has been reasonably satisfactory, although seasonal adversity was the experience in some areas. The estimated sugar yield for the current harvest is 820,000 tons, about 70,000 tons less than the 1939 output. Preliminary milling results indicate that the sugar content of the cane this year is above normal, so that the early estimate may be attained even though

the cane yield may be reduced because of the continuance of dry weather in the Central and Southern districts.

Arrangements with the British Government will again assure the sale of the entire production, provided, of course, that shipping is available to transport the sugar to Britain and other units of the British Commonwealth which are this year participating in the Empire buying scheme.

Attention is again directed to the sustained improvement in production efficiency. The average production per acre of 3¼ tons of raw sugar is the highest figure yet atttained, and is in sharp contrast to the yield of 1½ tons, which was the standard forty years ago. This has only been achieved by the application of scientific agricultural principles, which lead to reduction of waste and costs of agricultural production generally, as well as to the improved milling technique which places the Queensland factories in the forefront of the sugar industries of the world.

For the grain-grower conditions were favourable for high yields, although late frosts of varying severity and a dry period were limiting factors. The aggregate area cropped was 360,459 acres, from which a yield of 6,751,000 bushels was obtained. Over 45 per cent. of the acreage sown was under the five best varieties of Queensland-bred wheat, selected for their rust and drought resistance. Observation and seed selection plots were established throughout the wheatgrowing areas, from which satisfactory results were obtained. A comprehensive wheat-breeding programme was continued. In the maize-growing districts, crop returns were satisfactory, and many heavy yields were harvested. On the Atherton Tableland, however, cyclonic weather and a prolonged wet season prevented the fulfilment of an early promise of a heavy harvest. Record yields and prices were the satisfactory experiences of barley-growers.

Seasonal conditions generally were not conducive to high cotton yields, and a combination of fiscal uncertainty and the lateness of planting rains caused a steep decline in production. With the renewal of the bounty on raw cotton and the rapid expansion of the home market an intensive campaign to stimulate production is in progress. As a result, a greatly increased acreage can be expected in the coming season. The merits of growing cotton under supplementary irrigation were investigated in the course of the year, and results were strongly in favour of irrigation where it can be practised economically. The value of cotton-grassland rotation was again effectively demonstrated. Further satisfactory progress was made in developing stocks of seed of the most promising varieties, and it is now possible to meet all likely demands for seed of types required by Australian spinners.

The cultivation of grain sorghums and other fodder crops continues to expand. Seed propagation plots and yield and spacing trials in practically every farming district produced gratifying results.

The tobacco yield for the whole of the State was a record, and values also were higher than ever before. Approximately 3,000,000 lb. of cured leaf, valued at £340,000, was produced from 4,530 acres, the aggregate area planted. Investigational work on insect and disease control and cultural practice was continued throughout the year and noteworthy results were achieved.

Conditions favoured peanut-growers who had a satisfactory harvest. Irrigated potato crops were much higher in yield than those in unwatered fields. During one period, market prices were as high as

£20 a ton; general average values were fair. Interest in fodder storage has increased as an outcome of well-sustained departmental effort.

Investigations bearing on the maintenance of fertility and the economic use of the land resources of the State were continued. Soil erosion, it is recognised, is of the utmost importance to the whole economy of the State. Consequently, soil conservation has claimed close attention, and the extension work of the Department in relation to soil economy has been planned in accordance with recognised principles of effective and protective land utilisation.

Favourable conditions were general throughout the fruitgrowing districts. Yields were heavy and improved prices compensated for losses from climatic causes where they did occur. Banana-growers now number 2,326, and the planted area aggregates 10,829 acres, of which 8,606 acres are in bearing. The total marketed production for the year was 550,000 cases, an acreage average of 63. Pineapple-growers also had a good year, with satisfactory returns for fresh fruit and higher prices for cannery consignments. Tropical fruit culture and vegetable growing are rapidly expanding industries in the coastal regions of the Central Division. Citriculture also is extending in inland districts, especially in the western country. In the deciduous fruitgrowing districts, production and prices were satisfactory, and marketings compared favourably with those of the previous year. Losses from pests were not serious, and fruitfly particularly was less in evidence than usual.

Increasing areas of production and more diversified cropping continue as a characteristic of the fruit industry in Queensland.

The activities of the Plant Industry (Research) Division continued as among the chief bases of the development of the primary industries. A wide range of investigational work was done in relation to the control, by both biological and mechanical means, of insect pests and plant diseases. The services of the Division have been extended to many important problems and to the improvement of technique in relation to those problems. The flow of reliable scientific information from the research worker through the departmental extension services to the producer continued evenly and in appreciable volume throughout the term. The application of the results of investigations has continued systematically and effectively in co-operation with the field officers of the several branches of the Department. It is considered that direct personal contact through the instructional staffs is, when practicable, the best way of conveying the results of research to the farmer. The establishment of experiment and demonstration plots in various districts is another valuable form of extension work which was applied with advantage in the course of the year.

Dairy Production.

ALTHOUGH dairy production was about 10 per cent. lower than the record output of the previous year, the return of approximately £9,000,000 was only 8 per cent. less. The Australian championship for butter quality was gained by a Queensland factory—Nanango—for the first time, and the quality of the factory output as a whole was maintained at a high standard. The beneficial influence of the use of steam sterilisation in dairy plants has already become manifest in higher quality production. The output of butter for the year totalled 139,795,042 lb., of which 72·6 per cent. was exported and 4 per cent. was sold in other States. The production of cheese, in which there was a marked improvement in quality, totalled 13,841,405 lb.

Plant-Breeding and the Production of Better Seed.

L. G. MILES, B.Sc.Agr., Ph.D., Research Officer.

THE need for planting better seed cannot be emphasised too strongly in Queensland to-day. The use of cheap, inferior seed may mean an initial small saving to the farmer, but it represents, in the long run, very poor economy. The fact is lost sight of that better seed gives better germination, greater freedom from seed-borne diseases, increased yield per acre, and better quality, and, therefore, more efficient production. The cost of producing a crop may be apportioned under the headings of the purchase or rental of the land employed to produce the crop, and the cost of such fertilizer and lime as may be used, together with the time and money expended in preparing the land, and in sowing, harvesting, and marketing the crop. The difference between the return from the crop and the cost of production represents the profit to the farmer. If, by using better seed, the yield is increased by, say, 20 per cent., the costs of seed, harvesting, and marketing are increased, but the other costs remain unaltered. The excess, therefore, of increased return over increased cost of seed, harvesting, and marketing represents additional profit to the farmer. Improvement of quality may be still more valuable, as increased monetary returns therefrom should be obtained without any increase in the cost of production apart from the additional cost of the seed.

One purpose of this article is to demonstrate the value of plant-breeding work, particularly selection, in the production of new varieties, and in the maintenance of existing ones. It also outlines the methods by which this is accomplished, and shows how farmers may, in some cases, profitably devote some time and trouble to the selection of their seed. With certain crops, such as cotton and tobacco, where a State-wide standard of quality is sought, the Department of Agriculture and Stock definitely prefers to handle the production of seed for general sowings. With many miscellaneous crops, however, in which the farmer commonly saves his own seed, some attention to intelligent selection will be amply repaid.

METHODS OF REPRODUCTION OF CROP PLANTS.

Before attempting to breed a new variety of, or otherwise improve, any species of farm crop, vegetable, or garden plant, it is essential to know something of the mode of reproducton of such species under natural conditions. Most Queensland farm crops, with the important exceptions of sugar-cane and potatoes, are reproduced by means of seed. Such seed is formed as a result of the pollination of a female reproductive organ, known as the pistil, with pollen from the male organs or stamens. In many cases the pistil and stamens are enclosed together within the petals of a typical flower, while in other cases the flower may be extremely modified, as in wheat or oats, or again the pollen-producing and seed-producing organs may be on different parts of the plant, as in maize.

Crop plants such as wheat, barley, oats, tobacco, tomatoes, peas, and beans, have flowers in which the stamens and the pistil grow close together. In some cases the anthers, which are the essential parts of the stamens, burst and shed pollen before the flower has completely opened; in others, the anthers may more or less cover the pistil until after they have shed their pollen, even though the flower may have opened. In all these cases, therefore, flowers are naturally pollinated with their own pollen, or, as is said, self-fertilized. Occasionally pollen grains from other plants may be carried in the air or by insects and find their way to the pistil of a plant before its own pollen has been shed. This is rarely the case, however, with the above plants, and under normal climatic conditions over 98 or 99 per cent. of the seeds formed by such plants are the result of self-fertilization.

Another group of plants, including sorghums, lucerne, cotton, and some grasses, are largely self-fertilized under natural conditions, but also undergo a considerable percentage of cross-pollination—i.e., fertilization with pollen from other plants in the neighbourhood. In the case of this group, the flowers are similar in general structure to those of the previous group, but some factor or factors tend to promote cross-pollination. Thus the anthers and the receptive surface of the pistil may not be closely associated, as in cotton, or there may be some peculiar mechanism for the liberation of pollen, as in lucerne, and insects may play an important part in transmitting pollen from one plant to another.

A third group of plants is characterized by the fact that cross-pollination is the rule rather than the exception, and self-pollination occurs only to a very small extent in the field. Maize, rye, pumpkins, cabbage, many fruits, and certain grasses and clovers belong to this group. The reason for the predominance of cross-pollination in the case of maize can be readily observed. At tasselling time the slightest breath of wind liberates the pollen from all mature tassels, and the air is filled with a mixture of pollen dust from a very large number of plants. This mixture is continuously falling on exposed silks, and effecting fertilization, with the result that over 90 per cent. of the grains of an ear may be the result of foreign pollination, and only a small percentage the result of fertilization with pollen falling from the tassel of the plant bearing that ear. Other species of plants of this third group may be sterile to their own pollen, i.e., they fail to set seed when self-pollinated but are fertile to pollen from other plants of the species; others, again, mature their stamens before their pistils, or vice versa, and in such cases cross-pollination must of necessity predominate. Wind and insects are the two main factors in distributing the pollen from plant to plant.

A fourth small group have their male and female flowers on different individual plants. Such plants cannot be self-fertilized, since a "female" plant produces no pollen, and must be fertilized with pollen from a "male" plant. Included in this group are the date palm and hops of commerce.

It is well known that a variety of wheat may be kept reasonably pure for a number of years, while a variety of maize, pumpkin, or sorghum, in a very short time, may begin to degenerate and lose type altogether. The two main causes of such "degeneration" are natural

crossing with other varieties and accidental mixing of seed. With wheat or barley two or more varieties may grow side by side in the one paddock without fear of cross-pollination rendering them impure. Indeed, plant breeders often grow single rows of wheat varieties or strains side by side, and the small amount of cross-pollination occurring is generally not sufficient to materially affect the purity of the seed. The great point to be observed in keeping such varieties pure is to prevent mixing of the seed. Plant-breeders accordingly harvest their rows separately, and thresh the ears either by hand or by simple machines that can be easily cleaned. Most farm threshers are very difficult, if not impossible, to thoroughly clean in a short time. Any farmer desirous of saving his own seed for planting should, therefore, run off a number of bags of the variety which he is threshing or harvesting, in the case of the complete harvester, before he begins to set aside his planting seed. This procedure will afford an opportunity for seed of other varieties, lodged in cracks and corners of the machine, to be dislodged and removed and the varietal seed saved for planting will, therefore, be reasonably pure.

With maize, on the other hand, the growing of one variety near another will allow of a considerable amount of cross-pollination, unless the two varieties silk and tassel at entirely different times. If an early-maturing variety of maize be grown alongside a late-maturing one it is possible that the former may have completely finished shedding its pollen, and that its silks may have completely died off before the latter has commenced to flower; in such a case the seed of each variety will be uncontaminated by crossing with the other. The same protection may be afforded in cases where one of two varieties which would normally tassel at the same period is planted considerably in advance of the other.

In the United States of America, a distance of a quarter of a mile is considered by many as the *minimum* safe distance for a seed plot from other fields of maize, especially if the direction of the prevailing wind is from the other fields towards the seed plot. Smaller distances may be used, however, if windbreaks intervene, such as narrow belts of timber. If, on account of space considerations, the seed plot has to be planted closer to another variety than is desirable, planting seed should be obtained from the middle of the plot, if it is a large one, or from the side furthest from the other variety unless, as previously stated, the periods of flowering of the two varieties have not overlapped.

Occasionally the effects of crossing may be noticed in the harvested seed. Thus, if a farmer is harvesting seed of a white maize that has been grown in close proximity to a yellow variety, the appearance of yellow grains on the ears will indicate to him that out-pollination has occurred. If, however, he is harvesting seed from a yellow variety that has been growing near a red maize, such as Red Hogan, he will not be able to detect out-pollinated grains, as they will all appear yellow, like the original variety. In the next generation, however, the effects of the crossing will be seen, for plants which have grown from grains resulting from cross-pollinations between the two varieties will produce entirely red grain. Mixtures of this type in maize are very difficult to eliminate, as, even if red-grained ears are culled out each year from a yellow maize variety, the pollen from the plants producing them has

pollinated a number of other plants, and will make its effect felt in future generations. The best procedure is, therefore, to take a little extra trouble in buying or producing the seed, thus eliminating contamination from the start. Here, again, as with other crops, great care must be taken in shelling if varietal mixtures are to be prevented.

Sorghum and cotton, though mostly self-fertilized, are subject to a considerable percentage of cross-pollination through insect activities. Such natural crossing, which may result in up to 6 per cent. of the seed of sorghum and 15 per cent. of the seed of cotton being capable of producing hybrid plants, is sufficient to cause rapid contamination of a variety if it is grown adjacent to other varieties, without any attempt being made to protect the heads or flowers from cross-pollination. With cotton, isolation of varieties is the only logical method of preventing contamination, though the mixing of seed at the ginneries is a potential source of trouble that has always to be guarded against. The position has been met in some countries by the establishment of "one-variety" communities. If such a scheme is strictly enforced there is no fear of cross-fertilization with other varieties or of contamination of seed occurring at the ginnery serving each one-variety community.

Sorghum plants produce a considerable amount of seed per seed head; it, therefore, pays, with this crop, to produce seed "under bag" if there is any danger of the variety being cross-fertilized by others in the neighbourhood. A grocer's brown paper bag may be used for each plant selected for seed purposes; it should be large enough to completely enclose the mature head without fitting too tightly. The head is enclosed in this bag just before the pollen is shed, and the mouth of the bag is tied with string round the stalk just below the head. The bags are opened a week or so later, after pollination has run its course, to give the heads access to air and light, but the plants must be tagged in some way so as to be recognised at harvesting.

Tobacco, though normally cross-pollinated to only a slight extent, must be similarly protected if other varieties or even off types within the variety itself are nearby. The enormous amount of seed produced by a single flowering head of tobacco makes it economical, as well as desirable, to produce the seed under bag.

With vegetatively propagated crops such as sugar-cane and potatoes, the problem of pollination does not arise in farm practice. A variety, for example, of potatoes normally descends from a single plant or a single tuber, and if care is taken in keeping varieties separate there is no danger of contamination. Occasionally, however, in that crop "bud sports" occur spontaneously, i.e., owing to causes still little understood, certain buds of the one tuber or certain tubers of the one plant may produce shoots different from the varietal type, which in turn may develop distinctly different tubers. These "sports" will propagate themselves true to type, and may be either rogued out from the crop, if undesirable, or selected as a new variety if showing improvement over the original variety. A number of commercial varieties of potatoes have originated accidentally in this way.

Two main causes of degeneration of crop varieties have been described, namely, accidental mixing of seed and natural crossing with other varieties. A third cause of such "running-out" may be cross-pollination between plants of the variety itself. This cause would naturally be important only in the case of crops like maize, which are normally cross-fertilized, and cotton and sorghum, in which cross-fertilization plays a lesser, but still important, role. Very few varieties of such crops are genetically pure when released by the plant breeder, and natural crossing between plants of somewhat divergent types tends to increase the multiplicity of forms present in the variety. This process not only decreases the uniformity of the crop, but may also result in a lowering of the average yield and quality.

It is thus obvious that some means must be employed to maintain varietal standards in crops subject to cross-pollination by insect and other natural agencies; otherwise varieties tend to "slip back" in quality and productivity. The methods generally adopted to effect this purpose are mass selection and pedigree selection. These methods, together with a third, that of hybridization, are also used by the plant breeder in the breeding of new and better varieties of crop plants.

MASS SELECTION.

Of the various methods of plant improvement, practically the only one available to the farmer is that of mass selection. This comprises the selection of superior plants of a type for seed purposes, and the bulking of the seed from these plants to sow the following crop. This method is used not only in the production of improved strains but also in the maintenance of those already available.

Practically any crop grown in Queensland to-day will show a large amount of variation from plant to plant, these variations arising from two sources. They may be due either to inherited differences or to differences in the soil and in the treatment to which the plants are subjected. Take for example, a maize plant, which is outstandingly better than any other plants in its neighbourhood. This advantage may be due to a greater inherent yielding ability, a characteristic which it can transmit to its progeny, or may simply be due to the fact that this plant grew on a more fertile patch of soil than its neighbours, that it had less competition from weeds during the early stages of growth, or was in some other way favoured by its environment. If favourable environment was the factor responsible for the outstanding merit of this particular plant, then the farmer cannot expect its high yielding ability to be transmitted to its progeny, unless each and every one of them is grown under similarly favourable conditions. Sometimes a plant will be well developed and yield well, because it has no immediate neighbours, and, therefore, more space is available for root development. Such a case can be easily detected. In other cases, however, it is impossible to tell from inspection whether a fine-looking plant is of a superior strain or whether it is merely favoured by environment. If, however, plants of ideal type are selected, and harvested and threshed separately for seed purposes, at least no harm is done, and the probability is that the strain is being improved. Yield, of course, is not the only consideration

in selection. Such points as a suitable height of plant, the method of carriage of the ear in maize, the strength of the straw or stalk in maize and the small grains, the size, shape, and texture of the leaf in tobacco, and of prime importance, freedom from disease, should be given careful attention. It does not follow that plants which are free from disease are resistant to disease, or that in selecting disease free seed the selector is breeding for disease resistance. Seed, however, which is free from disease, stands a much better chance of germinating and of producing vigorous plants than diseased seed. If, therefore, selection were based solely on freedom from disease, the farmer would still be benefiting each season's crop, though possibly not effecting any permanent improvement in the crop.

Maize offers an excellent opportunity for selection on farms. Farmers should familiarise themselves with the appearance and characteristics of the variety or varieties which they are growing. Plants should be selected in the field, their ears harvested separately and subjected to a further selection in the barn. Selected ears should be shelled separately and the grain used to sow a small isolated seed plot which will provide seed for larger plantings. Since each good ear selected provides a considerable amount of grain, it is quite practicable for most farmers to select their own seed and sow their own increase plot each year.

The mass selection of a crop such as wheat requires more time and trouble since it is difficult to separate and study individual plants in the field, and a much larger number of plants are required to produce a bushel of seed than is the case with maize. Offsetting this disadvantage is the fact that wheat, being self-fertilized, requires less attention in order to keep varieties pure and to maintain varietal standards. If, however, a variety shows a falling off in yield or shows evidence of variation, e.g., by the appearance of bearded heads in a beardless variety, compact ears in a loose-eared variety, or *vice versa*, there is urgent need for selection. Individual plants which are true to type should be selected prior to harvest or individual ears should be chosen, if the plants cannot be separated, and the seed threshed out by hand. Sufficient seed should be obtained to hand-plant a small plot the next year. This plot should be rogued of off-types, if present, and used for seed purposes. In this way in a few years, sufficient improved seed will have been produced to plant the farmer's bulk fields. Care, of course, must always be taken at harvest to keep this selected seed free from mixtures, or otherwise the work is largely nullified. Such work, it must be admitted, comes more within the scope of the Department of Agriculture and Stock than of individual farmers. Signs of contamination have recently been noticed in a number of the major wheat varieties in this State. A programme is therefore being put into effect whereby selection and rogueing will be carried out by that Department, an increased supply of pure seed thus being made available through the agency of the Wheat Board.

Self-fertilized seed of tobacco, cotton, sorghum, and many other crop plants is usually obtained simply by covering the flowers or flowering heads with a bag, or some other protective cover to prevent the entrance of foreign pollen. In the case of tobacco and cotton, however, quality is of such prime importance and yet so difficult to determine, that farmers

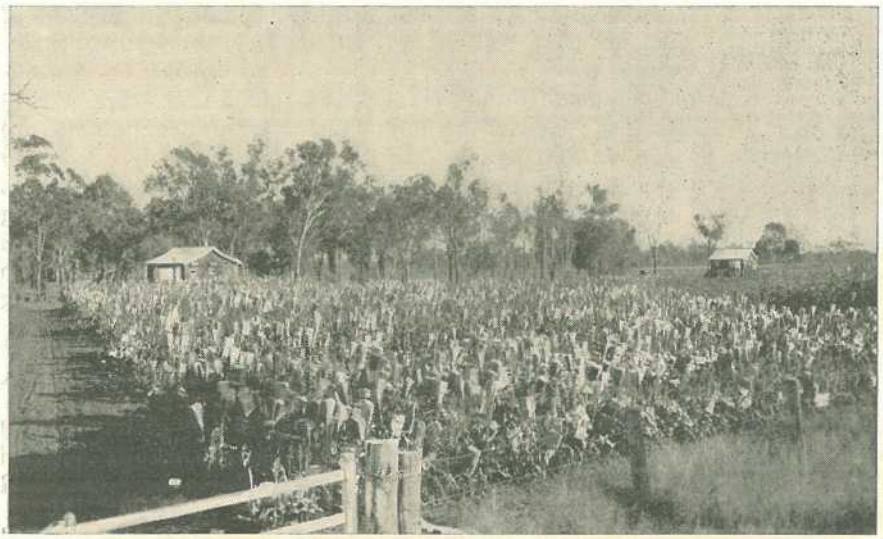


Plate 80.
SORGHUM BREEDING PLOT AT THE BILOELA RESEARCH STATION.

Plate 81.
COTTON PROGENY ROW BREEDING PLOT AT THE BILOELA RESEARCH STATION.

are not encouraged by the Department of Agriculture and Stock to produce their own seed. Selection for productivity and vigour alone may be quite successful in improving the crop yield but quality may be so impaired that the resulting strains are almost valueless. Departmental officers are therefore employed to select seed from these two crops with a view to improving or maintaining both quality and yield. This work is being carried out annually and the seed stocks thus obtained are made available to farmers growing these crops.

Departmental work with sorghum (Plate 80), especially the dwarf types of grain sorghum, is now being directed towards the improvement of yield and uniformity in a number of promising types introduced from overseas. Where farmers are, however, desirous of producing their own seed on the farm, the extra time taken to select and tag uniform, vigorous plants, typical of the variety, for seed will be repaid. The heads on such selected plants should be bagged, as previously described, in order to prevent cross-pollination with other varieties in the neighbourhood, or with inferior plants in the same field.

PEDIGREE SELECTION.

The method of selection usually practised by plant breeders is the pedigree, or plant-to-row method. Using this method, a number of plants of superior type are selected as in the ordinary method of mass selection. Seed of each plant is kept separate, however, and a separate row is sown next season from the seed of each selected plant. If one of the parent plants showed up well merely on account of rather favourable environmental conditions, its progeny row will not appear to such advantage. The inherent value of the selected parent plants is thus judged, not so much on their own appearance as on the appearance of their progeny rows. If the best progenies still exhibit variation, further plants are selected and the process continued until a number of uniform progenies are produced. These lines or strains have now to be tested against each other in carefully conducted trials over a period of a few years to determine the best, which is then increased for commercial seed production (Plate 81).

HYBRIDIZATION.

Hybridization is at once the most difficult and the most promising method of plant improvement. Selection of itself cannot introduce anything new into a variety; it can only pick out the best that is already available in that variety. If one variety of wheat possesses rust resistance and low breadmaking quality, while another is rust-susceptible but of high quality, the only logical method of obtaining a high quality, rust-resisting wheat is by crossing the two varieties. In crops possessing normal, perfect flowers, i.e., flowers with both stamens and pistil, the anthers must be removed, using a fine pair of forceps, from the flowers which it is desired to cross-pollinate. This removal is effected just before the anthers have shed any pollen, which is usually as they are turning colour from green to yellow, or whatever the colour of the ripe anther may be. These flowers are thus rendered incapable of self-pollination. They must then be covered by suitable bags to protect them from any pollen which is in the air or which may be carried by insects. At a suitable period, usually within a day or two, pollen is taken from

the other parent and applied to the stigmas of the treated flowers, over which the bags are then replaced. The hybrid seed when sown normally produces a uniform lot of plants from which seed is obtained for the next generation. This generation, the "splitting" generation, generally provides a great variation in types, and from it plants possessing the desired combination of characters are selected. These plants are subjected to a process of progeny selection until uniform, true-breeding strains are obtained. (Plate 82.)

Plate 82.

Hybridizing Wheat.—A tagged plant may be seen with the ear covered to prevent the entry of unwanted pollen from outside. Forceps are being used to remove the anthers from another ear.

VARIETAL TESTING.

Hand in hand with the production of new varieties, and the improvement of existing ones, must go a programme of varietal testing. Until a new variety or strain has been tested in the field alongside the best types already available, its actual value for a certain district cannot be determined. Again, with certain crops upon which plant breeding work is not being carried out at the time, the problem still arises of determining the most profitable varieties to grow in the various districts. Varietal trials with this object in view have been conducted in the past, and a still more comprehensive series of such trials is now being undertaken. The results of these trials are published when available, and farmers are advised to make use of the information obtained from them when choosing the varieties to grow on their own properties.

Should a farmer desire to test the merits of several varieties of a crop, it is suggested that information regarding the most suitable method to employ be obtained from an appropriate field officer of the Department of Agriculture and Stock, stationed in the farmer's own district; if no suitable local officer is available, then the farmer should communicate with the Department of Agriculture and Stock, Brisbane. Attempts are frequently made to test varieties by planting a single area

of each, or even by comparing the results obtained in one season with those realised in previous seasons, using different varieties in each season. The yields of single plots of each variety are, however, often not indicative of the relative merits of the varieties tested, and the results obtained in comparisons of varieties grown in different seasons are likely to be even less reliable. Careful investigations conducted in this State and in other countries have shown that great care should be exercised in carrying out varietal tests. Not only have several plots of each variety to be planted in the one experimental block, but care must also be taken to guard against any variability of the soil or slope of the field affecting the results obtained. As already indicated, the Department of Agriculture and Stock is only too pleased to give advice to farmers who intend testing varieties so that the design of the farmer's experiment may be such as to yield the fullest and most reliable information.

A NATIVE COUCH GRASS DANGEROUS TO STOCK.

Since January, 1939, over 1,100 sheep have died in one locality, apparently because of eating some poisonous plant. As many deaths were reported in April of this year, Mr. W. D. Francis, Botanist, made an examination of the area. He found that a native couch grass, *Brachyachne convergens*, was the cause of the death of the sheep. The presence of a prussic-acid-forming substance in this grass was first detected during the investigation in the field. When the green parts of the grass were broken in the hands they gave off the characteristic almond-like odour of prussic acid. A sample of the grass, which was brought to Brisbane and tested in the laboratory of the Agricultural Chemist, gave pronounced reactions of a prussic-acid-forming glucoside.

The rapidity of the deaths and the post-mortem results observed by Mr. Ohman, Government Veterinary Surgeon, are apparently consistent with prussic-acid poisoning. Other features of the native couch grass, such as its frequency in the locality referred to and the extent to which it had been eaten, are also consistent with the view that it was the cause of the death of the sheep.

This is the first occasion on which this grass has been found to yield prussic acid. As its common name suggests, it is allied to the common couch grass which is frequently found along bore drains in Western Queensland. Generally, the native couch can be distinguished from the common couch by its larger size and paler colour and by the fact that it is not confined to bore drains and other moist localities in western parts of the State.

Native couch has been recorded from many localities in the Gulf country, from Hughenden, Aramac, Clermont, Emerald, Milmerran, and St. George. So far we have not received it from south-western localities beyond Roma and Barcaldine in the Central Division. It also has been recorded as occurring in Northern Australia and Western Australia.

Occasionally, native couch grass is referred to as star grass. The Star grasses, however, are of the Rhodes Grass type.

By far the heaviest loss of sheep in the locality referred to occurred with a flock which had travelled over a route which was fairly bare of feed for 7½ miles before reaching the locality. From this experience, it appears that empty sheep which have been driven over a bare route are much more susceptible to poisoning than sheep which have passed over a route carrying good feed.

A sample of the native couch grass collected at the location where the sheep losses occurred was analysed in Brisbane by Mr. McKechnie, Acting Senior Analyst, who found in the sample submitted 66·7 milligrams of hydrocyanic acid (prussic acid) in 100 grammes of grass as received. This amount is more than three times that usually considered as dangerous in plants eaten by stock and cannot be considered as representing the total amount of hydrocyanic acid present in the grass when eaten by the sheep, for during transport to Brisbane a considerable amount of hydrocyanic acid must have been lost by volatilisation.

The Poison Plants Committee of the Department of Agriculture and Stock is arranging for the analysis of samples of native couch grass collected from different districts in order to ascertain the hydrocyanic acid content of this grass when grown in different localities.

Skeleton Weed.

SKELETON Weed (*Chondrilla juncea*) is the most serious weed pest with which wheat-growers in New South Wales have to contend. Officers of the Department of Agriculture and of the Rural Bank of that State regard it as the worst agricultural weed ever encountered in this country. It is a native of Central Asia, and has spread to southern Europe and North America. So far no specimens have been received by the Queensland Department. The Government Botanist, Mr. C. T. White, advises that he has several times received specimens of chicory (*Cichorium Intybus*) which farmers thought might be Skeleton Weed. Chicory, which is grown in Europe as a salad and for its tap root which is roasted and ground as an adulterant of coffee, deteriorates in the wild state, and becomes simply a weed pest. It is not a very persistent weed, however, and in Queensland, at least, is subject to the ordinary field methods of control. It is superficially like Skeleton Weed, but can be identified by its blue, not yellow, flowers.

To enable farmers to distinguish Skeleton Weed should it make its appearance in Queensland, the following illustration and description, taken from the publications of the New South Wales Government, are given.

If any farmer or pastoralist suspects that this plant has made its appearance on his property, he is asked to send specimens at once to the Government Botanist, care Botanic Gardens, Brisbane, for identification. It may be pointed out that the Botanical Branch is always willing to name and report on any specimens of weeds or other plants forwarded.

Description.

"In the early stages, the plant somewhat resembles a dandelion, but a fleshy tap-root, which grows straight down to a depth of 5 or 6 feet, is very quickly established, and some three to four months later the skeleton-like top growth is made, reaching a height of from 2 to 4 feet. When the plant is nearing maturity, the early rosette formation of leaves dies, leaving only this top growth. The normal period of growth commences during May, and continues until mid-spring, when the vigorous top growth is made, ending with profuse flowering and seeding during the latter portions of the summer. The top growth then dies back, but the root is of a perennial nature, and fresh growth is made from the old root the following autumn.

"The basal portion of the stems has a thick covering of bristles or hairs. The flowers are borne singly, and are conspicuous by their yellow colour. They are normally borne on the upper portion of the plant, but when heavily grazed or cut, they will form right on the ground, an important point in the control of seeding, in which the plant shows remarkable vigour.

"Occasionally, especially after interference of the plant with machinery or chemicals, side roots are formed. It is the pertinacity of the root growth which makes control such a difficult problem, cultivation tending to stimulation and multiplication of the weed."

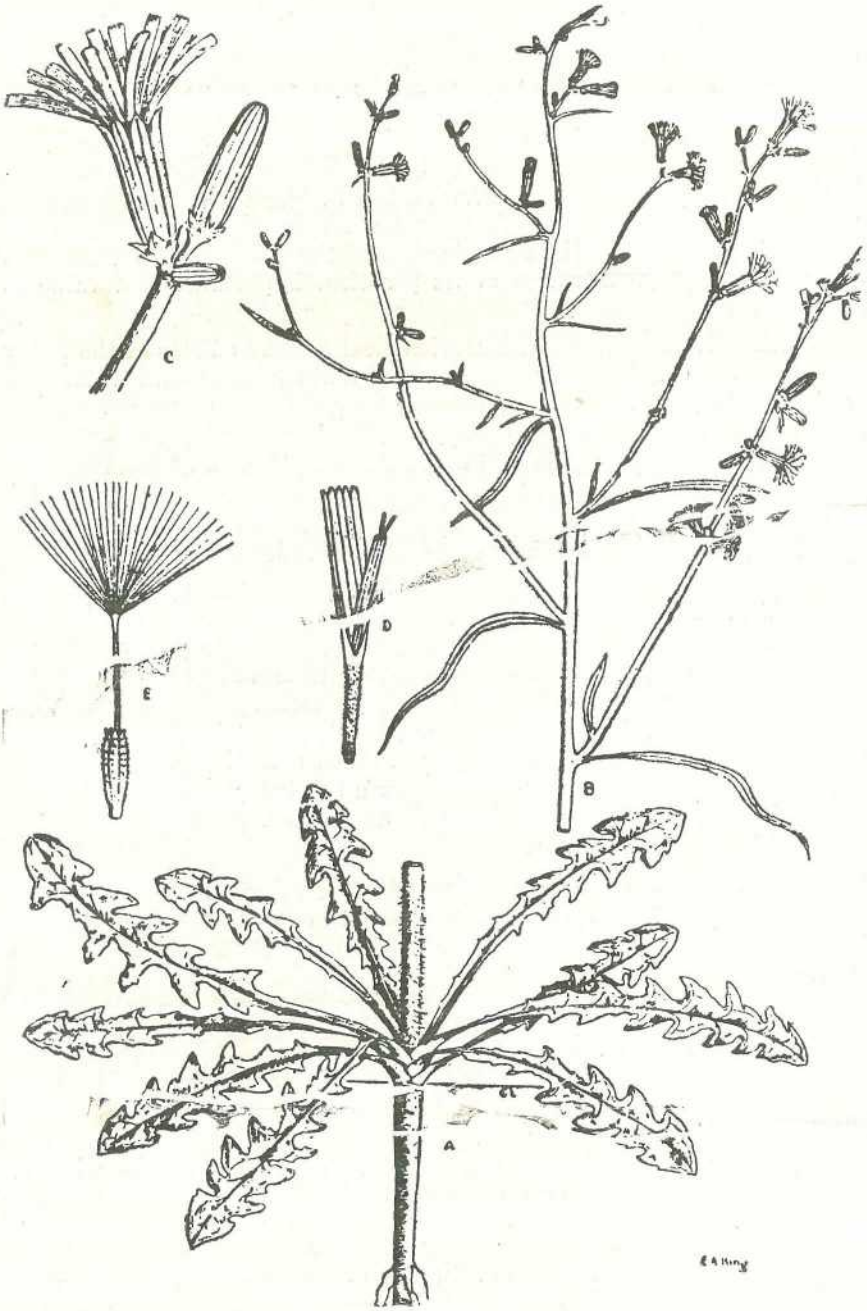


Plate 83.

Skeleton Weed (*Chondrilla juncea*).

Steam Sterilisation in the Dairy.

L. E. NICHOLS, B.Sc.Agr., Dairy Technologist.

THE recent amendment of *The Dairy Produce Act* in respect of steam sterilisation as an essential requirement where machine milking is practised justifies publication of the original experiments on the Downs, as an illustration of its practical importance and value to the industry.

Exhaustive scientific and bacteriological tests by officers of the Dairy Branch of the Department of Agriculture and Stock associated with the cheese industry on the Darling Downs over a period of eighteen months have revealed that practically 90 per cent. of bacterial contamination causing defective quality is of utensil origin, principally from milking machines.

Bacteriological Justification for Improvement in Methods.

An average of the results of tests obtained particularly over the first three warm weather months of this year, when cheese quality was dominantly poor, revealed 88 per cent. of milk supplied to factories of unsatisfactory quality for first-grade cheese manufacture. These grading standards were observed on a combination of tests, notably the modified methylene blue reductose test, the sediment test, the Wisconsin curd test, and direct microscopic observations revealing gassy, digested, slimy, fruity, and fermented curds, below a two hours modified reductose test and with an average bacterial count up to 20,000,000 per c.c., all dominantly of utensil origin.

These tests and results are what may be described as a mass confirmation of the original bacteriological tests of methods applied on an average Downs dairy, after the usual methods of cleansing and so-called "sterilising" had been applied.

Method of Testing.—Sterile water rinses were used in the initial tests and for the final official test. The first milk rinses along milking machine lines, milk trays, separator, and cream can were taken. Notice of tests was given about three days before investigations at farms chosen previously.

After notification, samples were taken under sterile conditions *before and after treatment,* the time elapsing between the first and second sampling three days. Temperatures and weather conditions were carefully noted over the period of tests. All samples were taken both *before* and *after* the addition of improved methods of steam sterilisation—packed carefully in ice and returned to the laboratory where they were analysed bacteriologically the same evening of sampling.

All samples were tested on standard Agar media, litmus, milk, and in brilliant green bite salt lactose media. All plates were incubated forty-eight hours at 37 deg. C., and bacterial counts made with comparative determinations.

After the ordinary methods of farm cleansing were applied, samples taken to illustrate utensil infection were revealed as follows, with comparative tests after steam sterilisation procedures:—

Bacterial Counts.—Incubated forty-eight hours, standard Agar.

Inoculated Litmus Milk and Brilliant Green Durham Tubes.

1st Rinse through machine milk line .. .. (A)
2nd Sample Can 4 gals. milk .. .. (B)
3rd First Rinsings Can through Separator .. .. (C)
4th Sample Cream 1st Cream Can .. .. .. (D)

Results—1st Set.

——	Before Steam Sterilisation.	Coli.	After Steam Sterilisation.	Coli.
2 minutes wet steam sterilisation in morning for afternoon milking—	Per c.c.			
Milk (A)	1,250,000	Neg. 1/100 c.c.	208,000	Neg. 1/100 c.c.
Milk (B)	1,265,000	Neg. 1/100 c.c.	84,000	+ 1/100 c.c.
Cream (C)	1,110,000	Neg. 1/100 c.c.	60,000	Neg. 1/100 c.c.
Cream (D)	1,160,000	Neg. 1/100 c.c.	60,000	Neg. 1/100 c.c.

From Udder direct 300 per c.c.

	A	B	C	D	Acid.
Litmus milk—					
Before	a/d	a/d	a/d	a/d	Digestion
After	Inert	Inert	Inert	Inter	..
Durham tube—					
A	Neg.	Neg.	Neg.	Neg.	..
P	Neg.	+	Neg.	Neg.	

Results—2nd Set.—Udder Sterile.

——	Before Steam Sterilisation.	Coli.	Litmus Milk.
2 minutes wet steam sterilisation just prior to milking—	Per c.c.		
Milk (A)	1,394,000	+ 1/100	a/g acid/gas
Milk (B)	2,500,000	+ 1/100	a/g acid/gas
Cream (C)	770,000	+ 1/1,000	a/g acid/gas
	After Steam Sterilisation.		
Milk 45 minutes after start of milking through machines—			
Milk (A)	1,200,000	Neg. 1/100	Inert
Milk (B)	All sterile	..	..
(C)	..	..	..

In the first set of results were seen the aspect of the personal element as affecting the efficiency of the sterilising procedures and the inefficiency of the cleansing procedures before sterilising. This is followed by a recontamination in between milkings and its relation to dairy hygiene.

The second set reveals efficiency in all divisions of the technique.

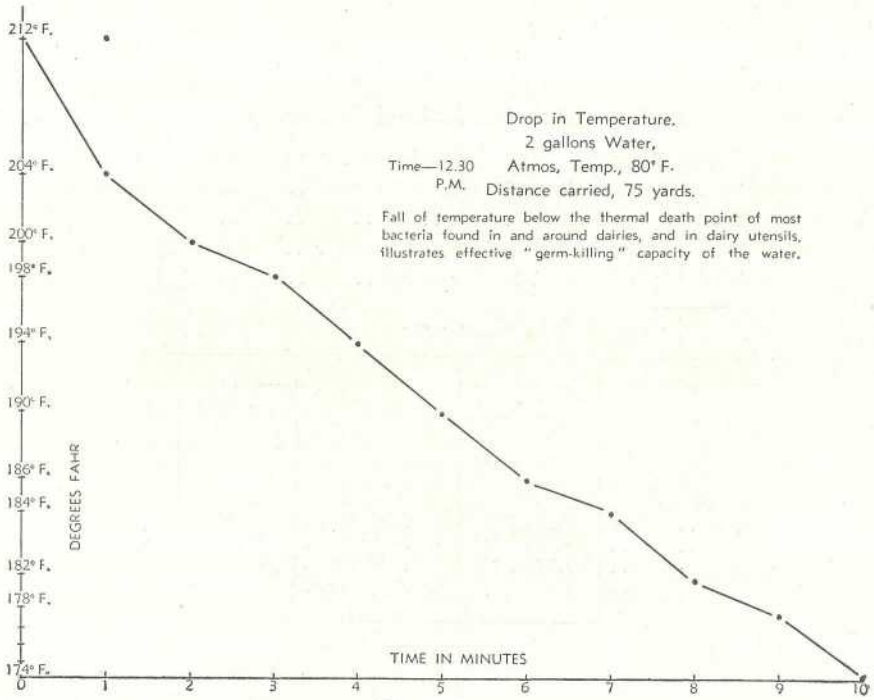


Plate 84.

Existing Methods Demonstrated under Local Conditions—Water Temp. at Copper 202° F. 2 gallons carried distance 75 yds. at amos. Temp. 80° F. Dropped to 190° F. Left further 15 minutes to half an hour in dairy before final use.

Photographic Evidences Reveal Conditions Before and After Treatment.

The graph indicates the drop of temperature revealing the ineffective germ-killing capacity below the thermal death point of most dairy bacteriological studies, and reproduced in photograph of a polluted "allegedly" clean can rinse of quality-affecting bacteria.

Just as with pasteurisation of milk, maintenance of temperatures at 145 deg. F. for thirty minutes is necessary for destruction of most disease germs, so for commerial sterility of dairy equipment and milking machines and utensils a temperature of 210 deg. F. on the Downs held for two to three minutes is essential. The most effective method of destruction of these organisms, by maintaining temperatures above their heat death point, is by *wet steam sterilisation.*

Having proved the need for greater appreciation of what actually constitutes *"bacteriological cleanliness"*—by addition of improved methods of wet steam sterilisation and dairy hygiene in individual dairies—*extension of the technique to a group of cheese factory suppliers was desirable* to determine the extent to which the whole of the milk supply quality and ultimate cheese quality could be improved.

An average factory was taken, which had been producing consistently a poor-quality milk supply and a second-grade cheese, and an extension of the fundamental principles of the technique was inaugurated.

Plate 85.
Polluted Allegedly Clean Can Rinse of Quality-affecting Bacteria.

Plate 86.
Plate Exposures in Dairy, Illustrating Contamination by Air-borne Bacteria about the Dairy.

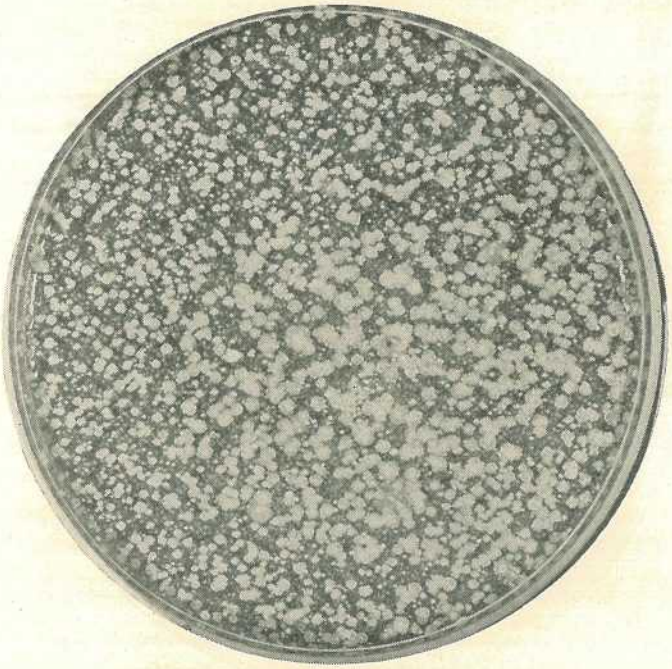


Plate 87.
YEASTS ISOLATED FROM WHEY IN MILK CANS.

Plate 88.
IMPRESSION OF ALLEGEDLY CLEAN UDDER CLOTH.

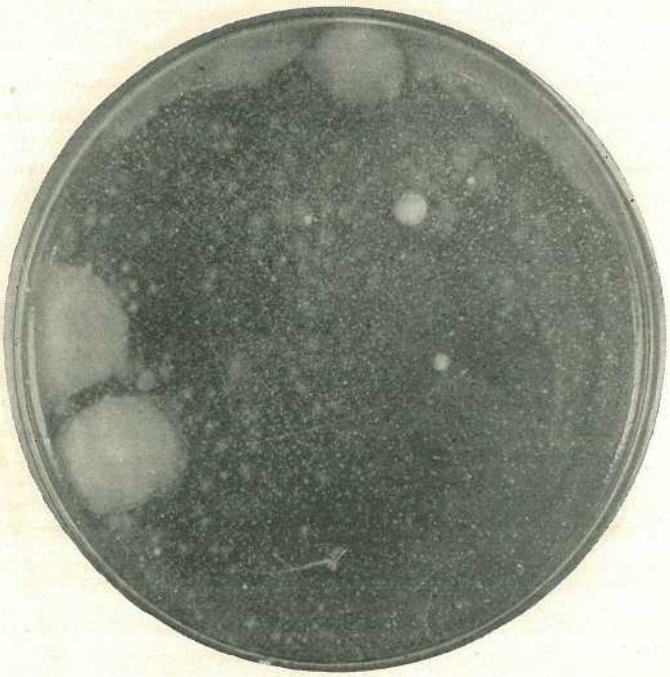


Plate 89.

Polluted Water Supply in Tank adjoining Dairy used for Cleansing of Dairy Equipment.

Each supplier to this factory was provided with or advised on a suitable cleansing technique with the approved method of wet steam sterilisation.

The Technique.

The extension of the principles to each individual supplier, involving an educational or instructional campaign over a period of three months, finally gained a full appreciation by all suppliers of what constitutes a perfect cleansing technique, effective and efficient sterilisation, and perfect "bacteriological" cleanliness with approved dairy hygiene.

A specialised technique of dairy hygiene is essential to overcome the personal equation factor in the extension of knowledge of the principles involved. Success following adoption of the principles depends on the individual and the extent to which he is prepared to follow, as well as understand, each step of the operations; and yet the application of one practicable to all dairymen.

It involves three distinct things—

1. Dairy hygiene.
2. Cleansing technique.
3. Steam sterilisation.

All three are inter-related, and the perfection or efficiency with which one is accomplished governs the efficiency of the other. Hence the need and adoption of a specialised technique.

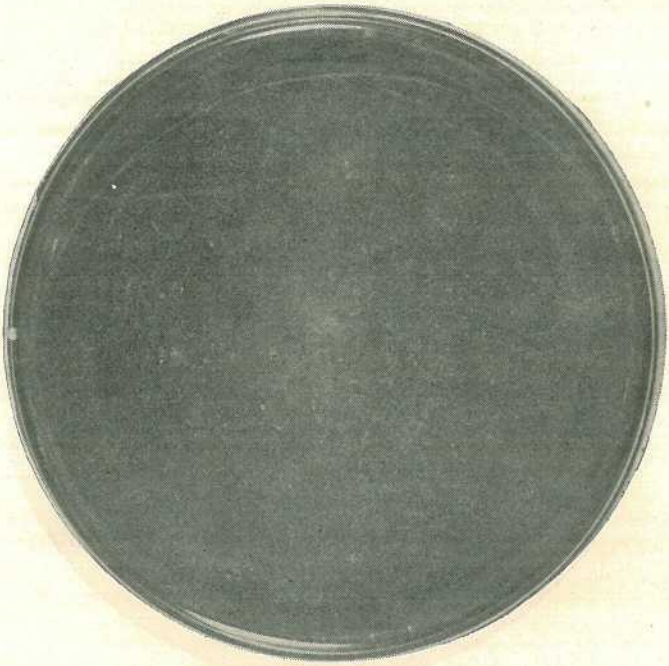


Plate 90.

BEFORE STERILISATION.—Milk direct from udder (Sterile) following rejection of foremilk after careful washing of udder with a weak chlorine solution.

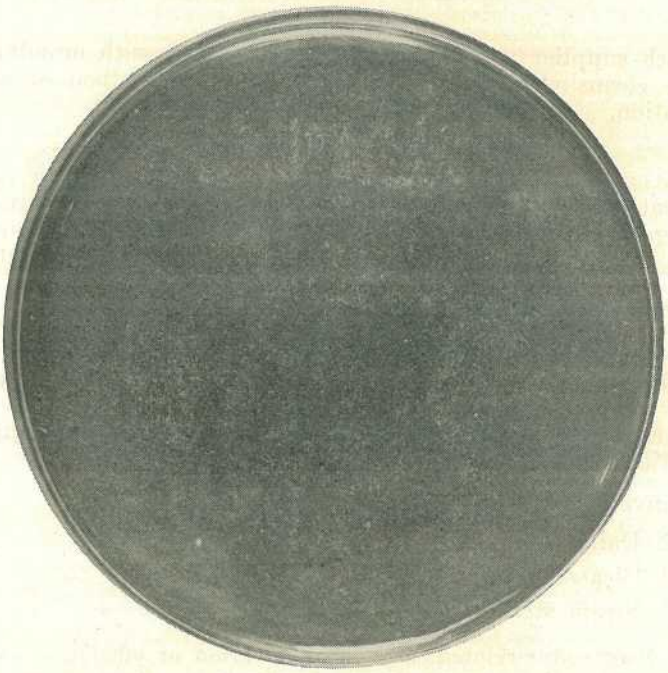


Plate 91.

AFTER STERILISATION.—Milk from can which had been sterilised with wet steam for two minutes.

Plate 92.

Before Sterilisation of Milking Machine.—Milk from releaser, showing extensive bacterial infection of quality-affecting types.

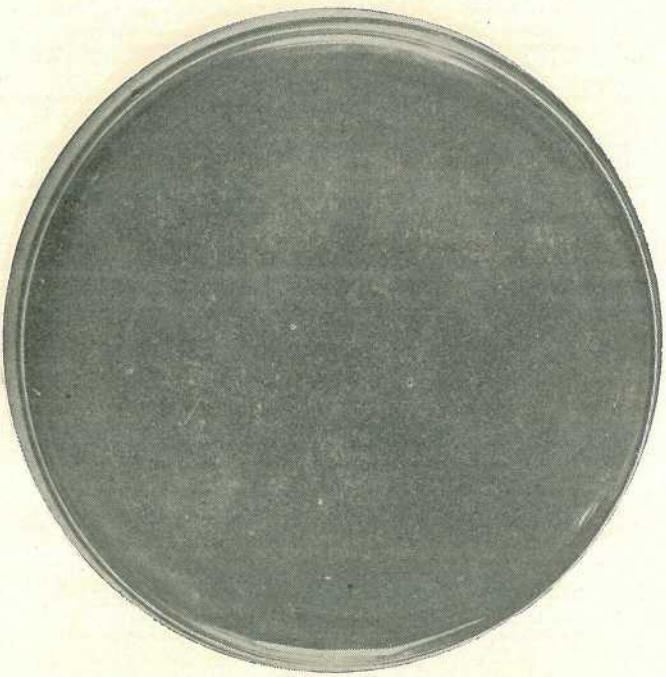


Plate 93.

After Sterilisation of Milking Machine (Wet Steam 2 Minutes).—Milk from releaser.

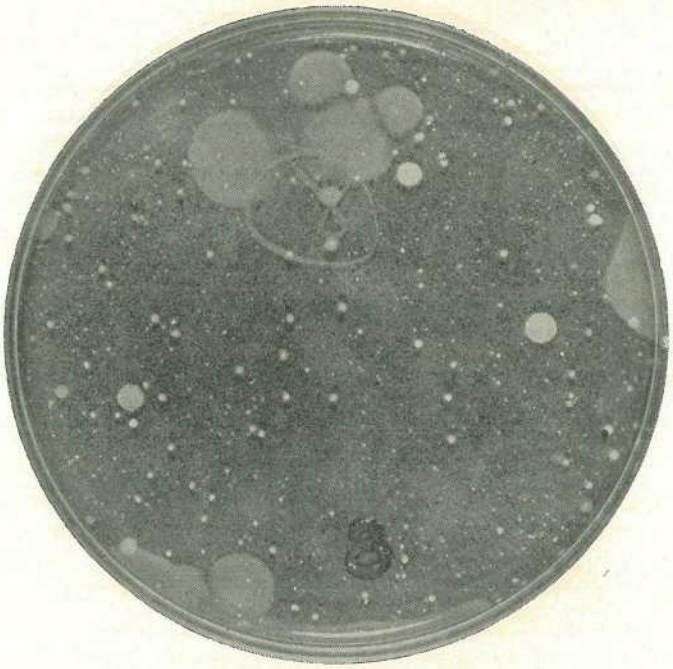


Plate 94.
BEFORE STERILISATION.—Cream from Separator.

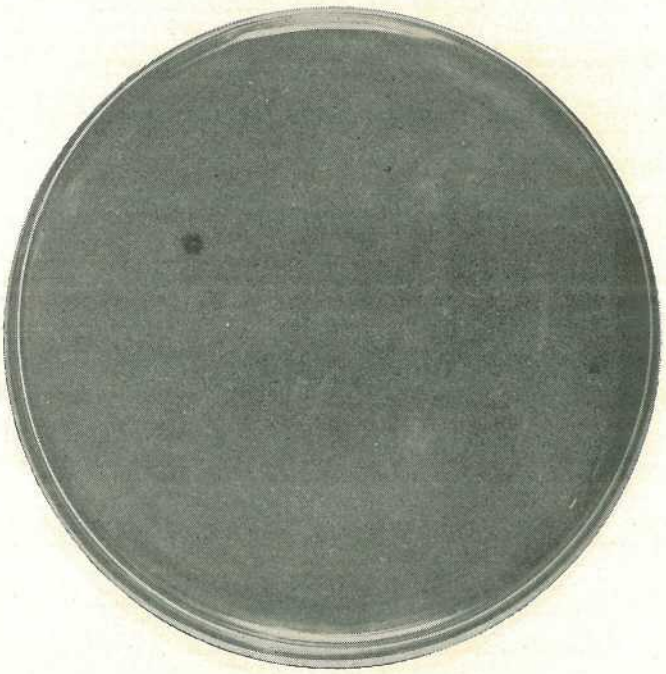


Plate 95.
AFTER STERILISATION (Wet Steam 2 Minutes).—Cream from Separator.

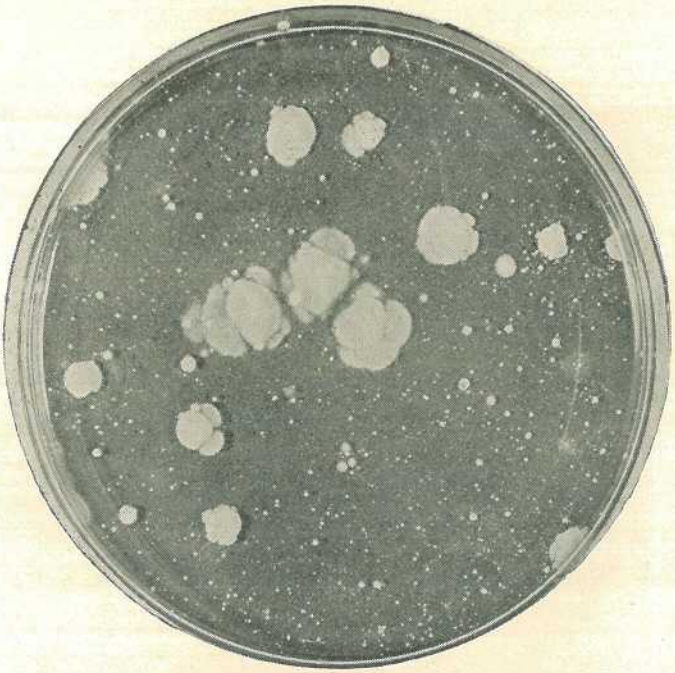


Plate 96.
Before Sterilisation.—Cream from Can.

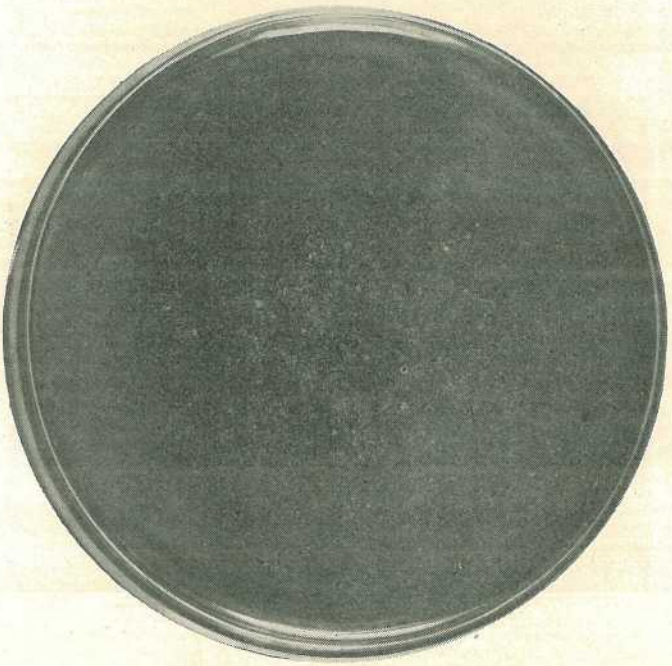


Plate 97.
After Sterilisation (Wet Steam 2 Minutes).—Cream from Can.

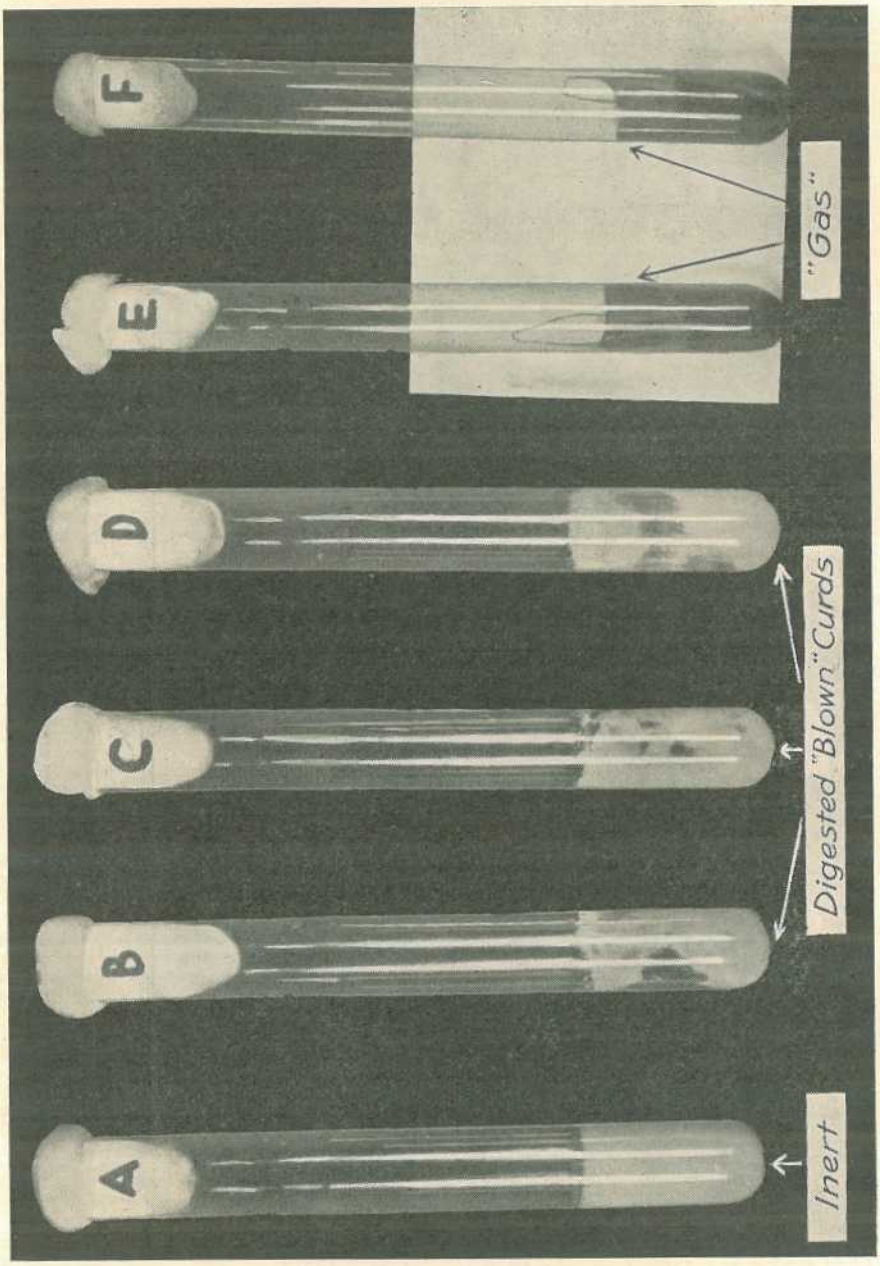


Plate 98.

BEFORE STERILISATION.—Effect of injurious bacteria on milk. (Note the condition of the curd).

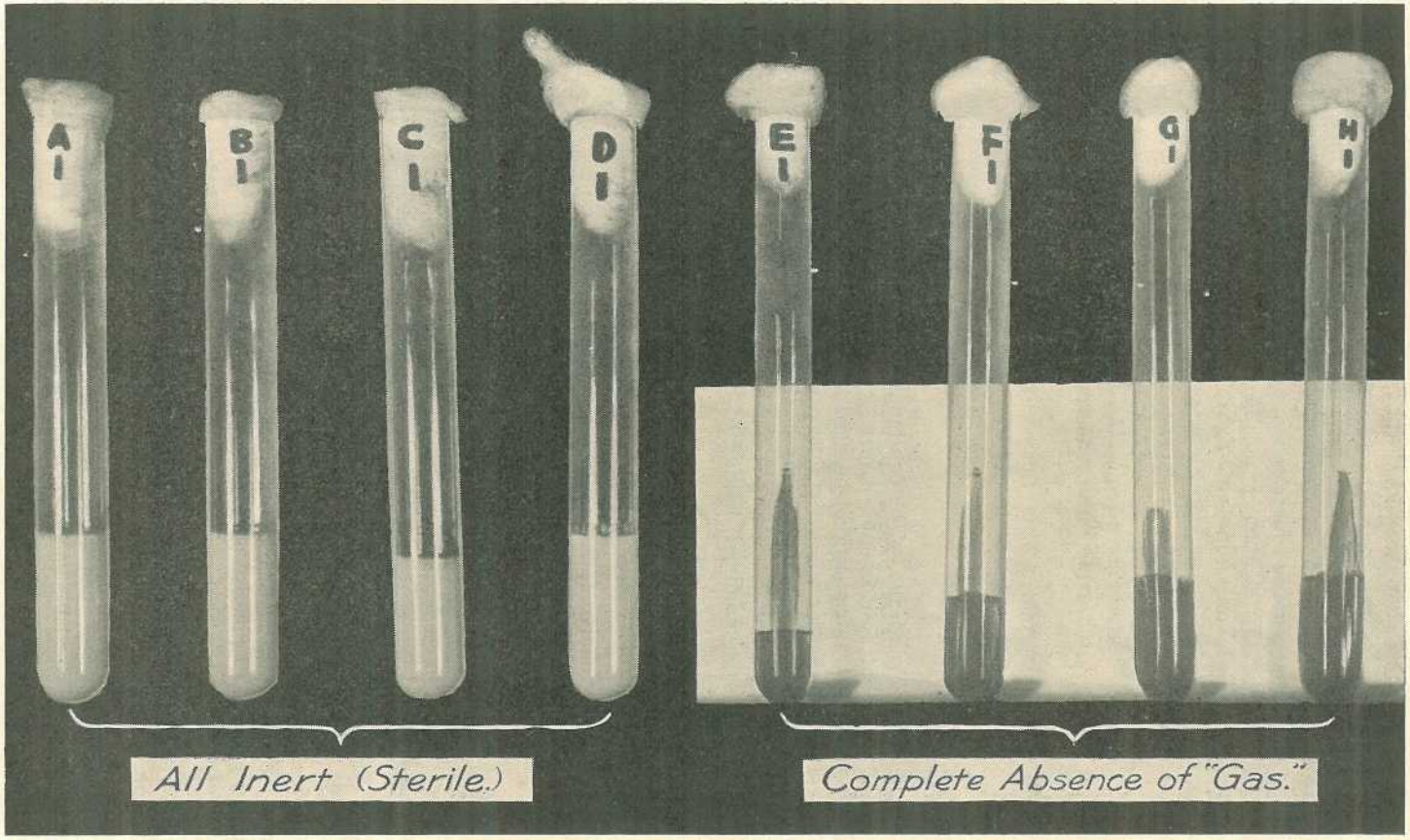


Plate 99.

AFTER STERILISATION (Wet Steam 2 Minutes).—Note the clean, firm curd and compare with Plate 98.

Take, as an example, general dairy hygiene and sanitation procedures. If these are neglected, irrespective of how effective cleansing and sterilising may be, a recontamination of previously sterilised equipment occurs as a result of environmental contamination, dust infections, slime gas coli-aerogenes infections, and other proven sources of pollution revealed in the plate exposure photographs. To combat these proven sources of contamination, apart from the recommended clean yards and bails, liming and limewashing, sterile rinses of all milking machines, buckets, cans, vats, &c., just prior to milking, has been advised.

Cold sterile water rinses from steriliser facilitate this operation, or failing this a cold chlorine rinse, the remnants of the chlorine solution being used as a careful udder wash before milking. Rejection of the foremilk then completes this first part of the dairy shed hygiene technique. *The importance of udder washing and rejection of foremilk* in both prevention and detection of udder troubles, such as mammitis, is emphasised.

Cleansing Technique.—The fundamental principle to observe in this procedure is that it does not involve complete destruction of quality affecting bacteria, nor should it be used as such. It is purely a chemical or physical process for the satisfactory removal of *milk solids and fats.* In fact, combining high temperatures with these procedures is often disastrous to equipment, milking machine rubbers and inflations, and, in numerous cases examined, baking of casein or milk solids along milk lines and droppers.

Aims of Cleansing—

(*a*) To remove milk solids.

(*b*) To dissolve fats.

(*c*) To remove soda detergents or fat solvents such as washing soda, &c.

Aims of Sterilising.—To effectively maintain a temperature above the thermal death point of most quality-affecting bacteria, in order that equipment may remain *bacteriologically sterile.* Therefore procedure of the cleansing operations shows need for ample cold rinses of dairy equipment, at least 1 gallon to each unit of milking machines, for removal of milk solids, casein, &c.

Procedure No. 2.—Ample detergent hot water rinses (use of washing soda, 1 tablespoonful per 3 gallons hot water or 1 teaspoonful of caustic soda in a similar quantity of hot water). At least 1 gallon per unit *for removal of fats.*

Procedure No. 3.—An ample scalding water rinse alone (at least 1 gallon per unit) for removal of previously used soda detergents.

Procedure No. 4.—Two minutes wet steam sterilisation for destruction of quality-affecting bacteria, with attainment of perfect sterility.

The comparisons illustrated reveal ample justification for adoption and practical application of the new recommended procedures.

Proof of their practical application is that groups of suppliers themselves, acting in conjunction with their hygiene committees, have evolved, organised, approved, and applied this specialised dairy shed hygiene technique, in an effort for uniform milk supply quality improvement.

Extension of Principles—Cheese Quality Improvement.

The factory taken was one showing an average second-grade product with a consistently poor-quality milk supply. (All suppliers except one showing, before the adoption of the improved methods, modified methylene blue reductase tests of less than half an hour and up to one and a-half hours; curds slimy, gassy, and digested, and average bacterial counts up to 20,000,000 per c.c., and cheese consistently second grade).

The first set of results involved summer milk tests, all suppliers using steam sterilisation procedures, but before the application of a uniform co-ordinated specialised dairy hygiene technique.

The Weather Conditions at the Time of Sampling: A Warm Night followed by Heavy Rain.

Distinguishing Number of Supplier.	Machine or Hand Milking and Steam Sterilisers.	Sediment Test.	Modified Reductase Test.	
			Nights.	Mornings.
		Morning.	Hours.	Hours.
2	Hand	Clean ..	4½	..
5	Machine	Clean ..	4½	..
8	Hand	Clean ..	2½	..
9	Hand	Clean ..	3	..
6	Machine	V. clean ..	4½	..
4	Machine	V. clean ..	½	2½
1	Machine	V. clean ..	2	..
7	Machine	Clean ..	4½	..
3	Hand	Clean ..	1½	..

No.	Fermentation Test. Digestion (D) Gas (g) Smooth, clean, coag. (S)	Wisconsin Curd Test.	Milk Agar Plate Counts Morning's Milk (37°C. —48 hours) Representing Initial Utensil Infection. Aim—50,000 Inert Count per c.c. with absence of Coli 1/100 c.c.	Coli Forms Absence Desired, in 1/100 c.c.
2	S	Firm, smooth, clean ..	1,000	Neg. 1/100 c.c.
5	S	Firm, smooth, clean ..	13,000	Neg. 1/100 c.c.
8	S	Firm, slight gas ..	50,000	Neg. 1/100 c.c.
9	S	Firm, smooth, clean ..	4,000	Neg. 1/100 c.c.
6	S	Firm, smooth, clean ..	1,000	Neg. 1/100 c.c.
4	D and g	Firm, slight gas and unclean	600,000	+ 1/100 c.c.
1	S	Firm, gas, unclean ..	100,000	Neg. 1/100 c.c.
7	S	Firm, smooth, and clean	20,000	Neg. 1/100 c.c.
3	D and g	Firm but gas and unclean	2,000	+ 1/100 c.c.

No.	Litmus Milk Inoculation.	Direct Microscopic Observations (Night's Milk).	Reason.	Grade Consideration of all Tests for First Grade Standard.
2	Clean acid fermentation	Bacterial and leucocyte count good	..	Satisfactory
5	Clean acid fermentation	Bacterial and leucocyte count good	..	Satisfactory
8	Acid, slight gas ..	Bacterial count fair; leucocyte count good	..	Satisfactory
9	Clean acid fermentation	Bacterial count fair; leucocyte count good	..	Satisfactory
6	Clean acid fermentation	Bacterial count good; leucocyte count good	..	Satisfactory
4	Acid digestion and gas	Bacterial count very high; leucocyte count good	Utensil infection	Unsatisfactory
1	Acid, slight gas ..	Bacterial count fair; leucocyte count good	Utensil infection	Satisfactory
7	Clean, acid fermentation	Bacterial and leucocyte counts good	Utensil infection	Satisfactory
3	Acid, digestion, gas	High bacterial and leucocyte counts	With confirmed mammitis	Unsatisfactory

The results reveal the comparative improvement after the addition of steam sterilisation procedures, but with still need for more uniform results with individual suppliers.

An educational and instructional campaign among the suppliers, combining the dairy shed hygiene technique with steam sterilisation, gave the following final set of results on summer milk tests:—

Distinguishing Number of Supplier.	Modified Reductase Test.		Milk Agar Plate Count in Morning's Milk representing Initial Utensil Contamination Aiming at 50,000 per c.c. Total Count of Inert Types with Absence of Coli.
	Night's Milk.	Morning's Milk.	
	Hours.	Hours.	
1	3	Over 6½	2,000
2	4	Over 6½	1,000
3	Over 6½	Over 6½	6,000
4	3	Over 6½	120,000
5	Over 6½	Over 6½	13,000
6	6	Over 6½	1,000
7	4½	Over 6½	20,000
8	5	Over 6½	5,000
9	6½	Over 6½	7,000

Most of the bacteria now occurring were chiefly desirable lactics. At the corresponding period last year, and prior to addition of steam sterilisation and dairy hygiene procedures this year, all except supplier No. 2 revealed modified reductase periods varying from one-half to one and a-half hours as well as dominance of bacteria detrimental to cheese quality, and this at a time when cooler climatic conditions prevailed.

The five machine-milking suppliers previously the worst are now included among the best. All of the suppliers are now producing satisfactory milk quality and, furthermore, the improvement has been maintained over a twelve months' period.

The marked improvement in the quality of the supply is reiterated, and the importance of the improved methods by both suppliers and factory in the production of the best quality cheese is stressed, and the enthusiasm of the suppliers and factory manager in their attempts to attain ideal bacteriological standards commended. This personal element and reliance on the individual for successful application of any new technique is, it is repeated, of first importance.

Cheese Quality.

Cheese manufactured from the pure-quality milk supply mentioned was held over a period of three months to judge the "type of maturation" of this so-called "clean milk" cheese. The milk supply quality was such as to make neither addition of hydrochloric or calcium chloride necessary during treatment, despite pasteurisation at 155 and 158 deg. F.

In the cheese maturity tests held from 15th November, 1938, to 2nd March, 1939, four loaf cheeses were held at 70 deg. F. On final grading all experimental batches of "choicest" grade standard were awarded 93 points. A progressive improvement from 88 points previously to excellent maturation, good flavour, body, and texture was recorded.

Furthermore, periodic tests have revealed maintenance of milk quality improvement since these original tests were applied. Also maintenance of cheese quality improvement was reflected in the many show successes of this factory over the last twelve months.

Following the extension of the principles from individuals to groups of individuals and a cheese factory, the satisfactory results obtained merited extension to a group of cheese factories. Here, again, similar results were obtained, giving generally a more uniform quality milk supply and a more uniform quality cheese.

The results of this group are reflected in the many show successes and continous grading results obtained. Moreover, cheese quality from this group improved to the extent of 51 per cent. choice grade standard with the rest first grade.

The maintenance of quality in all cases has been the most gratifying feature of the original tests applied, and surely sufficient economic justification and incentive for a general adoption of the fundamental principles involved by the whole of the cheese industry in this State, especially in view of the British price differentiation of pay on a quality basis.

Following are details of all tests applied by dairy research officers of the Department of Agriculture and Stock, covering all cheese factories and suppliers of the State over a period of two years testing, including two winter and two summer periods. The standards observed for suitable quality cheese manufacture, computed on the modified methylene blue reductase test, were:—

Class 1—Good milk, not decolorised in five hours.

Class 2—Milk of fair average quality, classed as satisfactory, decolorised in less than five hours, but not less than two hours.

Class 3—Unsatisfactory milk decolorised in less than two hours, but not less than thirty minutes.

Class 4—Very unsatisfactory milk, decolorised in thirty minutes or less.

For cheese industry purposes of classification, two hours and more is satisfactory; below two hours, unsatisfactory.

On these two divisions are based the accumulated summarised information of Tables 1, 2, and 3 and 4, covering comparisons of—

(*a*) Hand *versus* machine milking.

(*b*) Machine milking results with steam sterilisation.

(*c*) Machine milking results without steam sterilisation.

(*d*) Combined results.

Machine milking *versus* hand milking, covering 20 factories involving 559 suppliers tests and 245 suppliers, covering chiefly summer milk tests, and producing at the time of testing dominantly second grade (some thirds and some rejected), was studied.

TABLE 1.

Number of Suppliers—245, 20 Factories.

Number of Tests.	Under 30 Minutes.			30 Minutes to 2 Hours.			2 Hours to 5 Hours.			Over 5 Hours.		
	Hand.	Machine.	Steam Sterilisation.	Hand.	Machine.	Steam Sterilisation.	Hand.	Machine.	Steam Sterilisation.	Hand.	Machine.	Steam Sterilisation.
559 ..	123	117	15	73	75	10	48	47	21	16	9	5
100% ..	22 %	20·8 %	2·7 %	13·1 %	13·4 %	17·9 %	8·6 %	8·4 %	3·8 %	2·9 %	1·6 %	·8 %

Table 2 is showing a comparison of hand-milking tests with machine-milking tests, covering all suppliers of the State's cheese industry over a period of two years in three separate groups, and steam steriliser tests over a six months' period since the inception of compulsory steam sterilisation.

TABLE 2.

Modified Methylene Blue Reductase Test.

Suppliers in Group.	Number of Suppliers Tests.	0 to 2 Hours. Unsatisfactory.			Over 2 Hours. Satisfactory.		
		Hand.	Machine.	Steam Sterilisation.	Hand.	Machine.	Steam Sterilisation.
(1) 653 ..	1,437	401	335	..	464	237	..
(2) 72 ..	814	146	270	78	107	93	120
(3) 245 ..	559	196	192	25	64	56	26
970	2,810	743	797	103	635	386	146

Comparing hand milking with machine milking over a two-year period—

Total hand-milking tests, 1,378—
Satisfactory: 634, equals 46.9 per cent.
Unsatisfactory: 743, equals 53.1 per cent.

Total machine-milking tests, 1,183—
Satisfactory: 386, equals 32.6 per cent.
Unsatisfactory: 797, equals 67.4 per cent.

The results of the first group of suppliers' tests, including accumulated results to November of last year (prior to steam sterilisation being made compulsory), were:—

Hand-milking tests, 865—
Satisfactory: 464, equals 53.6 per cent.
Unsatisfactory: 401, equals 46.4 per cent.

Machine-milking tests, 572—
Satisfactory: 237, equals 41.4 per cent.
Unsatisfactory: 335, equals 58.6 per cent.

Comparative results following a three months' instructional campaign since January this year, covering 72 suppliers, and comparison with steam steriliser tests, were:—

Hand-milking tests, 253—
Satisfactory: 107, equals 42.3 per cent.
Unsatisfactory: 146, equals 57.7 per cent.

Machine-milking tests (without steam sterilisers), 363—
Satisfactory: 93, equals 25.6 per cent.
Unsatisfactory: 270, equals 74·4 per cent.

Machine-milking tests (with steam sterilisers), 198—
Satisfactory: 120, equals 60.6 per cent.
Unsatisfactory: 78, equals 39·4 per cent.

Results of tests, principally summer milks, at factories producing at the time of testing dominantly second, some third, and some rejected cheese, covering 245 suppliers, commencing in January of this year, were:—

Hand-milking tests, 260—
Satisfactory: 64, equals 24.6 per cent.
Unsatisfactory: 196, equals 75.4 per cent.

Machine-milking tests (without steam sterilisation), 248—
Satisfactory: 56, equals 22.6 per cent.
Unsatisfactory: 192, equals 77.4 per cent.

Machine-milking tests (with steam sterilisers), 51—
Satisfactory: 26, equals 51 per cent.
Unsatisfactory: 25, equals 49 per cent.

All results since inception of compulsory steam sterilisation requirements last December:—

Total machine tests (with steam sterilisers), 249—

Satisfactory: 146, equals 58.6 per cent.

Unsatisfactory: 103, equals 41.4 per cent.

Total machine tests (without steam sterilisers), 611—

Satisfactory: 149, equals 24.4 per cent.

Unsatisfactory: 462, equals 75.6 per cent.

The results, therefore, prove conclusively that, under average conditions, machine-milking has produced an inferior quality milk (bacteriologically) than hand-milking.

With the ever-increasing use of milking machines, the dominance of inadequately cleansed and sterilised machines as the cause of defective quality—especially in relation to the incidence of contagious mammitis—it was realised that some cheap yet effective measure had to be adopted.

This is provided for in the recommended steam sterilisation and dairy hygiene technique.

(1) *"Machinitis" or Mammitis and Quality.*—In support of this, apart from the foregoing results, the aspect of mammitis in dairy cattle, as having a very important influence on milk and cheese quality is quoted. The association of the two is too well known to enlarge on further. Two specific cases investigated very recently illustrate further need for its universal adoption.

(*a*) An outbreak of virulent staphylococcal mammitis in which a herd of forty-nine cows was reduced to nine milking cows as a result of the spread of infection through unsterile milking machine teat cup rubbers and inflations. The causal organisms were actually isolated from these points on the requisite blood agar, milk agar, and their distribution confirmed with brown thymol, blue field tests, with further confirmation by direct microscopic observations and bacteriological methods.

(*b*) Another outbreak of streptococcal mammitis examined revealed, approximately, one-third of a herd infected, with increasing spread of the disease. Five had reached a chronic condition and were in the process of losing quarters; others showed all four quarters affected. Spread was attributed to lack of observation and application of a very important fundamental principle of the technique—namely, rejection of the foremilk, so important in the early detection and prevention of spread, with the accompanying specialised hygiene technique.

It also is reiterated that the modified blue test reveals, too, the effect of such udder abnormalities, the leucocytes assisting reduction.

(2) The tabulated results also reveal the influence of the personal element. The three months' campaign reveals the material benefits of steam sterilisation and correct hygiene.

(3) The final results involving milking machines with steam sterilisers and milking machines without steam sterilisers show an appreciable increase in the satisfactory compared with the unsatisfactory percentages.

(4) Aims of the extension work on an educational basis have been to let the new procedures prove themselves, even if there is only one in each factory district.

(5) Finally, that the standards of classification chosen in the tabulated results facilitate the application of grading of milk supplies on a quality basis.

Grading of the Supply.

In support of grading there is the penalising effect of the unsatisfactory class degrading the satisfactory groupings. Secondly, the grading system instituted on the given standards, and classification, serve as a guide to the supplier as to whether a greater effort is necessary for suitable quality production. The competitive aspect, as well as the psychological effect, of testing is proving beneficial in many of the factories in which testing and grading on the modified methylene blue reductase test is now a routine procedure.

The grading standards of classification noted in the two groups are sufficiently wide and representative of all tests completed to ensure manufacture of a first-grade product, the limiting factors being the condition and quality of the starter culture used and the system of treatment and manufacture. Furthermore, the standards were fixed at a period during which the direct relationship of milk quality and cheese quality was revealed.

Finally, in support of grading on the classification is the fact that the present British price differentiation of pay on a quality basis facilitates grading and paying the supplier on a similar quality standard.

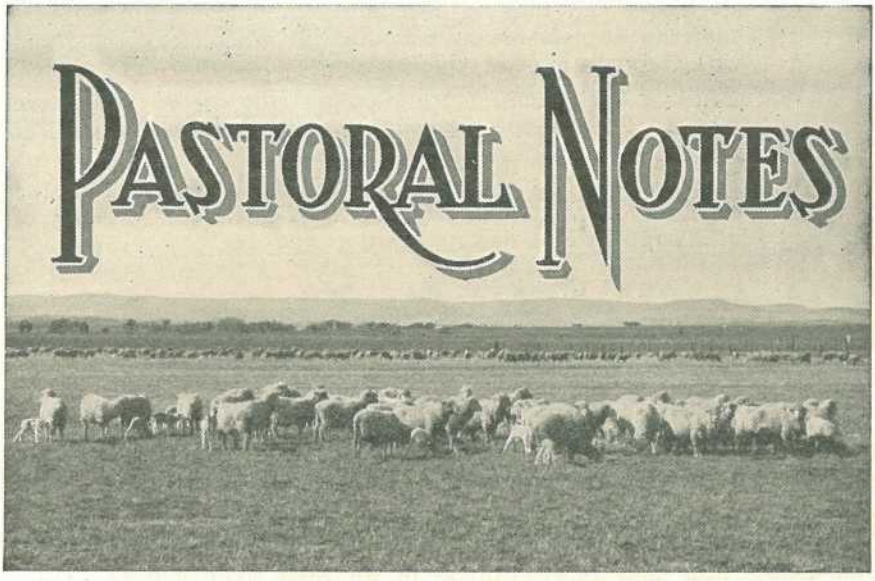
All standards for the satisfactory and unsatisfactory classes were classified on night samples over period of winter milk tests (dated from 1st April to 30th September), and on night and morning samples for summer milk test periods dated 1st October to 31st March.

For all practical purposes, the night milk reveals the limiting factor for cheese quality, and, judged on a two-hour basis for satisfactory quality, gives sufficient play for the elevating or diluting effect of the morning's supply with its germicidal period. The true state of efficiency of steam sterilisation and dairy hygiene procedures practised by suppliers is more forcibly judged on the hygienic condition of the night's milk than that of the morning. At the same time, the classification is sufficiently wide for cheese manufacture of first-grade standard to include the condition or hygienic quality of the treated morning's milk also. The addition of similar cleansing and sterilising procedures after the night's milking must, however, be considered for a suitable hygienic condition in the morning's supply.

With the recent cheese factory improvements in Queensland excellent conditions for quality cheese manufacture have been established.

ACKNOWLEDGMENT.

The assistance of Mr. E. B. Rice, who made available, for use in this paper, the results of 1,437 tests on the milk of 653 suppliers during the period July, 1938–September, 1939, and of Mr. W. J. Park for the results obtained from his examination of 814 samples of milk from 72 suppliers during his investigations in the Mount Tyson district, is acknowledged.



Soda Bush—A Plant Poisonous to Stock.

SODA Bush is a native plant of wide distribution in Western Queensland, northern parts of New South Wales, and parts of South Australia. It is particularly prevalent in the Longreach, Blackall, and Charleville districts.

Soda Bush is an annual with a perennial root stock about 1 to 2 ft. high. The leaves are placed alternately on the stems and are fleshy and nearly cylindrical. The flowers are small and are found in the forks of the leaves. It belongs to the saltbush family of plants.

Although widely distributed in the sheep districts and has no doubt caused heavy mortalities in past years, it never came under suspicion as a poisonous plant until quite recently when losses occurred in travelling sheep in the Ilfracombe district. Since then, other losses have occurred in the Longreach and Blackall districts.

Ordinarily, the plant is, apparently, not very palatable to sheep, and they rarely touch it. When, however, sheep are untrucked after a long train journey and are very hungry, they will eat the plant quite readily. Similarly, sheep which have been travelling over a bare stock route for two to three days will eat the plant when brought on to it. These facts have been noted by competent observers. The important feature, therefore, of Soda Bush poisoning is that there is always a previous history of semi-starvation to be followed by grazing in an area where the plant is abundant.

Symptoms Noted.—Frequently the animals are not seen sick and are found dead in the "break" in the morning. When seen, however, they appear dull and listless and often disinclined to move. When forced to move, they may rush forward for several yards and then fall. This may happen repeatedly. When an animal becomes too ill to stand up, it lies flat on its chest with its head stretched out on the ground in an attitude of sleep. This is one of the peculiar attitudes adopted, and appears to be characteristic of this particular condition. There may be some return of the fluid contents of the stomach to the mouth and throat, and this runs away through the nose or the corners of the mouth. Sometimes this material passes down the windpipe and causes pneumonia.

Sometimes poisoning may become chronic in character, and the animal is sick for several days. This is probably due to the ingestion of smaller quantities of the plant. The animal is dull and listless, and the breathing is increased. It is tucked up, and diarrhœa may be present. Such animals, if forced to travel, gradually become weaker and death follows.

Post-mortem.—There is sometimes a pneumonic condition of the lungs, and there may also be an inflammation of the fourth stomach and small intestines. Fluid may be present in considerable amount in the chest cavity.

Experimental Feeding.—Quantities of the plant, consisting of both old and young growths, were gathered at different times during the 1938-39 summer and sent to the Animal Health Station, Yeerongpilly, for experimental feeding. As a result, it was shown that sheep could be poisoned quite easily by feeding the ground-up plant, or by soaking the plant in water and then drenching the animals with the fluid obtained. Amounts as small as one pound killed some sheep, while others took amounts up to 5 lb. Probably the susceptibility of sheep varies, or, perhaps, the toxic agent may vary in amount in different plants.

General Remarks.—Since sheep losses are nearly always associated with a history of previous starvation, it is imperative that care be taken to keep hungry sheep off places where the plant is growing in profusion. If untrucked after long journeys, they should, if possible, be given a feed of lucerne if the Soda Bush is growing abundantly along the route which the sheep are to immediately travel, and particularly if other edible plants have been eaten out. It is, of course, a common feature of stock routes to find that all the usual edible grasses have been eaten out for miles from some of the western trucking areas, and very little but Soda Bush has been left growing. Once the animals have had a feed, even if only a small one, they are not likely to break away when first liberated from the yards.

SHEEP ON THE FARM.

Sheep should have a permanent place on any farm on which conditions are suitable. One of the advantages of sheep is that they provide two distinct sources of income annually—wool and mutton—besides their natural increase.

In Queensland, merino sheep constitute about 97 per cent. of our total number. This breed is especially adapted to conditions in the Central and Western districts of the State, but when forced to breed and develop in an unsuitable environment, constitutional weakness is a real risk.

British breeds have been developed and maintained under conditions where environment has influenced adaptability to Queensland conditions. In mixed farming districts these breeds—especially the pure-bred rams—can be used with advantage. The Corriedale originated in New Zealand, and the improvement of the breed has been progressive both there and in Australia. In Queensland, the Corriedale is regarded as a dual-purpose sheep coming between the merino and pure British breeds, overlapping both in adaptability to a considerable degree.

In sheep-breeding, local conditions should decide the system of production.

Sheep-breeding under diversified farming conditions where the British breeds are used is entirely different from merino breeding in the West. The merino is bred under purely pastoral conditions, and the progeny is retained for wool and mutton production. With the imported mutton breeds, the aim of the farmer is to dispose of the progeny at the earliest marketable age. To do this successfully, two major points should be observed:—

(1) The use of pure-bred rams of quick-maturing qualities suitable to location and conditions.

(2) Availability of suitable pasture or cultivated crops for ewes as soon as their lambs are dropped, and for topping off the lambs.

Other considerations of importance are the suitability of the ewe flock for wool production as well as for breeding; economy in pasturing the ewe flock from the time the lambs are taken off until the next drop of lambs; the general health of the flock and freedom from parasites, fodder provision for carrying the flock successfully through periods of scarcity; and culling the breeding flock for age while they are still capable of being fattened and sold at a profit. To start successfully in breeding, whether for wool, mutton, or for fat lambs, healthy sheep are essential. This may mean paying more for young sheep, but it will generally prove the best and safest policy.

THE DARLING PEA PEST.

When the Darling pea is in pod, its effects on animals are most noticeable. There is no medicinal treatment, but sheep noticed as affected should be removed immediately to a paddock in which the plant is not growing. Recovery is then certain and rapid, unless, of course, the animals are too far gone.

If practicable, the plants should be hoed out and destroyed. If very thick a flame thrower may be profitable to use.

One thing is certain, however, once sheep have acquired a taste for Darling pea, they will always look for it—hence the necessity of grazing these particular sheep on country where the plant does not exist.

VARIETY IN STOCK-FEEDING.

The flesh forming materials in foods (proteins) are composed of units termed amino acids. These amino acids are synthesised by plants, but it is very doubtful whether they can be "manufactured" by vertebrates.

The most useful proteins are those which contain the greatest variety of amino acids. For this reason, animal by-products—milk, eggs, flesh, &c.—stand alone. If a vegetarian diet is to be persisted with, it must be selected from a wide range of foods so that the missing amino acids in one material way may be made up from another. This explains the benefits of variety in live stock feeding.

HORSE BOTFLIES.

As warmer weather approaches, horses may become greatly troubled by botflies. These flies are bee-like in appearance and possess two wings and a slender pointed abdomen. When laying eggs, the female fly hovers around the horse with the abdomen curved beneath the body. This has given the erroneous impression that the botfly stings, but its abdomen is held in this position merely to facilitate the deposition of its eggs. The eggs are laid on the hairs of the chest, throat, mane, shoulders and legs of the horse, but more frequently on the hairs of the throat and the inside of the forelegs.

In time, the larvæ develop within the eggs and hatching occurs when the horse licks or rubs the spot on which the eggs are present. In some way or other the hatched larvæ reach the mouth of the horse and then burrow into the flesh of the tongue and cheeks. Here they remain for a little while, but eventually make their way into the stomach. When fully grown they are passed out of the animal with the dung, burrow into the ground and pupate. In the pupæ the adult botflies are formed and they emerge after a period of a few weeks.

Botflies are harmful to horses in two ways. Firstly, the horse instinctively recognises them as enemies and makes desperate efforts to prevent the female botflies approaching and laying eggs. During the botfly season, horses thus become very difficult to manage in harness, and may also hurt themselves in their attempts to avoid the flies. Secondly, the bots in the stomach may cause serious trouble. Each bot has a pair of stout hooks in its mouth, and also rows of hooks around its body. These hooks irritate the lining of the animal's stomach, and may cause ulcers and other ill-effects.

Various methods have been devised to prevent the botflies from approaching horses and laying eggs. One of the simplest and most successful is a piece of canvas attached to the horse's noseband and headstall so that it covers the throat completely. Deep sheds or brush shelters also will give protection, as the botflies will not follow the horse out of the sunlight.

For the removal of the bots from the horses's stomach, carbon bisulphide is advised. This is given in a capsule after twenty-four hours starvation at the rate of 6 cubic centimetres—about one ordinary teaspoonful—for every 250 lb. weight. The best time to treat a horse for bots is about May or June, for at this time of the year all eggs on the body will have hatched and, as no flies are about, the horse cannot become reinfested immediately after treatment.

OVERSTOCKING A WRONG POLICY.

Stocking capacity is a point in the management of pastoral lands which is often neglected. It should be accepted as a truth that two well-fed sheep will give a greater monetary return than three half-fed animals and more than four half-starved sheep. The return from properly nourished sheep would be probably even higher were their greater resistance to internal parasites taken into consideration. Some of the evils of overstocking—altogether apart from total losses—are loss in wool per head, as the result of unthrifty growth; a possible break in the staple; poor lambings; a distinct loss on those animals which should be turned off as fats; and last, but not least, the erosion of country, of which overstocking is an important cause.

From the point of view of returns alone, it will be found that over a period of years a property stocked well within its carrying capacity will average far better returns than one where overstocking is the policy of the management.

Some graziers put forward the argument that, taking lean years into consideration, they have to stock to over-capacity to make ends meet. This policy is however, considered to be wrong, especially when returns are averaged over a number of years.

CARE OF THE FAT LAMB EWE FLOCK.

Some farmers have the prospective mothers of the fat lamb drop too fat for the purpose. This is wrong in two ways, Firstly, with too much condition a light lambing is likely; and, secondly, feeding the ewes at mating time on grown crops is wasteful and unnecessary.

The ewes should be in strong store condition. It is advantageous to "flush" the ewes on green feed a fortnight before mating. No feed is too good for the flock when the lambs are dropped.

Beware of jetting with an arsenical preparation before joining. This results very often in a poor lambing. If jetting is necessary, the job should be done six or seven weeks before the rams are joined.

Crutching the ewes a month before lambing is advisable.

Careful watch should be maintained for internal parasites, and systematic drenching undertaken so as to free the ewes of the pest long before the lambing season.

Avoid unnecessary yarding with the in-lamb ewes.

Provide a lick suitable to compensate for known deficiencies in the pastures.

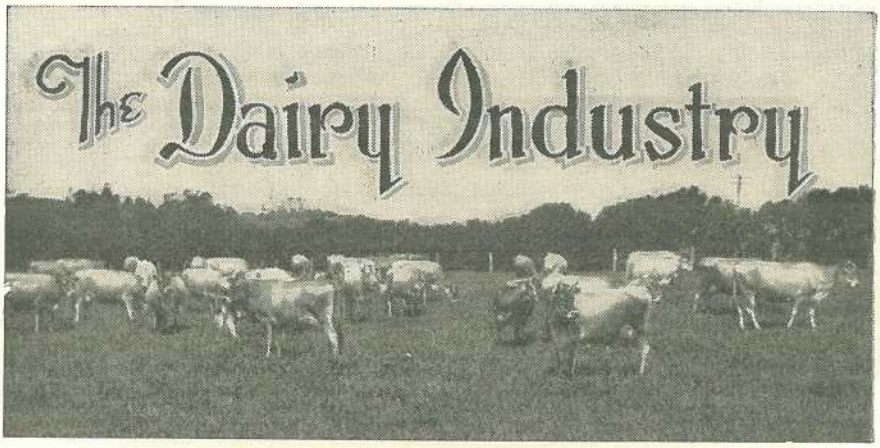
THE CORRIEDALE AS A FARMER'S SHEEP.

As an all round general utility farmer's sheep nothing beats the Corriedale. There is no better ewe for the production of fat lambs. Joined with one of the Downs rams—such as the Dorset Horn or the Southdown—the lambs they produce are first class.

Corriedale ewes are docile, good doers, and great milkers.

In Queensland there is a tendency to breed the Corriedale too fine, thus defeating the object for which the breed was evolved.

No finer wool than a 56 counts should be tolerated in the Corriedale stud. To get the fleece as fine as merino counts can only be done at the expense of constitution, one of the Corriedale's most important characteristics. Growers of pure bred Corriedale sheep would be well advised to cull rigorously any animal showing too fine a tendency.



Dairy Management.

TEMPERATURES on the average farm sometimes present a difficult problem, but good dairy management depends largely on their regulation and control. The removal of animal heat from milk and cream as soon as possible after milking or separating, followed by storage in cool surroundings, will greatly lengthen their useful life by delaying the growth and development of bacteria. Together with straining, which serves to remove the visible dirt and so reduce the numbers of micro-organisms, control of temperature forms a method whereby the farmer can definitely increase the value of his product.

Straining.—Cow hairs, flies, dust, and dung particles and other foreign matter carry with them enormous numbers of bacteria, and should be kept out of milk by every possible means, for no amount of straining can remove bacteria once they have become free in the milk. Should some visible dirt gain entrance, however, the straining of each cow's milk through a cotton-wool disc immediately after milking will minimise the damage caused.

Straining should be done once only, and should take place before cooling or separating. The disc type strainer prescribed by the Dairy Regulations is preferable to any other, since each disc is discarded after use; provided that the metal parts are scrubbed and sterilized, there is no risk of recontaminating the milk as with a cloth which has not received thorough washing and boiling; also, the finer mesh of the wad will trap smaller particles than will a cloth. If a large quantity of sediment is being removed, the disc should be changed during milking.

Cooling.—Some form of cooling is necessary to counteract rapid bacterial development; and the most usual medium for the purpose is water. Adequate water is necessary for cooling, and if the supply is insufficiently cold an evaporating device or the use of ice may be required to bring the temperature of the cooled milk to 60 deg. F. or lower, and cream to 70 deg. F. or lower. If deep well water is available the maximum advantage in temperature can be obtained by pumping it direct to the cooler or trough when required. In the case of shallow well, surface, or tank water, some means of storing it, protected from the heat of the sun, must be devised if it is to be useful as a cooling agent.

An insulated tank, through which cold water flows and in which cream cans may be placed, is a fairly satisfactory arrangement for reducing the temperature steadily with constant stirring, which also aerates the cream; the water is then run to a trough for watering stock.

For cooling and aerating milk, the best type of cooler is the endless corrugated type, which can be used in conjunction with a water-bag evaporator (filled after each cooling in preparation for the next), or with a fixed tank to which water is pumped and flows through the cooler by gravity, or with a refrigerating unit using brine. Such a cooler, having wide corrugations and no end plates, can be easily cleaned with a brush and has no awkward crevices. Porous cylindrical containers, large enough to hold a single can, working on the evaporation principle, are being used in some districts successfully, and have the advantage of being transportable and economical of water.

Refrigerating is a sure and certain way of improving quality, for, although it actually does not kill harmful bacteria, it renders them dormant and unable to cause deterioration of milk or cream. Many farmers are coming to the conclusion that the improvement in grade resulting from refrigerating their product on the farm makes it financially economical. Very little bacterial growth takes place below 45 deg. F., but the growth rate of the common milk types increases steadily above this, up to around 100 deg. F., and is, of course, favoured by summer conditions. During sultry weather, especially, extra care and precautions need to be taken with regard to cooling and cool storage of milk and cream.

Storage.—The Dairy Regulations provide for a suitable storage room (Dairy House A) for milk and cream, or for milk only a well-covered ventilated stand will suffice. A clean wet bag wrapped around a can will assist cool storage by insulation and by evaporation. Direct summer sunshine in Queensland has tremendous heating power, and the proper protection of cream left adjacent to the road awaiting the carrier is, therefore, also important. Thick timber roofing over the cream stands affords greater protection than galvanised iron, which is not permitted under the Dairy Regulations.

Careful temperature control right from the start is the key to safeguarding quality in either milk or cream production, for whatever purpose they may be required.

MANAGING THE BULL.

The bull should be kept away from the rest of the herd in a separate run securely fenced and provided with water and shelter. A small service yard and a crush to facilitate the handling of the bull when necessary should also be provided.

The advantages gained by keeping the bull away from the herd are:—

1. Calving can be regulated.
2. It is easier to decide whether or not the cow is in calf.
3. The bull's services are controlled and not wasted.
4. There is less likelihood of the cows having to return to the bull.

If the run is placed well away from a public road, any annoyance caused by a neighbour's cows breaking into the bull or the bull breaking out is avoided.

STEAM STERILIZATION OF DAIRY UTENSILS.

Research in most countries of the world has demonstrated that the most prolific source of contamination of milk and cream is the utensils with which they come into contact, many of the investigations having shown that 90 per cent. of the original contamination arises in this way.

Many hundreds of tests carried out recently in this State have revealed that under sub-tropical dairying conditions and also because of the extensive use of the milking machine—which is most difficult to maintain in a sanitary condition—utensils are of even greater import than in countries with a more temperate climate and where mechanical milking is not so common. Because of this special problem, steam sterilization on all farms operating milking machines is now compulsory under the Dairy Produce Acts. A recent investigation on the Darling Downs showed that milk produced on farms operating milking machines was decidedly inferior to that produced on farms on which only hand milking is practised. It may be confidently stated, however, that if sterilizing equipment were installed and used properly on the farms using milking machines, the milk produced would surpass in bacteriological standard that produced on the hand milking farms, for undoubtedly milk of the highest bacteriological quality can be obtained when milking machines are operated according to an approved hygienic technique, embracing steam sterilization.

The Department, by insisting on any sterilizer intended for dairy purposes being officially tested and approved before being marketed, is protecting the farmer, who now has a choice of a number of small sterilizers suitable for dairy purposes. The additional cost of the sterilizer should not be considered a bar to its purchase by anyone who can afford to equip his farm with a milking machine, for, in fact, it is a necessary adjunct. Moreover, the cost will, in many cases, soon be recouped because of a consequent improvement in cream grading.

It is sometimes suggested that "scalding" is as effective as steam sterilization. Certainly, the small dairyman may achieve consistently good results by the use of boiling water only for sterilizing, but "scalding" temperatures have been found in recent field investigations to vary from 130 deg. F. (little better than luke warm) to really boiling water, provided by a special semi-cylindrical boiler in which the cans may be completely immersed. Under every-day farm conditions, however, "scalding"—that is, pouring hot water from vessel to vessel—even in the hands of a careful supplier is not an effective substitute for steam. For sterilization to be effective, utensils should be completely immersed in boiling water—an almost impossible requirement for milking machine parts.

It is emphasised, however, that although steam sterilization only cannot be expected to solve all the problems associated with the production of a choice quality cream, it will almost certainly be successful if coupled with methods calculated to minimise the contamination from other sources besides the utensils. In this connection the salient points which should receive attention are:—

(1) Keeping buildings and equipment clean and free from dust.

(2) Rejection of foremilk.

(3) Washing of udders and milkers' hands.

(4) Thorough cleansing, immediately after milking, of all utensils in the approved way and washing of milking machines according to recommended procedures. (Sterilization is only complementary to thorough washing.)

(5) Storage of washed and sterilized utensils away from a contaminated atmosphere.

(6) Keeping milk or cream as cool as possible and away from dusty yards.

Finally, the economic aspect of steam sterilization is of particular importance. By ensuring the supply of choice quality cream—the producer gets paid for that grade, as provided for in the Dairy Regulations—a material contribution is made towards the raising of the quality of Queensland's butter output.

A CATTLE CRUSH ON EVERY FARM.

A crush for holding cattle or horses should be built on every farm. It costs little and occupies a small area; yet it saves much time and labour when full-grown stock are to be dehorned, branded, castrated, speyed, drenched, or otherwise treated. For these operations, the animal should be held in a position which allows of no movement.

The ordinary crush can be arranged to accommodate large or small animals. A series of auger holes ($\frac{1}{2}$ inch diameter) are bored about 6 inches apart along two rails of convenient height on each side of the crush. The holes should be deep enough to seat a bolt or iron pin firmly. The bolt or pin should stand 4 to 6 inches above the rail. These pins—one on each side—serve as chocks against which a cross rail may be placed. By working the animal right to the front of the crush, the pins and rails may be arranged to prevent any "backing." In a similar way the width of the crush may be adjusted to prevent lateral movement.

To secure the head of the animal, the "A" shaped bail-type of structure may be made from a double cross rail between which slide vertical poles attached to the base of the crush posts by stout hinges. With such a crush, many farm operations usually requiring four men can be done quickly and efficiently by a man and boy.

A HORN-TIPPING TIP.

Much time and energy is often wasted in the practice of tipping the horns of cattle. Some owners of stock are slipshod in their methods of removing the points of horns. In doing the job, care should be taken to ensure that the cut does not slant. Oblique or slanting saw cuts defeat the object of the operation, for, although the tips are removed, sharp, chisel-like edges remain on the horns, leaving an animal still capable of inflicting a nasty injury to another. Even when cut squarely across, tipped horns remain capable of causing severe bruises. Horns with chisel-shaped points are a menace to all other animals within reach of their possessor, and consequently a probable cause of reduced profit to the stockowner.

RIGHT METHODS IN DAIRY PRACTICE.

Some dairy farmers—especially some who have only recently established dairy herds—are often unaware of the essential points for the satisfactory and cleanly production of milk and cream.

The bacteria responsible for the spoilage of milk and cream are to be found in large numbers on the farm, and if careful methods are not used they may enter from any or all of the following sources:—

(*a*) The udder, if the animal is not absolutely healthy, and if fore-milk is not discarded.

(*b*) The cow's coat and skin, if not groomed before milking.

(*c*) Dust in the cowbail or dairy.

(*d*) The milker's hands, cloths, or person.

(*e*) Milk buckets and equipment imperfectly cleaned, or not sterilized.

The health of the cow is, of course, of first importance and the farmer must assure himself that every animal in his herd from which milk is being produced is in fit condition and free from any signs of disease.

Grooming the Cow.—Some preparation of the cow before commencing to milk is necessary in wet weather to remove the mud and dung splashed on the udder and teats, and, under summer or drought conditions, the dried dust, which is equally dangerous to milk quality.

The flanks and tails should be kept free from caked mud and dung by the occasional use of a currycomb, and the dust removed as often as necessary by grooming with a stiff brush dipped in clean water. It is a common practice on "model" farms to keep the hair on the flanks as well as the udder clipped short to avoid the collection of dust and dirt. Occasional clipping and regular grooming will make the daily routine of keeping the udder clean a very simple task. It is only when cows have been neglected that the washing of udder and flanks takes any great length of time.

The udder and teats should be washed before each milking. This is best done with a cloth (preferably of the woven type) kept for the purpose, and a bucket of clean water, using a separate cloth, with a second lot of clean water, if necessary, for finishing off the udder. A small amount of potassium permanganate (Condy's crystals) or some chlorine compound, added to the water is an extra precaution observed by many farmers, which is advisable if there are any cases of sore teats, or where the water used is of doubtful purity. The teats are left damp, but not dripping, so that any remaining dust or loose hairs will adhere to the surface and not fall into the milk. Uddercloths must be washed out and boiled every day, otherwise they become a dangerous source of bacteria and the object of washing the udder will be defeated. Both cloths and bucket should not be used for any other purpose.

With practice, this routine preparation of the cow for milking can be very quickly and yet thoroughly carried out. It can be done by a boy, and the time spent—one minute or less per cow—is negligible compared with the reduction in the number of bacteria gaining entrance to the milk and cream from this source.

POLLED CATTLE.

In any programme of breeding or of grading up existing herds, the introduction of polled stock should be regarded as a necessity. Shorthorns and Herefords represent the bulk of the beef cattle in Queensland. The polled Shorthorns and Herefords are a comparatively recent development and the percentage of polled stock which will result from crossing with horned breeds is uncertain.

With the so-called "natural polls," the power to transmit this characteristic is marked. It is most noticeable in the Galloway breed, but this type is not largely represented in Australia.

Red polled bulls crossed with horned breeds or their crosses may produce a large percentage of hornless stock, but the prepotency of Aberdeen Angus bulls with respect to colour, conformation, and hornlessness is superior. From 80 to 90 per cent. of the calves obtained when Aberdeen Angus bulls are mated with horned stock of mixed breeding are black in colour and most of them hornless.

VEALER CALVES.

Provided a calf is kept on the mother to allow it to reach a live weight of about 80 lb., a satisfactory return is assured when marketed. Large numbers of calves are being slaughtered annually for export as boneless veal, and the trade has reached such proportions that buyers are usually operating in all dairying districts. It is well worth while to keep the calf for a while before selling for slaughter. A calf responds quickly to a few days' suckling, and this can quite easily mean the difference between an underweight and overweight calf—a matter of at least 5s. in its value.

POINTS OF A DAIRY HEIFER.

In the selection of a dairy heifer, the form and general character will, to a great extent, indicate whether she will develop into a good producer. When a heifer is quite young, the trained eye of the judge can see its dairy value and can discern the dairy type as distinct from the beef type. The production records of her ancestral dams on both sides are important factors in determining her future dairy value, while constitution is also important.

The form of the heifer with a future as a profitable producer is, in miniature, that of a good type, fully-developed dairy cow. Dairy characteristics are indicated by an absence of surplus flesh; she is somewhat angular and spare. The head is typical of her breed, the eyes large and bright, and muzzle large, ears of average size, neck lean and lengthy, sloping with the shoulders. She is sharp over the shoulders, ribs well sprung, with good heart girth. The forequarters are light. Digestive capacity is indicated by the depth through the barrel from the centre of the back to the navel. Good depth indicates ample capacity to convert food into milk. The greater the depth through the middle, the greater the production is likely to be. The back is straight. There is a good length from the hip to the pin bones, and from the hip to the flank. The thighs are flat and free from fleshiness; the line of the thigh is incurving. The bones should be light and not coarse. The tail should be thin and free from flesh. All of these points should indicate that there is no tendency to lay on flesh.

The udder (as yet undeveloped), milk veins, and wells are reliable indications of the heifer's future value as a dairy cow. The skin covering and surrounding the immature udder is soft and loose with teats well placed. The milk veins can be followed with the finger and milk wells gauged. Comparatively well-developed milk veins and large milk wells also are important points in judging a dairy heifer.

VARIATIONS IN CREAM TESTS.

Some dairy farmers wonder why their factory returns show variations in the fat tests of their cream. Actually, variations are bound to occur.

Conditions under which milk is separated lead to changes in cream tests, as shown by the following facts:—

The separator should always be run at the speed directed by the manufacturer. It is better to turn at too high a rate than too low, for in the latter case the fat loss in the skim milk is increased in proportion to the decrease in the number of revolutions.

The milk must be allowed to enter the bowl freely during separation. The level is automatically controlled by the float, and if the flow is partly shut off a higher testing cream will result. An over supply will result in a lower testing cream, and, more important still, excessive fat loss will occur.

Milk is at the best temperature to be separated as it comes from the cow, as it is less viscous than at lower temperatures, so runs easily though the separator, and more perfect separation of the fat results. At lower temperatures, due to the viscosity of the milk, separation becomes more difficult with greater fat losses. It is doubtful whether any machine will do good work if the milk is below 80 degrees Fahrenheit.

The quantity of skim milk or water used to flush the bowl usually varies considerably from day to day, and may cause a variation in the test of 2 to 5 per cent., depending on the quality of cream. Vibration of the separator causes the skim milk and cream to be shaken together, so that they do not find their way to their respective outlets. Fat losses are increased by the escape of fat globules through the skim milk outlet.

Other factors which influence fat losses are the cleansing of the separator and the condition of the milk, but these should not cause any difficulty where there is a proper appreciation of the necessity of hygienic methods.

There is a daily variation in the fat content of the mixed milk from the herd, and this is sometimes appreciable. This affects the test of the cream, but does not influence the quantity. For example, if a herd produced 100 lb. of milk with a fat test of 4 per cent., there would be 4 lb. of butter fat, while, if the fat were 5 per cent., 5 lb. of butter fat would be the result.

DAIRY CATTLE—PURE-BRED OR GRADES?

The question is often asked: Which is the more profitable—pure-bred or grade dairy cattle? The difference in value of pure-bred and high-grade dairy cattle lies in the higher selling price of the pure-bred. Dairy farms which are so equipped that they can handle the record work effectively will find more profit in pure-bred than in grade cattle. There is a steady market for high-quality, pure-bred cattle at prices which net good returns to the breeder. Whether pure-bred stock will show the best results with any particular dairy farmer depends, however, on his keeping authentic records, and also on his ability as a salesman. Pure-bred cattle which a breeder is unable to sell are no more valuable to him than an equal number of good grades.

A herd of carefully selected grade cows will produce as heavily as the average pure-bred herd, for the reason that they can be culled more closely, as their lower value does not encourage keeping an animal which is not a profitable producer. There is always a good demand for the female offspring at payable prices. Any person going in for dairying for the purpose of producing milk or cream, and not with the idea of gaining a large part of his income from sale of stock, may do quite as well with grades as with pure-breds.

As in most things, success with dairy cattle depends on the individual farmer himself, and whether grade or pure-bred cattle are more desirable can be settled only when the particular conditions surrounding the individual case are considered.

It is sometimes stated that grade cows are better than pure-bred animals. This is not so, but it is true that some grades are better than some pure-bred stock.

One very important fact to remember, however, is that the herd sire should always be a pure-bred. Unfortunately, this is not sufficiently understood by some Queensland dairy farmers, and this accounts to a very large extent for the poor type of dairy cattle one sometimes sees when travelling through the country.

Paddocks for Pigs.

FARMERS who have not already adopted the practice are advised to give careful consideration to the advantages of running pigs on the grazing system as compared with the intensive penning system which, until a few years ago, was the recognised practice of most pig keepers.

There is little doubt that the old custom of confining pigs to small pens resulted from the desire to produce very fat carcases. Present-day buyers demand leaner pork and bacon, so it is necessary to alter pig-raising practice accordingly, especially in respect of breeding, feeding, and penning. Provided pigs are bred to the correct type—that is, pigs intended for light porkers bred from quick-maturing stock, and pigs intended for baconers bred from later-maturing stock—they may be kept under grazing conditions from birth until fit for slaughter with very good results. Pigs kept in paddocks throughout their lives have a tendency to grow rather than fatten, and it is the lean, growing pig and not the fat pig which is required for meat.

When grazed, pigs find a lot of their food in the form of pasture or forage crops specially grown in the pig paddocks, and these foods usually require less labour and are cheaper than other pig foods. The pigs not only do their own harvesting, but also return a good amount of manurial matter to the soil, thus maintaining or improving soil fertility.

With the run of a good paddock containing some pasture or green crop, there is very little chance of pigs suffering from mineral or vitamin deficiency. This is a decided advantage over the intensive penning system, in which ill-health often results from a lack of knowledge or care in attempting to supply a complete diet. Penned pigs often suffer from diatetic disorders, and when turned out on pasture recover rapidly.

Under the intensive system, it is necessary to have buildings, floors, and drains well constructed in order to maintain a safe standard of hygiene. This also means extra labour and water for cleansing pens.

There is little, if any, difference in the costs of establishing a good paddock piggery and a good intensive piggery. One of the most important features of a paddock piggery is that the work of tending the pigs is much more congenial, for the only cleaning-up of the piggery consists of cultivating or resting the pig paddock and moving the sheds and troughs, which should be built on skids to allow of easy transport.

Probably the most practical method of controlling worm infestation in pigs is to run them in paddocks which can be cropped, fed off, and ploughed in rotation. This system and the use of moveable equipment is a very satisfactory method of pig raising under Queensland conditions.

RISK OF FEEDING RAW OFFAL TO PIGS.

On many farms a fat beast is killed occasionally for domestic use. Portions of the carcase and viscera are sometimes fed raw to pigs. These form a valuable pig food if cooked; but, if fed raw, the health of animals may be endangered. For example, when an animal is affected with tuberculosis, the primary lesions in the organs, being small, may escape detection. Although the carcase may not be grossly affected, there is a real danger to pigs—especially young ones—if fed with uncooked material from a diseased beast.

Under the Cattle Slaughtering Act, the Diseases in Stock Act, and the Pig Industry Act the feeding of any meat offal or blood to pigs, unless it is thoroughly cooked, is a serious offence.

CORN COB CHARCOAL FOR PIGS.

A good use for the corn cobs (cores) that accumulate on most farms, and around piggeries, is to make charcoal of them. The cores are of little value as a food for pigs because of their coarse, dry fibre content, and even if the whole cob (grain and core) were ground, it is doubtful whether it would be worth the trouble.

After the pigs have chewed all the corn from the cob, the waste cores and husks may be raked toogether into a pile and burned. When the heap is a mass of red hot coals, water may be poured over the pile. The partially charred cores, when cold, may be gathered for the pigs. Bones should also be gathered and burned, and added to the charcoal made from the cores. This cleaning up serves a double purpose; it gets rid of matter that would otherwise accumulate and become a nuisance, and provides charcoal and mineral matter for the pigs.

WHEN SELLING PIGS.

Porkers should be marketed at an age and weight to suit export market conditions, as well as the local trade. Best trade weights, for prime conditioned pigs, range between 60 lb. and 90 lb. dressed (approximately 95 lb. to 139 lb. live weight). For local markets, the best range is 60 lb. to 80 lb. dressed weight (95 lb. to 130 lb. live weight). Porkers should be in good condition, free from bruises, whip marks, or other faults, and be protected from the effects of severe heat; otherwise, they will not dress out to advantage on slaughter. Lighter weights and very thin pigs are not profitable as porkers, and at factories and meatworks will only be paid for at valuation.

Bacon pigs for local markets should be 90 lb. to 130 lb. dressed weight (approximately 140 lb. to 185 lb. live weight) with added range to 160 lb. dressed weight (220 lb. live weight) at slightly lower rate per lb. dressed. For export, the range of weights varies from 120 lb. dressed weight (175 lb. live weight) to 160 lb. dressed weight (220 lb. live weight), but the heavier pigs should not carry too much fat; otherwise, they are subject to reduction in price or to rejection. For local markets also, there is a strict limitation to the percentage of fat, and factories prefer pigs in meaty condition with only a slight covering of fat.

Sows for small goods trade should be in good condition, and should have weaned their litters two months or more before marketing; also, they should not be in pig any more than one month, if in pig at all. Sows close to farrowing and those farrowed recently are liable to condemnation at the factories. Poor brood sows and poor stags are useless and will not be accepted, while boar pigs are useless for meat purposes until castrated, and then well fed for approximately two months, the time depending on the progress made after the operation.

In every instance the greatest care should be taken to avoid bruising and damaging the pigs in transit, especially when loading and unloading. Pigs carted to country sidings for trucking or sale should not be fed immediately before despatch, as such feeding is conducive to heavier shrinkage and to digestive disorders in transit.

It is again emphasised that under the Queensland Pig Industry Act all pigs must be branded by the vendor before sale, barter, or exchange. Full information on any of these points is obtainable from the Department of Agriculture and Stock, Brisbane.

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire ..	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	Australorps
E. J. Blake, Rosewood	Sunnyville ..	White Leghorns, Australorps, White Wyandottes, and Rhode Island Reds
W. Brown, Waterworks road, Ashgrove	Strathleven ..	White Leghorns
A. F. Buchler, Milman	Pincrow ..	White Leghorns
J. Cameron, Oxley Central ..	Cameron's ..	White Leghorns and Australorps
M. H. Campbell, Albany Creek, Aspley	Mahaca ..	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlington ..	White Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard ..	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
T. G. Crawford, Stratford, via Cairns	Rho-Isled ..	Rhode Island Reds
B. Cross, Apple Tree Creek, Childers	Spring Hill ..	White Leghorns, Australorps, and Langshans
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	Australorps, White Leghorns, and Rhode Island Reds
O. M. Dart, Upper Brookfield ..	Woodville ..	Australorps, White Leghorns, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla ..	Dixon Bros. ..	White Leghorns
W. Easson, Formosa road, Tingalpa	Grassdale ..	White Leghorns and Anconas
E. O. F. Eckert, Laidley ..	Laidley ..	Australorps, White Leghorns, and Langshans
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner ..	Australorps
Elks and Sudlow, Beerwah ..	Woodlands ..	White Leghorns and Australorps
B. E. W. Frederich, Oxley road, Corinda	Glen Albyn ..	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	Australorps and White Leghorns
Gisler Bros., Wynnum ..	Gisler Bros. ..	White Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Grice, Loch Lomond, via Warwick	Kiama ..	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. and C. E. Gustafson, Tannymorel	Bellevue ..	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby ..	White Leghorns and Anconas
H. Hufschmid, Ellison road, Geebung	Meadowbank ..	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
S. W. Kay, Cemetery road, Mackay	Kay's	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Brown Leghorns, and Australorps
W. S. MacDonald, Box 208, Babinda	Redbird ..	Rhode Island Reds and Anconas
F. McNamara, Vogel road, Brassall, Ipswich	Frammara ..	White Leghorns and Australorps
A. Malvine, junr., The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	Australorps and White Leghorns
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
C. Mengel, New Lindum road, Wynnum West	Mengels ..	Australorps
J. A. Miller. Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, White Leghorns, and Brown Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen ..	Australorps and White Leghorns
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Light Sussex, and Silver Campines
S. V. Norup, Beaudesert rd., Cooper's Plains	Norups ..	White Leghorns and Australorps
H. W. and C. E. E. Olsen, Marmor	Squaredeal ..	White Leghorns, Black Leghorns, Australorps, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Langshans, Rhode Island Reds, Light Sussex, White Wyandottes, Khaki Campbell Ducks, Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Douglas street, Oxley Central ..	Pennefathers ..	White Leghorns and Australorps
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Brown Leghorns, Australorps, Langshans, White Wyandottes, Rhode Island Reds
G. R. Rawson, Mains road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View ..	White Leghorns and Australorps
H. K. Roach, Wyandra ..	Lum Burra ..	Australorps and White Leghorns
W. G. Robertson, Bilson road, Nundah	Ellerslie ..	Australorps, Light Sussex, and Plymouth Rocks
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa ..	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
J. Steckelbruck, The Gap, Ashgrove	Cosy Nook ..	White Leghorns and Australorps
A. G. Teitzel, West street, Aitkenvale, Townsville	Crescent ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns and Australorps
P. and K. Walsh, Cleveland ..	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Atherton ..	Weaver's ..	Australorps, White Leghorns, Buff Leghorns, Wyandottes, Anconas, Indian Game, Rhode Island Reds, Barred Rocks, Buff and Black Orpingtons
H. M. Witty, Kuraby ..	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps
R. H. Young, Box 18, Babinda	Reg. Young's ..	White Leghorns, Australorps, and Brown Leghorns

BLACK COMB DISEASE IN FOWLS.

Black comb disease in poultry occurs frequently throughout the State from October to March. It usually affects laying hens, and is responsible for heavy losses to the industry either by death or decreased egg production.

Where treatment is prompt the mortality does not appear to be as extensive as when treatment has been delayed. Again, early treatment appears to assist in getting affected birds back into production much more quickly than when it has been deferred.

The first indication of the disorder is a bird's pronounced loss of appetite, followed in the course of a few hours by a darkening of the comb. In fact, it is not uncommon for 25 per cent. of the flock to have a very darkened comb within 24 hours of the first sign of the trouble.

In the early stages of this disease, the temperature of sick birds rises. This induces thirst. As the disease develops, little desire for water is in evidence, and as treatment for this trouble is given by means of the drinking water, the necessity for prompt action is obvious.

On further examination of the sick birds, it will be found in most cases that the crop is full, an indication of the suddenness of the attack. This condition of the crop has caused many breeders to attribute the trouble to the food and water. As the disorder advances the legs, of the Leghorns particularly, become very much darkened in colour; and if the feathers of a bird of any breed are turned back, the skin will be found to be darker than usual. Diarrhœa has been observed in some cases, but it is not apparent in all affected flocks.

The mortality from this disorder appears to be governed largely by the general condition of the flock, and the rapidity with which treatment is applied. Where prompt measures have not been taken, losses have been as high as 20 per cent.; but where early treatment is given deaths have been as low as 1 or 2 per cent. The loss from deaths, however, is not the only important factor. Egg production has been observed to fall from 60 to 5 per cent. within six or seven days.

Treatment.—Several proprietary mixtures are used with apparently beneficial results, but in preference to deferring treatment until these mixtures are procurable, the breeder is recommended to administer Epsom salts to the birds in the drinking water at the rate of 1½ to 2 oz. to the gallon.

SIZE OF EGGS.

Although the internal quality of the egg is of primary importance in determining price, the factor of size cannot be overlooked. Eggs are usually graded for sale according to size, but those averaging 24 oz. to the dozen are in greatest demand, not only in Queensland, but in the markets to which our surplus production is consigned.

In these circumstances, every poultry raiser should strive to produce eggs that meet the requirements of the market. To do this, it is necessary to select breeders that will reproduce progeny capable of laying the maximum number of eggs closely approaching 2 oz. in weight. Most poultry keepers when selecting their breeders know very little about the early performance of their stock in respect of size of egg—particularly the size of egg that a hen laid during her first year of production. As a breed is more prolific during the first laying year, it is then that the egg size is of particular importance.

All pullets when commencing to lay produce an egg very much undersized. Some birds take a considerable time before their eggs reach the most desirable commercial size and others, again, may take only a week or two. As it is an inherited factor, egg size is one of the chief points to be considered in selecting future breeders. Many pullets—the breeding stock of the future—will be coming into production within the next month or so, and it is suggested that poultry breeders who are not entirely satisfied with the size of egg from their flocks should take the opportunity of selecting and marking pullets that commence to lay eggs of a 2 oz. standard early in life. Many of these birds may have to be rejected for some purpose or other, consequently the number selected should be large enough to allow for a reasonable percentage of rejections.

FEEDING COSTS IN THE FOWL RUN.

Every effort should be made to keep production cost down to a minimum. On many poultry farms this is being done, but on many more feeding costs are too high.

The actual costs of foodstuffs is governed by supply and demand; therefore no material saving can be made at this point. Any change in the present ration fed is of doubtful value, because such a change may result in lowering the egg yield. Again, it is doubtful whether any substitute for the existing rations would be economical. This only leaves the actual practice or management of feeding open to question.

Summed up, the cost of production is governed to a great extent by the food consumed and the wastage. Any reduction in food consumption is followed by a reduction in egg production, therefore feeding costs cannot be reduced by feeding less food.

Food wastage is an appreciable factor in feeding costs. This applies irrespective of the actual cost of foodstuffs, and is applicable to dry mash, wet mash, and grain feeding. By far the greatest wastage occurs with the dry-mash system of feeding. This fact has been pointed out to many farmers, who have immediately remedied the fault.

Faults in the construction of hoppers are the cause of nearly all the wastage that occurs with the dry-mash system. There are many different designs of dry mash hoppers, and a plan of a suitable hopper may be obtained on application to the Department of Agriculture and Stock, William street, Brisbane. This hopper embodies other important features, in addition to that of minimising wastage. The most important thing about any feed hopper is the feeding trough, which should permit ample space for the birds to eat, at the same time preventing any of the mash being wasted.

The hopper referred to embraces these features within certain limits. It also permits the mash to fall freely. It must be understood, however, that some mashes will run or feed more freely than others. Therefore, no one hopper will prevent different grades of mash overfilling the trough and allowing the mash to be readily scratched out. The hopper recommended has a lath along the front of the trough, and in the event of the mash running too freely and permitting wastage this lath can be shifted to reduce the space. This hopper is easily and cheaply constructed.

Recently a poultry farmer installed several of this type of hopper, and although production was maintained at the same level, the hoppers brought about a saving in food costs of approximately £4 a week. Some time ago another farmer installed similar hoppers and reduced feeding costs from five bags to three bags

of laying mash each week. These two illustrations should be sufficient to demonstrate that wastage can be prevented. In the latter instance, the farmer was confident that no wastage existed on his farm.

To ascertain if wastage is occuring, a rough estimate may be obtained by looking up the purchases of foodstuffs for the previous month or a longer period. As the birds consume approximately equal quantities of mash and grain, the quantities (by weight) purchased should be approximately the same. In the event of the quantity of ingredients for a mash exceeding the quantity of grain purchased, it indicates that the excess quantity is being wasted.

A more accurate method is to count the number of birds in one shed, then empty the hopper, refill it and record the weight of mash supplied; the period which the mash lasts will indicate the true position, as each bird will consume on an average 2 oz. of mash daily. For example, 100 birds supplied with 100 lb. of mash will consume it in eight days; if it only lasted six days each bird would be wasting 4 oz. weekly; if it lasted seven days there would be a wastage of 2 oz. per bird weekly. Such a small wastage as outlined, of 2 oz. per bird weekly, does not appear to be of great importance, but with a flock of 1,000 birds this would amount to 6,500 lb. in a year and would cost about £35, based on present feeding costs.

Present high costs of all poultry foodstuffs make it essential for every poultry farmer to eliminate wastage. By putting into practice the advice offered wastage will be minimised and the margin of profit increased.

POULTRY POINTS.

In poultry farming, culling serves two important purposes. By getting rid of the culls, all of the feed goes to the laying hens; and only the best hens remain in the flock to serve as future breeding stock.

Other sound points in poultry farming include care in the handling and marketing of eggs. Eggs are considered to be one of the best of foods, yet in spite of that fact the quantity consumed by Queenslanders (estimated on an annual *per capita* basis) is extraordinarily low. Why more eggs are not eaten is probably because their regular dietary value is not more widely appreciated. There are other reasons, too; for instance, the delivery of dirty-shelled eggs and the production of fertile eggs in hot weather. Clean nests, clean floors, and clean containers will soon overcome the dirt difficulty; while selling off all the male birds at the close of the hatching season is the answer to the other problem. Eggs should be gathered two or three times daily, and marketed at least twice weekly in hot weather.

In looking after poultry, even with the best of care, we often overlook a very common source of trouble, and that is the house fly. Flies can go a long distance and carry germs and contamination from a diseased flock, or from microbe-infested filth. The industrious pullet will chase and catch flies just for the fun of it, and, at the same time, take in all sorts of germs or worms. So it would be wise to clean up every attraction for flies and spray the fowl houses just before cleaning them out. For general health reasons, apart from the requirements of the fowl run, it pays handsomely to swat the fly.

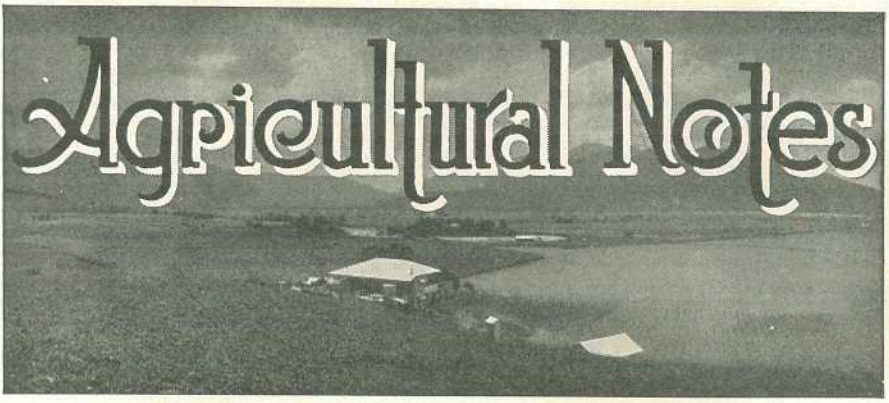
MILK AS A FOOD FOR FOWLS.

Skim milk is an excellent poultry food, and if fowls are given all the skim milk they can drink, and even if fed on nothing else but grain, they will continue to lay well.

Farmers generally appreciate the necessity of efficient feeding and, to give their fowls the necessary amount of protein, use one or other of the prepared mashes. These mashes are usually fed with grain, the birds being given an equal quantity of each. In these circumstances a sufficient amount of protein is made available to the birds.

The farmer who has skim milk to give his birds may therefore depart somewhat from his ordinary practice, for skim milk is a protein-rich food; but how far he may do so depends on the quantity of skim milk available. If the birds are given only, say, half the skim milk they will consume, half the quantity of mash that is usually fed should be supplied and the grain increased by about 50 per cent.

It will generally be found a sound policy when milk, mash, and grain are being fed to the flock to give the birds all the grain that they will consume and not force them to eat given quantities of mash. This policy will largely enable the birds to balance their own ration.



Manure Means Money.

THE unused dung of farm animals in Queensland must represent a great loss of national wealth each year. On almost every dairy farm one can see this waste from the freshly voided piles round the milking yards to last year's undisturbed cake lying bleached and useless in the field.

Idle dung is not only idle money, it is wasted money. About four-fifths of the food consumed by farm animals is excreted, and the fertilizing constituents of this manure are equal pound for pound to the best obtainable.

The urine soaks into the earth and soon makes its nutrients available to the plant roots, but the dung lies on the surface and if left unbroken may take years to decompose.

The direct results of this condition are readily observed. A definite area is temporarily spoiled for grazing, and when eventually grass grows around or through the heap it is completely ignored by stock until there is nothing else left. By this time the grass has aged, become harsh, and lost much of its nutritive value.

The indirect results are not usually recognised. Rats and other vehicles of disease revel in droppings, and transfer any infection to feed bins, troughs, and stored foods.

These disadvantages can not only be eliminated, but, by using a proper system of conservation and distribution, be converted to profit.

The material which accumulates in sties and stalls or where animals congregate can be readily collected and tipped into a nearby excavation. The excavated earth can be banked to form a run-off. A covering of palings, old posts, sheets of iron or other suitable material should be used to avoid trouble to stock and inconvenience to farm workers. Manure stored and covered in this way loses little of its fertilizing value. Manure piled in the open and exposed to the weather loses much by fermentation and leaching.

When land is to be manurured the pit can be opened and the material removed.

Where the paddocks are large and the droppings widely distributed a system of conservation is not practicable. In such cases periodic visits should be made with a rake and the dung under shade trees, around watering places, or along "pads" broken up and scattered. This allows the material to dry quickly and continuous tramping by stock soon works it into the soil.

The benefits derived from the farm manure are twofold. It supplies plant nutrients as well as an excellent medium for the production of humus—the organic water conserving colloid of soil.

The daily production of dung per 1,000 lb. live weight is approximately—

Cow	52 lb.
Horse	40 „
Pig	50 „

This means that on a farm running 35 cows, 4 horses, and 4 sows, there would be a weekly production of 6 tons. If only one-third of this could be collected it represents at least 100 tons of good fertilizer each year.

PROPAGATION OF GRASSES.

Frequently enquiries are received by the Department of Agriculture and Stock as to where seed of blue couch, Kikuyu, *Panicum muticum* (Para), and Guinea grass can be obtained. Kikuyu grass fails to set seed in Queensland, and little or no seed of commercial value is collected from stands of the other grasses.

Propagation is usually carried out with roots, runners, or plants, except in the case of Guinea grass which is reproduced from roots or plants only, as it does not send out runners. Supplies of the roots may best be obtained direct from the grower.

It is sometimes the practice to pass the runners of Kikuyu grass or Para grass through a chaffcutter set wide so that the resultant "chaff" can be broadcasted and harrowed in.

Blue couch should not be confused with the ordinary couch of Queensland, which can be grown from seed.

PARA GRASS—USEFUL IN DAMP SITUATIONS.

Para grass—known in Queensland also as *Panicum muticum* and giant couch—is grown to a large extent in many tropical and sub-tropical countries. The grass is a rapidly-growing perennial, spreading by means of thick runners which grow along the ground and root at the joints. Vertical shoots are produced at the joints and reach a height of up to 5 feet. The runners spread very quickly, and the area occupied by the grass rapidly increases in size as the mat of foliage is produced.

Stock are fond of both leaves and succulent stems, but the trampling of animals may injure the runners, and under some conditions it is advisable to cut the grass and feed it green rather than graze it heavily. The feeding value of Para grass is fairly good.

Para grass has proved very useful on our coastal country. In North Queensland, it has established a good reputation and is widely grown. It grows best on moist or even swampy land, and a paddock on a wet portion of any coastal farm might well be planted with Para grass to provide a change of diet from paspalum. Heavy frosts cut the grass back rather severely, but recovery in spring is rapid.

Seed of Para grass is usually of poor quality; hence the planting of roots or stem cuttings is the usual method of setting out the grass. These may be planted on ploughed land in furrows or started by mattocking in on the edges of waterholes or damp patches. Roots may be purchased in most of the coastal districts. A small number of cuttings will multiply rapidly in warm, showery weather.

RISK OF USING SALT BAGS FOR SEED.

The use of bags which had previously contained salt, for packing seed is attendant with risk, unless due precautions are taken.

Salt—particularly crude salt—chiefly because of certain impurities which it contains, absorbs much moisture from the air, especially in humid weather. Both the salt dissolved by this moisture on a bag used previously for holding salt, and the damp conditions caused by the salt, can be deleterious to the keeping qualities of the seed packed in it.

If old salt bags—because of the current shortage—must be used, it is advised that they be *thoroughly soaked* in successive lots of water, and then *completely dried* before use.

A good way of soaking is to fasten the bags below the surface of a flowing stream, if possible, for a few hours; the bags should be "thinned out" sufficiently to allow free access of the water to all parts. It is no use merely soaking the bags in one lot of water, and then spreading them out to dry. The job should be done completely, using several waters if necessary.

Lime for the Garden.

LIME is very useful in neutralising the excess acidity of the soil. It improves the physical condition of heavy acid soils, ensuring better drainage and aeration, and making cultivation easier, and it is an essential plant nutrient. When present in sufficient amount, it promotes some types of bacterial activity which convert the reserves of nitrogenous material in the soil into the soluble forms of nitrogen which plants utilise.

There is no foundation for the common belief that the exposure of acid soil to sun and air "sweetens," or reduces, its acidity. Acidity is developed through an insufficiency of lime in the original soil-forming material, or the loss of lime through leaching and absorption by plants. Acidity thus developed can only be counteracted in field or garden by the use of some form of lime. The forms of lime used for counteracting soil acidity are quicklime, hydrated or slaked lime, and ground limestone or carbonate of lime.

Slaked quicklime is formed by exposure to the air, causing it to become a very fine powder which can be spread quite easily. Ground limestone is a cheaper and more pleasant material to handle than slaked lime, provided the material is sufficiently fine and well distributed, and that equivalent dressings are applied. In the last respect, 4 lb. of ground limestone are required to supply as much "effective" lime as is contained in 3 lb. of slaked lime.

The soil to be limed should be dug over and reduced to a good tilth, after which the lime should be uniformly spread, and then lightly worked into the top soil to a depth of several inches. The amount of lime to be used depends on the degree of acidity of the soil, its texture, organic matter content, and the type of plant to be grown. Unless all these features can be determined, suggestions on the amount of lime that it is necessary to add to a soil can be approximate only.

On loams and heavier soils, dressings may range from 1 lb. of slaked lime, or 1¼ lb. of ground limestone, per square yard on loams, to double these quantities on clay loams and clays. Sandy loams or, still more, sandy soils can receive lighter dressings of approximately half the amount required for loams. Lime is lost most rapidly from sandy soils, which are usually more acid than heavier soils under the same conditions. Under garden conditions, with frequent waterings, lime is continually being lost, especially from the sandier types of soil. After the initial liming, which may need to be heavy to counteract strong acidity, it is preferable to add light dressings each season, rather than occasional heavy dressings.

It is not necessary always to add sufficient lime to neutralise soil acidity completely, as most garden plants grow well on slightly acid soils. This slightly acid condition will result only in the majority of garden soils after liming. Only

for those plants listed below as very sensitive to acidity is it advisable to neutralise the acidity completely. Whilst many plants grow best on neutral soils, or on slightly alkaline soils, a considerable number of plants will tolerate fairly acid soils.

By careful planning of the garden cropping scheme, portion of the area may be set apart and only lightly limed, if at all, for certain plants (as indicated below), and the remainder limed for those crops with a higher lime requirement. Potatoes, which will grow on acid soils, do best on slightly acid soils, and in gardens where dry conditions are not experienced the danger from scab diseases in slightly acid soils is small.

The following statement shows approximately the relative sensitiveness of a number of garden and crop plants to acid soil conditions:—

Very Tolerant.—Potato, radish, strawberry, sweet potato, rhubarb, watermelon, pineapple.

Tolerant.—Bean, carrot, cucumber, turnip, crimson clover, maize, oats, tomato, cowpea, cabbage.

Sensitive.—Rape, red clover, sweet clover, white clover, peas, onions, lettuce, cauliflower.

MARKETING PASSION FRUIT.

With the coming of warmer weather, passion fruit growers should exercise greater care in the harvesting of their fruit. Fruit should not be allowed to fall from the vines, as fallen fruit quickly becomes crinkled, reducing its size and value to the retailer. By picking the fruit when it is showing half colour its marketing life will be greatly increased, and its selling value raised. Where a grower has a percentage of crinkled fruit, it should be included with marked and blemished fruit and packed separately from the uncrinkled fruit. While most retailers have no outlet for crinkled fruit there is, however, a good market otherwise for fruit of this description.

All fruit should be carefully handled and packed on the diagonal system, which gives the fruit the maximum of protection and display value, thereby enhancing its general appearance.

MARKETING BANANAS.

During hot weather, bananas which have been cut and left exposed to the sun for only a short period soon become quite unfit for sale, and the pulp is eventually reduced to a soft, "boiled" condition. Cutting should be done in the early morning, before the heat becomes severe, and care should be taken to keep the fruit covered completely, even from the early morning sun, while waiting to be carried or wired to the packing shed.

The fruit should at all times be handled with the greatest care—in fact, the less it is handled the better—and for this reason it is wise to have the packing shed right in the plantation, if possible. On cutting the bunch it should not be laid carelessly at the foot of the stem, which usually means it rests on a bed of sticks and dead weeds. A bed of leaves is easily and quickly formed if the bunch must be set down in the plantation, although a better plan is to carry it straight into the shed or to the end of the wire and there place it upright on bags or trash with the stalk leaning against a rail provided for the purpose. In this way, possible damage will be reduced to a minimum.

On being dehanded, the fruit should be allowed to "drain" for a few hours. Packing immediately after dehanding sweats the fruit in the case and makes bruising much easier. Care should be taken to ensure that fruit which is "sprung" or in the early stages of ripening is not packed, as it will quickly be reduced to pulp and be unsightly in a case of otherwise sound bananas. No fruit should be packed for Southern markets from bunches in which some of the fingers are already showing colour indicating ripening. The fruit should be dehanded just at the collar joining the fingers to the main stalk. The most suitable knife for this work is one of a sharp, flexible, and very narrow type.

There is a right and wrong way to separate the hands into singles, if a "single" pack is desired. Tearing the bananas apart endways often peels part of

the skin from the fruit and also bruises the stem, thus setting up an entrance for organisms which cause blackend. The correct method of separating into singles is to grasp the cluster firmly with both hands at the stem end, then twisting one hand forwards and the other backwards, the fruit is separated easily and without any damage to the stalk end.

On completion of packing the cases should be packed on their sides in a cool, shady position to await transport to rail or market.

Should it be desired to use the "cluster" pack, the same method should be adopted, separating three or four instead of the single finger. If a cluster of three or five is used, a single banana should be added to make it a four or six. The secret of clusters is to have the fruit in twos.

THE CAPE GOOSEBERRY.

Actually, the Cape Gooseberry is not a true gooseberry, being of the same family as the tomato, potato, and tobacco. This fact suggests immediately the class of soil it requires and what would be a suitable location for its growth.

The Cape gooseberry is best propagated from seed, 1 oz being sufficient to plant an acre. Sow the seed in a carefully prepared seed-bed in the same way as tomato seed is sown. Cover the seed to a depth of half an inch, using a rich loam, with a fair percentage of dry horse manure, if possible. Keep the bed moist, but shading is not necessary under normal conditions. The young seedlings grow rapidly and should be ready to transplant in, approximately, eight weeks from sowing. Harden the plants off by reducing the watering gradually prior to removing the plants, but give the bed a thorough soaking immediately before lifting the young plants.

Plant in a well-cultivated field in rows 4 feet apart, and at a distance of 4 feet between each plant. Water the plants at the time of planting. If land requires fertilizing, apply as a top dressing 1 part of sulphate of ammonia to 2 parts of superphosphates. A small amount of sulphate of potash applied just before the fruit appears is an advantage.

Harvesting may commence approximately three months after transplanting. The season lasts two to two and a-half months, regulated to a large degree by the season of the year. A fair crop would be about 3,000 lb. of fruit per acre, although much heavier yields have been recorded from time to time.

The market price ranges from 4d. to 7d. a lb. locally. The demand for this fruit is good, with little chance of a glutted market. The fruit is sold as fresh fruit or for jam or preserves.

The chief troubles affecting the Cape gooseberry are downy mildew (control by spraying with the Bordeaux mixture 4-4-50); and soft, brown scale (control by spraying with white oil 1 in 56). Annual planting is recommended, but, if pruned back, the plants do quite well for two seasons.

SELECTION OF BANANA SUCKERS.

In planting a new area of bananas it is advisable to make a good selection of suckers. In every banana plantation there are stools which are above the average, and it is from these that growers should select material for future plantings. Some stools are outstanding in growth and quality production. For example, they may have remained free, or nearly so, from borer attack, or they may have benefited from better soil, greater amount of moisture, and other conditions in their immediate vicinity.

It is advisable for growers to mark these outstanding stools for use at planting time, noting the quality of the fruit which has been recently cut from them or which they are still bearing. This can be done by placing a stake against the selected stools or some other suitable means of easy identification at the time when planting material is required.

If by selection it is possible to produce a more open bunch of the Cavendish variety, it will be of benefit in so far that the harbourage for skin-blemishing insects is lessened, that the bracts are permitted to fall more freely from the bunch, and that individual fingers fruits are more exposed to sunlight—thus ensuring uniform development of the bunch.

THE FRUIT MARKET.

J. H. GREGORY.

DRY conditions have continued to the detriment of berry fruits and tomatoes in some districts. Bowen received good rains early in the month, and a good late crop of tomatoes was harvested. Southern Queensland did not share in the relief; notwithstanding this, good lines of most fruits have come on to the market, with good prices for all except tomatoes, which during the last week of the month fell from 10s. to 6s. to 7s. to 3s. Custard apples are now finished. New season's mangoes are making their appearance and selling at high prices. Stone fruits also should be seen soon and no doubt will be welcomed. Prices during the last week of the month were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Eights and Nines, 17s. to 21s. 6d.; Sevens, 14s. to 17s. 6s.; Sixes, 10s. to 15s.; Smalls, 8s. 6d. to 11s. 6d.

Sydney.—Cavendish: Eights and Nines, 19s. to 23s.; Sevens, 15s. to 19s.; Sixes, 12s. to 15s. Few specials higher.

Melbourne.—Cavendish: Eights and Nines, 21s. to 23s.; Sevens, 19s. to 21s.; Sixes, 17s. to 19s.

Adelaide.—Cavendish: to 22s.

Brisbane.—Lady Fingers: 2½d. to 10½d. dozen.

Pineapples.

Brisbane.—Smooths, 5s. to 8s. case; 3s. to 6s. dozen. Ripleys, 7s. to 8s. 6d. case; 3s. to 6s. 6d. dozen.

Sydney.—7s. to 11s. case.

Melbourne.—8s. to 12s. case.

CITRUS FRUITS.

Oranges.

Brisbane.—Common, 5s. to 8s.; Navels, 6s. to 10s. imp.

Lemons.

Brisbane.—6s. to 8s. Gayndah, 9s. to 13s.

Grapefruit.

Brisbane.—5s. to 8s.

Passion Fruit.

Brisbane.—6s. to 13s.; Seconds lower.

Melbourne.—18s. to 20s. half bushel.

OTHER FRUITS.

Strawberries.

Brisbane.—7s. to 10s. dozen boxes.

Sydney.—Trays, 3s. to 5s.; boxes, 6s. to 14s. Many lines were wasty.

Cape Gooseberries.

Brisbane.—5s. to 7d. lb.

Mangoes.

Brisbane.—11s. to 14s. per case. Growers are advised to keep the maturity standard high.

Papaws.

Brisbane.—Locals, 2s. 6d. to 5s.; Yarwun, tropical case, 5s. to 9s.

Sydney.—Tropical case, 8s. to 14s.

Apples.

Brisbane.—Granny Smith, 6s. to 13s.; French Crab, 4s. to 8s.; Others, 4s. to 9s.

Tomatoes.

Brisbane.—Locals, Green, 3s. to 7s.; Ripe, 3s. to 6s. Northern, 3s. to 6s. Few special lines higher.

Sydney.—Bowen, Yarwun, 2s. to 4s. Special repacks higher. Redlands, 3s. to 6s.

MISCELLANEOUS, VEGETABLES, ETC.

Cucumbers.—Brisbane, 7s. to 11s. Sydney, 16s. to 18s. Melbourne, 16s. to 20s. bushel.

Beans.—Brisbane, 5s. to 12s. bag. Sydney, 4s. to 12s. bushel. Melbourne, 5d. to 10d. lb.

Peas.—Brisbane, 4s. to 8s. bag. Melbourne, 3d. to 5d. per lb.

Carrots.—Brisbane, 3d. to 9d. bundle. Sydney, 8s. to 10s. case.

Parsnips.—Brisbane, 9d. to 1s. 6d. bundle.

Beetroot.—Brisbane, 3d. to 8d. bundle.

Celery.—Brisbane, Local, 6d. to 1s. 3d. bundle.

Rhubarb.—Brisbane, 6d. to 1s. bundle.

Cauliflowers.—Brisbane, 9s. to 12s. Inferior, 3s. to 8s.

Cabbage.—Brisbane, 3s. to 5s.

Marrows.—Brisbane, 4s. to 5s. dozen. Melbourne, 8s. to 10s. case.

Pumpkins.—Melbourne, £10 to £11 ton.

APPLE JUICE AND TREACLE.

While Queensland and other Australian applegrowers are wondering what can be done to improve the apple situation because of the heavy reduction of exports caused by the war, it may interest them to know that science workers at the Bristol (England) University Research Station have produced a concentrated form of apple juice which contains 80 per cent. of sugar. This has already been used commercially for sweetening all kinds of confectionery and "soft" drinks, and soon it will be available in retail shops. The concentrate takes two forms—juice and treacle—and although both have an apple flavour, it is described as "quite unnoticeable" in such jams as strawberry and raspberry. The apple "treacle" can be used by the housewife for any purpose for which she would use ordinary treacle or golden syrup, and the juice can be used for jam-making or for cakes and other forms of confectionery. With jam it will set just as well as ordinary sugar. The juice is quite sweet as sugar, and the treacle a little sweeter. By adding pectin made from other parts of the apples, these science men have also succeeded in converting the apple treacle into a very appetising jelly. It is claimed also that it is possible to conserve the aroma and "bouquet" of the fresh apples, concentrate them, and put them back into the jelly.

OVERSEAS EXCHANGE.

Its Operation in Wartime.—The Necessity for Limiting Imports.

Subjoined are notes of an address by Mr. J. A. Butler, Acting Economist of the New South Wales Rural Bank, at the recent State Conference of the Agricultural Bureau of New South Wales, and reported in the AGRICULTURAL BUREAU RECORD, issued by the Department of Agriculture, New South Wales.

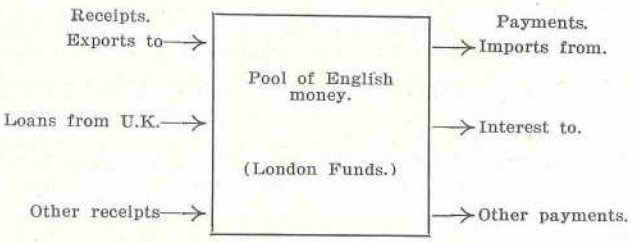
The first point to understand in relation to overseas exchange is that money does not go out of the country. This idea is a most important one, and if we understand it fully we have gone a long way towards understanding the whole problem.

If you buy an American tractor, the agent you buy it from does not send a cheque for so many Australian pounds over to United States of America. The tractor manufacturer would not have it; he would want to be paid in dollars. The agent has, in some way or another, to get hold of dollars so that he can make the payment in United States of America.

The United States is taken as an example because the difference between pounds and dollars is quite clear, but much the same would be true for making a purchase from the United Kingdom. If you purchase a British petrol engine, the Australian agent from whom you buy it will have to find some means of paying the British manufacturer in English pounds or, as it is frequently expressed, in sterling. Australian pounds are not the same thing at all as English pounds, and it is rather confusing that they have the same name.

How is the payment to the English manufacturer made? The answer is that Australian banks own a pool of English money which they keep in London and call by the jargon name of "London funds." To make his payment in England, the agent who has sold you the petrol engine will go along to his Australian bank and ask to buy some of the English money from the pool in London. The bank will quite readily sell, charging the agent the rate of £125 10s. Australian for every £100 English bought. The bank will thus receive an amount of Australian money, and will give the agent a cheque on their London office, which will be sent over to the English manufacturer, and cashed by the London office of the bank from its pool of English money. When any payments have to be made overseas the bank thus receives Australian money in Australia and pays out English money from its pool in London.

You might now ask how the bank could keep on paying out from its pool of English money without this pool running dry. There must be some flow into the pool—and there is. If we sell wheat to the United Kingdom they pay us in English pounds. Again the Australian bank fills the function of an intermediary. It receives this money into its pool in England and pays out in Australia, Australian money to the dealers or farmers in Australia who have sold the wheat. Thus the pool of English money is continually filled by our sales to the United Kingdom and other receipts which we might have from the United Kingdom, and emptied by our purchases from the United Kingdom and any other payments which we might have to make in the United Kingdom. The operation may be illustrated by means of a diagram:—



At this stage it is appropriate to ask why we need to cut down on imports. It will be easy to understand from the above discussion and from the diagram presented that if the flow into the pool of English money is less than the flow out of it, the size of it would decrease and it would eventually become empty.

One of the consequences of a war is that large payments have to be made out of the pool by Australia for the purchase of war equipment and for paying and maintaining the A.I.F. overseas, and for contributing to the Empire Air Scheme.

Thus, the flow out of the pool is likely to be very much higher than normal, unless the flow out to pay for ordinary imports is checked. On the other hand, the flow into the pool is at a rather higher rate than during any pre-war years, but is hardly likely to be large enough to offset the flow out, unless ordinary imports are considerably restricted.

EXCHANGE WITH UNITED STATES.

Why it it that imports from the United States are especially being singled out for restriction? To answer this most important question, it is necessary to proceed somewhat further with our study of the machinery of foreign exchange.

When Australia exports to the United States, payment for the goods exported is made in dollars, but we do not follow the practice of keeping a pool of dollars in the United States in the same way as we keep a pool of English money in London. When we receive dollars for our exports, we immediately sell them in England and receive English money for them which we add to our single pool. On the other hand, when we have to make payments to the United States, such as for imports from that country, we take from our pool of English money in London and buy dollars which we then use for the payment of the debt. Thus exports to the United States add to our English pool in much the same way as exports to the United Kingdom, and imports from the United States subtract from the pool.

THE PURCHASE OF WAR EQUIPMENT.

This brings out the really important point. Exports to the United States and imports from the United States not only alter the level of our pool of English money, but also the United Kingdom's pool of dollars. Now the United Kingdom's pool of dollars is one of the most important factors in the present war situation. The United States has become an extremely important source of supply for aeroplanes and other war equipment. It is a very urgent matter for us to get these war supplies, but we have to pay for them in dollars, so that it is important that the pool of dollars owned by the United Kingdom is not used for the purchase of any thing which we can do without. It is, therefore, clear that the less we import from the United States at the moment, the more dollars are left free for the Empire to purchase war equipment in the United States.

AGRICULTURE IN BRITAIN.

We are all naturally interested in how the war is affecting farming in the Old Country. Drastic changes have been made, and made quickly, and British agriculture is now working under a broad, comprehensive scheme to ensure the people's food however long the country is forced to fight. In Britain, every private interest and every consideration of cost is being subordinated to the supreme aim of extracting the last ounce of food from every acre of farming land. The two main effects of the new policy are—first, a large increase in production; and second, a drastic change in the economic status of primary industry. It is remarkable, when you come to think of it, that in the last twelve months the British farmer has broken up more than 2,000,000 acres of new land, mostly grassland, and is expanding that immense area most energetically.

Of course, in such a disturbance of the ordinary routine in any country someone has to suffer individually for the common good. The specialist producer cannot escape from being hard hit. For instance, the poultry farmers have been called on to reduce stocks as all the available feeding stuffs are required to keep the dairy industry going at the increased rate of production. As a matter of fact, many of the specialist farmers may have to transfer their energies to some other branch of production.

As part of the general scheme, the wages of farm workers have been raised to something near the wages of other skilled workers, so that they may stick to the job in which they will be most useful to the country.

PUTTING THE "POT" INTO THE POTATO.

Germany claims to be making forty different kinds of dyes and colouring materials from the potato. In other processes of manufacture, starch and sugar are squeezed out of potatoes for use in chocolate factories, pastry shops, and breweries. Motor spirit also is made from potatoes.

Another German claim is the making of numerous other essential substitutes out of potatoes—such as vinegar, rum, and even beer. So the "pot" in the name of the potato means something after all.

Plate 100.
YARDED.—Blood mares and foals, Northampton Downs, Western Queensland.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of August, 1940 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Mature Cow (Standard, 350 lb.).				
Valera Sheila	Sullivan Bros., Valera, Pittsworth	12,887·09	656·96	Royalist of Strathdhu
Merravale Tulip 4th	W. Soley, Malanda	13,802·6	457·304	Greyleigh Honorarium
Melody 8th	J. C. Meier, Mount Mort	11,602·45	385·843	Blacklands Beauty Prince
Evansvale Bonnie	J. F. Evans, Malanda	10,368·2	353·263	Malanda of Glenora
Senior, 4 Years (Standard, 330 lb.).				
Merravale Model 4th	W. Soley, Malanda	10,455·15	336·195	Greyleigh Honorarium
Junior, 4 Years (Standard, 310 lb.).				
Kyabram Betty	A. H. E. Black, Kumbia	10,466·33	509·898	Springlands Brigadier
Melody's Pearl	J. C. Meier, Mount Mort	8,893·15	343·611	Blacklands Beauty Prince
College Mayflower 3rd	Queensland Agricultural High School and College, Lawes	7,193·4	328·952	Trevlac General
Junior, 3 Years (Standard, 270 lb.).				
Blacklands Stately 4th	T. Ryan, Allora	6,219·15	316·747	Blacklands Major
Senior, 2 Years (Standard, 250 lb.).				
Sunbridge Broady 2nd	T. Ryan, Allora	10,377·4	418·712	Blacklands Royal Star
Junior, 2 Years (Standard, 230 lb.).				
Kyabram Betty 2nd	A. H. E. Black, Kumbia	6,127·07	284·944	Berry Joker
Sunnyside Empress 65th	P. Moore, Sunnyside Stud, Wooroolin	7,533·55	283·71	Cosey Camp Rupert
Ardilea Kitty 2nd	W. Hinrichsen, Ardilea, Clifton	6,785·9	277·278	Midget Sheik of Westbrook
Happy Valley Linda	R. R. Radel, Happy Valley, Coalstoun Lakes	6,209·0	241·902	Sunny View Artist
Trevor Hill Melba 2nd	Geo. Gwynne, Umbiram	6,233·6	239·228	Corunna Supreme

JERSEY.

Mature Cow (Standard, 350 lb.).				
Trecarne Rosella 4th	T. Petherick, Trecarne, Lockyer	9,424·5	589·713	Trinity Officer
Jolly Jean of Glenmoore	S. H. Caldwell, Walker's Creek, Bell	8,960·12	512·963	Glenmoore Jolly Jester
Overlook Remus Sweetie	J. Sigley, Millaa Millaa	7,691·45	449·385	Overlook Ginger Remus
Trinity Golden Beauty	A. H. O. Koppen, Peeramon	6,936·25	406·599	Trinity Dreaming Pioneer
Fauvic Countess	A. T. Meyers, Valoma, Theebine	7,416·85	399·795	Earl of Roselands
Junior, 3 Years (Standard, 270 lb.).				
Hopewell Cinderella	Geo. Harley, Childers	5,714·85	310·157	Carnation Queen's Golden
Banyule Tiddlewinks 25th	Young Bros., Kingaroy	5,691·85	272·965	Banyule Oxford Don
Senior, 2 Years (Standard, 250 lb.).				
Woodside Orion	F. P. Fowler and Son, Glenview, Coalstoun Lakes	6,556·3	316·013	Rochettes Volunteer (imp.).
Junior, 2 Years (Standard, 230 lb.).				
Maudlands Luxury	L. J. Comiskey, Warra	7,070·48	371·273	Grasmere Calm 2nd's Progress
Strathdean Gentle Frolic	S. H. Caldwell, Walker's Creek, Bell	6,279·11	349·365	Glenmoore Gentle Volunteer
Hadleigh Lily 16th of Grasmere	T. W. McMiken, Southbrook	6,008·37	286·23	Grasmere Floss 12th's Dan
Fauvic Buttergirl	H. Cochrane, Fauvic, Kin Kin	4,487·35	235·908	Austral Park Sheik
Woodside Merry Princess	F. P. Fowler and Son, Glenview, Coalstoun Lakes	4,651·95	230·542	Rochette's Volunteer (imp.).

The Young Farmer

THE WONDERFUL WORLD OF THE BEES.*

J. A. WEDDELL, Research Officer.

WHEN it was first suggested to me that I might speak to you on bees I was for a while undecided on a very important point. Should I talk to you about the honey bee, or should I discuss the many other kinds of bees? I finally thought it better to concentrate on the honey bee, which is so important in many ways, and in which I hope some of you are interested in connection with School Project Club work, and from which almost anyone may draw interest and profit either as a hobby or as a means of livelihood. I would like to point out, however, that the honey bee is only one species in a large family of bees. The honey bee was introduced into Australia by one of the very early settlers, in February, 1810. In addition, there are many small wild bees native to Australia which also gather honey and pollen, but these are unsuitable for our purposes. Again, there are carpenter bees which make holes in suitable dry timber for their nests, leaf-cutting bees which remove neat crescents from the leaves of certain plants and use the pieces for the purpose of making or lining their nests, and bees which make their nests by digging galleries into sandbanks and other soft soil. All of these, however, would be too long a story for to-day, and we shall look only at the honey bee.

Exploiting the Honey Bee.

In these days of a plentiful supply of sugar from sugar-cane and sugar-beet it may not be realised that for many centuries in the past honey was the only food-sweetening material available to man, and, again, that while to-day we have materials like paraffin wax, synthetic resins, and other wonderful products of the modern laboratory, the not-so-ancients depended quite a lot on beeswax for modelling, waterproofing, polishing, and so on. In spite of the importance of these products of the hive, i.e., honey and beeswax, developments in the manner of handling bees have been only slight. This is due to the fact that even to-day the honey bee is still essentially a wild animal. A horse, a cow, an elephant, or a dog becomes and remains docile under kind treatment, but the honey bee will always sting unless handled with great discretion. In beekeeping, then, we do not domesticate the bee, we simply provide a suitable house for it from which it is most convenient to rob it at intervals.

If honey bees swarm away from the hive into the bush they usually select a hollow log or tree, and in this they build their wax cells for the storage of food and the development of their young. Thus, all that is necessary for their home is some secluded hollow. The early hives were simply hollow containers of various shapes and materials, baskets, woven straw, mud structures, and wooden boxes being some of the types. They all suffered the same disadvantage that when the hive was robbed for the removal of honey and wax the whole life of the hive was disorganised and the brood was killed. Nowadays, bees are kept in frame hives—that is, hives fitted with light wooden moveable frames. A thin sheet of wax known as foundation wax is placed in each frame and the bees work new wax on to the foundation and build up the typical wax comb. You must understand that the bees could do it all themselves in an empty box, but for his own convenience it is better and necessary for the beekeeper to have the comb readily removable from the hive. So much so that in Queensland it is provided that the bees should be kept in frame hives.

Life in the Hive.

You all know that the bee stores honey in the cells of the comb, but the comb has another important use. A large number of the worker bees in a hive are nurse bees, and these bees look after the cleanliness of the hive and care for the brood or young. They clean out numbers of cells each day and the queen immediately lays a small white egg into each cell. Let us watch one of these eggs closely and see what happens to it. In about three days it hatches and there emerges a small white grub. This grubs rests in the bottom of its cell and it is

* This is the text of a School Broadcast delivered through Stations 4QG, 4RK, 4QN, and 4QS on 2nd July.

fed by the nurse bees on food compounded by them from honey and pollen. It grows until, at the end of about six days, it almost fills its cell and is full-grown. At this stage the nurse bees seal the cell off with a thin cap of wax. The grub now changes into the pupal stage from which it finally transforms into an adult bee after about another twelve days. The bee pushes its way from the cell, and for a day or two it remains quietly on the comb from which it has emerged. After a few days it begins its own work as anurse bee, caring for and feeding the grubs and the queen, cleaning and ventilating the hive, building new comb, and guarding the hive from intruders. After it is about a week old our bee will probably choose a bright day and in company with others about its own age will bravely emerge from the hive and go for a short circling flight, keeping very close to home. Every few days it will go for longer and longer flights, always returning to the hive and busying itself most of the day with the nurse bee duties. However, when our little bee is about two to three weeks old it drops inside duties altogether and starts its new duties of gathering nectar, pollen, propolis, and water. I shall tell you something of these materials in a moment or two. For the remainder of its life the worker bee is a forager, leaving the hive at sunrise and working until evening. If there is suitable material nearby the individual flights are short; if the foraging is poor, the bee may need to make flights of two, three, or more miles. After strenuous work of this kind for from one to three months the bee is reaching old age and its wings are becoming frayed. Finally, there comes the day when it cannot fly back to the hive with its load, or it arrives in such an obviously weak condition that the nurse bees then in charge of the hive recognise its weakness and push it out. Only vigorous healthy workers are required or tolerated in the hive. The life span of a worker bee is from two to four months.

If there should be too few nurse bees in the hive some of the foraging bees will resume the nurse bee work, and, alternatively, if for any reason there should be more nurse bees than are necessary some of them will start foraging earlier in life than is usual. I should like to emphasise the wonderful nature of this organisation of work, particularly in view of the large number of bees, anything from 40,000 to 60,000 living in each hive.

Nectar Gathering.

The most important duty of the foraging bee is to gather nectar from flowers. This it does by sucking, and the nectar is carried in a honey-stomach which is separated from its digestive stomach. Many flowers need to be visited and then the bee returns to the hive. The nectar is passed over to nurse bees, and finally stored in a cell in the comb, and gradually the store cells become filled. When first gathered the nectar is too thin and watery for honey so that the filled cells are left unsealed for a time by the bees. Some of the water evaporates, certain chemical changes take place, and the nectar ripens into honey. At this stage the honey will keep indefinitely without going bad and the nurse bees seal over the filled cells with wax capping.

Pollen Gathering.

While the bee is pushing its way into a flower to reach the nectar it rubs against the pollen in the flower and the pollen grains stick to the tiny branched hairs that clothe it. The bee then rubs its legs over its body and collects the pollen into special pads on its hind legs, called pollen baskets. This pollen is taken back to the hive and stored in certain of the cells in the comb. You must understand that the object of all of this work by the bee is to store honey and pollen so that these can later be used for feeding the young ones.

In moving from one flower to another a bee, of course, cannot collect all of the pollen from its body and some of the pollen grains become rubbed off in the next flowers. As you know from your natural history lessons the transfer of pollen fertilises the flower and makes possible the development of seeds. Hence the bees are unconsciously and continually carrying out a wonderful piece of work for farmers, orchardists, and gardeners.

Building the Wax Comb.

The wax of the hive is produced in a wonderful manner by the nurse bees. Those producing wax hang in festoons in the top of the hive and the temperature rises to about 97 deg. F., that is, about the temperature of our bodies. Tiny beads of wax then commence to appear on the under sides of their bodies from special wax glands in much the same way as beads of perspiration come out on our skin. As the wax comes in contact with the air it hardens into tiny scales. These scales are then wiped off, moulded together, and placed where they are wanted for the

building of comb. The honey comb is a most wonderful structure. It consists of a central wax partition hanging down vertically and on each side it is built out into neat regular six-sided cells. If I were asked to draw a regular six-sided figure, that is, a regular hexagon, I would need a pair of compasses, a ruler, and a pencil, but the bees work so wonderfully that one bee after another places down a little bit of wax gradually building up the framework and the result is a piece of exact modelling. The cells are also shaped so that they do not jut out exactly horizontally, but they have just sufficient upward tilt so that the nectar and honey will not pour out or drip. Of course, when comb is built in a rough frameless hive, such as in a hollow log, the main lines of the comb will probably be twisted, but when the bees are given the opportunity of building in a proper hive the lines are beautifully regular.

Wax is a very valuable material in a hive, for the bees that produce it need to feed heavily on honey. It has been estimated that for each pound of wax produced, the worker bees need to eat about twenty pounds of honey.

Miscellaneous Duties.

In dry, hot weather the bees need to take water to the hive, and if you watch closely round a pool of clean water, or the wet patch under a dripping tap, on a hot day, particularly if someone is keeping bees nearby, you will see bees come down and sip the water.

I mentioned propolis a short time ago. Propolis is a material which the bees collect from trees; it is a resinous or gummy exudation. In the hive it looks and feels like very dirty beeswax, and it is used by the bees for sealing up unwanted openings in the hive. In a natural log hive the bees would close the broken opening with propolis except for the small necessary entrance; if a box hive warped and the sides cracked the unwanted openings would similarly be sealed up.

A little earlier I mentioned the temperature in a hive, and you will probably be surprised to learn that the bees very largely control the temperature themselves. On a hot day numbers of the nurse bees stand at the entrance and fan with their wings, and other bees inside direct the currents of air round the hive. In cold weather the bees crowd together, if necessary using only part of a big hive, and also may block up part of the entrance so as to prevent undue ventilation and draughts of cold air.

My time to-day is almost gone and I have had to miss out a lot of interesting information. However, I hope that when opportunity offers you will read about bees, for although bees are certainly small they are not insignificant. The amount of honey and beeswax produced in the world is valued at several millions of pounds every year.

KEEPING OUR BALANCE IN THE SOIL BANK.

A soil is productive in proportion to its capacity to supply to growing plants the elements required for their development. If we look upon the soil as a bank in which we have an account, we will realise that the producing power is largely in proportion to what we have on deposit. When we open our account, the bank supplies us with a cheque-book so that we may draw on our account at any time. When we begin to operate on our account by drawing a cheque, there is so much less in the bank according to the amount so withdrawn. As our account dwindles we realise the necessity of depositing more money in our account.

Our account with the bank may be regarded as a parallel with our account with the soil—the soil on our farms represent a bank. Nature supplied the soil in its original state with certain deposits of plant food—nitrogen, potash, phosphorus, and other elements necessary for plant growth. For years the land on our farms has been tilled. The crops produced represent cheques drawn against the original deposits of nitrogen and other elements. If these elements are not replaced in amounts corresponding to the amounts absorbed by the growing crops, the soil eventually gets into exactly the same condition as a depleted banking account. It refuses to honour the draft made on it by the crop we have produced. Therefore, if we are to continue to grow crops we must put back into the soil the same amount of chemical elements which the crops take out of it. In this year of national emergency, the production of bumper crops is of prime importance. For this reason the maintenance of plant food in our soil in proper proportion to ensure maximum crop yields is more necessary than ever before.

General Notes

Staff Changes and Appointments.

The appointment of Mr. B. B. Brett, New Angledool, New South Wales, as a temporary honorary inspector at Habnarey Gate has been cancelled, and Mr. E. H. Best, Yarranbah Station, New Angledool, has been appointed honorary inspector of stock to fill the vacancy.

Messrs. M. E. Playford (Assistant General Manager, Mount Morgan Ltd.), B. G. Patterson (Mount Morgan), and H. A. Kendrick, Senr. (Burleigh Heads) have been appointed honorary protectors of fauna.

Mr. A. W. McLauchlan, field assistant in the Poultry Section of the Department of Agriculture and Stock, has been appointed also an inspector under *The Diseases in Poultry Acts.*

All inspectors of stock, slaughter-houses, dairies, and plants, Department of Agriculture and Stock, have been appointed also protectors under *The Fauna Protection Act of* 1937.

Mr. A. C. Peel, Department of Agriculture and Stock, has been appointed an inspector under *The Seeds, Fertilisers, Veterinary Medicines, Pest Destroyers, and Stock Foods Acts.*

Fauna Sanctuary at Drayton.

"Southdown," the property of Mr. H. B. Shennan, at Drayton, has been declared a sanctuary under and for the purposes of *The Fauna Protection Act of* 1937.

Mourilyan Mill Levy.

Regulations have been issued under *The Primary Producers' Organisation and Marketing Acts* empowering the Mourilyan mill suppliers' committee to make a levy for administrative purposes at the rate of twopence a ton on all cane crushed during the 1940 season.

The Peanut Industry.

A Proclamation has been issued under *The Peanut Industry Protection and Preservation Act* declaring that section 17 shall be made applicable to the following diseases of peanuts. Seedling blight, wilt, leaf spot, chlorosis, bunchy plant, leaf curl, and rosette disease. It is provided that the occupier of land shall give notice of the appearance of any of such diseases to an inspector or the Under Secretary, Department of Agriculture and Stock.

Additional regulations to give effect to the provisions of the Act also have been issued.

Goondi Mill Levy.

Regulations have been issued under *The Primary Producers' Organisation and Marketing Acts* empowering the Goondi mill suppliers' committee to make a levy for administrative purposes at the rate of twopence a ton on all sugar-cane supplied during the present season.

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

Cockatoo Grass, Swamp Millet, Woolly Finger, and Rat's Tail Grasses.

H.R. (Kenilworth)—

1. *Alloteropsis semialata*, Cockatoo Grass. This grass is a native of Eastern and Northern Australia, and extends to Southern China, India, and Africa. In south-eastern Queensland it is particularly common on the poorer sandy country. It is not a very good fodder species.
2. *Echinichloa Walteri*, sometimes called Swamp Millet. It grows nearly always on the edge of creeks and in similar situations, being recognised readily by the reddish bristles of the seed head. Cattle and horses appear to like it. The grass is believed to be a native of the east coast of the United States of America.
3. *Digitaria eriantha*(?), a woolly finger grass. Several species of Woolly Finger Grass have been introduced from Africa into our grasslands. There is a native species known as Summer Grass, *Digitaria adscendens*, which it very closely resembles. Your specimen may be a very robust form of this, and in the absence of the base of the plant it is difficult to be sure of the identification.
4. *Sporobolus capensis*, a rat's tail grass. This is a native of South Africa, but is now widely spread over the eastern seaboard of Australia. It is a coarse tussocky grass, and is only eaten by stock in its younger stages.

"Peanut Tree" (Sterculia foetida).

J.P.R. (Port Douglas)—

The specimens represent *Sterculia fœtida*, a native of India and Malaya. The specific name "fœtida" comes from the unpleasant odour given off by the flowers, and is simply Latin for fœtid. The seeds of the present species are eaten roasted, we believe, in India. We have a closely allied species in Queensland. It is particularly common in some parts of North Queensland, especially on the islands of Whitsunday Passage, and is sometimes called "Peanut Tree." It has large red pods, smaller, however, than those of your species, and has black seeds, which, after the shell has been removed, make quite pleasant eating. The Bottle Trees and the Kurrajong are placed by some botanists in the same genus *Sterculia*, but most now regard this as belonging to a separate genus *Brachychiton*.

Stagger Weed. "Catch Fly." "Fat Hen."

B.W. (North Tamborine)—

The specimens have been identified as follows:—The plant with the yellowish-green leaves, and small lavender-coloured flowers borne in whorls or circles, is the Stagger Weed (*Stachys arvensis*). Our experience has been that this plant is harmless for ordinary resting paddock stock, and animals have to be excited or worked before any symptoms of "staggers" or "shivers" are shown. Most dairymen look on it as a good fodder. Working horses, however, get staggers or shivers after feeding on the plant.

The other two weeds are *Silene gallica*, the French Catch Fly, and *Chenopodium album*, the Fat Hen. Neither of these plants is known to possess any poisonous or harmful properties.

Swamp Millet.

C.R.T. (Mackay)—

The specimen is Wild Millet or Swamp Millet (*Echinochloa crus-galli*). This grass is very widely spread over the warmer regions of the world, and several forms of it occur in Queensland. The one you send is most abundant in rather swampy areas. It is a valuable grass for stock, and is very closely allied to and probably one of the wild parent forms of such well-known cultivated fodders as Japanese Millet and White Panicum.

South Burnett Plants Named.

D.T.C. (Barlil, via Murgon)—

1. *Eragrostis cilianensis,* Stink Grass. This is a common weedy grass in cultivations and gardens. The common name arises through the odour emitted by glands along the margins of the leaves. Probably because of this odour, it is not usually eaten by stock.
2. *Cynodon dactylon,* Common Couch. Along creek flats and in similar situations this species forms quite a dense sward and provides useful fodder for stock. In one form or another it is widely spread in coastal and inland Queensland. It is often used as a lawn grass.
3. *Echinochloa colona,* Barnyard Millet. This grass is widely spread over the subtropical regions of the world. In Queensland, it usually only grows where the ground has been disturbed, and does not occur in any great quantity. It is good feed for cattle, being closely related to such well-known cultivated fodders as Japanese Millet and White Panicum.
4. *Eleusine indica,* Crow's Foot Grass. Quite solid tufts are usually formed by this grass, and in New South Wales it is regarded as a bad weed of cultivation. At times it contains a prussic acid yielding glucoside, and has been suspected of poisoning calves.
5. *Chloris virgata,* Feather Top Grass. It is a member of the Rhodes Grass genus, but unlike that species, rarely seems to be eaten by stock.
6. *Brachiaria foliosa,* Leafy Panic Grass. In shady and more moist places this grass is generally to be found. It is quite good feed for cattle, but rarely occurs in sufficient amount to affect ordinary pasture.
7. *Cyperus fulvus,* a sedge. On the whole, the sedges have not the fodder value of grasses, and they mostly grow in and around water.
8. *Fimbristylis dichotoma,* a sedge. This species is often quite common among the larger tufts of grasses in the ordinary pasture.
9. *Eragrostis leptostachya,* Paddock Love Grass. At times this forms quite a large amount of the feed in some paddocks, and is quite a useful species in the average mixed native pasture.
10. *Paspalidium gracile,* a native Paspalidium Grass. This often occurs in shady places, and on the tops of hills is sometimes quite common. It generally shows signs of having been eaten.
11. *Echinochloa crus-galli,* a Wild Millet. See No. 3.
12. *Paspalum dilatatum,* the common Paspalum. This is the main dairying grass of subtropical coastal Queensland and Northern New South Wales. It is a native of South America, but has been naturalised here for many years. The fungus on the seeds known as ergot has caused trouble among dairy cattle in many areas.
13. *Chloris divaricata,* a Star Grass. A very common grass, but of little use.
14. *Alternanthera repens,* Khaki Weed. This has been declared a noxious weed throughout Queensland. In some districts, it is known as Bindy-eye.
15. *Gnaphalium purpureum,* Cud Weed. This is generally looked on as a quite useful herb in the native pasture.
16. *Stachys arvensis,* Stagger Weed. This is generally eaten without harm by paddock stock. However, if horses or bullocks are worked after feeding upon it, they begin to show symptoms of staggers. It also taints milk slightly.
17. *Cyperus rotundus,* Nut Grass. This is a troublesome weed, being practically impossible to eradicate.
18. *Bromus unioloides,* Prairie Grass. This is winter-growing grass, which reaches maturity in the spring and early summer. It is quite good feed, and is sometimes cultivated for this purpose, although better kinds are generally available.

"Pear Tree."

N.L.K. (Charters Towers)—

The plant you send is *Terminalia platyphylla.* The name we have mostly heard applied to this plant is "Pear Tree." Of course, it is not a member of the Rosaceae like the ordinary pear, but belongs to a comparatively small family, Combretaceae. Some of these Terminalias make excellent shade trees in the Gulf country. One rather distinct from the rest is *Terminalia cattapa,* the Fiji Almond, which is largely used as a street and esplanade tree about Townsville.

Guinea Grass.

W.B. (Bracalba)—

The specimen is Guinea Grass, *Panicum maximum*. This grass is naturalised in many parts of Queensland, and is especially abundant on some of the fruit farms of the North Coast line, where it comes up as a weed. It is a very good fodder, which is relished by all classes of stock. The difficulty has been in obtaining a satisfactory seed supply, as the seeds lose their vitality very quickly after gathering. The plant can be usually spread by root division. Some varieties, we think, are an improvement on the normal form, and have been introduced into Queensland in recent years. One of the best of these is the sort known as Green Panic, or Fine Leaved Panic Grass, *Panicum maximum* var. *trichoglume*. A small plot of this grass for periodical cutting and feeding-off is a desirability.

Purple Top Chloris Grass.

H.T.V. (Gumlu)—

The specimen is *Chloris barbata*, Purple Top Chloris. This is a robust grass with stout creeping stems similar in general appearance to Rhodes Grass, but usually somewhat smaller. It is easily distinguished by its purple seed-head. It is frequently called in North Queensland, Purple Top Rhodes Grass, sometimes simply Purple Top Grass. It is very common in Queensland along the coastal belt from Port Curtis northwards, and has been found as far west as Julia Creek. On the whole, it favours old cultivation areas and other places where the ground has been disturbed. It is very common along railway embankments and roadsides, but is seldom seen in undisturbed pasture lands. The general opinion is that it is rather a poor fodder, but we have seen the grass when kept short eaten quite readily on a face with other grasses and herbage.

Geebung. Tumbling Mustard. Cud Weed. Milk Thistle.

F.C. (Kuraby)—

1. *Persoonia media*, Geebung. A small tree of the family *Proteaceae*. Some of the Geebungs have much narrower leaves than the one you sent, but this is the common one about Brisbane. The fruit, when ripe, is edible, though we have never found them in anything but a very acidulous state. So far as we know, the bark of Persoonia has not been used as a tanning agent. The tannin content is not known.
2. *Sisymbrium orientale*, Tumbling Mustard.
3. *Gnaphalium purpureum*, Cud Weed.
4. *Emilia sonchifolia*. A common weed allied to the Sow Thistle, and sometimes called Purple Sow Thistle or Milk Thistle. A very closely allied species of Emilia is grown in gardens as an ornamental under the name of Caecilia.

None of the plants is known to possess any poisonous or harmful properties.

Kangaroo Grass.

D.McW. (Toowoomba)—

The specimen is Kangaroo Grass, *Themeda australis*, a valuable native grass relished by all classes of stock. Its chief disadvantage is that it does not stand up to heavy stocking. The grass would grow quite well under cultivation, but seed is not always available through ordinary commercial channels. If, however, you are interested in getting this grass on to your property, the best plan, we think, would be to gather the seed yourself. This could be done in the rough, the seed-heads scattered about, and stock allowed to trample them in.

Tree Lupin.

W.J.E. (Zillmere)—

The Tree Lupin (*Lupinus arboreus*), so far as we can find, is not known to be poisonous, but in view of the fact that so many species of Lupins are poisonous to stock, it is a dangerous practice to feed any of them indiscriminately. The general experience has been that the plants have to be eaten in considerable quantity before any trouble ensues. There is very little likelihood of any trouble being caused by a few bushes in a garden or thrown over a fence to a home cow. Most trouble with the Lupins has been experienced in the United States, where many species are common plants on the sheep and cattle ranges. Trouble also has been caused in Europe, from both wild and cultivated species.

Rural Topics

A Land Girl on War Service—And a Barber Beards the Barley.

Here is a story from an official bulletin issued by the British Ministry of Agriculture—an unusual source of light-hearted humour:

It is the tale of a member of the Women's Land Army who went into training on a mixed farm. Last September she was a nineteen-year-old student of economics at the London University with no farming knowledge at all, and not even able to drive a car—which is something exceptional for a modern "miss." Machinery had little interest for her, but she was put on a tractor and given lessons in milking. After a fortnight, the owner of the farm offered her a job for "six months or the duration." Soon she was milking every morning and ploughing every day—when weather permitted. On wet days she painted farm machinery!

Such are fruits of enthusiasm and eagerness to serve, although it must be said that the girl herself says she has never been so happy in her life.

The same official bulletin reveals that one of the best ploughman of Leicestershire's War Agricultural Executive Committee was, until recently, a barber who knew nothing about ploughs or tractors. "He is now able to plough a field," the committee reports, "without supervision, and the results of his work are highly commended." The question is, will the barber "beard" the barley. No doubt, a steady hand and a good eye help him in his new job of "trimming up" the land.

But what counts for most in these things is the willing spirit and the big heart displayed by Britain's new recruits to the very important job of food production in war time.

The Submarine and Machinery for British Farms.

Despite the submarine "sink-at-sight" campaign, shipments of agricultural machinery are still being delivered in large volume to Britain for the "speed-the-plough" plan on British farms. There have been few losses of tractor consignments. This is important, because substantial shipments of tractors are made from America in the ordinary way, and they are doubly valuable to-day.

Although it is supposed that losses are usually covered by insurance—a sort of a "sinking fund," so to speak—there is actually a loss to the importers, since there is no goodwill to be got by sending tractors to Davy Jones and his team of mermaids.

Refrigeration for Hire.

The freezer locker plan is gaining ground rapidly in rural districts in the United States. Under this plan a cold store is built in a central place. In this cold store there are individual refrigerated lockers which are let to farmers and others to enable them to store for their own use fresh foods and other commodities. In all the States of the Union these community refrigeration plants are multiplying rapidly.

Refrigeration is gaining ground remarkably in Queensland, and the home refrigerator is coming into use to an ever increasing extent. Even if electric power is unavailable, the kerosene "fridge," is a most useful job. The obvious thing is to make primary production in all its forms reasonably profitable so that every farm will have its freezer.

Milk in the Cooler.

Cooling aerates milk which, as it passes in a thin film over the cooler, allows any animal or fodder odours to pass off. Cooling also means a slowing down in the rate of multiplication of germs that may have found their way into the milk, so that the milk keeps fresh and sweet over a much longer period. After milk has been cooled, we should not undo what we've done by exposing the cans to the hot rays of the sun. The same applies to cream which, of course, should be completely shaded when left on the side of the road for the factory lorry to pick up.

"Save Your Soil or Perish."

Losses by soil erosion are regarded very seriously in the South. In fact, in some places farmers are asking business firms to include a slogan, such as "Conserve your Soil or Perish," in all their advertising.

In one district soil erosion has reached such alarming proportions that there is a definite need to educate landholders on the necessity of soil conservation.

In discussing the matter, a business man in a town in New South Wales suggested that the slogan should be "Stop cutting down the Timber on the High Country and there will be no Soil Erosion." In one locality, it is said that the clearing of timber from the mountainside has been the cause of 95 per cent. of the property destruction that has occurred.

Italy had a similar problem; so engineers were called together. They had pits dug on the mountain sides and trees planted. The rain filled the pits, supplying moisture to the trees and soaking to the soil below. To-day this region is completely reafforested, and what was formerly a ruined area is fast being reclaimed for profitable production.

Old "Dobbin" Wins—From the Plough to the Racecourse and Back Again.

Here is a story from England that gives point to the revival of horse power on the farm—and off the farm, too. "Sawfish" is the farm horse which won an important steeplechase at Liverpool (England) recently. He is certainly a remarkable animal. Usually we hear the story of the Cup winner earning an honest living in his old age between the shafts of a milk cart, so this yarn may sound like a step in reverse. "Sawfish" got his race training working on a farm, with an occasional gallop in a neighbouring paddock. He was entered for the steeple' and was brought to the Aintree racecourse in his owner's cattle trailer, and, although bought originally for £4 10s. at a sale, won the event in great style! After this, it would be expected that the owner would value him very highly and would be unwilling to part with him. Such, however, was not the case, for soon afterwards "Sawfish" was put up for sale. And the reason? The owner wasn't worrying about winning more races, he wanted to buy a tractor with the money and grow more food in the "Plough for Victory" campaign. The steeplechaser is now working on another farm doing his bit for Britain.

Poetry in Agriculture—The English Scene.

Here is another example of how spring affects officialdom with its light and airy spirit. This slab of poetic expression from an official bulletin of the British Ministry of Agriculture which came in the post recently. "The pattern of the English scene has altered, with more frequent splashes of ploughland breaking up the green of the predominant permanent pasture." And, again, "Never have so many tractors been working through the night, so that many a village hears the *hum of machinery under the stars through the hours of darkness.*"

Speaking of the "hum of machinery under the stars through the hours of darkness" makes us think that the jazz band has at last accomplished what music-lovers and critics pessimistically predicted, that is, that the ear would soon become insenstive to any extraneous noise whatsoever, and that no distinction would eventually be made between a pneumatic drill and an oratorio. Of what use, then, would the "Cradle Song" be, if a running tractor engine would rock us to sleep just as quickly? However, remarkable progress has been made in tractor engine manufacture since American jazz assailed our ears, and it is no exaggeration now to call the running of a tractor a "hum," yes, a hum like a sewing machine.

A Showdown at the Show.

An amusing incident occurred at the Brisbane Show when two well-known graziers were having a long conversation on the John Macdonald Stand. Each, apparently, wanted to get away without seeming to be discourteous, and eventually some excuse for parting was found plausible enough. Within very little time both friends found themselves at the Show Post Office writing out telegrams almost elbow to elbow. One of them remarked rather sheepishly about the nuisance of having to send important business wires while at the Show; but the other, a trifle more candid, exclaimed, "Yes, what have you backed?" The shot hit the mark and the real confession came out on both sides without loss of time or words. Both were on the winner of the Ascot Handicap.

Farm Notes

NOVEMBER.

WHEAT-HARVESTING will become general in November, and now is the time to see that all field equipment—header-harvesters, tractors, and other machinery —is in thorough working order. All working parts should be oiled and examined and necessary readjustments made in order to avoid the risk of stoppages in busy times.

Rust is not the menace that it used to be, now that more or less rust-resistant wheats are in general cultivation. Three Seas and Seafoam wheats are moderately resistant, while other varieties—such as Flora and Florence—usually ripen early enough to escape rust.

November is regarded as the best time for the establishment of the main maize crop, because the tasselling period coincides usually with normal summer rains. Too much attention cannot be given to the preparation of land for maize, which should now be well advanced, for no amount of inter-row cultivation will overcome the retarding influence of faulty initial preparation. Inter-row cultivation should become progressively shallower as growth proceeds, and may be discontinued at the cobbing stage.

Increased attention is being given to the growing of grain sorghums, chiefly in districts where the rainfall is insufficient to assure profitable yields from maize. Yields up to 12 bags to the acre have been obtained under conditions fatal to maize, while the capacity of header-harvesters to deal with the new dwarf-growing varieties is a big factor in economical production.

For intermediate crops, the rapidly maturing millets, Japanese millet and white panicum, can be recommended for present sowing, being suitable for grazing, silage, or hay. If seed production is desired, preference should be given to the variety known as Giant Panicum or Giant Setaria, and to the French millet.

Local potatoes and onions will now be arriving on the market, and, in order to obtain the best possible returns, attention should be given to grading, and to marketing produce in good, clean bags. To retard infestation by the potato tuber moth, the potatoes should be bagged and removed from the field without delay, for if exposed overnight, some infestation may occur during storage.

The planting of peanuts will be continued in the main South Burnett districts, where Virginia Bunch and Red Spanish are the principal varieties grown. Growers are reminded of the better germination obtainable if seed is treated with a fungicide before sowing.

In addition to the crops mentioned, seasonal sowings of Sudan grass, broom millet, buckwheat, pumpkins, and melons can be made, and cow cane and sweet potatoes planted out.

Where broom millet is grown as a sideline, it is sometimes preferable to make small successive sowings so as to spread the harvesting over a longer period.

CAROB BEAN.

The Department of Agriculture and Stock has a limited quantity of Carob Bean seed on hand, and is prepared to supply seed samples to interested farmers and graziers on application to the Under Secretary, Department of Agriculture and Stock, William Street, Brisbane.

The Carob Bean is especially suited to the Darling Downs and the cooler districts of the State.

Orchard Notes

NOVEMBER.

THE COASTAL DISTRICTS.

Citrus Fruits.

In the citrus orchard increasing temperature and the possibility of a dry period call for the utmost attention to soil conditions, particularly aeration and moisture conservation. At the slightest sign of distress because of lack of moisture, trees should be irrigated thoroughly whenever water is available. At the same time attention should be given to cultivation, particularly on hillside orchards. In the coastal districts, the possibility of the approach of storms will prompt growers to consider the completion of each cultivation by forming shallow drains for running off excess water and preventing soil loss.

The incidence of mites, the direct cause of the darkening of the skin of the fruit, a condition known as "Maori disease," is another matter for observation. Usually the first indication of the trouble is when, with the sun shining on it, the fruit has the appearance of being covered with a grey dust. If examined with a good lens, the skin will be seen to be covered with numerous yellow slug-like insects which are living on the skin.

Under certain weather conditions scale movement may be expected.

Detailed information regarding insect control may be obtained from departmental publications on the subject. Every fruit and vegetable grower should have the Agricultural and Pastoral Handbook, Vol. III. (Insect Pests and their Control, Plant Diseases and their Control), obtainable from the Department of Agriculture and Stock. Price 3s., post free.

Pineapples.

Continue planting pineapples as discussed in these notes last month, always remembering that the modern practice is smaller areas, close planting with more pineapples to the acre, quicker, better, and healthier growth, and finally better fruit by liberal fertilizing through the leaf bases with 10-6-10. Collectively, these practices tend towards the elimination of wilt.

Bananas.

New Plantings.—November and December are very suitable planting months in most districts. Just as modern methods have brought about great improvements in pineapple culture, so they might be applied in principle to banana-growing. Smaller areas and large production per acre should cut overhead costs, lighten labour, lengthen the profitable life of the plantation, and reduce the time of waiting for the crop. To this end, select planting material with care, plant in large holes, and break up the ground as soon as possible after planting. To prevent the loss of top soil by erosion and to provide the bananas with a cooler and moister environment, plant a cover crop as soon as the weather permits and initial weed growth has been suppressed. This will hold the loose surface soil during the summer rains.

Young Plantations.—The correct follower or followers for each plant should be selected, if not already done, and all additional suckers suppressed. Cultivate to conserve moisture, and mulch with a cover crop. A complete fertilizer will improve the coming crop.

Old Plantations.—De-sucker to one follower to each plant. Apply a complete fertilizer, if not already done, and cultivate to conserve moisture.

General.—Bait for borers; be prepared for caterpillar plagues; watch for bunchy top.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, for if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth.

Spraying for codling moth should be continued, and all pip fruit trees should be bandaged by the beginning of the month; further, the bandages should be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is a cause of the increase in this serious pest in the Granite Belt, and growers are warned that they should pay more attention to the destruction of this pest if they wish to grow pip fruit profitably.

Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once. Unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action should be taken to combat this the most serious pest of the Granite Belt, and growers should realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry.

A sharp lookout should be kept for brown rot in fruit, and, on its first appearance in a district, all ripening fruit should be sprayed with lime sulphur 1 in 120.

All grape vines, potatoes, and tomatoes should be sprayed with Bordeaux or Burgundy mixture, as required, for the control of downy mildew and anthracnose of the grapes, and Irish blight and target spot of the potato and tomato.

RHODES GRASS AS HAY.

While the value of Rhodes grass as pasture is well recognised in Queensland, its usefulness as a hay crop is little appreciated. Not only could fodder reserves be built up on the farm or station by conserving surplus Rhodes grass pasturage as hay, but, in some circumstances, sowing down of special areas to Rhodes grass for hay would be sound agricultural practice.

The cutting of hay from grassed country will be restricted, necessarily, to cleared land with a fairly even surface, and is practicable only in seasons of abundant growth. When seasonal conditions are such that a surplus of grass is indicated at an early date, the paddocks which can be mown should be closed to all stock and permitted to develop to the hay stage, when the crop may be harvested. In normal seasons, if the cutting is made during summer, the grass will recover quickly.

Apart from lucerne, the main summer-grown hay crops (e.g., Sudan grass and millets) are annuals. Cropping with annuals has the very obvious disadvantages of high cost of production and of exposing soils to erosive influences, particularly storm waters. A perennial or long-lived hay grass costs little to maintain, prevents erosion, improves the texture of the soil, and adds materially to its organic content. Although it is not suggested that Sudan grass and millets should be abandoned as hay crops in favour of Rhodes grass, farmers and pastoralists might well give consideration to the testing of Rhodes grass for hay purposes.

Because of its susceptibility to injury by heavy frosts, Rhodes grass is, however, not likely to prove more useful than a rotation of annuals in the colder regions of the State, such as parts of the Darling Downs.

In the drier localities in which Rhodes grass is grown largely, the hay is easily cured. In most cases it should be in the stack within forty-eight hours of cutting. The yield varies, of course, with seasonal and soil conditions, but on fertile soils young stands should provide at least two cuttings a year, each of 1½ to 2 tons of hay to the acre. The quality of the hay, particularly its palatability, is somewhat variable, but all classes of stock will eat it without much waste.

Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

YOUR CHILD.

THE APPROACH OF SUMMER.

BABY enjoys the summer months when he becomes released from the burden of clothing which hampered his movements during the cold weather. There is nothing that pleases him more than to exercise his limbs freely in the most scanty attire or in no clothes at all.

Avoid Overclothing.

If baby is overclad in hot weather he will suffer from prickly heat. This is caused by excessive sweating and the sweat not being allowed to evaporate freely. The condition is aggravated by friction. As we mentioned in our article on baby's clothing, he should wear cool singlets, not heavy woollens. Outside the singlet he should wear, in hot weather, the lightest of airy garments, which should be removed when he is indoors. He should not be tormented with flannel binders. Prickly heat affects the back chiefly, because he lies on his back and the sweat cannot dry quickly. He should be allowed to sleep on a cool sheet placed on a firm mattress, and during the day he may lie and kick on a soft grass mat on the floor, provided he is out of a direct draught. He should be trained to sleep on his side.

Avoid Overfeeding.

Baby does not require as much food or as much fat in his food in the hot weather. The intervals between feeds should be lengthened to four hours if this has not already been done. He should be encouraged to drink cool boiled water between meals as he naturally gets thirsty in hot weather.

Danger of Diarrhoea—Mortality Reduced.

Before Baby Clinics were established in Queensland by the Government in 1918, many infants died as the result of diarrhœa. The epidemic began with the sudden onset of hot weather, which usually occurred in October when flies became prevalent.

Although deaths due to diarrhœa have been reduced to about one-tenth of what they were as the result of mothers learning how to guard against it, our efforts to prevent it should not be relaxed.

It is well to remember that a breast-fed infant has soft motions. They are scarcely ever firm and solid like those of an artificially fed infant. A healthy breast-fed baby may have two or three motions daily, perhaps one larger than the others. When an artificially fed infant has several loose motions or motions which are green or pale a mother should be on her guard. An underfed infant may pass small fluid motions because he is not having sufficient food to give the motions substance.

Diarrhoea from Unsuitable Food or Feeding.

There is a form of diarrhœa which is brought about by overfeeding or by giving unsuitable food. The loose motions represent nature's effort to expell the undigested surplus or harmful material. If the overfeeding continues, an upset may occur, the child refuses his food and loss of weight follows.

Diarrhoea Due to Infection.

Diarrhœa due to infection by germs is more serious. The germs responsible for the infection are present in the motions of children suffering from the disease and are conveyed to the food on the hands of the attendants or by flies, or by other means. Most breast-fed infants escape the infectious form of diarrhœa, because their food is germ-free. Occasionally one becomes infected by using a contaminated dummy or by accidentally swallowing some infected material.

In this connection it is interesting to note that calves, like babies, suffer from "scouring" in warm weather, while the young of horses, pigs, and dogs remain free. Calves are liable to suffer because man takes the cow's milk for himself and feeds the calf out of a bucket. The baby is liable to suffer when he is denied his mother's milk.

Encourage Natural Feeding.

For this reason every effort should be made to give baby his natural food, both what he is able to take himself and what can be expressed by his mother. In cases where the mother's supply is short she should do what she can to increase it. She should drink as much water as possible; she should take 1½ to 2 pints of milk each day; she should try to make time for more rest both physical and mental; she should feed baby regularly, making sure that at least one breast is emptied at each feeding, and she should express milk from both breasts after each feeding. If her supply continues to be short, and she is not already receiving help at a Child Welfare Centre, she should seek the advice and help of a child welfare nurse, either personally or by letter, who will teach her the methods of breast stimulation. In most cases the supply can be increased by these means.

Complementary Feeding.

In cases in which the mother's milk is not sufficient for the baby's requirements, some form of artificial milk mixture will need to be added.

If a refrigerator is available and reliable pasteurised milk is received in sealed bottles, these should be placed in the refrigerator as soon as possible. If a refrigerator is not available this milk should be placed on the ice or in an improvised cooler such as that illustrated in the book entitled "Care of Mother and Child," issued at the Child Welfare Centres throughout the State.

All other milk should be brought to the boil as soon as possible after it is received, cooled as quickly as possible and kept cool, below 60 degrees if possible, because germs multiply most rapidly at about blood heat—98 degrees Fahr.

If no other convenience is available the milk should be poured into an upright jug standing in cold water and placed in the coolest, shadiest, and most draughty part of the house. The jug should be loosely covered with damp butter muslin which is allowed to dip into the water all round.

PREVENTION.

The Care of Milk.

Once it is decided to introduce cow's milk into a child's feeding, the greatest care must be exercised in securing the freshest and cleanest milk, particularly when

the weather is hot. The hotter the weather the more readily germs multiply. All bottles, jugs, saucepans, teats, &c., must be washed absolutely free of all traces of milk immediately after they are used. An almost invisible amount of stale milk may render the whole day's supply dangerous. Wash all utensils in cold water before using hot water and soap. Keep everything that is used in connection with baby's food covered from flies. Milk may become contaminated and poisonous after being pasteurised or boiled, although it may not be sour. If a change in the quantity or composition of the milk mixture becomes necessary during the hot weather, make the change gradually.

Dried Milk.

If reliable clean fresh milk cannot be obtained, dried milk should be used. Dried milk is also very useful during long journeys.

Care of Napkins and Hands.

Remove soiled napkins to a covered pail at once and wash the hands carefully before handling baby's food.

Treatment of Diarrhoea.

In some cases the motions are observed to be pale or green and the child "off colour" before the motions became frequent. This is the time when treatment should begin. The following treatment is recommended:—

1. Give a dose of castor oil—one teaspoon or more according to age.

The practice of giving castor oil to babies who are well is condemned, but when it is given in cases of diarrhœa it is found to hasten recovery.

2. Stop milk and all other food and give boiled water only.

Diarrhœa in a breast-fed infant is not likely to be as serious as in an artificially-fed infant. When it does occur the omission of several feeds and the substitution of boiled water may be all that is necessary. During this time the mother should express the milk from her breasts at the usual feeding times. When the child is put back on the breast, he should be given short feeds at first and boiled water given before and after until it becomes evident from the character of the motions and the improvement in the child's general condition that he is able to deal with his food. The time of each feeding is gradually lengthened until his usual feeds are resumed. This may take some days.

3. In the case of an artificially-fed baby proceed as above, giving as much boiled water as baby will take. After the omission of one or two feeds, in addition to the water give barley water sweetened with glucose every two or three hours. Continue this treatment until the motions lose their unhealthy appearance and the child's general condition has improved. Crying and irritability during the course of the disease are favourable signs, whereas drowsiness and limpness are unfavourable.

Relapses are often brought about by giving milk too soon, therefore do not be in a hurry to give milk. A dextrinised food made with water is very useful and can be used in conjunction with the barley water. Dried apple powder made into a mixture with water is often very useful.

In the case of older children cereal jellies, strained vegetable broth, vegetable puree, and rusks are gradually added before any milk is given. Begin adding milk—small quantities, even one teaspoon—to the barley water and other mixtures which the child is taking, and gradually increase according to his tolerance, which is decided by the appearance of the motions and by the child's general condition. The child may have an intolerance for fat for a time subsequent to an attack, and it will be advisable to add such things as cream, cod liver oil, and butter very gradually.

In cases in which definite signs of improvement have not occurred within twenty-four hours after commencing this treatment, medical advice should be sought.

You may obtain information on all matters concerning infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred street, Fortitude Valley, N.1, Brisbane.

BEAUTY AND GOOD TEETH.

"All facial beauty depends basically on the harmony of a well-developed bony structure, and the bones of the face must be well-shaped to achieve a pleasing result. These include the bones of the cheeks, nose, and jaws; no other part of the face so influences the whole. An over-developed or an under-developed jaw entirely alters the expression of the face, and we hear the owners of such features described as 'pugnacious' or, alternatively, as 'weak-chinned.'"

It is truly amazing the extent to which the lower third of the face, including the jaws, lips, and, of course, teeth, is responsible for its expression. The most homely face can be transformed by a smile revealing even white teeth, while on the contrary the most perfect features will lose their attraction if on smiling they reveal dirty, uneven, or missing teeth.

The harmonious effect of well-developed bones is not unattainable. Practically all are born with correctly formed and proportioned jaws, and given the proper conditions for growth will develop as they should. Unfortunately, incorrect breathing, lack of sufficient exercise, and bad habits, such as sucking a dummy or a finger, which retard development, are so common that few of us reached adult age looking as we might have done.

The teeth themselves form a very vital part of this bony framework; their disarrangement might cause many and varied results, as "buck teeth" when the lips cannot cover them and their loss is always attended by the collapse of the lips and cheeks. Even the loss of back teeth, which the individual often hopes will pass unnoticed, cause the cheeks to fall in, giving an older and sometimes even a haggard expression.

Crooked teeth may be straightened and lost teeth may be replaced, and the earlier the better. But, better still, teeth and jaws may be looked after in such a way that neither of these calamities occur. Good teeth are not only an asset to looks and personality, but to health itself, without which, of course, we can be sure of neither.

School children are noticed frequently sitting with their chin leaning on the hand. If this habit is continued, the jaw will grow sideways. Biting in one position was bad, and breathing through the mouth must not be permitted. Teeth should be cleaned after every meal. From about three years of age the child should be taken regularly to the dentist. It is much cheaper to have a tiny hole filled than a large one. Children should be taught to regard the dentist as a friend.—Mrs. J. K. Savage, B.D.S., Director of Dental Health Education for the Australian Dental Assn., N.S.W. Branch.

IN THE FARM KITCHEN.

FOR A CHANGE IN THE MENU.

Stuffed Cabbage.

Divide a well-washed cabbage into single leaves and boil in salted water until limp, but not cooked. Drain well and fill with the following mixture:—Fry a minced large onion until cooked, but not brown; add 1 large diced raw potato and 1 small green diced capsicum. Cook a little longer, then add 2 cups cooked diced meat (left-overs), 1 teaspoon chopped parsley, pepper, salt, and a little nutmeg. Cook gently for about ten minutes, then add enough tomato sauce to bind mixture together. When all leaves have been filled, roll up tightly and place them in a greased casserole dish, pour over 1 tablespoon butter, ¼ cup cream, and ½ cup milk, mixed together. Cover well and bake in a moderate oven for one hour. When ready to serve, sprinkle with 2 tablespoons finely-chopped and fried red capsicum and 1 dessertspoon chopped parsley.

Onion Farcies.

Wash onions well, but do not peel them. Simmer in boiling salted water for half hour, drain well, remove the outer skins, and then carefully remove centre, leaving only a wall about ½ inch thick. Chop the centres and fry in a little butter until cooked, but not brown. Mix cooked onion with 1½ cups cooked rice, 1 teaspoon chopped parsley, pepper and salt to taste, ¼ cup each chopped almonds and walnuts, 1 dessertspoon chopped and cooked green capsicum, and 1 beaten egg. Fill prepared onion cases, place in greased casserole dish, cover and bake in a moderate oven for about forty-five minutes.

Savoury Girdle Cakes.

Beat 2 egg-yolks with 1½ cups milk, 1 teaspoon salt, and pepper to taste. Gradually beat in 1½ cups sifted flour, then 1 dessertspoon melted butter. Now add 1½ cups grated potato, 1 tablespoon shredded and fried bacon, and 1 teaspoon chopped parsley. Beat the whites until stiff and fold into batter. Bake at once on a hot griddle and serve at once.

Rhubarb Pie.

Line a tart plate with a good short crust and reserve enough to cover top. Mix together 1 bunch rhubarb cut into 1-inch pieces, 1 cup each seeded raisins and sugar, and 1 tablespoon sago. Add ¼ cup water and mix well together so the sago will not be in one place. Fill prepared tart case, cover with lid. Make a hole in it for steam to escape, and bake in hot oven for about forty-five minutes.

Fish Pudding.

Boil 1 lb. fish and 1 lb. haddock in salted water until tender, but not broken. Drain well and flake. In the meantime, cook 1 cup rice in 2 cups water and 2 cups milk and salt to taste, until quite tender, but not sticky. Drain well and place a layer in the bottom of a fireproof dish. Now add a layer of prepared fish, season with pepper, salt, and a little grated lemon rind, and a few dots of butter, continue with alternate layers of fish and rice until dish is almost full. Beat 3 eggs slightly, add 2 or 3 cups milk, pepper and salt to taste, and pour over contents. Bake in a moderate oven until set and nicely browned.

Mocha Bread Custard.

Have some thin slices of brown bread and butter free from crust. Place a layer in the bottom of a fireproof dish, sprinkle with brown sugar, then another layer of bread. Now add a little more sugar, 1 tablespoon chopped candied peel, then another layer of bread. Now spread with a layer of whipped cream (about ¼ cup), then another layer of bread. Beat 3 eggs slightly, add 2 cups milk, 1 cup strong black coffee, pinch salt, 1 dessertspoon sugar. Pour over prepared bread, and place in a dish of water. Bake in a moderate oven until set and nicely browned.

Vegetable Salad.

Mix together 3 cups cooked peas, 2 teaspoons finely-chopped onion, 1½ cups finely-chopped raw celery, pepper and salt to taste, ½ cup chopped capsicum, red or green, 4 cups finely-shredded white cabbage, 2 grated raw carrots, 4 or 5 sliced radishes. Mix 1 packet cream cheese with 1 cup French dressing, add to prepared vegetables, mix well together, and lastly add 1 small lettuce broken into pieces.

Grilled Ham with Cornmeal Cakes.

Place 2½ cups boiling water in the top of a double pan, gradually add 1 cup cornmeal and ½ level teaspoon salt. Stir well over the fire until it thickens, then cook for one hour. Well grease a medium-size making-powder tin, or any other cylindrical tin will do, fill with mixture and allow to become quite cold. Cut into slices about ½ inch thick, dip in beaten egg, flavoured with pepper and salt. Fry in boiling fat until a golden brown. Fry as many slices of tinned pineapple as required in a little butter until a nice brown. Place a fried cake on a slice of pineapple, then garnish with slices of grilled or fried ham.

Sausage and Cabbage Hot Pot.

Boil some cabbage, or, if you prefer it, cook it in the following manner:—Shred up the cabbage finely in strips, removing any hard parts, and put these into cold water as you do them. Put a little butter in a saucepan, and when it is melted take the cabbage strips out of the water in handfuls just as they are and put them into the pan. Do not add any more water than that which adheres to the strips, but dust in some salt and pepper, put on the lid and cook for about an hour, stirring the cabbage now and then to bring the cooked parts up to the top. Butter a hot pot and put into it alternate layers of cabbage, lightly fried onion, and parboiled sliced potatoes. Season as you go, and embed here and there as many chipolata sausages as you think fit, skinning them if you think it necessary (or larger sausages in small pieces may be used equally well). See that the top layer is of potatoes, put on the lid, and bake in a moderate oven for three-quarters of an hour. Then take off the cover and let the potatoes on the top brown quickly before serving.

Frankfurts en Brochette with Red Cabbage.

Drop 6 frankfurts in boiling water for a few minutes, then remove skin and cut in three slices lengthwise. Cut some cheddar cheese into slices the same length as the frankfurts, but not as thick, and sprinkle with lemon juice and a little cayenne. Place a slice of frankfurt on a skewer, a slice of cheese, a slice of frankfurt, a slice of cheese, and another slice of frankfurt. Place under a hot griller and cook until cheese is melted a little and brown. Turn during the cooking. Dish up on the skewers around red cabbage cooked as follows:—Shred a small red cabbage and soak for one hour. Drain well and place in a saucepan with 1 tablespoon melted butter, pepper and salt to taste. Cover with tight-fitting lid and cook over a low gas until tender, stirring it now and again. It will take about 20 minutes.

Baked Fillet of Pork.

Place about 2 lb. slice of pork (from the leg, and cut about 2 inches thick) in a well-greased casserole dish. Cook 2 or 3 apples with as little water as possible and rub through a sieve. Add the juice of 1 orange, 2 tablespoons lemon juice, 2 level tablespoons each brown sugar and melted butter, ½ teaspoon ground cinnamon (optional). Cover pork with mixture and bake in a moderate oven for about one and a-half to two hours.

Meat Loaf.

Mix together 4 cups cooked and minced cold meat, 3 cups stock, 1 cup water, 3 cups fine white breadcrumbs, 2 medium-minced onions, 2 level teaspoons salt, 1 teaspoon chopped parsley, pepper and a little grated horseradish to taste. Beat 3 eggs and bind mixture. Press into a well-creased oblong loaf tin and bake in a moderate oven for 1 hour or until it feels firm. Turn out and serve with a sauce made from the left-over gravy, adding 6 chopped mushrooms, 1 chopped hard-boiled egg, 1 teaspoon Worcestershire sauce, and seasoning with pepper and salt. Simmer until mushrooms are cooked and serve separately.

Ham Rolls.

Have as many thin slices of ham as required, allowing two per person. Spread each slice with made mustard. Chop 2 hard-boiled eggs finely, add 1 teaspoon made mustard, pepper and salt, 1 teaspoon each butter, chopped sour gherkins, and chopped chutney. Spread this on ham, roll up and fasten with a toothpick. Place on a greased tray and spread with a little butter. Grill quickly and serve.

Honey and Walnut Rolls.

Dissolve together 1 level cup each sugar and butter and boiling water, 1½ level teaspoons salt, and 2 well-beaten eggs. Place 2 oz. compressed yeast in 1 cup cold water, allow to stand for 5 minutes, then stir until dissolved. Add to butter mixture, which should be lukewarm. Now add 6 cups sifted plain flour, knead until quite smooth, cover with a cloth, and set aside in a warm place until it has doubled its bulk. Form into rolls and place on a greased baking tin, in which there is about ½ inch honey, and sprinkle well with chopped walnuts. Allow to rise until they have again doubled their bulk, then bake in a hot oven for about twelve to fifteen minutes. Dip brush in honey surrounding rolls and brush over top. Return to oven for a few mintues and serve hot with butter.

Steamed Raspberry Pudding.

Cream 4 oz. butter and gradually add 4 oz. castor sugar; add 2 eggs, one at a time, then add 7 oz. self-raising flour, sifted together with a good pinch salt. Add the grated rind of 1 lemon, the strained juice, 4 dessertspoons raspberry jam, and a little cochineal to colour slightly. Mix well and add a little milk if too dry. Steam for two hours and serve with a custard sauce.

Grilled Butter Fish with Mustard Sauce.

Prepare fish and wipe dry. Cut down the back and remove bone. Put the fish flat on a well-greased dish, sprinkle with salt and pepper and dot with butter. Grill slowly for a few minutes, then spread with the following sauce:—Melt 1 dessertspoon butter in saucepan, add 1 dessertspoon flour, 1 teaspoon dry mustard; cook a little, then add ½ pint milk. Stir until thick, then add salt, pepper, and 1 dessertspoon vinegar and a pinch ground ginger. Pour or spread over fish and finish grilling.

Grilled Kidneys and Bacon.

Prepare kidneys in the usual way, then place a skewer through the two halves in order to keep them flat. Place them on a tin with bacon rashers and cook until tender, taking care to turn them often. Sprinkle with pepper and salt and serve.

Banana and Strawberry Meringue.

Make a meringue case with 4 egg-whites and 8 oz. castor sugar. When cooked and quite cold fill with the following:—Mash 3 ripe bananas, add ¼ teaspoon lemon rind, a little lemon juice, and ½ pint cream, and about 2 oz. castor sugar. Whip until stiff, then add 1 box sliced strawberries, keeping a few back to decorate top. Fill meringue, decorate top, and when just about to serve sprinkle with icing sugar.

CITRUS PRESERVES.

Orange Syrup.

An exceptionally fine beverage which may be kept quite a while may be made from any sound oranges as follows:—

Dissolve 3 lb. sugar in 1 quart of water and bring to the boil. Then add ½ oz. Epsom salts and boil fifteen minutes before adding 1 oz. tartaric acid and ½ oz. citric acid. The grated peel and the juice of six average-sized oranges and of two lemons are then added. Allow the mixture to cool, then strain through cheesecloth; bottle and securely seal with paraffin or sealing wax.

When desired for use, dilute with water according to palate.

Orange, Grapefruit and Lemon Marmalade.

Finely shred one orange, one grapefruit, and one lemon, all of average size. Add 5 pints of water (boiling) and allow to stand overnight; then boil until tender and let stand a further twenty-four hours. The following morning add 6 lb. of sugar and boil briskly until it jells—about one and a-half hours.

Orange and Apple Jam.

Slice three average-sized oranges and add 6 pints of boiling water; allow to stand overnight. Add three finely-sliced apples (Granny Smith for preference) and boil for half an hour, or until tender. Then add 6 lb. of sugar and boil the whole briskly for up to two hours, when it should jell if tested.

As with other orange recipes, the use of freshly picked fruit is advised, but if picked for some time, or if uncertain, add the juice of two lemons to prevent crystallisation or candying of the jam.

Sweet Orange Jam.

Allow 2 pints of boiling water to each lb. of finely-sliced oranges and let stand overnight. The following morning boil for half an hour to soften and let stand a further twenty-four hours. This is important, having a decided effect upon the jelling quality. Measure the pulp, and to each pint allow 1 lb. of sugar. Boil briskly until the jam becomes clear and sets well when tested—it generally takes about one and a-half hours of brisk boiling.

The juice of two lemons may be added with the sugar to improve the flavour, and, if the fruit has been picked some time, to prevent crystallisation.

Orange Jelly.

Cover six sliced oranges and two lemons with 4 quarts of boiling water. Allow to stand overnight, and then boil briskly for about half an hour, or until tender. Allow to stand a further twenty-four hours, then bring to the boil, and, after straining through cheesecloth, filter through flannel. Avoid any squeezing of the pulp, since this results in clouding. Measure the juice, and to each pint allow 1 lb. of sugar; boil briskly until it jells when tested.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1940 AND 1939, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1940.	Aug., 1939.		Aug.	No. of years' records.	Aug., 1940.	Aug., 1939.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	0·87	39	0·64	0·19	Gatton College ..	1·10	41	0·21	1·56
Cairns	1·69	58	0·61	0·52	Gayndah	1·16	69	0·06	1·68
Cardwell	1·25	68	0·38	0·90	Gympie	1·70	70	0·76	1·85
Cooktown ..	1·17	64	1·16	0·23	Kilkivan	1·40	61	0·25	1·80
Herberton ..	0·62	54	0·30	0·16	Maryborough ..	1·65	69	1·24	1·39
Ingham	1·43	48	1·86	1·27	Nambour	1·89	44	3·35	3·36
Innisfail	4·92	59	3·52	0·73	Nanango	1·31	58	0·41	1·67
Mossman Mill ..	1·26	27	0·35	0·68	Rockhampton ..	0·82	69	2·17	1·18
Townsville ..	0·60	23	2·12	0·54	Woodford ..	1·64	53	1·26	2·25
Central Coast.					*Central Highlands.*				
Ayr	0·53	53	3·65	0·35	Clermont ..	0·68	69	2·92	1·17
Bowen	0·62	69	7·84	0·63	Gindie	0·63	41	..	0·83
Charters Towers ..	0·50	58	1·44	0·53	Springsure ..	1·01	71	1·62	1·07
Mackay P.O. ..	1·00	69	7·09	1·04	*Darling Downs.*				
Mackay Sugar Experiment Station	0·84	43	6·76	0·94	Dalby	1·19	70	0·04	1·14
Proserpine ..	1·35	37	6·68	0·31	Emu Vale ..	1·11	44	0·10	1·77
St. Lawrence ..	0·78	69	2·81	1·02	Hermitage ..	1·15	33	..	..
South Coast.					Jimbour	1·13	52	..	0·74
					Miles	1·13	55	..	1·05
Biggenden ..	1·10	41	0·29	1·55	Stanthorpe ..	1·79	67	0·13	2·18
Bundaberg ..	1·31	57	0·93	3·56	Toowoomba ..	1·62	68	0·43	1·73
Brisbane	1·95	88	0·40	2·29	Warwick	1·45	75	0·07	1·44
Caboolture ..	1·51	53	1·24	2·21	*Maranoa.*				
Childers	1·26	45	0·79	3·43					
Crohamhurst ..	2·17	47	4·01	2·52	Bungeworgorai ..	0·70	26	0·08	0·80
Esk	1·43	53	0·24	1·29	Roma	0·89	66	0·09	1·08

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—AUGUST, 1940.

COMPILED FROM TELEGRAPHIC REPORTS.

Divisions and Stations.	Mean Atmospheric Pressure at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·04	78	67	83	10	59	23, 25	116	10
Herberton	..	69	51	76	26	42	16	30	5
Rockhampton	30·16	77	56	85	27	49	5, 6, 7, 17	217	4
Brisbane	30·22	72	51	83	13	46	8	40	6
Darling Downs.									
Dalby	30·22	72	41	82	27	28	7	4	1
Stanthorpe	..	65	34	73	26	21	7, 16	13	4
Toowoomba	..	65	45	75	27	36	16	43	5
Mid-Interior.									
Georgetown	30·06	84	56	89	26	46	5	1	1
Longreach	30·15	78	47	85	13	36	16	51	2
Mitchell	30·22	71	39	81	26	26	8	51	2
Western.									
Burketown	30·06	85	58	91	27	50	22	..	..
Boulia	30·15	78	51	87	26	43	4, 5, 7	..	..
Thargomindah ..	30·21	72	45	86	26	35	8	9	1

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	October, 1940.		November, 1940.		Oct., 1940.	Nov., 1940.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					MOONRISE.	
					a.m.	a.m.
1	5·32	5·52	5·0	6·11	5·2	6·0
2	5·31	5·52	..	6·11	5·48	6·53
3	5·30	5·53	..	6·13	6·35	7·49
4	5·29	5·53	4·59	6·14	7·24	8·46
5	5·28	5·54	4·59	6·14	8·15	9·43
6	5·27	5·55	4·58	6·14	9·8	10·40
7	5·25	5·56	4·57	6·15	10·3	11·34
						p.m.
8	5·24	5·56	4·56	6·15	10.58	12·27
9	5·24	5·57	4·55	6·16	11.53	1·19
					p.m.	
10	5·23	5·58	4.55	6·17	12·47	2·10
11	5·22	5·58	4·55	6·18	1·40	3·0
12	5·20	5·58	4 54	6·19	2·32	3·51
13	5·18	5·59	4·53	6·19	3·23	4·42
14	5·17	6·0	4·53	6·20	4·14	5·33
15	5·16	6·0	4·52	6·21	5·5	6·26
16	5·15	6·1	4·52	6·22	5·55	7·18
17	5·14	6·1	4·52	6·23	6·47	8·10
18	5·13	6·2	4·51	6·24	7·38	9·1
19	5·12	6·3	4·51	6·25	8·30	9·50
20	5·10	6·3	4·51	6·25	9·22	10·37
21	5·10	6·4	4·50	6·26	10·14	11·21
22	5·9	6·4	4·50	6·27	11·3	..
						a.m.
23	5·8	6·5	4·50	6·28	11·51	12·4
24	5·8	6·6	4·50	6·28	..	12·47
					a.m.	
25	5·7	6·6	4·49	6·29	12·38	1.28
26	5·6	6·7	4·49	6·29	1·23	2·11
27	5·5	6·8	4·49	6·30	2·7	2·57
28	5·4	6·8	4·49	6·31	2·52	3.45
29	5·3	6·9	4·49	6·32	3·36	4.36
30	5·2	6·9	4·48	6·33	4·20	5·31
31	5·1	6·10			5.8	

Phases of the Moon, Occultations, &c.

1st Oct.	●	New Moon	10 41	p.m.
8th ,,	☽	First Quarter	4 18	p.m.
16th ,,	○	Full Moon	6 15	a.m.
24th ,,	☾	Last Quarter	4 4	p.m.

Perigee, 2nd October, 2.0 a.m.
Apogee, 15th October, 8.0 p.m.

On the first of this month a total eclipse of the sun will occur, but it will not be seen in Australia. We must wait until 1999 before we see a total solar eclipse. The eclipse of 1st October will be seen along a track about 120 miles wide across the north of South America, the South Atlantic, and South Africa. There will be a partial eclipse, growing progressively smaller from the central line over the greater part of South America, and south from Equatorial Africa.

Venus is still the Morning Star. She reached her greatest altitude last month and is now descending toward the farther side of the sun. There were reports of Venus being seen in full daylight last month, but the planet is now getting too near the sun to be visible while Old Sol is above the horizon. Regulus, the bright star in the handle of the Sickle in Leo, may be seen near Venus on the mornings of 6th and 7th October. Although appearing small when compared with Venus, Regulus is a very large and tremendously hot sun, seventy times more luminous than our sun. Its light has taken fifty-six years to reach us, while the light from Venus, at present, takes but a little more than seven minutes.

An interesting feature of the evening is a phase of the rare phenomenon of the triple conjunction of Jupiter and Saturn, mention of which was made in August. On 12th October the second conjunction takes place, when Jupiter will pass a little north of Saturn. The planets rise about quarter to eight on 12th October.

In the second half of this month we should see Mercury, the little world which is the nearest to the sun and is heated by the solar rays seven times hotter than the earth. Mercury, however, does not rotate like the earth but keeps one hemisphere always toward the sun, while in the other eternal night reigns. On 20th October, Mercury will be 24 degrees east of the sun and will not set until nearly 8 o'clock. It will appear as a bright, sparkling star, a little below the head of the Scorpion, which is going down head first with its starry, curved tail entangled in the Milky Way. We sometimes see Mercury clearly but, it is said, Copernicus, the father of modern astronomy, never saw the planet, probably because of its low altitude in Poland, his native country.

7th Nov.	☽	First Quarter	7 8	a.m.
15th ,,	○	Full Moon	12 23	p.m.
23rd ,,	☾	Last Quarter	2 36	a.m.
29th ,,	●	New Moon	6 42	p.m.

Perigee, 27th November, at 10.0 p.m.
Apogee, 12th November, at 2.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night: when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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