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Edited by
J. F. F. REID
Associate Editor
C. W. WINDERS, B.Sc.Agr.

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Event and Comment.

Queensland Prize Beef Praised.

IN a letter to the Premier, Hon. E. M. Hanlon, the Agent General for Queensland in London (Mr. L. H. Pike) writes of the high quality of a consignment of Queensland beef exhibited at Smithfield recently. "The beef," says Mr. Pike, "which was from prize-winning cattle at the Gladstone (Queensland) Fat Stock Show, certainly proved an excellent run of real butcher's meat; the quarters were of very good quality, of an ideal weight and finish, while the butchering and dressing were perfect. It had been prepared and shipped in the *Port Phillip* by Swift (Australian) Company, Pty., Ltd., and its condition was excellent: in actual fact there was little doubt it was perhaps the best consignment of Australian beef seen in Smithfield.

"This display, which consisted of 311 quarters and represented approximately 52,000 rations, was sponsored by the Australian Meat Board to mark the generous action of the exhibitors, Port Curtis graziers and the people of Gladstone, in donating the whole of the fat cattle exhibited at their recent show to the Aid for Britain Appeal."

Considerable interest was aroused in this display and among the many distinguished visitors were Mr. John Strachey (Minister for Food), Mr. J. Beasley (High Commissioner for Australia), Mr. L. H. Pike (Agent General for Queensland), Sir Charles McCann (Agent General for South Australia), Mr. P. Newcomen (United Graziers' Federal Council of Australia, Capt. R. H. Heywood (London Representative of the Australian Meat Board) and Mr. Fred. Paul (President,

Meat and Allied Trades Federation of Australia). Mr. Strachey took the opportunity of expressing Britain's thanks for this generous gift and added that his Ministry was having discussions with the Australian High Commissioner and other representatives of Australia with a view to increasing Anglo-Australian trade.

Tobacco and Cotton.

As stated in the Annual Report of the Department of Agriculture and Stock, tobacco and cotton are two Queensland-grown crops the production of which still falls far short of meeting Australia's domestic requirements. In view of this fact the Department in the past has given much attention to the investigation of problems associated with the growing of these two crops. During 1946 the work on tobacco was extended to include exploratory plots in the Burdekin River district. The results obtained on these plots were very promising and a more extensive programme for the Burdekin district in 1947 was drafted accordingly, the crops to be grown and harvested before the onset of the heavy rains of summer. One of these experiments—at Home Hill—is being carried out in co-operation with the Council for Scientific and Industrial Research. The other Burdekin River tobacco experiment, situated at Clare, is a purely departmental one and is duplicated at Abergowrie on the Herbert River, a coastal district in which the outlook for tobacco is also promising, provided it is grown during the spring and early summer months.

Another development in tobacco experimental work to which reference is made was the decision by the Federal Government to make available—through the Department of Commerce and Agriculture—a grant of £10,000 per annum for five years to the States of Queensland, New South Wales, Victoria, and Western Australia for the purpose of carrying out additional experimental and demonstration work in tobacco production. Queensland's share of this grant is £3,750 per annum, which must be expended by the State on a pound-for-pound basis on new tobacco projects. The way in which these funds might be spent most profitably was the subject of much discussion at a week's conference of departmental tobacco officers in Brisbane. The purpose of this conference was to review the status of the industry in Queensland, to assess the nature and the relative importance of the problems to be overcome before the industry could be thoroughly stabilized and expanded, and to prepare suggestions as to how these problems could be tackled most effectively.

The other crop for which there is still a large unsatisfied local market is cotton, and here again the Department has been assiduous in obtaining the information required by the farmer to guide him in the actual growing of the crop. This has largely been obtained over a series of years at the Biloela Regional Experiment Station which, at its inception in 1925, was devoted exclusively to cotton experimental work. At first the programme at this centre was restricted to experiments on rain-grown cotton but, in later years, work with crops produced under irrigation has been done at Biloela, because it has been obvious for some time that cotton may merit serious consideration in the cropping programme of some of the areas on which irrigation facilities are likely to be developed in the near future.

Some Administrative Aspects of Irrigation.*

ARTHUR F. BELL.

IN a report on "Irrigation, Water Conservation and Land Drainage" presented to the Commonwealth Government in December, 1945, the Rural Reconstruction Commission states, "The Commission accepts the view that *water will ultimately be one of the most important of all commodities in the Australian economy.*" In summarising their conclusions on the availability of water the Commissioners further say: "The possibilities of increasing Australia's irrigated acreage, although considerable, are not as great as is popularly supposed. Ultimately, shortage of water will be the greatest of the obstacles to increased population. For this reason, and because the allocation of the water of a catchment once made cannot easily be changed, it is desirable that the use of the available waters should be carefully planned and that irrigation should be given priority over electricity generation."

The recent—and, in some areas, the still-current—disastrous drought has inevitably turned the thoughts of Queenslanders towards irrigation. While this interest has waned with the coming of relief rains, it nevertheless does appear that the trials of the past two years have awakened a lasting public consciousness of the pressing necessity for development of our water resources. Queensland, in common with its sister States, is a land of deficient and uncertain rainfall,† and our agriculture is to a marked extent adversely influenced by the vagaries of climate. Since the progress of this State is so intimately integrated with primary production, it follows that stability will be attained only to the degree that primary production is stabilised by the widespread development of irrigation and of practices designed to ensure a better exploitation of our summer rainfall.

Previous papers presented to this Society on the subject of irrigation have dealt mainly with the field technique of water application and its effects on soils and crop yields. The purpose of this paper is to present some observations on the investigations, planning, and administrative work which must precede and accompany the successful launching of an irrigation "scheme." There exists a great deal of misconception regarding the practicability and cost of irrigation schemes and their

* Paper presented at Innisfail Conference, Q.S.S.C.T., May, 1947.

† The Irrigation Department has recently compiled and published a series of graphs which clearly illustrate this factor of unreliability.

effects on the community, the availability of water for irrigation, the volume of reservoir storage required, and the losses of water in storage and in transit to the fields. As I commence to write, I note that the quotation for the day on my desk calendar is, "Getting rid of a delusion makes us wiser than getting hold of a truth"; it is hoped that this paper may both dispel some delusions and submit some truths.

Sources of Water for Irrigation.

Irrigation water may be obtained from three ultimate sources: (*a*) from wells and bores which reach underground water-bearing strata or aquifers; (*b*) from reservoirs created by dams or weirs thrown across streams and impounding the water of those streams and their tributaries; (*c*) from natural unregulated streams. All three sources are widely exploited, the lastnamed being the least important since the water available is least in time of drought when the need is greatest.

This State is fairly well served by underground water supplies and further investigation might well show that it is, in fact, very well served; in this respect its resources appear to be much greater than is the case in the other States of the Commonwealth. The advantages of subsurface water are that it can be used for irrigation right at the source of supply; no costly headworks and reticulation channels are necessary; there is no loss of water from storage by evaporation; and pumping from the wells facilitates the use of sprays which bring about economy in water usage. Whereas surface water storage facilities may take years to plan and construct, subsurface water can be used immediately a source of power is available for pumping from wells. Rural electrification with cheap power can therefore play an immediate and important part in increasing the area under irrigation—as has been so well demonstrated in the development of 20,000 acres of irrigated crops in the Lockyer Valley during the past decade. In the sugar industry the intensive development of the Burdekin delta is a striking example of successful large-scale irrigation with subsurface water.

The quality of subsurface water is naturally inferior to surface water; greater care is necessary in its use, and research is required to anticipate the soil problems which will certainly arise where well water is used. Such water must always be pumped, whereas stored surface water is usually delivered to farms by gravitation; in view of the cost of this pumping, subsurface water is generally used only for the production of higher-value crops. With these qualifications, the development of our underground water resources can play a very important part in the stabilisation of agriculture in Queensland. The distribution and extent of suitable subsurface water have not by any means been fully established, and a comprehensive State-wide boring survey of these resources would amply repay the expense involved.

In some contrast, Queensland is for the most part poorly endowed in the factors which favour the development of large-scale surface-storage irrigation schemes. The rainfall over most of the State is relatively low, poorly distributed, and uncertain, resulting both in a small run-off into reservoirs and the necessity for large storages to carry water supplies over long periods of drought. The main "dividing" range is close to the coast so that streams in the heavier rainfall areas are relatively short, with steep gradients. There are no snow-capped mountains to store water in the winter and to regulate stream flow in

spring and early summer. The country is geologically old, so that mountain ranges are low and there is a great lack of deep narrow-mouthed gorges for use as storage reservoirs. The evaporation rate is high, ranging from about four feet per annum in the south-east, to perhaps ten feet in the north-west; the annual loss by evaporation of the top five or six feet of water is obviously a serious matter in broad shallow reservoirs.

Availability of Water.

In respect of common misconceptions, it is in the visualisation of available water that advocates of particular irrigation schemes are liable to go most astray. People are naturally apt to be misled by the sight of flood waters if they do not bear in mind that the waters have been drawn from a vast area and that the flood actually covers a small proportion of that area. The bulk of Queensland's good agricultural land lies in the 25 to 30 inch rainfall zone and stream gaugings show that under these conditions the average run-off of rainfall is about four per cent. or *only about one inch per year.* Naturally this figure varies a good deal in particular areas according to topography, type of vegetation, and intensity of storms, but overall the figure is a good enough approximation. In the Condamine River basin on the Darling Downs, for example, the amount of water which ultimately finds its way into the Downs section of the stream is equivalent to less than one inch of rain over that part of the catchment area per year.

The rest of the rainfall percolates down through the soil to lower levels, evaporates from small pools and from the soil surface, or is used up in the transpiration activities of plants. In Victoria, where rivers have been intensively gauged, it has been computed that if all the water in all the streams were impounded it would not constitute more than five per cent. of the annual rainfall.

As rainfall rises above the 25-30 inch bracket, the percentage of run-off increases rapidly: It has been calculated, for example, that of the 61 inch mean annual rainfall of the Barron River catchment area above Picnic Crossing, 25 inches or 41 per cent. runs off in the Barron and its tributaries; corresponding figures for the Tully basin are 92 inches and 56 inches or 61 per cent. However, due to the proximity of the coastal range to the sea, the catchment areas of coastal rivers in the high-rainfall zone are small, and over the greater part of Queensland the average run-off is less than one inch.

Before considering any surface storage irrigation proposal in detail, therefore, it is necessary to have access to stream gaugings in order to determine the quantity of water which will be available for storage. This involves a knowledge not only of average annual stream discharge, but also of its distribution and minimum discharge rates. Stream gaugings made on the Condamine below Warwick by the Irrigation Department indicate that the average annual stream flow over a period of 15 years was 45,500 acre feet, but this fluctuated between 100,000 acre feet in 1927-8 and 14,000 acre feet in 1932-3. Moreover, the minimum discharge of 14,000 acre feet was immediately preceded by the sub-average discharge of 32,000 acre feet. The catchment area involved is about 1,150 square miles, or nearly 750,000 acres. Obviously, any irrigation project involving the full capacity of this river will, to be quite safe, have to provide for the storage of about two years' supply of water—and to restrict the area which can be irrigated.

Siting of Irrigation Works.

Should the study of rainfall and stream-gauging records indicate the availability of a reasonable volume of water, it then becomes necessary to seek a site, for the construction of a dam, which will be suitable both as to topography and foundations. Contour surveys must also be carried out in order to determine the capacity of the proposed reservoir at different heights and also, and this is important, determine the area which would be submerged. As emphasised earlier, the smooth topography of much of Queensland does not make for good dam sites and it is possible for the contour surveys to show that, say, 3,000 acres of good river-flat land would have to be submerged to store sufficient water to irrigate 5,000 acres. Compensation for the loss of the submerged land would in such case add a serious burden to the capital costs per acre irrigated.

Having determined the site, capacity, rate of replenishment, and approximate cost of a dam of given height, it is necessary to determine whether land of required topography, texture, and fertility is suitably situated for irrigation from the reservoir. In the past many irrigation settlements have been established only to fail through unsuitability of the soil or its drainage. Irrigation and drainage are complementary and, if success is to be assured, they must be planned and established concurrently on the basis of intensive soil surveys. In the Murrumbidgee Irrigation Areas, some 6,000 acres of citrus orchard, with an annual productive capacity of well over £100 per acre, were reported in 1943 to be in a serious state if ill-health. Investigation showed that this was due to poor drainage caused by "pockets" in the sub-strata which had become water-logged during continued irrigation and particularly as a result of the heavy irrigation of the wartime increased rice plantings.

It is a basic rule in irrigation that water should be used as near as possible to the source of storage in order to minimise wastage through seepage and evaporation. Careful determinations made by the Victorian State Rivers and Water Supply Commission show that of the water which is released from the reservoirs of that State, only about one-third actually reaches the fields; the rest is lost by leakage, seepage, evaporation, and the maintenance of riparian rights. If we add to this the evaporation and seepage losses in the reservoirs themselves, it will be seen that stored water is far from being delivered water. (As a matter of passing interest, it may be noted that non-observance of this basic rule is one of the defects of the so-called Bradfield Scheme for the diversion of coastal waters of North Queensland to the western part of the State.)

In order, finally, to drive home this matter of water availability, it might be instructive here to make a simple back calculation: Suppose we wish to irrigate 5,000 acres, and that we propose to give it supplementary irrigation to the extent of one and a-half feet per acre, or a total of 7,500 acre feet of water per year. On the basis of Victorian experience of water loss, this would entail the delivery from the reservoir of 22,500 acre feet, and allowing for reservoir losses, the storage of, say, 25,000 acre feet. But our rainfall is so erratic in many places that we would have to store two years' supply to leave a reasonable margin of safety, bringing the total required storage to 50,000 acre feet. Let us assume that the catchment area is in the 25-30 inch rainfall zone and that the annual run-off is one

inch; then if we wish to fill the reservoir in an average year a catchment area of 600,000 acres would be required. In other words, a catchment of 120 acres would under these conditions supply the water for the irrigation of only one acre.

It is true that in Victoria a good deal of the irrigable land is situated very considerable distances from the storage reservoirs and that, with careful planning, we should be able to reduce these distances in Queensland; at the same time, however, our average evaporation rates and possibly our seepage rates per mile will be higher. It must therefore be accepted that we shall never be able to irrigate a very great proportion of the agricultural lands of Queensland.

Sponsors of irrigation projects often advance in favour of their proposals the suggestion that flood prevention and power for the generation of electricity will also be achieved. In practice conservation of water for irrigation is largely incompatible with flood prevention and hydroelectric schemes. The fundamental requirements for irrigation and flood prevention are diametrically opposed, since the irrigator's object is to keep the reservoir full, while for flood prevention the object is to keep it empty. Some compromise can no doubt be effected in areas of reliable seasonable rainfall, the reservoir being lowered just prior to the expected onset of the wet season. The generation of electricity for industry requires a steady round-the-year discharge of water from the reservoir whereas irrigation requirements aim at conservation in rainy periods for release during dry periods; at the same time, intermittent generation of power from an irrigation reservoir discharge can be used in subsequent pumping of the same water to the field.

Maintenance of Irrigation Works.

The physical administrative problems associated with surface-storage irrigation schemes do not cease with the construction of the dam and the excavation of distribution and drainage channels. Obviously no scheme could be designed to supply all irrigators on the same day, and complex systems of rotational delivery must be worked out and enforced. Steps must also be taken to see that only the stipulated quantities of water are drawn from the distribution channels. In most places it has been found necessary to provide that water will not be delivered unless the farmer has graded his land and has a suitable system of delivery ditches.

The likelihood of siltation of reservoirs is an ever-present problem. Sites for reservoirs are few and generally irreplaceable, so that if a reservoir becomes silted there can be no question of moving on elsewhere. The protection of watersheds against the soil erosion which causes siltation of reservoirs must henceforth engage the very serious attention of irrigation authorities backed by comprehensive statutory powers where necessary. Senseless felling of trees, indiscriminate burning of vegetation, carelessly caused bushfires, and wrongful land use combine to increase erosion and siltation. One of the oldest reservoirs in Australia, the Laanecoorie on the Loddon River, had a capacity of 14,000 acre feet when constructed in 1892; fifty years later siltation had reduced the capacity to less than half. Following the destruction of ground cover by the disastrous Victorian bushfires of 1937, about 1,000 acre feet of silt was deposited in the Eildon Reservoir during the succeeding twelve months.

Minor Storages.

What has been said in the foregoing pages in relation to large-scale surface storage applies, in less degree, to minor surface storages effected by the construction of weirs within streams. Fixed weirs are usually between ten and twenty feet high, their height being limited by the dangers of flooding caused by impeding the flow of the channel. The primary function of weirs is stream regulation and they are widely used in conjunction with large reservoirs for this sole purpose. However, when constructed in streams which are more or less perennial, single or multiple weirs may have great value in the absence of reservoirs, as has been amply demonstrated in this State. In these circumstances, they act much in the same way as a car battery, being continuously recharged. Since storage is within the confines of the stream only, the cubic capacity of weir storage is not great and is not usually more than a very few hundred acre feet. As the cost of a weir may be well in excess of £100 per acre foot of storage capacity they are not, as a rule, economic propositions on streams which run for only short periods; exceptions may be found in the case of deep watercourses of low gradient, where water is required for the production of high-value crops such as vegetables.

Control of Water.

The Department of Irrigation licenses all artesian bores, and all sub-artesian bores in the artesian basin, but up to the present there has been little need for the exercise of administrative control of sub-surface irrigation waters. However, most irrigators will agree that in areas where supplies become limited, there should be some measure of control to prevent wastage, or extravagant use of water. It is also becoming evident that the extent of the underground water resources should be determined before development in any particular area is permitted to go very far. Although they have not hitherto been treated as of equal importance the determination of volume of storage and rate of replenishment should be regarded as just as important for subsurface as for surface-storage irrigation schemes. There is inevitably a strict limit to the volume of underground water available to any one area, and to the annual replenishment of that water; if these are disregarded there must be some bad crashes in dry years if farmers are permitted to extend irrigation and pump indiscriminately. Irrigation from wells close to the coast has the added danger of encroachment of salt water if water tables are lowered by over-pumping.

In this connection a very interesting investigation is now being carried out in the Lockyer Valley for the Bureau of Investigation of Land and Water Resources. Following reticulation of cheap electric power in this valley some ten years ago, irrigation developed, and is still developing, rapidly. The question arose as to whether the volume of the water in the aquifers, and the wet season replenishment of their annual loss of water, were sufficient to permit continued expansion at this rate. Over the past two years a large number of borings have been made down to the sandstone bottom of the valley so as to furnish some idea of the volume of the aquifer. Over the same period a surveyor's level datum point has been placed on all wells and the standing water levels of a representative number have been read at selected intervals. From these borings some idea has been obtained of the probable volume of the aquifer, while the series

of water level readings has shown that the rate of replenishment of this underground reservoir is such that further expansion of irrigation may be confidently encouraged. It might be mentioned in passing, that the borings also revealed the past existence of an old river which flowed under the bed of Lockyer Creek and which was larger than any of our existing rivers.

Economic Considerations.

Thus far we have concerned ourselves only with the physical problems of construction, supply, and distribution of irrigation works and water. There are, however, the equally important administrative questions of finance, economics, and social effects.

It has been generally accepted by people and their Governments that an irrigation scheme, like a highway, is a national asset benefiting the community and as such entitled to a measure of national financial assistance. Consequently we find an increasing tendency for the nation to assume a considerable proportion of the cost of construction of headworks for surface storage and main distribution channels. The remaining cost is frequently met by a special rating on the benefited urban and rural areas plus, of course, a charge applied to the direct beneficiaries—the actual users of the water.

Construction of headworks and reticulation channels involves the expenditure of very large sums of money and cannot be entered upon by Governments or other institutions without a full survey of costs, probable returns, and economic effects, and also of the relative degree of urgency or priority. It will readily be appreciated that capital expenditure can soon rise to a level out of proportion to the value of the land; a dam to store the water necessary to irrigate six or seven thousand acres might easily cost £1,000,000 plus the cost of delivery channels, resumption of submerged land, adjustments to roads and bridges, and so on. The probable use of the land must also be considered when assessing a proposal; for example, water used for the irrigation of tobacco could carry a cost perhaps ten times that which could be paid for water used for producing fodder for cattle.

Social Effects.

Irrigation may have one or both of two objects: (*a*) stabilisation of production, and (*b*) increased production. In prewar days most of the cash crops grown in Queensland were already produced to the limit of their available markets, the notable exceptions being cotton and tobacco. To increase the production of crops with already saturated markets can only lead to chaos; the object of irrigation in these cases should be that of stabilisation by the elimination of alternate gluts and famines. Insurance of crops by irrigation enables planned production, the stabilisation of prices, income, and labour requirements; and should generally reflect itself in a more prosperous and happier community. Moreover, irrigation, by causing the more intensive use of land, brings closer settlement with improved communications, better schools, and better amenities generally.

In submitting proposals for various localities their sponsors do not usually give consideration to the repercussions which their adoption would have in other areas, but the authorities who examine the proposals

must necessarily do so when the expenditure of public money is involved. For example, the country's requirements of, say, peanuts, might be grown in Zone "A," a dry farming zone. The citizens of Zone "B" in advancing their claim for an irrigation works might point out that with irrigation they could diversify their farming and, amongst other things, grow peanuts in great abundance. The question then arises as to how far public money should be spent to provide Zone "B" with an irrigation project which will put Zone "A" farmers out of business. The large-scale development of irrigation bristles with problems like this, and there seems little doubt that as it expands some sort of crop assignment system will have to be worked out.

There are, of course, strict limitations to the degree to which irrigation will effect either increase or stabilisation in primary production. Even though the State, and the general ratepayers of a benefited area, bear a large proportion of the capital costs of irrigation schemes, the "per acre" value of a wheat crop for example, is too low to warrant irrigation under the most favourable conditions. Perhaps it is as well, for these crops require broad acres and there is so much land to which irrigation water can never be brought.

Among major crops for which the visible market is far from saturated we have mentioned cotton and tobacco; but the most important in Australia is undoubtedly fodder, not for immediate sale but for direct feeding to animals. As far as one may judge, an unlimited world market for high quality meat will be available indefinitely if we bestir ourselves to export to its requirements. The development of large areas of irrigated pastures would enable us to produce enormous quantities of high grade lamb and beef, and, what is of paramount importance, would enable continuity of supply. We cannot hope to play a leading part in the chilled beef trade if we are limited to fluctuating seasonal exports. The status of our large dairying and adjunct industries would also be immeasurably improved by the widespread production of irrigated fodder.

By far the greatest development of irrigation in Australia has taken place in Victoria, and it is of interest to note that of 600,000 acres annually under irrigation in that State, 550,000 are devoted to fodder production, mainly as permanent pastures. It seems definite, therefore, that the planning of irrigation in Queensland must contemplate emphasis on animal production.

Conclusion.

The foregoing is a fairly cursory survey of the problems which confront planners and administrators of irrigation schemes. Some of these problems are considerable, but they can all be met; reflection on them should engender discrimination, but not pessimism.

The amount of money which any State can spend annually on irrigation is limited, so that schemes must be put into operation in the order of their productivity, urgency, and feasibility; that any particular proposal is a sound one is thus not sufficient to justify its immediate implementation. There are many economic and technical engineering and agricultural reasons why fair-sized schemes may be preferable to dispersed small schemes. Nevertheless, we should be careful not to err in the opposite direction; a £40,000,000 scheme

holds the imagination, but ten £4,000,000 well-distributed schemes would be better for the State—and some of them would be in production years before a gigantic scheme could be completed.

In this dry country our goal must be the conservation of every drop of water which would otherwise run to waste and we should pursue that goal with all the energy and resources at our command. At the same time, we must maintain a realistic attitude; the green fields of irrigated areas have an emotional appeal and grandiose schemes are often propounded without much knowledge or restraint. Mistakes in irrigation often cannot be rectified, so that sound planning must accompany energy, enterprise, and courage in the development of this priceless asset, water, for which there is no substitute.

The Weed Problem.*

W. J. S. SLOAN.

Introduction.

A WEED is commonly defined as a plant growing "out of place." Most weeds are useless, some are poisonous to stock, others may harbour plant diseases and pests, while a few are actually parasitic on economic crops; for example, the cane-killing weed (*Striga* spp.). Some plants, which in their proper place are useful, become weeds when they grow amongst other crops where their presence is not desired. For instance, leguminous cover crops are very necessary and useful in the cane rotation, but volunteer plants coming up in the plant and ratoon cane are unwanted and classed as weeds, particularly if the legume concerned has a twining habit of growth such as to interfere with the normal harvest of cane.

Ever since man began to cultivate patches of plants for domestic use, the problem of weed control has been a real one. If unchecked, weeds may add considerably to the difficulties of seed bed preparation, may lower yields and hinder harvesting. Their effective and economic control should be the aim of every efficient farmer, whether he grows cane or any other crop, for weed control can be a prominent item in costs of production. Methods of control have steadily improved, but the need for even better methods still stimulates the ingenuity of farmers, engineers, and chemists, and large industries have been built up to provide the machines required for this purpose in modern agriculture. Weed control by introduced insect parasites has achieved success in some cases, but the cane farmer can expect no assistance in this direction for solving the weed problems in cane fields. Despite much intensive research many difficult weed problems still remain, and there can be no relaxation in investigations to solve them.

In Queensland there is a wide variety of weed species infesting cane lands, but the most important species and those most difficult to handle belong to the grass family, including summer grass (*Digitaria adscendens,* and other species), common couch grass (*Cynodon*

* Paper presented at the Innisfail Conference, Q.S.S.C.T., May, 1947.

dactylon), and Guinea grass (*Panicum maximum*), while nut grass (*Cyperus rotundus*) is well established in a number of areas. Most common weeds are able to survive and grow under conditions of high and low temperatures and can resist drought to a remarkable degree. Species such as summer grass, red pigweed (*Portulaca oleracea*), black pigweed (*Trianthema portulacastrum*), goat weed or Mother Brinkly (*Ageratum conyzoides*), and many others produce enormous numbers of seeds and multiply and spread rapidly, particularly in warm weather when soil moisture is good.

Hand hoeing and the use of cultivation implements, which have steadily improved in quality and variety over the years, constitute the main method of control at the disposal of farmers. Spraying with weedicides has received limited attention, while a new method of control advocated in recent years is the use of "flaming machines" to burn and kill the weeds on the surface of the ground without injuring the cultivated crop. Mechanisation of cultivation equipment has helped considerably to reduce the labour problem and has greatly speeded up operations, enabling weeds to be attacked more readily at the right stage of growth, and fields to be covered more rapidly than was possible formerly with horse-drawn implements.

WEED CONTROL BY CULTIVATION.

Crop rotation, efficient seed bed preparation, the judicious use of implements for inter-row cultivation and, to some extent, hand hoeing are all necessary for effective economic control of weed growth.

Crop rotation is valuable from many points of view, and not the least important is the influence on weed populations. It is common experience that land, freshly cultivated after being under grass sod for several years, develops less weed growth, and requires less inter-row cultivation. The weeds die more easily after cultivation because the friable soil falls away more readily from the weed roots than is the case in old cultivations. The need for laying down land to a sod grass crop for several years at regular intervals to improve soil structure, has been recognised for a long time, and it is obvious that in many of our sugar lands such a rotation must receive attention in the future.

Good ploughing is necessary for the burial and destruction of weed growth, especially of deep-rooted weeds, and for the preparation of a mellow seed bed to facilitate row planting and inter-row cultivation. In soils deficient in humus, good ploughing is particularly important for the creation of good planting tilth. The soil granulating effects of ploughing are temporary and tend to disappear under the compacting and hammering influence of rain-drops, hence the seed bed must be worked after rains, especially in soils which are normally poorly structured. Various types of implements, including the disc harrow and grubber, are used to work down the seed bed, check weed growth and prevent re-seeding of weeds. A matter for some debate is whether rotary tillage is more efficient than ordinary methods or *vice versa*. No experiments of this nature have been carried out to date in Queensland cane fields, but it is of interest to note experimental results obtained at Rothamsted. In general, yield results with several crops did not differ greatly with the various forms of tillage, but germination of seed and early plant growth were better in the rotary tilled plots. However, as the season advanced the tilth in these plots

became less favourable to plant growth, the effect being more obvious in some crops than others. It was believed that the initial growth response was due to the loose tilth produced by rotary tillage, but later, setting and compaction of the soil became more pronounced in the rotary tilled plots and checked growth.

The ideal preparation of a seed bed requires cultivation on each occasion after rain has stimulated germination of weed seeds. Thus the land is kept in good tilth and the weed seed population in the surface layer of soil is practically exhausted prior to planting and the young crop is then subjected to less competition from weeds for soil moisture and plant nutrients. Cultivation is best carried out when the soil is not too wet and not too dry. The proper time to cultivate a field is not always easy to define exactly, because most fields do not dry out at the same rate and while certain patches are ready for cultivation, others are too wet. Cultivation should be carried out when the weeds are young and their root systems have not developed to any great extent. Large plants of weeds such as summer grass and pigweed often survive ordinary methods of cultivation and are able to root and grow again. However, weather conditions are not always suitable for best cultivation results and at times excessive weed growth worries even the most efficient farmer.

The labour devoted to hand hoeing of weeds in cane fields is decreasing and will obviously become less and less in the future. The use of horse-drawn implements and, more recently, tractor-driven equipment, has provided easier methods of dealing with inter-row weeds. It is not difficult to forecast that the employment of high clearance tractors with attachable fittings will expand rapidly and eventually crop cultivation will be completely mechanised.

The soil erosion factor in regard to inter-row cultivation for weed control should be seriously considered by all farmers. Cultivation on the contour reduces erosion because little channels are not left down slopes between the rows. Such channels often serve as conductors for excess water and may eventually erode into large gutters. Little or no cane planting in Queensland is done on the contour, but there are a number of areas where contour planting is possible and practicable. In addition, cultivation on gently sloping contours can be more efficient and less power is required than where cultivation up and down the slope is practised.

A form of weed control which may merit investigation is the interplanting of legumes in the row interspaces of young plant and ratoon cane for the smothering out of weeds and the reduction of soil losses. The objective would be to use a legume such as Poona pea to smother weeds during early cane growth; later when the cane covers in, the pea vines would die and lie on the surface. Obvious drawbacks are the competition between the legume and cane for soil moisture and plant nutrients and the nuisance value at harvesting from the growth of volunteer legume plants. Possible advantages would be the reduction in the number of cultivations and better retention of top soil during heavy rains, while the legume vines would add nitrogen and some organic matter to the soil, which would be available for the maintenance of cane growth during the latter part of the growing season.

Other Effects of Cultivation for Weed Control.

One of the main objects of cultivating the soil is the suppression of weed growth, but there is a widely held belief among farmers that the creation and maintenance of a shallow, loose, dry soil mulch on the surface by frequent cultivations conserves moisture, apart from the benefits of weed control. It is appropriate, therefore, to examine here some of the effects which cultivation for weed control may have on the soil. These effects are not as well understood as they might be, and much investigation is required yet to elucidate certain aspects.

The need for weed control is obvious. Weeds take moisture and plant nutrients from the soil which would otherwise be available to the crop. This is particularly noticeable in the luxuriant growth of weeds which follows rain on ground previously treated with surface dressings of fertilizer. If weeds are allowed to grow unchecked, they spread rapidly and choke the cane as well as interfere with its harvest.

Many practical farmers and agricultural workers have held the belief that the loose soil formed by surface cultivation acts as a mulch which reduces evaporation of moisture from the underlying moist soil by keeping it at a lower temperature and preventing the capillary rise of moisture. Evidence on the subject is conflicting and a great deal of investigational work has failed to give a clear picture as to the value of cultivation for conserving moisture under varying conditions and with different soil types. However, when much of this experimental work is interpreted in the light of the depth of the water table below the surface, some very interesting points are indicated. For instance, some cultivation experiments have shown that soil moisture is conserved when the water table is about six feet or less from the surface, and the deeper the mulch the better the retention of moisture in the soil. On the other hand, in experiments in drier areas with a water table deeper than six feet, the soil mulch, in itself, has been shown to be of no value in reducing the moisture loss. Actually under these conditions cultivation may only serve to dissipate moisture particularly that contributed by showers which wet only the surface soil layer.

Briefly soil scientists now hold the view that the soil mulch, by breaking the soil capillary tubes and forming a dry, loose surface mulch does not conserve soil moisture unless a temporary or permanent water table exists within six feet of the surface. If this is true for the soil types and climatic conditions of our sugar areas, the point is of importance to cane farmers, because it indicates that good seed bed preparation and cultivation in the autumn, after the summer rains in many instances have raised the water table to within six feet of the surface, may assist considerably in the retention of moisture for the benefit of the young plants. On the other hand, however, cultivation of dry soil for the sole purpose of maintaining a soil mulch during the winter, spring, and early summer months, when the water table is further than six feet away from the surface, is valueless.

The maintenance of good soil tilth in the growing crop is important. By cultivation at a suitable soil moisture, fair tilth can often be mechanically created and the soil crust which commonly forms on medium and heavy clay soils is broken. Infiltration of rain is promoted, particularly on undulating fields, by improving the porosity of the surface soil. Raindrops tend to destroy tilth and cultivation after rain is required to restore that tilth. Soils which tend to pack readily even

after comparatively light rains require more cultivation than sandy loams and soils of good structure. Hence the need for good soil management to improve soil structure. The degree of permanency of granulation in the soil at planting usually determines the frequency of tillage. In general, inter-row cultivation, except when it is necessary to break up consolidation of the lower soil layers by the grubber, should not be deeper than three inches. Excessively deep cultivation may be harmful, especially in dry weather, because the roots are torn off and plant growth is thereby retarded.

Experience has shown that cultivation of packed soils in certain instances causes a response in plant growth which does not appear to be associated with weed control or soil moisture effects. It is believed that the factor of soil aeration is implicated. The importance of this factor is far from clear, for even in compacted soils the amount of pore space in the surface layers of soil is considerable and apparently sufficient for plant growth. However, compaction does reduce pore space, particularly in medium to heavy clay soils, while aeration is improved by maintaining good tilth and so increasing the total pore space of the surface soil layer. It is probable then, that under certain conditions, improved aeration of soils by cultivation is important.

Summing up, the main services of cultivation are the killing of weeds, the creation of good tilth and possibly the conservation of soil moisture when the water table is about six feet or less from the surface of the soil. Cultivations, which are not required for weed control or breaking the surface crust, should be avoided because the disturbance and breaking of roots of the growing plant are harmful. Cultivation effects may vary on different soils and the different objectives of soil cultivation must be modified according to type of crop, season, and soil.

WEED CONTROL BY WEEDICIDES.

Cane growers do not use weedicides extensively and, on present indications, are unlikely to expand their use very greatly. Weedicides are unlikely to displace cultivation in the major role of controlling weeds, but a good weedicide could be a very useful supplementary control. In furrow irrigated areas where it is not desired to break the water furrows and then reform them, or where elimination of particular weed species is required along creek banks, fence headlands, and other places not readily accessible to cultivation implements, a cheap, effective, and reliable weedicide could be usefully employed.

Before a weedicide could take the place of implements in inter-row cultivation, it would need to be capable of killing weeds normally handled by cultivation, without injuring crop plant growth. Furthermore, it would need to be easy to apply, an economic proposition, not liable to increase the fire risk to cane and preferably should not be unpleasant to handle or toxic to the operator. Spray weedicides usually require that a considerable amount of suitable water be available. A disadvantage also is that under showery conditions, when normal cultivation implements can often be used, a weedicide application may be diluted or washed off so completely as to render it ineffective. On the other hand, however, an effective weedicide would eliminate unnecessary pulverisation of the soil and disturbance and injury to surface roots. Weeds along the row close to the plants could also be controlled. The

weed residues would be left on the surface of the soil to rot down and form a layer of organic matter to assist rain penetration and reduce soil washing. However, where the structure of the soil has greatly deteriorated, particularly on undulating medium to heavy clay soils, it is improbable that weedicides would be a substitute for cultivation which is required to break the surface crust and open up the soil.

It is not intended here to discuss the wide range of materials which have been tried as weedicides, but to discuss briefly a group of new selective weedicides which have received publicity in recent years. These are the synthetic hormone type of selective weedicide. The most commonly employed of these chemicals are 2, 4-dichlorophenoxyacetic acid and salts or esters of this acid. They may be used as dusts or sprays, are non-poisonous, non-inflammable, and not unpleasant to use. On susceptible weeds they cause twisting and contortion of stems and leaves. Stems may thicken and split, the leaves discolour and finally the plant dies. Effects may be seen in twelve hours or so, but death may take several weeks. One or several applications at three- to four-weekly intervals may be required to cause complete death.

These selective weedicides do not cause appreciable harm to plants belonging to the grass family. While this would be advantageous in that cane would not be harmed, it is unfortunate that most of our serious cane weeds, such as summer grass, belong to the same group, and would also be little affected. Hence on present indications 2, 4-dichlorophenoxyacetic acid and its derivatives are unlikely to play a very prominent part in weed control in cane cultivations in Queensland.

The Bureau of Sugar Experiment Stations intends to carry out spraying and dusting trials with this type of weedicide, using a number of different weed species as test plants, and the results will be made available later. Control of weeds such as goat weed, Star of Bethlehem (*Ipomaea Quamoclit*) and volunteer legumes in the cane rows offer scope for the use of hormone type sprays. At present a limited number of farmers in the Nambour area spray the inter-row spaces with an arsenical spray for the control of goat weed. Hormone type sprays, if equally satisfactory, would be an acceptable substitute for the poisonous arsenical solution. The former type is also claimed to cause a temporary soil sterilisation after application, and it is hoped that in addition to killing the plants, germination of goat weed seed will also be prevented or delayed for some weeks. Experiments already conducted in Louisiana have indicated that control of susceptible weeds in the cane row by selective weedicides increased cane yields. In exploratory trials at Meringa results with Noogoora burr (*Xanthium pungens*), goat weed, and several other weed species were promising, and further trials are to be carried out.

FLAME CULTIVATION.

The destruction or checking of weeds and undergrowth by flame throwers has been practised for a number of years, and most farmers are familiar with the common knapsack equipment used for this purpose. The application of flame for inter-row cultivation of crops, however, is of recent origin. Like many other improvements in farm machinery,

flame cultivation is aimed at the reduction of the amount of labour required on the farm, as well as giving more effective control of weeds.

It is based on the principle of selective burning, whereby the young weed growth is destroyed by a flame without seriously injuring the crop plants. The method has been used with success in cane and cotton fields in the U.S.A., particularly in the destruction of weeds in the row. Fallow flaming has also been practised. A brief description of the two main types of machine in common use in Louisiana is given in the October, 1946, issue of the *Cane Growers' Quarterly Bulletin* in an article "The Sugar Industries of Louisiana, Cuba, and Hawaii, with Particular Reference to Mechanical Harvesting and Loading," by E. R. Behne.

Among the advantages claimed for flame cultivation are that it can be used effectively at night, and when the ground is too wet for hand hoeing; the root system is not damaged as with implements; many insects are killed and erosion is reduced by the dead weed residue left on the surface of the soil. In cane fields in Louisiana it is also claimed to improve suckering of the cane and to increase yields. Although cane is comparatively fire resistant the young plant cane does suffer some scorch and there is a possibility that early flaming has a slight adverse influence on the sugar content of the mature crop.

Since no experimental work has been carried out yet in Queensland, no data are available on the economics and efficacy of the flaming machine for use in cane fields. The necessary equipment should not be costly but the fuel item will be important. The cost of the latter will depend on the frequency with which fields will have to be flamed to secure effective weed control. Indications are that to keep a satisfactory check on weed growth weekly use of the flaming machine would be necessary particularly with the more troublesome weeds such as nut grass and the grass weeds.

HANDY FARM AND HOME DEVICES.

Handy Farm and Home Devices and How to Make Them, published in Adelaide by Mr. J. V. Bartlett on behalf of the War Blinded Association, is a book which has had a remarkable sale in other States. It contains about 1,500 useful and practical ideas and suggestions, illustrated by about 1,700 drawings and sketches of which some have been published in this Journal from time to time. The book will be found to be very helpful not only to farmers and graziers but to all householders, motorists, and others, as the wide range of gadgets and wrinkles it contains give just the ideas wanted for doing a handyman's job easily and effectively. In some section of its 300 carefully indexed pages there will be found one or more items which will more than pay for the cost of the book, which is £1 1s. posted.

The author has stated his intention of publishing a series of five books altogether—the second is now in the printer's hands—and many buyers of the first book have already made application for the full series at a subscription cost for the lot of £3 15s. A proportion of the profit on sales is given to the War Blinded Association in each State.

The first and succeeding volumes can be obtained in Queensland by direct application to the Queensland Wool Selling Brokers' Association, Eagle street, Brisbane.

APPLIED BOTANY

Hemlock—A Poisonous Plant.

S. L. EVERIST, Botanist.

EARLY in October, 1947, specimens were received from the Toowoomba district of the hemlock, a plant well known in Europe and Asia to be poisonous to man and beast. This note is published in the hope that the weed may be recognized wherever it appears so that it can be destroyed before it spreads too far.

Other Common Names: Poison hemlock, carrot fern.

Botanical Name: Conium maculatum Linn.

Description.—Erect annual or biennial herb 3–5 ft. high, with a strong mousy smell when crushed; root white, parsnip-like; stems stout, hollow, shining green outside, often with purple spots or patches, repeatedly branched; leaves alternate, sometimes opposite on upper part of stems, 4–12 inches long, deeply divided into narrow segments like a carrot leaf; smaller and less divided near top of plant; flowers very small, white, in clusters (umbels) at the ends of stiff, slender rays ¾–1 inch long; rays 8–15 in number, spreading out from the top of a stalk 1–2 inches long; 5 small green bracts beneath the ray clusters; fruits ("seeds") numerous, about ⅛ inch long, nearly globular but somewhat flattened with thick ribs. (Plate 112.)

Distribution.—Hemlock is a native of Europe and Asia, now naturalized in most temperate regions of the world. It is common in parts of New South Wales, Victoria and South Australia. In Queensland it is sometimes grown in gardens under the name "carrot fern" and in appearance resembles the "meadow sweet" or "bishop's weed." This year the plant was reported to be growing thickly in places on Gowrie Creek, west of Toowoomba.

Seasonal Occurrence.—In Queensland, the plant needs a wet winter and spring to make any growth. In Europe, the leaves and stems are reputed to be most dangerous before flowering, and the young fruits to be very poisonous.

Evidence of Poisoning.—*†

(*a*) Field.—For many centuries, hemlock has been known to be poisonous to man. The plant is alleged to be that used by the ancient Greeks for executing state prisoners, including Socrates. Evidence of poisoning in grass-feeding animals is somewhat contradictory, but cases are on record of mortalities in cattle, horses, sheep and pigs. Goats are supposed to be less susceptible than other animals‡, but cases have been recorded.† Cases are also on record of sheep and cattle having eaten the plant without ill effect.†

Plate 112.

HEMLOCK (*Conium maculatum, L.*).

Copied from "The Weeds, Poisonous Plants and Naturalized Aliens of Victoria," by A. J. Ewart.

(*b*) Feeding Tests.—No cases of actual feeding tests have been found in the literature available, but it is assumed that the details of symptoms, post-mortem appearances and lethal doses quoted in the literature are based in part on feeding tests.

(*c*) Chemical.—Several alkaloids have been isolated from the plant. Of these, the volatile alkaloid coniine is most plentiful and several others have been found in smaller quantities. In Europe, in the early stages of growth the toxic principle is chiefly in the leaves. As the fruits develop, the alkaloid moves into them, reaching its maximum concentration in the unripe fruits. Cutting and drying considerably reduces the amount of alkaloid present.

*Symptoms**†.—The following symptoms have been recorded in poisoning by this plant:—

Man.—Excessive flow of saliva, bloating, dilation of the pupils, rolling of the eyes, laboured breathing and gradual weakening of muscular power, often with loss of eyesight. Death occurs after a few hours and the mind usually remains clear until death. The poison acts on the nerves, causing paralysis of the lungs.

Cattle.—Excessive flow of saliva, loss of appetite, bloating, constipation, weakness and stupor. The milk of cows is tainted and pregnant cows have been known to abort. Bloody scours have been observed in some bullocks.

Sheep.—Abdomen tucked up, dazed appearance, dilation of the pupils, unsteady gait, the hind limbs being dragged, coldness; death after a few convulsive movements.

Pigs.—Prostration and inability to move, coldness, slow breathing, livid mucous membranes, feeble pulse, paralysis, particularly of the hind legs, no convulsions.

Goats.—Bloody scours, dullness, loss of appetite, excessive flow of saliva, coldness of extremities, kicking and trembling, grinding of teeth and grunting.

Post Mortem.—It has been stated that there is no characteristic appearance of the alimentary tract on post-mortem examination, though some congestion may be noted.§ The organs are engorged, the blood black and tarry, the right heart full and left heart almost empty.§ In sheep, congestion of the paunch, fourth stomach and bowel have been recorded, and in goats, inflammation of the intestine.†

Prevention.—The weed should be pulled up or dug out and burned wherever it makes its appearance. If there is any doubt about the identification, a specimen should be sent to the Government Botanist for verification. Although hemlock is distasteful to most animals, they will eat it if they are hungry, and care should be taken to see that very hungry animals are not allowed access to it. The plant is easily killed by the hormone-type weedkillers (Methoxone, Weedone 2, 4-diweed, &c.).

* Long, H. C.: Plants Poisonous to Live Stock. 2nd Edition. pp. 41-42, 1924.

† Hurst, E.: The Poison Plants of New South Wales, p. 302-305, 1942.

‡ Ewart, A. J.: The Weeds and Poison Plants and Naturalised Aliens of Victoria, p. 29, 1909.

§ Lander, G. D.: Veterinary Toxicology, p. 214, 1912.

PLANT PROTECTION

Red Scale Control.

A. W. S. MAY, Entomologist.

RED scale,* a citrus pest of world wide importance, is commonly associated with citrus throughout Queensland and attains major importance in those districts subject to hot, dry atmospheric conditions. Although all varieties of citrus may be attacked, lemons and grapefruit are most susceptible to attacks. Uncontrolled infestations of this pest reduce tree vigour, induce dieback in twigs and small branches, cause excessive leaf shedding, and restrict the normal development of the fruit. The presence of scales on mature fruit detracts from their market value.

This small creamish insect is protected by a reddish parchment-like scale, which, in the adult female, is circular in shape and measures less than one-tenth of an inch in diameter. The scale of the male insect is oval and much smaller. The crawlers escape from beneath the parent scale and seldom wander far before settling down on the fruit, twigs, and leaves. Each then secretes a whitish circular scale, which later becomes reddish and increases in size as the insect grows beneath it.

Seasonal Behaviour of the Pest.

The rate of reproduction of red scale during the autumn months is low, and as conditions are adverse to its survival during the winter, populations fall to a minimum during the late winter and early spring. Although five generations are possible each year, the time between generations decreases with increasing temperatures, and approximately six to seven weeks are required in mid-summer for the young to develop and reach maturity. Thus it can be appreciated that a negligible infestation in early spring may assume serious proportions by late summer and autumn.

Scale Populations in Relation to Control.

Although efficient results may be obtained when a control measure is applied, reinfestation is bound to occur. Invariably, scale colonies comprise individuals of various ages, and some of the more mature scales survive treatment and their progeny soon reinfest the trees. In view of the fact that the rate of scale development is low during the autumn, control measures applied at this period are particularly efficient, for appreciable populations cannot again develop on the trees before the onset of cold weather.

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* *Aonidiella aurantii* Mask.

Although a late summer-autumn treatment may prove suitable for controlling scale on some mid- and late season varieties, it has proved less satisfactory for varieties harvested prior to April or May. If the fruit of these varieties is to be free from scale at harvesting, control must be achieved in early to mid-summer. If populations are reduced to low levels before mid-summer, reinfestation is normally of little consequence before the fruit of early and mid-season varieties reaches maturity.

Choice of the Insecticide.

Either fumigation or a white spraying oil may be used to control red scale, but the benefit derived from either is conditioned by a number of factors.

Although fumigation is a more efficient control measure for red scale than an oil spray application, its use is not advisable before late November. Prior to this period, the mechanical effect of the sheets on the trees may damage the rind of small, tender fruit and knock some of them to the ground. Also, young leaves and fruit may be "scorched." Fumigation must precede the application of copper fungicides in order to prevent foliage injury which may occur if residues are present at the time of treatment, or else be delayed for some time afterwards. On the other hand, fumigation will control some other important pests, such as the larger horned citrus bug and Maori mite.

The value of a white oil spray for red scale control is dependent to a large extent on the thoroughness of its application. Too frequently, poor control can be traced to inefficient coverage which, although at times due to faulty spraying, is more usual in large and densely foliaged trees. The efficiency of an oil spray is also dependent on the age of the scale itself, for some of the more mature individuals and adult scales may survive treatment. Thus spray applications which coincide with periods when young scales are particularly numerous give the most beneficial results.

Although periods of extremely high temperatures should be avoided for the use of either method of scale control, the more obvious adverse effects of oil sprays are particularly noticeable during the summer months. Fruit injury may follow the injudicious use of oil during this period, and it is possible that the increased volatility of the oil at high temperatures may reduce the efficiency of the treatment.

Despite the difficulties involved in its proper application, fumigation should be regarded as an essential part of the red scale control programme when facilities are available. Its use, at least once a year, is recommended on trees of the more susceptible varieties. White oil may be used in conjunction with fumigation where an efficient control of heavy red scale populations is required.

Timing the Applications.

When fumigation or a white oil spray is used, sufficient time must elapse between treatment and harvesting for the dead scale to be shed as the fruit rind expands. This period depends on climatic factors and rind condition and may be as long as six weeks. The pitted or coarse rind often associated with heavy scale infestation, lush growing conditions and some varieties, tends to retain the dead scales for a prolonged period. White oil sprays applied within one month of harvesting tend to delay colouring.

In the past, orchardists were accustomed to spray or fumigate their trees when scale populations became obvious, but this practice proved unsatisfactory. In some districts, too, the timing of fumigation was delayed to meet the larger horned citrus bug position or by climatic conditions, often with a marked loss of efficiency in the control of red scale.

Widely spaced treatments, although sometimes effective on varieties which are not very subject to red scale attacks, may not give effective control in some other varieties. Irrespective of the time when the initial control measure is applied in spring or early summer those scales that survive treatment will continue breeding and may reach pest proportions by late January. Infestation may then exceed that which can be effectively reduced to the required level by a second treatment. The application of a control measure at this period carries a risk of tree injury should climatic conditions be unfavourable, may prejudice fruit colouring and allows insufficient time for the shedding of the dead scales in early varieties.

Following the use of either fumigation or an oil spray, a certain proportion of the red scale population will survive treatment. Should these survivors be subjected to a second treatment before they can breed to any great extent, very few live scales will remain on the trees. Recent experiments have shown that the application of two treatments at an interval of from two to three weeks reduces scale populations to very low levels and that the pest is of little consequence for some months afterwards. Such a double treatment schedule for red scale control should be carried out on a varietal basis, applications being timed by reference to the period of fruit maturity.

The Control Schedule.

Double treatment for red scale control has been designed primarily for quickly reducing heavy infestations and for ensuring scale-free fruit in areas where climatic conditions favour development of the pest. Orchardists will find that the following recommendations differ in some respects from those adopted in the past. If existing practices have proved adequate, they should not be altered. The new double treatment schedule is designed primarily to overcome the difficulty experienced in controlling red scale at Gayndah and may be of value in other districts with a similar climate.

Lemons and Grapefruit.

The early varieties—namely, lemons, and grapefruit—are very prone to red scale attack, and control should be established in the early to midsummer period before pest populations get out of hand. Double treatment of these varieties is recommended, the first treatment being applied in the first half of December and the second two to three weeks later. Naturally, the timing of treatments is influenced by weather factors, but if necessary, the first treatment may be delayed for a short period. However, it is important that the two treatments should not be more than three weeks apart. At least one of the treatments, preferably the second, should be a full strength fumigation; the other may be a fumigation or a white oil spray. If fumigation is impracticable, a white oil spray (1-40) may be used for each treatment.

In lemons, a copper fungicide is often used in late November, or early December for black spot control. This spray will influence the use of fumigation in the scale control schedule. Hence the schedule may commence with fumigation in late November and be followed two weeks later with white oil (1-40) in combination with the copper fungicide. Alternatively a white oil-copper combination spray may be applied in early December, followed by a further white oil spray after the necessary time interval of two to three weeks has elapsed; this schedule is the least efficient of those discussed above.

Double treatment for scale control will greatly reduce scale numbers and, if treatments have been applied thoroughly with the prescribed interval of time between them, there is little likelihood that scales will constitute a problem before harvesting. However, it is important for these early varieties that the first treatment be applied before mid-December.

Navel and Joppa Oranges.

Double treatment of these varieties is recommended prior to mid-summer. Although the schedule may coincide with that recommended for lemons and grapefruit, later treatment is often practicable. However, the initial treatment should not be postponed later than the end of December owing to the likelihood that adverse weather conditions will be encountered in January, when the second treatment would fall due.

Glen Retreat Mandarins.

Full strength fumigation, or white oil (1–40), should be applied between early and mid-January, and followed with a further treatment within three weeks. It is preferable that the first treatment should be fumigation as weather conditions later often tend to hamper the application of this control measure.

Ellendale Mandarins and Late Valencia Oranges.

For Ellendale mandarins and late Valencia oranges, both of which may be classed as late varieties, a double treatment schedule will only be necesary if scale populations are high in late summer. The initial treatment, preferably fumigation, should be applied in late March or early April, depending on weather conditions ruling at the time. A further treatment of white oil (1–40) may follow within three weeks.

Banana Rust Thrips Control.

W. A. SMITH, Assistant Entomologist.

FOLLOWING indications in Departmental trials in North Queensland that DDT and benzene hexachloride might be effective against the banana rust thrips, experiments were carried out in the Pimpama district early in 1947 to test these insecticides under southern Queensland conditions.

Outline of Experiments.

The experiments were located in a plantation comprising mainly first cut Cavendish and Mons Marie bananas. The block used was situated on the northern slope of a spur running east from the hills at Upper Pimpama. Newly thrown bunches were selected for treatment at fortnightly intervals from the early January to mid-March to gain some idea of the relative severity of the attacks on bunches thrown at different periods during summer.

In the first experiment, the bunch and bunch stalk were treated with one or other of the following insecticidal dusts:—DDT, DDT and nicotine, nicotine alone, and nicotine applied under brown paper tubes permanently attached to the bunch. All insecticides were applied at fortnightly intervals except for nicotine which has no residual effect and must be applied weekly. Some bunches were treated for six weeks, some eight weeks, and some for the whole life of bunch. Treatments in this experiment ceased on 20th May, because, by then, thrips activity on untreated bunches had become negligible.

In the second experiment, DDT and benzene hexachloride were the insecticides used, the former being applied in both spray and dust forms. They were applied to the whole stool—bunch, pseudostem and suckers—in an attempt to prevent reinfestation of the bunch. For comparison the spray was also applied in one series of stools to the bunch alone. The need for treatment was determined by the presence of living thrips on the fruit at fortnightly examinations and this resulted, for the dusts, in four fortnightly treatments with a final treatment a month after the last of those, and for the sprays in three fortnightly treatments followed by a final spray six weeks later.

Prior to, and for the first two weeks of the experiment, the weather was exceptionally dry. Cyclonic winds and rains towards the end of January caused some plant losses in the experimental block. Heavy rains were again experienced towards the end of March.

The banana rust thrips was moderately active in the plantation during the course of the experiment, but more serious rusting has been experienced on north coast plantations in some past years.

Nicotine Dusts and Brown Paper Tubes.

The nicotine treatments were included in the first experiment to provide known methods of control with which to compare the new insecticides.

A 3 per cent. nicotine dust applied at weekly intervals through the life of the bunch kept the fruit tree from commercial rust, although the top hand in some bunches was moderately damaged. When treatment was stopped six weeks after the bunch was thrown, a significant increase in rust resulted, but some degree of control was still achieved.

Good control of rust was obtained on bunches covered with double brown paper tubes as early in the life of the bunch as practicable and also dusted fortnightly with 3 per cent. nicotine dust. This treatment proved somewhat better than that in which weekly applications of a nicotine dust were applied to uncovered bunches. Even when the nicotine dustings were stopped after three treatments, very few of the covered bunches showed commercially rusted fruit.

Dust residues remained on all nicotine treated bunches and were greatest on those treated right up to cutting time. The bulk of the dust was removed by dipping the bunch after it was cut in a drum of water. The residues are not poisonous.

Brown paper tubes were used in the experiment because good quality sugar hessian was difficult to obtain at the beginning of the season. Many were blown off the fruit by cyclonic winds and had to be replaced as soon as possible to prevent sunscald. The type of fruit produced under bags was very attractive from the market point of view, being light in colour and unblemished by sundry pests or sunscald.

DDT.

This insecticide proved very effective for rust prevention on bananas. Without exception, when used on the bunch as a 2 per cent. dust with fortnightly applications through the life of the bunch, it kept the fruit free from commercial rust. The maximum damage was a light rusting restricted to the contact points of adjacent fruits in the upper hands, and even this damage was not apparent on many bunches. Equally good control was obtained on bunches given only four fortnightly treatments, but a little commercial rust did develop when the number of treatments was cut down to three.

In the second experiment later in the summer, the DDT dust was used at 4 per cent. strength. By this time, thrips were less active, but still in sufficient numbers to provide a contrast between treated and untreated bunches. The dust applied at fortnightly intervals kept the fruit free from rust with rare exceptions, but there were no indications that the higher concentration was necessary or that treatment of the whole plant is better than treatment of the bunch alone.

Dust residues were almost the same as in the nicotine treated bunches, and again removal of much of it was effected by dipping the cut bunch in water.

For the spray an 0·2 per cent. DDT agricultural emulsion was used. It provided good protection against thrips, but no apparent benefit was derived from spraying the whole plant rather than the bunch alone. This may have been due to the fact that the damage on most of the treated bunches was restricted to the smoky stage and little or no commercial rust developed. Further trials under more severe thrips infestation would be necessary to compare the relative merits of these treatments.

Some fruit burn was noticed with the 0·2 per cent. DDT emulsion. It took the form of a purple spotting on the fruit surface, but it was neither severe nor always present on the treated bunches. Apparently, 0·2 per cent. is the upper concentration at which the emulsion can be used with safety on the fruit. At the time of the experiment a water-dispersible DDT powder was not available for test, but this type of DDT spray may prove equally effective and less likely to injure the plant if concentrations of more than 0·2 per cent. are accidentally applied.

Spray residues on the fruit were present as white spots, but were barely noticeable.

Two combination dusts each containing 2 per cent. D.D.T. and 2 per cent. nicotine were also used. In one of these, the components were mixed just before each application; the other was purchased as a ready-mixed dust. Fortnightly applications of the fresh-mix gave results comparable with nicotine dusts applied weekly, although it proved superior when the number of treatments were limited to three. The ready-mix gave a reasonable degree of control, but on the whole was inferior to all other treatments. It has since been reported elsewhere that nicotine and DDT are not compatible in dusts with an alkaline diluent, the DDT losing some of its insecticidal efficiency. However, in view of the results obtained with DDT alone, there seems to be now no point in considering this combination for rust thrips control.

Benzene Hexachloride.

A 4 per cent. benzene hexachloride dust containing 0·5 per cent. of the gamma isomer was applied fortnightly to the whole plant in the second experiment. No bunch thus treated developed any commercial rust, and some fruit on only two of the bunches developed any redness at all. Again the test was not a severe one, because of the relatively low thrips activity, but this new insecticide showed promise of being equal or superior to DDT for rust thrips control.

A sample of benzene hexachloride emulsion was tested in sprays containing ·025 per cent., ·0375 per cent., and ·05 per cent. of the active constituent. Fruit burn occurred at all three concentrations and, consequently, these sprays were omitted from the experiments.

Recommendations.

Where an area is free of thrips, any planting material brought in should come from a thrips-free area or, if that is not possible, from an area of light thrips infestation.

If thrips are already present in the plantation, treatment of the bunch will usually be necessary to protect it from rust blemishes during summer. From early October, a watch should be kept for smokiness (an early indication of thrips activity) between the fruits, particularly those in the top hand. When it becomes fairly general, and perhaps on some bunches extensive, control measures should be started. Normally this will not occur until November, or occasionally later. Thrips damage will practically cease again in April or May the following year.

Four applications of a 2 per cent. DDT dust on each bunch at fortnightly intervals from the time it is thrown should give adequate control in a normal season, but the following points should be noted:—

(*a*) If rust develops on some of the early summer-thrown bunches after the fourth dust application, thrips populations will be very high, and fortnightly treatments should be continued right through the life of the bunch.

(*b*) The damage caused by thrips early in the life of the bunch can be severe, so the first treatment should be applied to each bunch as early as practicable. When dusting is carried out on one day in each fortnight, some bunches may be thrown for 13 days before receiving their first treatment. In a moderate thrips outbreak, one dusting day a fortnight has proved satisfactory. In a severe outbreak, the same procedure should be followed, but it may be desirable to treat any newly-thrown bunches during the intervening weeks. Such bunches would, of course, be treated again during the following week and thus brought into the fortnightly treated series.

(*c*) Bunches which have emerged from the throat of the plant but not yet opened will probably benefit by a few puffs of dust.

(*d*) If four treatments only are given to each bunch, some system of marking the bunch to indicate the number of treatments it has received may be necessary, or the grower will have to accurately judge its age and treat only those up to two months old. The latter method should be the more serviceable.

(*e*) In dusting, the aim should be to get a light, even film of dust on the fruit and the bunch stalk. Excessive dust may require removal when the bunch is cut.

If it is desired to use hessian covers on bunches of low-growing varieties to improve the appearance of the fruit, the DDT dust should still be applied. It may eventually prove possible to reduce the number of dustings from the four required on uncovered bunches to two on covered bunches if the covers are of good quality sugar hessian. When dusting inside a covered bunch, particular care should be taken to get a light, even dust-flow, as the residues are not removed by wind and rain as they are on exposed bunches.

THE KEEPING OF FARM ACCOUNTS.

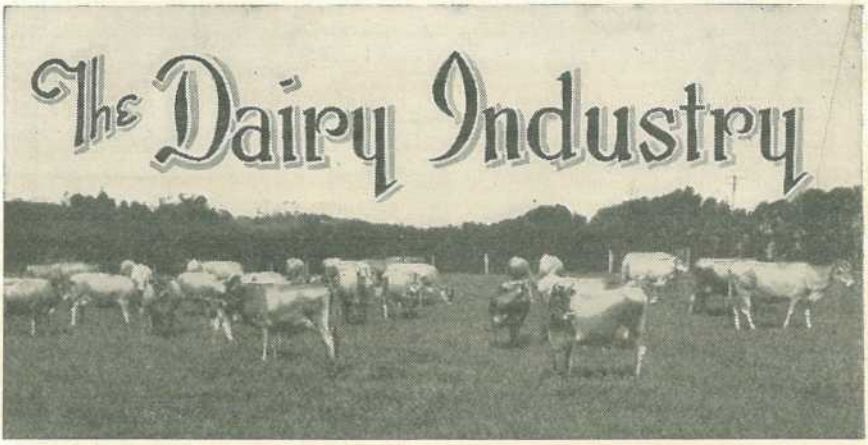
In the business of farming, as in any other commercial enterprise, the keeping of accounts is a necessity.

An accurate system of bookkeeping, besides showing the results of trading operations, will enable a farmer to see his exact financial position and to say definitely what he is worth at a particular date; what he owes; what is owing to him; and whether he is gaining or losing.

To meet the need of a simple system of keeping farm accounts, the Department of Agriculture and Stock has published a handy brochure on farm bookkeeping. A copy may be had free of charge on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Plate 113.
BALED HAY FOR STORAGE.

Plate 114.
ANOTHER LOAD FOR THE HAYSHED.



The Production, Processing, and Transport of Milk Under Tropical Conditions.

W. C. T. MAJOR, L. MORIARTY,† and D. S. ROBERTSON.‡

UNDER the Health and Dairy Produce Acts milk for human consumption must conform to a very high standard of quality. The attainment of these desirable standards is a difficult matter under adverse tropical conditions, particularly where the product has to be hauled long distances; milk from Malanda district is transported to Townsville, a distance of 217 miles by road and rail through a humid, tropical climate.

The object of this article is to outline the methods which have given satisfactory results in providing Townsville with a high-quality market milk. The success of these methods is largely due to the close co-operation between the farmer and the factory and the efficiency of the transport system.

Healthy Herds.

The supplying of a high-quality milk depends, in the first place, on healthy herds. Cows should be free from such diseases as tuberculosis and mastitis, the first because of its public health significance and the second because of its effect on the keeping quality and the composition of the milk. All herds at Malanda have been tested for tuberculosis and care is taken to detect and reject any mastitis-infected milk.

Dairy Shed Methods.

The sheds and surroundings are kept scrupulously clean, neat and tidy. To do this efficiently with the minimum labour, layout and construction of the sheds and yards needs careful consideration. Concrete floors and drains and adequate protection from the weather have been found necessary to reduce to a minimum contamination from dust, mud and manure, as well as to provide comfortable conditions for milking.

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* Manager, Atherton Tableland Butter Association, Malanda.
† Senior Dairy Adviser, Innisfail.
‡ Dairy Officer, Malanda.

The following milking methods have been found to be of considerable assistance in the production of high quality milk:—

1. Wash the teats and udder of the cow and hands of the milker with a clean solution of hypochlorite and completely dry the teats, udder and hands before commencing milking.
2. Practise dry-hand milking on hand-milked herds.
3. Use a strip-cup to detect abnormal milk.
4. Where machines are used, dip the cups in a hypochlorite solution between each cow in order to reduce the spread of mastitis.
5. Use clean udder cloths.
6. Immediately after each milking thoroughly wash the milking machines and utensils.
7. Clean out the sheds and yards.

Scrupulously clean and sterilized utensils are necessary for the production of city milk in the tropics. The following simple rules of shed sanitation are closely adhered to by milk suppliers to the Malanda factory. As soon as milking is finished the machines and the utensils are: (*a*) first rinsed with cold water; (*b*) washed with hot soda water; (*c*) rinsed with boiling water; and (*d*) sterilized with steam. The utensils are then placed on racks to dry. Twenty minutes before the commencement of milking a solution of one of the proprietary brands of hypochlorite is run through the milking machine and then used to rinse other utensils. This solution is later used to wash the hands of the milker and the udder and teats of the cows. As investigations have shown that the germicidal value of the solution decreases rapidly after washing the udder and teats of six cows, a fresh portion of this solution is used for every sixth cow.

Care of Milk on Farm.

Immediately after milking, the milk is cooled to 60 deg. F. or as low a temperature as possible. It is then stored in a roadside milk box or a farm refrigerator until transported to the factory.

Factory Treatment and Transport.

Milk Grading.

On arrival at the factory the milk is graded, tipped and weighed. Samples of each supplier's milk are then taken for bacteriological and chemical analysis. The samples are first tested by the methylene blue reductase test. Samples with a methylene blue reduction time of less than 5½ hours are then examined microscopically in the laboratory. From the appearance of the milk sample examined under the microscope the cause of the defect is determined. The farmer is then advised that the milk is of unsuitable quality and further supplies are separated until the quality reaches the desired standard. The reason for its unsuitability is stated and the supplier advised of the remedy. The response to this service has resulted in a good quality milk supply, increased sales and almost negligible losses due to "sour milk."

Laboratory Control.

The campaign for improved milk quality hinges on the laboratory. Here milk grading is carefully carried out, the farmer advised of the quality of the supply, and if unsatisfactory the cause determined scientifically. The laboratory also checks the treated product to ensure efficiency of pasteurization and processing of the milk by means of the phosphate test and plate counts.

Processing.

At Malanda an A.P.V. plate heat exchanger is used to pasteurize the milk supply. The milk is heated to 162 deg. F., held for 16 seconds, and then chilled to 34 deg. F. To ensure that the pasteurization is efficiently carried out all pasteurized milk is tested by the phosphatase test, a sensitive test which enables even the slightest error in processing to be detected. Plate counts are also carried out to ascertain the efficiency of pasteurization and processing of the milk. Routine chemical tests are conducted to ensure that all consignments conform with the standards laid down in the Health Act.

Can Washing.

Cans, which usually arrive back from the depots in an unsatisfactory state of cleanliness, are first hand scrubbed and then passed through a rotary can washer. The cans, prior to being used, are rinsed with a chlorine solution of suitable strength. The lids are also subjected to the same treatment before being replaced on the cans.

Transport and Temperatures.

During the peak period in 1944 when large quantities of liquid milk were required in Townsville, insulated box bodies were constructed on 3- to 5-ton truck chassis for transporting milk by road from Malanda to Innisfail, a distance of sixty-one miles. Processed milk ranging in temperature from 34–37 deg. F., loaded on to these vehicles at Malanda at 2.30 p.m., arrived at Innisfail with very little rise in temperature in the cool of the tropical evening. The milk was then off-loaded into railway wagons previously pre-cooled with ice. The goods train carrying the milk left Innisfail at 10.20 p.m. and arrived at Garbutt Siding, Townsville, at approximately 3.30 p.m. the following day, an interval of at least 25 hours elapsing between entraining at Malanda and arrival at Townsville. En route the milk was kept at a low temperature by the utilization of 44-gallon drums containing a mixture of ice and salt. Temperatures on arrival at Innisfail during the summer months averaged 42 deg. F.

Modification of the above technique, involving the distribution of 6 cwt. of cracked ice over the cans and throughout the van, has resulted in temperatures as low as 37 deg. F. being recorded on arrival at Townsville. At present the cans on being loaded at Innisfail are covered with 15 cwt. of cracked ice. This procedure has resulted in temperatures ranging from 34–38 deg. F. being recorded on arrival in Townsville.

Efficient organization has ensured the low temperatures which have been carefully recorded at Malanda and on arrival in Townsville.

Contemplated Improvements.

The use of rail tankers for conveying the milk from Malanda to Townsville—294 miles—is being considered. It is hoped to fit the tankers with a means of controlling milk temperature. This is considered necessary in view of the long journey through a hot tropical climate and inevitable rail delays which occur at times through tropical storms. Adequate temperature control is essential to maintain the quality of the milk and ensure a satisfactory article for consumers.

Conclusion.

The Atherton Tableland Co-operative Butter Association, by constant attention to details not only on the farm but also at the factory and during transport, has proved that it is possible to supply high quality milk to a distant city situated in the most humid tropical area in Australia. It has been demonstrated that for the maintenance of quality an efficient laboratory is essential. The laboratory control enables specific advice to be given to the farmer to assist him with his milk problems and a constant check to be kept on processing at the factory. This eliminates guesswork and maintains a constant standard of quality.

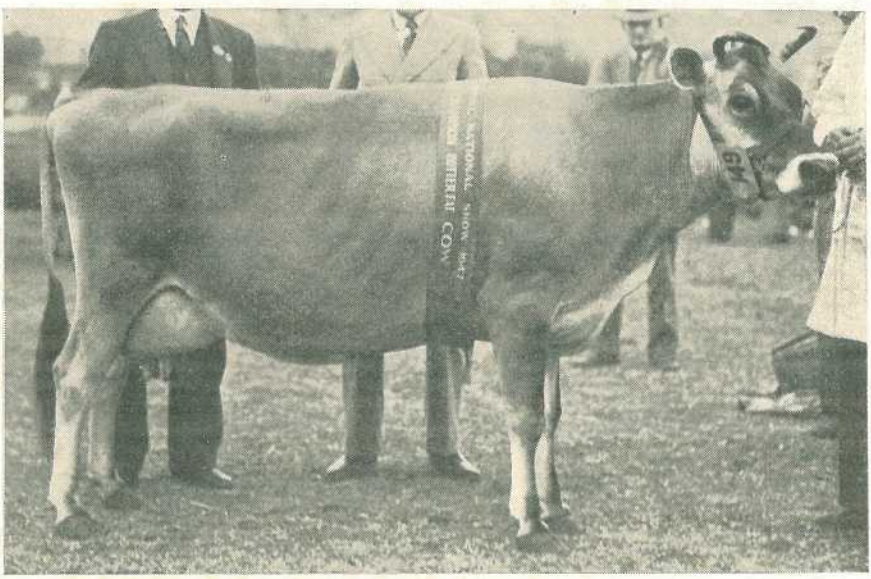


Plate 115.

CHAMPION BUTTER FAT COW at the 1947 Brisbane Show.—"Gem May," of the GEM JERSEY STUD, KENMORE, the property of Mr. Wallace Bishop.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S. Jersey and Guernsey Societies Herd Books, production records for which have been compiled during the month of September, 1947 (273 days unless otherwise stated).

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE (STANDARD 350 LB.).				
Mountain Home Gem 42nd	H. C. Lester, Glengallon	9,820·85	401·991	Fairvale Ensign
JUNIOR 2 YEARS (STANDARD 230 LB.).				
Faversham Dewdrop 9th	W. D. Davis, Chinchilla	6,619·35	271·19	Croydon Marchese
JERSEY.				
MATURE (STANDARD 350 LB.).				
Westwood Leda	F. Porter, Cambroon	8,067·8	411·592	Hunstreets Emperors Volunteer
Westbrook Tulip 122nd	L. E. Harmer, Beaudesert	8,418·15	386·806	Selsey Royal Standard
SENIOR 4 YEARS (STANDARD 330 LB.)				
Glenrandle Jean	P. Kerlin, Killarney	7,750·3	419·060	Bellgarth Stylish
Windsor Princess Madge	H. G. Johnson, Gleneagle	7,092·65	415·437	Bobs of Wingate
SENIOR 3 YEARS (STANDARD 290 LB.).				
Bellgarth Fairy 4th	D. R. Hutton, Cunningham	6,298·15	304·916	Trecarne Victor 2nd
JUNIOR 3 YEARS (STANDARD 270 LB.).				
Brooklands Cream Flake	W. S. Conochie, Sherwood	8,342·3	465·766	Englove Cunning Victor
Connemara Mistress	J. J. Ahearn, Conondale	6,252·65	330·062	Trinity Mighty Prince
SENIOR 2 YEARS (STANDARD 250 LB.).				
Glenrandle Lotus Lily	P. Kerlin, Killarney	4,823·8	253·096	Bellgarth Glory King
JUNIOR 2 YEARS (STANDARD 230 LB.).				
Brooklodge Victorine	J. J. Ahern, Conondale	5,664·85	298·601	Trecarne Some Victor 4th
Brooklodge Style	J. J. Ahern, Conondale	5,288·85	271·457	Trinity Mighty Prince
GUERNSEY.				
SENIOR 2 YEARS (STANDARD 250 LB.).				
Willowbrae Sparkle	E. G. Foxton, Maleny	5,209·7	252·415	Linwood Peace Boy

Beef and Dairy Cattle Champions.

R.N.A. SHOW BRISBANE, 1947.

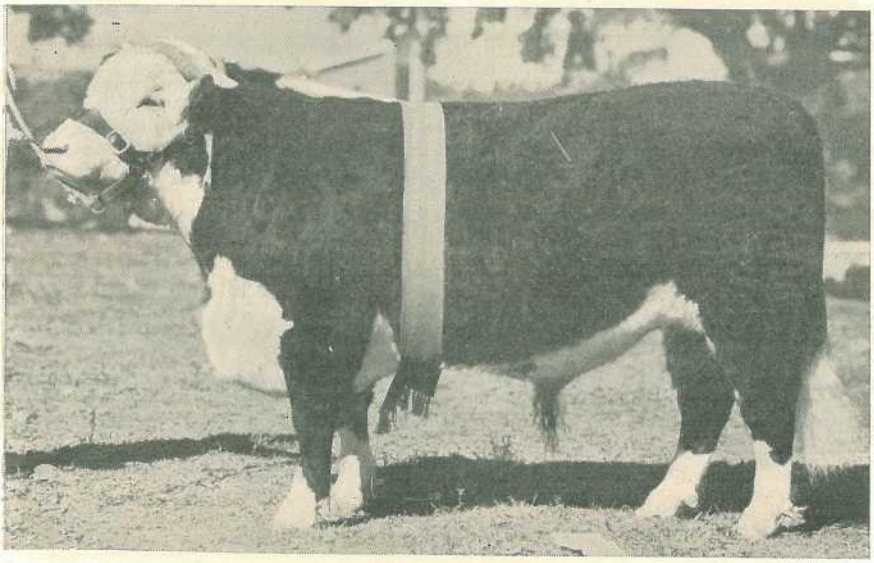


Plate 116.

JUNIOR CHAMPION HEREFORD BULL.—"Blandford Better Luck." Mrs. N. P. Wright.

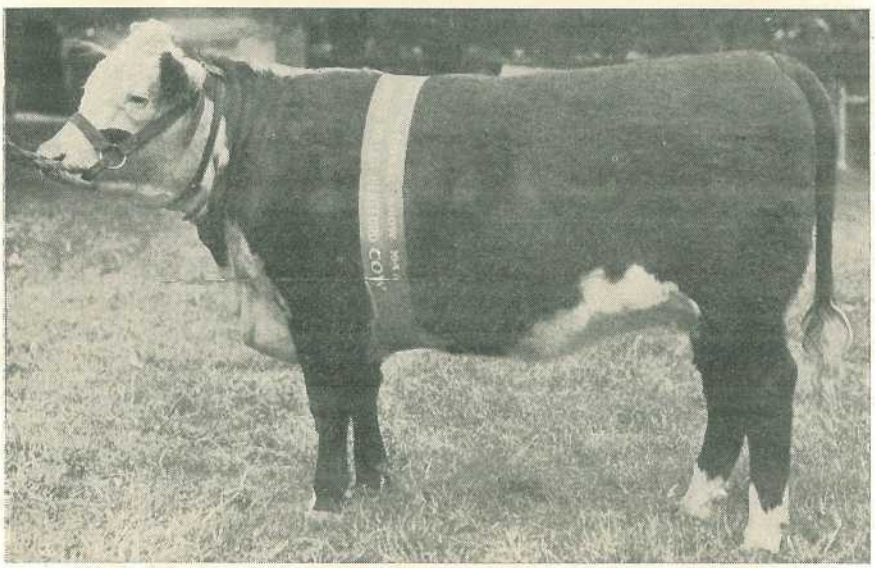


Plate 117.

CHAMPION POLLED HEREFORD COW.—"Eulogie Cherry 3rd." E. W. McCamley.

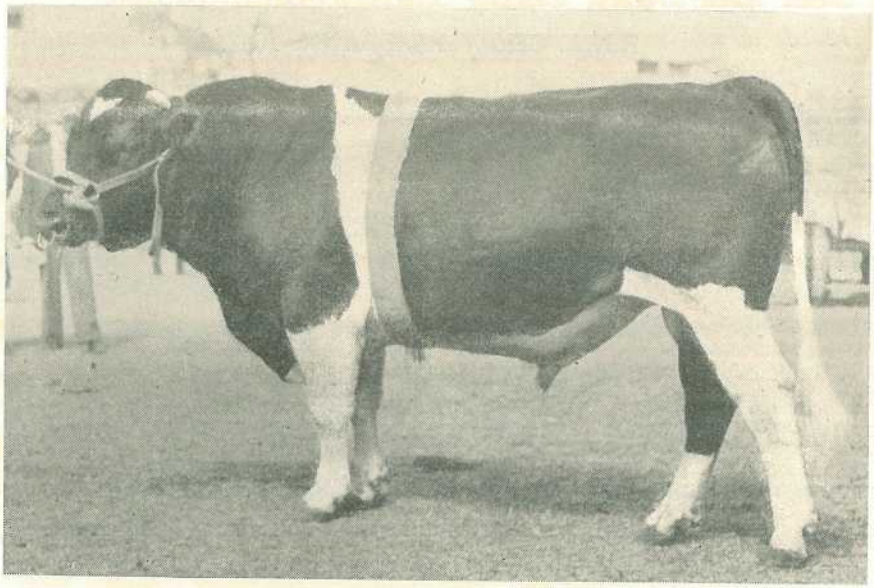


Plate 118.
CHAMPION FRIESIAN BULL.—"Anama Transvaal Stamp." J. P. Larson.

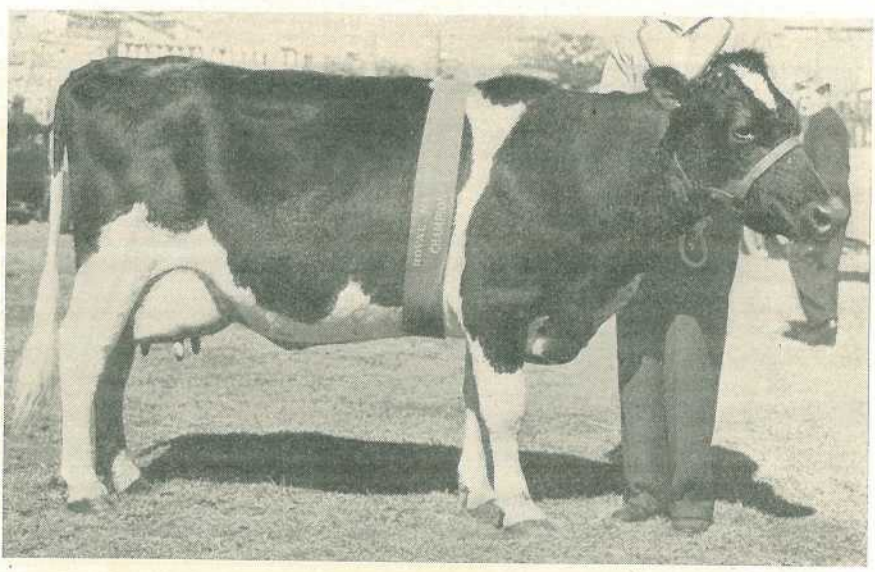


Plate 119.
CHAMPION FRIESIAN COW.—"Ivavale Novice 7th." Young Bros.

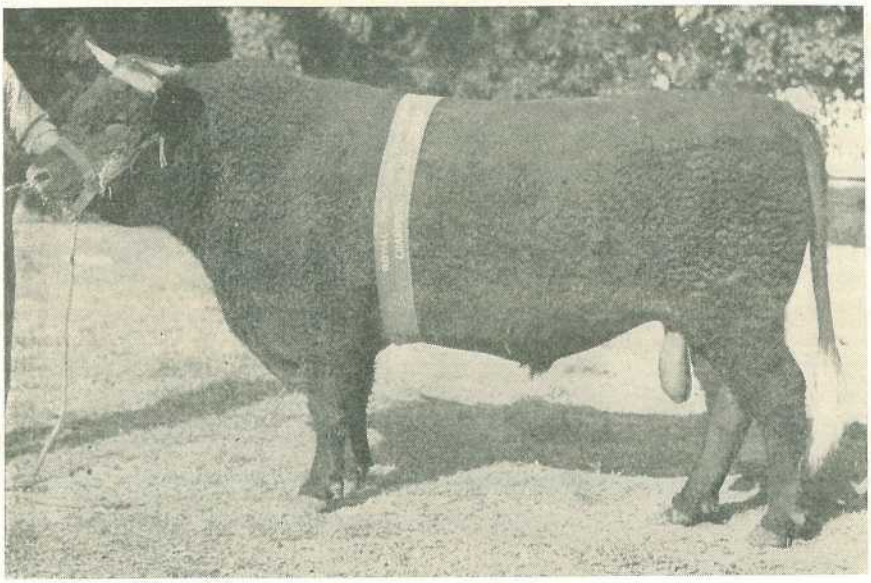


Plate 120.
CHAMPION DEVON BULL.—"Devon Court 3238th." R. A. Howell.

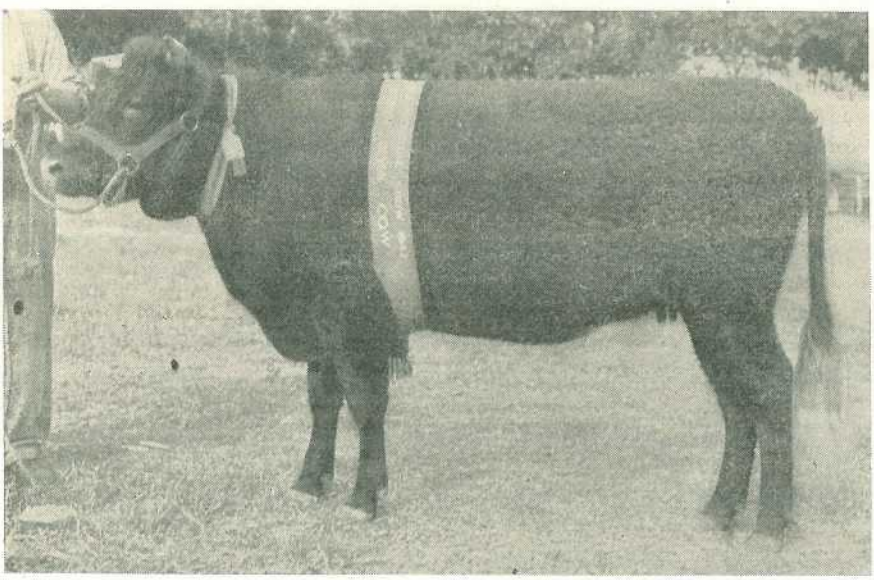


Plate 121.
CHAMPION DEVON COW.—"Devon Court Gipsy Countess 3405th." R. A. Howell.

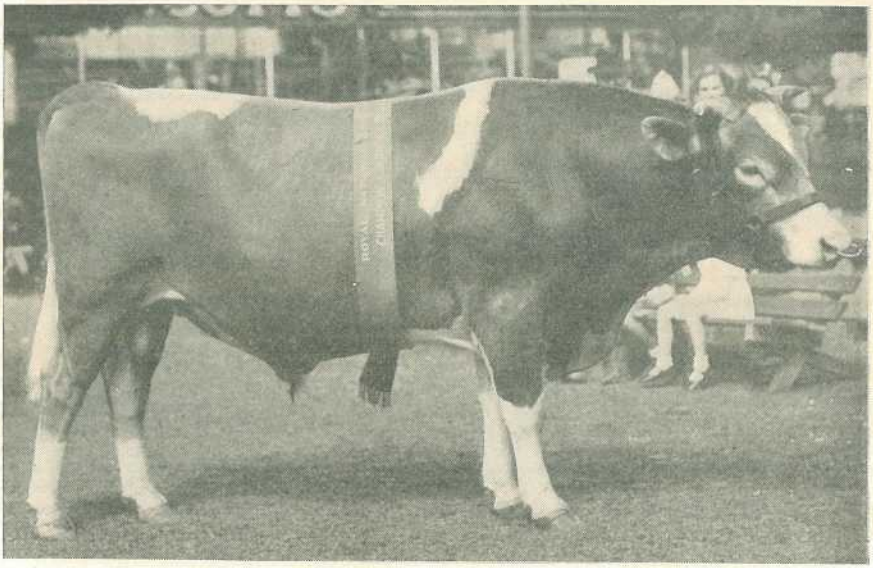


Plate 122.
CHAMPION GUERNSEY BULL.—"Laureldale Prospect." W. A. Cooke.

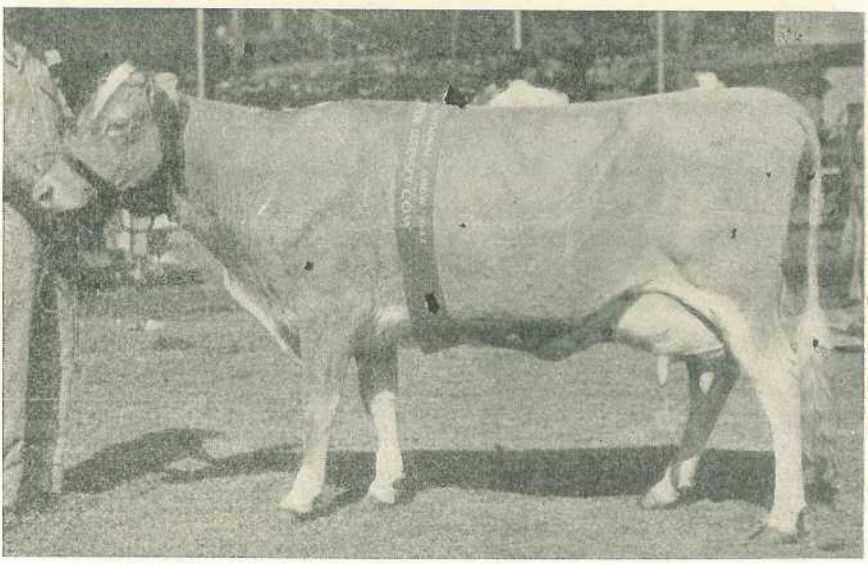
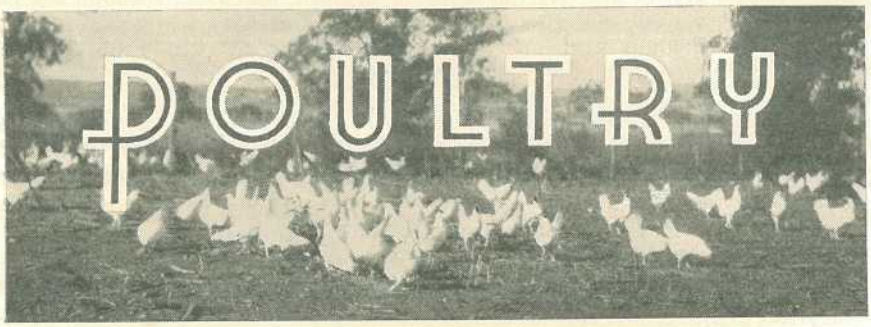


Plate 123.
CHAMPION GUERNSEY COW.—"Laureldale Buttermaid." W. A. Cooke.



Cleaning and Disinfection of Poultry Houses.

C. MANNING, Poultry Inspector.

TOO much stress cannot be given to the importance of a thorough and proper cleaning of the poultry quarters. Accumulations of poultry manure, fouled litter and dust give rise to many diseases, as well as harbourage for lice, ticks, fleas, mites, and worm eggs, causing the flock to be unduly upset by irritation with consequent falling off in production. Although poultry can be treated for parasites, it is more economic to attack the infestation at its source by cleaning and disinfection of poultry houses and equipment than by treating after the infestation has occurred. Then again, from the production standpoint, the quality of eggs is affected by staining, which may be caused by accumulations of excreta and fouled litter. Wet floors may also facilitate bacterial invasion.

On many poultry farms the only cleaning done is the sweeping of manure and litter from fowlhouse floors. This is not enough if disease and parasites are to be kept in check. Coccidia, as well as other disease-producing organisms, have been found in the dust on the walls, rafters, and wire-netting of fowl sheds.

The cleaning of poultry sheds and yards should not be left until they are filthy, but should be part of the regular farm routine, and should be planned so that the sheds are cleaned before they become offensive. Poultry, as with other farm stock, appreciate well-kept sanitary quarters and clean, vermin-free sheds. As well as inducing greater egg output and making work more congenial, cleanliness in the fowlhouse reduces the number of eggs to be cleaned, and ensures a better grade product and bigger returns to the farmer.

Apart from routine cleaning, poultry sheds which have been used for the housing of grown birds and are intended for the housing of young stock should be disinfected and kept in repair, as pullets may not have developed the resistance to disease that more mature birds may have. It is at this time also that any repair work that is necessary should be done without disturbing the birds.

It is recommended that every fowlhouse should have floors of concrete. However, where wooden floors have been put down these have given satisfaction and are easy to keep clean, but as the cracks in the flooring cannot be effectively cleaned out, the farmer has to rely on disinfectants to penetrate these parts. It should be remembered that

these disinfectants are not effective on organic matter. Wooden floors, therefore, are not as good as concrete. Earthen floors cannot be thoroughly cleaned and may be a habitat for all kinds of disease-producing organisms and larvae of parasites.

When cleaning pens for young stock, the nest boxes should first of all be emptied of their contents, treated with creosote or used sump oil, and then allowed to stand either in the sun or a draughty position for, say, some weeks before replacement in the sheds. Next, the perches should be removed and scraped, also the supports and slots. All accumulations of fouled litter and excreta should be cleaned out dry and bagged. However, some excreta may adhere to the floors of the sheds; to remove this, first soak it and then scrape it off with a flat spade. It may not be practicable to hose fowlhouse walls because of no pressure water system, but where it can be done it should be done, making sure that all dust is removed from the tops of the rafters, cracks, and crevices of the building. Hosing of the fowlhouse is, of course, preferable to dry cleaning, for once heavy accumulations are removed the germ-laden dust does not lodge.

Routine cleaning of poultry houses should not be done while the fowls are still in occupation, as shifting the birds upsets them and may affect their laying.

With the semi-intensive system of housing poultry, a start should be made with the cleaning of the yards, as in raking up the accumulations of litter dust may arise and settle in the sheds. Yard litter may be spread over the grazing area after sticks, weed-stalks, and other rubbish have been removed and burnt. There is usually a ready market for fowl manure, and when cleaning the fowlhouse this should be gathered and bagged dry.

When poultry are housed on the intensive system, cleaning should be done with as little disturbance to the birds as possible, working from one end of the shed to the other. As fouled material is removed, it should be replaced with clean litter.

Under the semi-intensive system the birds may be locked out in the yard while cleaning is in progress. As in the cleaning of unoccupied houses, nests should first be emptied and then the perches and supports cleaned and scraped. The walls, netting, rafters, and uprights should then be swept, care being taken to minimize disturbance to the flock. Perches, walls, and uprights should then be treated with either creosote or used sump oil. To hasten drying the perches should be sprinkled with fresh sawdust or litter. Some farmers prefer to lime-wash the walls. If creosote is used, care should be taken that it does not come in contact with the operator's skin, and particularly his face, if a spray is used in its application.

When cleaning vacant pens, floors should be thoroughly disinfected with a good germicide, but effectiveness of any disinfectant depends largely upon how well the cleaning has been done. A small amount of litter or sweepings may neutralise the effect of any disinfectant, hence a frequent complaint of money spent without beneficial results. Not until the floor of the shed is completely clean and dry should any disinfectant be used; then, for best results, the disinfectant should be used in strict accordance with the manufacturer's recommendation.

Carbolic acid (phenol), chloride of lime, and several coal tar preparations are available and are all satisfactory for general poultry farm usage. Sodium hypochlorite is also a good cleansing agent with germicidal qualities.

When the floor of the pen has dried, fresh litter should be placed on it to a depth of several inches. Pine sawdust or shavings are best for this purpose, although good straw, peanut, or rice hulls may be used. Litter should be dry and not damp or mouldy. Moulds may cause a respiratory disease known as aspergilliosis in chickens, for which there is no cure.

When chicken houses or battery brooders are being cleansed and conditioned for the reception of young stock, these premises, especially the woodwork, framework, and netting floors, should be scrubbed and cleansed with either a soda solution or sodium hypochlorite. When everything is thoroughly clean and dry, the use of a fresh solution of some efficient disinfectant is advisable.

If the chicken houses have concrete floors it is advisable to cover them with small amounts of litter daily. The used litter should be gathered and burnt daily and so reduce the risk of infection from disease-laden droppings. If sand is used, this also should be swept up daily and replaced with fresh sand.

Most poultry raisers have small runs in front of the chicken houses which are ploughed and planted with some green feed for the young stock. This is a good practice, as the ground gets the benefit of sunlight when turned over regularly.

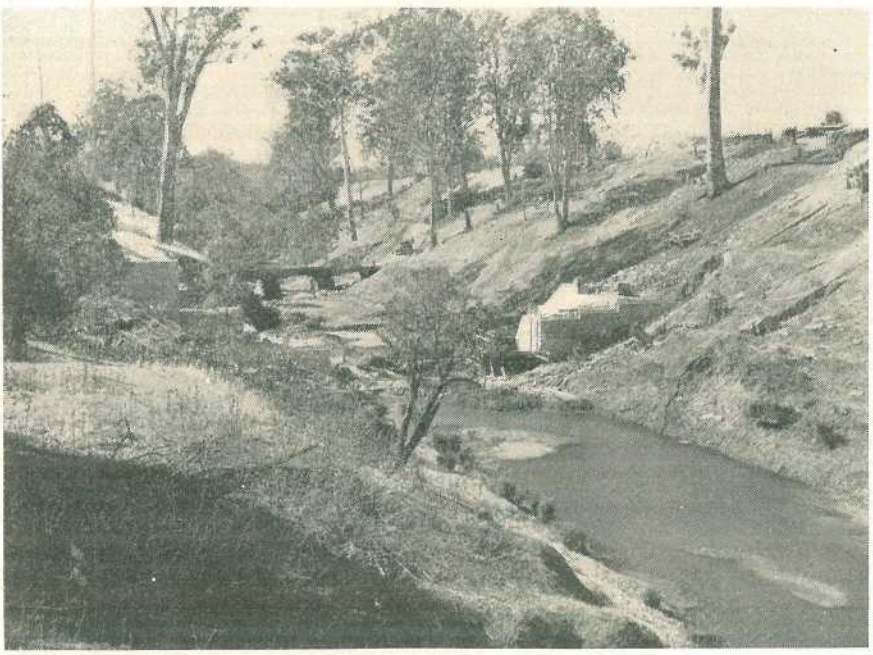


Plate 124.

WEIR UNDER CONSTRUCTION ACROSS THE LOCKYER.

ANIMAL HEALTH

Milk Fever *(Hypocalcaemia)* and Pregnancy Toxaemia of Ewes.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

MILK fever (*hypocalcaemia*) and pregnancy toxaemia are two conditions which affect sheep and closely resemble one another. As it is possible to treat one of these conditions successfully, it is important that a correct diagnosis should be made and the following notes have been compiled to assist woolgrowers in this matter.

MILK FEVER.

The name milk fever is actually a "misfit," as there is really no fever—i.e., no rise in temperature with the complaint. The disease may occur in ewes before, during, or after lambing, but it is not confined to ewes, for sheep of either sex may be affected.

Cause.

Milk fever is caused by a sudden drop in the amount of calcium circulating in the blood. The occurrence of the disease does not necessarily indicate that there is an actual deficiency of calcium in the country. In point of fact, the level of the calcium content of the blood is controlled by a special calcium regulating mechanism, and during the time when the young lambs are developing within their dams' bodies, or when the first flow of milk is being produced, there is often a sudden call on the readily available calcium in the body. The animal carries a large store of calcium within its bones, and when there is a lag period between the *mobilization* of the bone calcium and the time of this *sudden call* on the *readily available calcium* of the body, milk fever develops.

Observations have shown that milk fever becomes much more prevalent as the age of the ewe flock increases. An attack may be precipitated by a large number of conditions which include the following:—

Fasting.—The fasting to which sheep may be subjected during shearing, crutching or jetting, road or rail journeys is a common cause of milk fever.

Poison Plants.—Some plants, many of which are regarded as good sheep feed, contain at certain stages of their growth large quantities of oxalic acid. On being eaten, this oxalic acid lowers the blood calcium and thus sets up "milk fever." Pigweed and soda bush are two plants rich in oxalic acid.

Cold, Wet Weather.—Some of the losses which follow cold, wet weather are caused by milk fever.

Drugs.—The toxic action of carbon tetrachloride is partly dependent on its capacity to produce a lowering in blood calcium.

Exercise.—Exercise may cause a sudden drop in blood calcium and thus precipitate symptoms of milk fever.

Diet.—A diet which is low in calcium is likely to predispose animals to a lowered blood calcium, and in this regard it is as well to remember that maize, grain sorghum and wheat, which are often fed to lambing ewes as a drought supplement, are particularly low in calcium content. Fat lamb "mothers" grazing green oats often suffer from a sudden lowering of blood minerals.

Parasitic Infestations.—Even light infestations of hair worms (Trichostrongyles) will decrease the amount of calcium in the blood of sheep, and in this way may predispose to acute attacks of "milk fever."

Symptoms.

(i.) If the sheep are watched carefully, the first symptom seen is excitement. They become very unsteady on their feet—stagger in their gait—arch their backs and put their heads out as if in an effort to prevent falling.

(ii.) When down, some animals manage to rise, but only with great difficulty. If lifted, they assume a cramped, crouched attitude as though their feet were too sore to take their weight. At this stage there is usually considerable trembling of the muscles. This often gives one the impression that the sheep is making grimaces.

(iii.) If the affected animal remains down, it becomes drowsy and finally unconscious. Its glassy eyes and slow, shallow breathing give it the appearance of being dead. Food is usually regurgitated from the paunch (rumen) and the nostrils become clogged. When this occurs the animal makes a snoring noise when trying to breathe through the nose or else it breathes through its mouth.

(iv.) Despite the apparently unconscious condition of the animal, it will be found practically impossible to bend the legs, which are usually stretched out straight.

(v.) Death usually occurs rapidly (i.e., within 24 to 48 hours) if affected sheep are left untreated.

(vi.) When a bad outbreak of milk fever develops at lamping time, it may be noticed that the unaffected animals in the flock appear to be drowsy and sleepy.

Treatment.

The obvious treatment is to correct the lowered blood calcium by the injection of a calcium solution under the skin. A suitable solution is prepared by warming the following ingredients until they dissolve in the water:—

Calcium gluconate	¼ oz.
Boric acid	¾ drachm
Water	3 oz.

The dose is injected under the skin when the water has cooled to blood heat.

A stock solution of the calcium may be prepared and will keep well if tightly corked. The stock solution can be diluted and used as required. The injection is easily made under the unwooled skin, say inside the leg, with an ordinary hypodermic syringe. The skin should be cleaned with a little methylated spirit or iodine before the needle is inserted.

An alternative is to purchase calcium-boro-gluconate already prepared, and use it as a 20 per cent. solution, the dose being 30-50 cc. injected at blood heat as described above. Sheep usually recover in from ½ to 1 hour, although it is often necessary to treat affected animals more than once.

Prevention.

The prevention of outbreaks of milk fever is based on providing diets adequate in calcium and in controlling internal parasites, particularly hair worms. In addition, care should be taken with travelling animals to prevent over-fatigue and prolonged fasting. Likewise, if in-lamb ewes are being worked through yards, special care should be taken to make sure that they are not subjected to long periods of starvation.

If plants containing oxalic acid are prevalent, care should be taken during mustering and every effort made to keep travelling mobs off parts of the stock routes where these plants are plentiful. It should be remembered that fasting will bring about a decrease in the amount of calcium circulating in the blood and accordingly hungry animals are already predisposed to "milk fever" and they, in particular, should be kept off plants likely to cause trouble. If crossbred ewes with lambs at foot are grazing green oats special care may have to be taken. The precautions which may be considered are—

(1) Confining the sheep on a small area with a temporary fence and seeing that they eat the oats right out before moving them on to the next area.

(2) Allowing the sheep access to a paddock containing fairly dry grass as well as oats. This ensures a more varied diet and the animals get more roughage.

PREGNANCY TOXAEMIA.

Pregnancy toxaemia develops in ewes during the later stages of pregnancy. The exact cause of the disease is not clear but it is known that the nutrition of the sheep does play an important part in its occurrence. It is particularly widespread in Queensland and is often the cause of severe losses.

Predisposing Causes.

It has been observed that sheep on a falling plane of nutrition are more likely to develop pregnancy toxaemia. Sudden changes in diet will also precipitate an attack. Interesting outbreaks have been observed in the field under widely different conditions. In the Clermont district in 1944, in-lamb ewes carrying a fair length of wool were badly affected with grass seed in late April and early May. As a result, the sheep became too sore to walk and accordingly stayed about the water troughs and did not go out to graze. Because of this, starvation

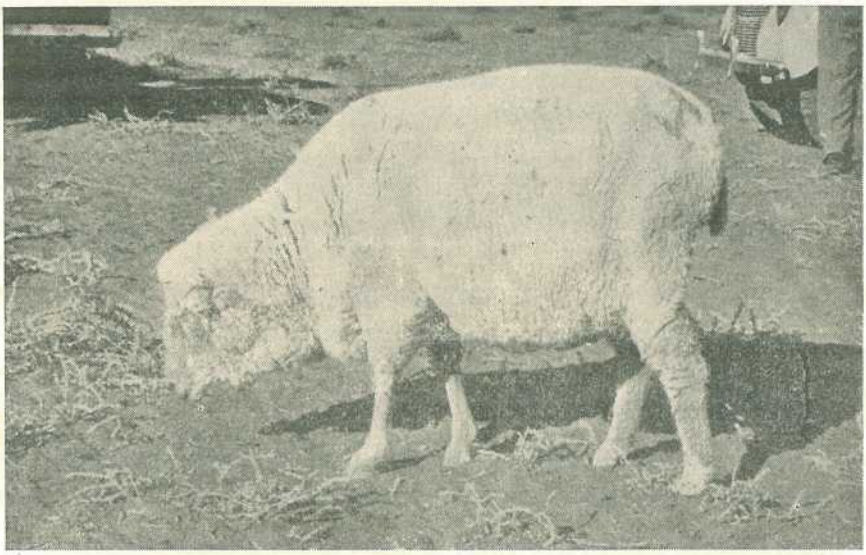


Plate 125.
EWE SHOWING SYMPTOMS OF PREGNANCY TOXAEMIA. (Note Stance.)

Plate 126.
EWE SHOWING ADVANCED SYMPTOMS OF PREGNANCY TOXAEMIA.

pregnancy toxaemia developed. In the Muttaburra district in 1942, in-lamb ewes which were running on black-soil plains were caught in heavy rain. Many of the animals became bogged and pregnancy toxaemia caused heavy mortalities. The disease also was very prevalent in the South-west during the drought conditions of 1946.

Although many of the predisposing causes of the disease appear to be similar to those of "milk fever," the chemical changes which take place in the body in these two diseases are not alike. Pregnancy toxaemia appears to result when the liver is unable to convert the nutriments mobilized from the body's reserve stores in the muscles into a form which can be readily utilized.

Symptoms.

The symptoms seen are indefinite, but may be set down as follows:—

(i.) The ewes are dull, listless and appear to be fatigued for several days before the outbreak develops.

(ii.) Sometimes animals stand with their heads lowered as though they are eating (Plate 125), but there is actually a disinclination to eat. Sometimes, on the other hand, the head is held high with the ears drooping. At this stage the animals appear dazed and can be approached and caught without making any effort to take evasive action.

(iii.) Apparently the sight is impaired, and the sheep will stagger along with a blundering gait and swinging head. Finally, the ewes go down (Plate 126), and may linger for some days before death supervenes.

(iv.) Sometimes there is twitching of the face and ear muscles, grinding of the teeth and fit-like seizures.

(v.) The careful observer will notice affected animals are inclined to be constipated, and while urination is normal at first it later becomes suppressed.

(vi.) The offspring is usually alive until the time the ewe dies, athough sometimes abortion occurs.

Post-mortem Findings.

Usually there is nothing very spectacular to see on post-mortem examination. Sometimes the liver is fatty and "soapy," and in many cases there are twin lambs, but this is not always the case.

Prevention.

It is not a simple matter to make recommendations which will be easy to apply in the field, because the occurrence of the diseases is closely bound up with seasonal conditions. Mating breeding ewes in anticipation of relief rains at lambing time is a gamble in the pastoral areas of Queensland because of the low rainfall reliability. Mating after good rains also is a risk because unless "follow up" rains fall the plane of nutrition of the ewes is usually declining as pregnancy advances and there is insufficient food just at the time when it is most needed. Accordingly, in planning property management to prevent

the occurrency of pregnancy toxaemia, full consideration should be given to the location and improvements on the property as well as to seasonal conditions, the occurrence of grass seeds and shearing dates.

It is a basic principle of good management to curtail periods of starvation of pregnant ewes to an absolute minimum and this, of course, means careful handling of sheep at pre-lambing crutching or jetting, or at shearing time.

The provision of a supplement for ewes during the last six or eight weeks of pregnancy is often useful if the pastures deteriorate rapidly at this time. A few ounces of ground grain sorghum or meatmeal per day to which has been added a little sterilized bonemeal, salt and/or molasses is inexpensive and will often save the lives of a large number of ewes and lambs.

Differential Diagnosis.

It is often difficult to differentiate between milk fever (*hypocalcaemia*) and pregnancy toxaemia. There are certain pointers in the history and symptoms which are summarized below, but it is as well to keep a hypodermic syringe and some calcium-boro-gluconate on hand and to try treatment before making any final decision as to the nature of the complaint.

Milk Fever (Hypocalcæmia).

1. There is usually an abundance of feed, and often certain plants, such as pigweed or soda bush, may be growing in profusion.

Occasionally there is a sudden scarcity of feed.

2. A rail or road journey or a period of starvation.

3. May affect any sheep, irrespective of sex and/or condition. (Pregnant ewes probably more susceptible.)

4. Sudden onset with fairly rapid loss of consciousness. Early death if untreated.

5. Response to calcium injections.

6. Can occur at any time.

Pregnancy Toxaemia.

1. History of a falling plane of nutrition for some time beforehand, or a sudden change of diet.

2. Rail or road journey or a period of starvation.

3. Affects pregnant ewes only, usually during the last two months of pregnancy.

4. Onset slow, early loss of appetite, gradual onset of drownsiness and stupor, no sudden loss of consiousness Lingering death.

5. No response to calcium injections.

6. Stops suddenly as soon as lambing is over.

Note.—It is always advisable to treat affected sheep with calcium-boro-gluconate. If this fails it may be worth while injecting 15 cc. of a 5 per cent. solution (1 oz. to a pint of water) of magnesium sulphate (Epsom salts). This is because the control of the amount of calcium circulating in the blood is closely linked with that of the amount of magnesium, and a fall in the level of the latter may produce symptoms very like those produced by a lowering of calcium.

If the animals do not respond to either treatment and the symptoms and history are similar to those described above it is reasonably certain the condition is pregnancy toxaemia.

[Grasshopper Baits.—Referring to the possibility of grasshopper plagues, the Minister for Agriculture (Hon. H. H. Collins) stated recently that the distributing firm did not maintain stocks of gammexane in Brisbane but ordered them from Melbourne as required. The use of poison baits had proved suitable for the control of grasshoppers in closely settled areas and experiments had shown that gammexane was a good bait ingredient. He advised anyone who contemplated its use to place an early order. Rail transport from Melbourne usually takes eight or ten days.]

Plate 127.
A BRITISH SHEEP BREED TYPE.—Hampshire Down Shearling ram, bred by Sir William Rootes and sold recently to a U.S.A. breeder.

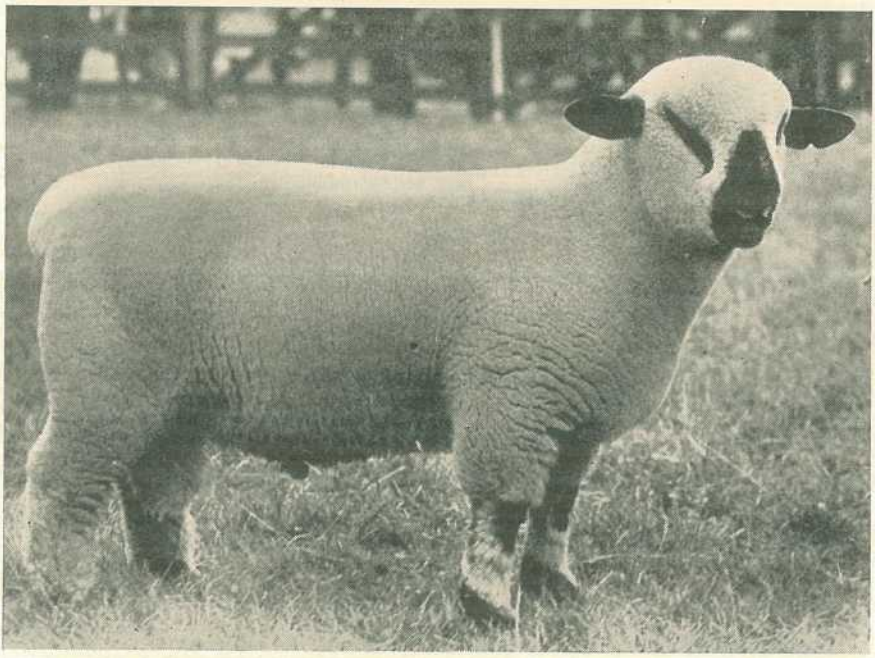


Plate 128.
A BRITISH BREED TYPE.—Three-times Champion Hampshire Down ram, Stype Monarch III., bred by Sir William Rootes, Stype Farm, Berkshire, England.

Co-operative Use of Farm Machinery.

AT a recent conference which was convened by the Minister for Agriculture and Stock (Hon. H. H. Collins) to discuss means of overcoming the effects of recurrent dry periods in Queensland, representatives of primary producers' organizations present were unanimously of opinion that the success of any plan for conserving fodder in larger quantities on farms depends to a great extent on the availability of modern farm machinery, particularly for harvesting.

Investigation has shown that the comparatively poor response to past fodder conservation schemes was caused by shortage of labour for the harvest. Most fodder crops must be harvested at a certain stage of maturity in order to achieve best results. This necessitates the concentration of all available efficient labour on the task over a comparatively short period. If labour is short, only a limited amount of fodder can be conserved. With machinery, however, the harvest can be speeded up and the labour required reduced to a minimum.

Modern machinery for harvesting is expensive and it would not be economical, therefore, to suggest that individual farmers should purchase machines entirely for their own use. It has been demonstrated in some districts that it is practicable for groups of farmers to share the cost of buying machines and operate them co-operatively to their mutual advantage.

Publicity has recently been given to co-operative schemes in the Gayndah and Beaudesert districts and this has aroused the interest of farmers in other areas. For their information and guidance the basis of operation of these machinery pools is set out.

It is understood that farmers in some other districts have united for the group purchase and co-operative use of farm machinery and implements. Particulars and results of any such enterprise would be welcomed for publication in this *Journal*.

The Gayndah Co-operative Scheme.

The Gayndah Co-operative Dairy Association owns a number of machines and general farm tools which are made available to suppliers to the factory on a hire basis. In this way, the Association is materially assisting dairy production in the district. Among other useful implements is a concrete mixer available for 3s. a day. A saw bench is to be added by which a farmer may cut enough wood in a few hours to keep his household supplied for up to six months. The association also has a winch, stocks and dies, wrenches and spanners for the use of which a small charge is made. At present, negotiations are proceeding for the purchase of a post-hole digger and a power-driven post-hole borer.

About two years ago, a group of farmers in the district submitted a proposal to the executive of the Association that a header-harvester be purchased at a cost of £280 and be made available to suppliers on a hire basis. The proposal was considered carefully and it was foreseen that certain difficulties were likely to arise which would militate against the success of a scheme to provide harvesting machinery. Weather, an important factor, had to be considered. The rainy season at Gayndah occurs in January, February and March, and thus limits the period

during which grain crops can normally be harvested to about two months. During this short period, there would be a big demand for such machines as were available and unless sufficient could be provided to meet the needs of all, some crops would deteriorate because of the late harvest and might even be lost altogether, and so cause dissatisfaction among the farmers concerned.

The Association could not see its way clear to finance the purchase of enough machines to meet the needs of all; and so it was suggested that small groups of farmers should purchase their own machines. Two such groups, each consisting of five farmers, have been formed and have bought their own header-harvesters capable of harvesting 200 acres of sorghum each within the safety period of 6 to 8 weeks.

The groups work on the co-operative principle and members help one another between milkings. Each member advanced a share of the purchase price, provides his own fuel and bags and pays a levy at the rate of 1s. 6d. an acre of crop into a bank trust fund to provide for maintenance and replacement. The members mutually agree when the machine can be worked. They have entered into an agreement under which the manager of the Association shall act as arbitrator in the event of any dispute.

Group Use of Farm Machinery at Veresdale.

The original scheme was initiated in December, 1943, when Paul's Ice Cream and Milk Ltd. of Brisbane made farm machinery and implements (one of each type) available for group use by dairy farmers in the Veresdale area, in the Beaudesert district, as follows:—

W.4 McCormick Deering Tractor;

G.L. 70 3-Furrow Disc Plough;

7 ft. Tandem Disc Cultivator (with scalloped discs);

Heavy Mouldboard Plough } for making trench silos.
Mechanical Scoop }

The total cost of this machinery was roughly £800, and the only stipulations respecting this machinery were—

(1) That it would be used to grow and conserve additional fodder thus increasing production.

(2) That a small committee of farmers would control its operation and make a charge for its use to cover cost of fuel; wages of operator; repairs, maintenance, and depreciation—an amount sufficient to ensure that enough money would be in hand to replace the machinery as it wore out.

A management committee of three was set up—comprising Messrs. T. M. Richardson, W. H. Teese and J. McGrath—with another farmer, Mr. K. C. Stewart, keeping the books. Another local farmer was engaged full time to operate and look after the machinery. A charge was struck on an hourly basis for actual time and machinery worked on a farm.

In the early stages there was much scepticism regarding the success of group use of machinery. To gain support, a low rate of 9s. per hour was made, but this charge has since been raised to 12s. per hour. This rate may yet prove to be somewhat on the low side to fully cover cost of replacement.

A simple set of rules governing the operation of the unit was drawn up. The unit has serviced up to 50 farms in one year and has worked within a radius of 10 miles from the centre, although most of the work has been done within a circle of 5 miles.

With the original plant the work done was confined to ploughing and cultivating land preparatory to sowing, together with the sinking of a great number of trench silos and several dams. Although very little pasture renovation has been attempted, a fair amount of cultivation of lucerne paddocks with the tandem disc cultivator has been done.

Later, other equipment was added by the group itself and included—

(1) A suitable trailer for transporting the group machinery.

(2) A grinding machine with which a great deal of work has been done grinding grains for stock feeding—wheat, milo, oats, barley and maize.

(3) A second 3-furrow plough to obviate delays through breakages.

Neighbouring farmers have also shared in the purchase of other machines—such as huskers and shellers, and circular saws, using the group tractor to operate them.

The order of work has been arranged according to applications for work received. No job, however small, has been refused and in nearly four years of operation of this group scheme there has been a complete absence of any friction over allotment of work. The success of this effort in group use of machinery has been largely attributable to the fair and capable control exercised by the management committee; and also to the excellent service given by the operator, Mr. L. A. Hiscock.

In the case of the Veresdale Group there has been a continued evidence of confidence in acquiring and putting to good use additional labour-saving equipment. Accordingly, three years after its inception the group decided to purchase two new modern labour-saving machines:—

(1) I.H.C. Automatic Hay-baler;

(2) I.H.C. Ensilage Cutting and Harvesting Machine.

Financial assistance to purchase these machines was satisfactorily arranged through the Agricultural Bank. To simplify the position relating to the purchase and ownership of these additional machines, the group of farmers concerned formed themselves into a small co-operative society early in 1947, and it is intended that this co-operative society will later acquire ownership of all machines previously operated by the group committee.

A board of five directors was appointed to control the co-operative committee as follows:—T. M. Richardson (chairman), J. McGrath, W. H. Teese, R. L. Harrison, K. C. Stewart (secretary).

This co-operative society will now have the power to purchase any additional equipment or goods required by its members; already the co-operative committee has bought on behalf of members large quantities of concentrates for stock feeding.

The possibilities of labour saving by the two machines are great. The automatic hay-baler only requires that a field of lucerne or grass be cut and raked, after which it is a one-man job for the tractor operator to pull the hay-baler along to the windrows. The machine will bale up to 4 to 5 tons an hour. A charge for the hay-baler drawn by the group tractor has been struck at £2 an hour. The ensilage machine will cut and chaff and deliver into a tip truck or trailer up to 7 or 8 acres of maize or sorghum a day. Besides the ensilage machine, two trucks and trailers at least are required to deliver the chaffed material into the silo, and to operate the machine to capacity it would require a team of 4 men (including the tractor driver). The hire of this machine has been set down at 25s. per hour.

Over the past 3½ years there is no doubt the group use of machinery has not only overcome the labour shortage in the Veresdale area, but has also been responsible for a big increase in production.

Plate 129.

A QUESTION OF QUALITY.—Early Morning Visit to the Brisbane Fruit and Vegetable Market. *From Right to Left*: Messrs. Guy Short, Harry Moon, and Hector Spring (Division of Marketing, Department of Agriculture and Stock) with Harold Campbell (Rural Broadcasts Officer, Australian Broadcasting Commission).

MARKETING

Production Trends, October.

The favourable seasonal conditions experienced during September were well maintained by moderate October rains throughout the farming areas of Queensland.

In the dairying districts pastures have responded well to the mild weather and good summer fodder crops for grazing are expected. The production of milk and cream is rising rapidly, but warmer weather conditions and a prevalence of weed taints are beginning to affect milk and cream quality.

Wheat grain harvesting has commenced, and providing weather conditions remain favourable, a record crop of 10 million bushels should be obtained.

In the main southern areas favourable weather has facilitated the sowing of extensive areas of general summer fodder crops. Some excellent cuttings of lucerne have been obtained in the Lockyer and adjacent Southern Districts.

A review of the previous estimate of 550,000 tons of sugar has revealed a slight increase and it is now estimated that the current crop will produce 557,000 tons of 94 n.t. sugar.

In the Mareeba-Dimbulah districts tobacco has been planted out on irrigated lands, and seed-bed work is progressing in the dry farm areas of this district. Land preparation on seed bed-work is also under way in the South-west tobacco districts.

Marketing Board Elections.

The term of office of the present members of The Butter, Cheese, Egg and Cotton Marketing Boards expires on 31st December, 1947, and postal ballots are now in progress for the purpose of electing the growers' representatives on these Boards for a period of three years commencing 1st January, 1948.

A referendum is also to be conducted to decide whether The Cheese Marketing Board will continue to function until 31st December, 1953. The duration of The Butter Marketing Board and of The Egg Marketing Board will be extended until 31st December, 1953, and 31st December, 1950, respectively, as no petition came to hand requesting a ballot on the question of the extension of the operations of either of these boards.

A Potato Marketing Board is to be set up under the Primary Producers' Organisation and Marketing Acts for a period of three years from 1st January, 1948. An election of growers' representatives on this new Board is also in progress.

World Census of Agriculture.

The Food and Agriculture Organisation of the United Nations proposes to conduct a World Census of Agriculture in 1950. The first of a series of regional meetings has been held in Rome where members of the F.A.O. staff met experts from European countries to discuss a list of basic items proposed as minimum schedules for the census. Later meetings will be held in Latin America, the Middle East and the Far East. After interchange of viewpoints at these meetings, F.A.O. will submit formally to governments the list of basic items for the 1950 Agricultural Census.

Farmers' Co-operatives.

Addressing the American Institute of Co-operation at Purdue University recently, George H. Maughan said:—"Farmers need much more help than they are getting in developing a co-operative philosophy. We are not thinking of the academic methods and facts so often stressed by the professional teachers. We have in mind the matter of participation—thinking, speaking, acting in local groups without stress on how this is done. Managers, all responsible employees of co-operatives, are the natural teachers and leaders in this work. They should assume the duties of educating and actuating their employers—the patrons. This takes wise, unselfish, statesmanlike leadership."

GENERAL NOTES

Staff Changes and Appointments.

Messrs. J. B. Davey (Department of Agriculture and Stock, Nambour), J. T. O'Rourke (Traveston), J. R. Craigie (Banks Creek, Fernvale), S. J. Kuskie (Wilston), R. J. MacBean and M. J. Hurley (Department of Agriculture and Stock, Brisbane) have been appointed inspectors in the Horticulture Branch, Division of Plant Industry, Department of Agriculture and Stock.

Messrs. W. A. H. Cheales (Gympie) and A. K. G. Watt (Upper Coomera) have been appointed growers' representatives on the Banana Industry Protection Board until 30th September, 1948.

Mr. P. J. O'Sullivan, Assistant Parasitologist at the Animal Health Station, Yeerongpilly, has been appointed a member of the Veterinary Medicines Board in succession to Dr. F. H. S. Roberts, who recently resigned.

The resignation of Mr. H. K. Lewcock, Assistant Director of Marketing and Senior Marketing Officer in the Department of Agriculture and Stock, has been accepted as from 24th November, as tendered.

Drought Feeding of Stock.

The fodder problem in drought feeding is much more difficult in pastoral districts than in agricultural areas nearer the coast, the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said in the course of a recent Press announcement. It is well known that the storage of hay in a hot dry climate is risky, because of moisture loss and deterioration of feeding value. Grain alone is not sufficient for animals, as some roughage is normally necessary.

Mr. Collins added that his Department had looked into this aspect of feeding in pastoral areas and had formed the opinion that much could be done to offset the effects of dry seasons by growing suitable fodder trees possessing high feed value. Arrangements were accordingly being made with the Director of Forests for the raising of seedlings for planting by stock owners.

Among the best fodder trees are kurrajong, Portugese elm and Bella sombra, each of which has a high protein content comparable with that of choice lucerne. They are suitable for the Darling Downs and the South-west, while the two first named also grow well in the Central West. Portugese elm has achieved its greatest development in the Burnett district and has become naturalised along the banks of the Burnett River, especially near Gayndah.

The bottle tree, weeping myall, mulga, and carob bean are other good fodder trees. The trunk of the bottle tree is the best part of it for stock food and when opened up it will help to maintain a fairly large number of animals for some weeks. It is rich in starchy material and may be compared with fair-quality oats rather than with hay. The bottle tree and weeping myall both grow well on the Darling Downs and in the South and Central-West. The feeding value of weeping myall may be regarded as comparable with good eaten hay.

Mulga grows best in the Maranoa and far South-west and responds readily to natural regeneration. As a stock food, it conforms very closely in all respects, except in ash content, with the composition of cereal hay.

The carob bean is a native of the Mediterranean, and consequeutly thrives best in somewhat cooler parts, such as the Darling Downs and Southern highlands, but may also be suitable for the South-west. The bean approximates the composition and feeding value of sorghum; it is better than oats and rather poorer than maize.

Fauna Sanctuaries.

Orders in Council have been approved to-day under the Fauna Protection Act which declare the property of Mrs. E. M. Lodwick, "Water View," South Yaamba, and the property of Mr. R. W. Birchley, "Dawson Park," Cracow, to be sanctuaries for the protection of native fauna. Mr. L. R. Birchley has been appointed an Honorary Fauna Protector in connection with the sanctuary on the latter property.

Certified Seed.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) stated recently that the first seed to be sealed and labelled as certified seed in Queensland has been harvested from two crops of Wheatland grain sorghum grown in the South Burnett district by Messrs. S. E. Marshall and C. J. Turner, of Wooroolin. This is a further step towards putting into operation a system for the certification of various seeds for sowing.

Certification provides for the selection of ground and growing of crops under the supervision of departmental seed certification officers. This supervision includes the roguing of crops and such other action as may be necessary to ensure that the resultant seed is true to type and free from prohibited seeds.

Certified seed can only be sold in packages sealed and labelled by the Department of Agriculture and Stock.

Mr. Collins added that, in the interests of growers who are desirous of producing crops true to type and of first-class quality, the provisions of the Acts with reference to the production and sale of certified seed would be strictly enforced.

Cattle Husbandry Branch.

The Department of Agriculture and Stock has for many years provided animal husbandry advisory services in respect of sheep, pigs, and poultry, and now proposes to extend such services to dairy and beef cattle. Accordingly, a Cattle Husbandry Branch will be set up within the Department's Division of Animal Industry, and the Minister for Agriculture and Stock (Hon. H. H. Collins) has announced the appointment of Mr. R. D. Chester, B.V.Sc., Government Veterinary Officer, to be Officer in Charge of the Cattle Husbandry Branch.

Mr Chester served for a number of years in the Central district and the Wide Bay and Burnett areas prior to coming to Brisbane, and is well acquainted with all phases of animal production, especially in its relation to beef cattle.

Roofing Material for Slaughter-houses.

An amendment of Regulations under the Slaughtering Act provides for the substitution of corrugated fibro cement for corrugated iron as a roofing material for slaughter-houses. This amendment has been prompted by the present difficult supply position regarding galvanized iron.

Soda-bush Poisoning of Sheep.

The Minister for Agriculture (Hon. H. H. Collins) said recently that after a heavy mortality in a consignment of sheep trucked to Cannon Hill there had been rumours that the cause of death was anthrax. Mr. Collins said that the carcasses had been examined by officers of his Department who had reported to him that the rumours were entirely without foundation, and it was considered that the death of the sheep was caused by soda-bush poisoning. Investigations would be continued in the area near Charleville from which the sheep were trucked.

Mr. Collins also stated that no case of anthrax in livestock had ever occurred in Queensland; outbreaks had occasionally been reported, but subsequent field and laboratory investigations had always proved the reports to be false.

Cheese Marketing Board.

The Minister for Agriculture and Stock (Hon. H. H. Collins) has announced that the following nominations have been received for the election of three growers' representatives on the Cheese Marketing Board for the three-year term commencing 1st January, 1948:—

Duncan, Reginald C. (Toowoomba)
Latham, William Alfred (Goomeri)
McIntyre, Malcolm (Pittsworth)
O'Shea, David Gabriel (Southbrook).

Messrs. O'Shea, McIntyre, and Duncan are the present sitting members of the Board.

As a petition requiring a poll on the question of the extension of the Board's operations for the period 1st January, 1948, to 31st December, 1953, has been signed by the requisite number of growers a referendum will be necessary to decide whether or not the Board will continue to function for such period.

The referendum and the election will be held on 22nd December, 1947.

GADGETS AND WRINKLES

HOW TO OBTAIN RIGIDITY IN CRATE CONSTRUCTION.

One of the features of a crate is rigidity or ability to resist weaving and skewing during transportation. No method of joining the corner members of a crate, not even the three-way corner construction, is sufficient alone to give rigidity to a crate. Some kind of bracing across the faces is usually necessary.

Figure 1 shows a kind of bracing found in many crates which are sent to the United States Forest Products Laboratory, Madison, Wis., for testing. Partly because of the amount of material used, this construction appears to be very strong. Laboratory tests have shown, however, that crates so braced are weak in the diagonal direction of the faces, and are therefore apt to weave and skew during transportation.

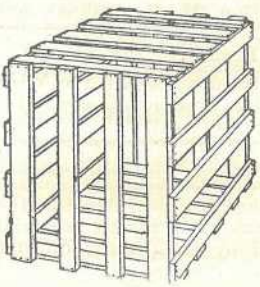


Figure 1.

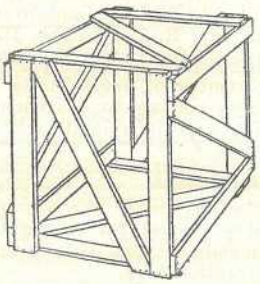


Figure 2.

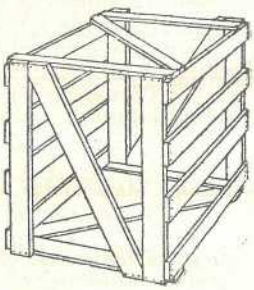


Figure 3.

Diagonal braces on six sides as shown in Figure 2 have been found to give a maximum rigidity for a minimum amount of timber. Crates so braced withstand with considerably less distortion twice as great a diagonal compressive force in actual tests as crates braced as shown in Figure 1.

A combination of diagonal and parallel slat bracing as shown in Figure 3 makes the crate more rigid than parallel bracing alone, but not so rigid in all directions as cross bracing on the six sides. It may be found an advantage in packing contents which need protection on the sides and are rigid enough themselves to withstand stresses in the direction in which the crate is weak.

Solid sheathing on all the faces does not make a crate so rigid as diagonal bracing, except perhaps sheathing which is made of wide boards with tighter joints than can usually be obtained. The crate with ordinary sheathing might withstand as great a load, but the distortion caused by that load would be greater than the crate with diagonal braces, and would ordinarily be great enough to allow damage to the contents.

THE LIFE OF ROPE.

Ropes which are constantly exposed to severe climatic conditions quickly deteriorate unless precautions are taken to give them some measure of protection, which is most readily done by tarring them. To tar a rope, put some Stockholm tar in a bucket and slowly pass the rope through the liquid; as it comes out wipe it down with a piece of rag, and then hang it along a fence in the sun until dry.

It is not advisable to tie a knot in the ends of a new rope to prevent the strands from unravelling. Thread a packing-needle with waxed sewing twine, lay one end of the twine along the rope and bind back over it for a couple of inches, pulling the twine tight. Then grease the needle, force it through the rope down the centre of the binding, pull tight and cut off the twine.

Care of Mother and Child.

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

HEALTH AS BASED ON HABIT.

THE baby less than a year old usually receives much more attention than the child who is running around. This should not be. The toddler or pre-school child needs as much thought on the part of the parents as does the baby—perhaps even more. When parents are making every effort to give the proper care to the child who is leaving babyhood behind many questions arise: How fast should he be growing? How many tteth should he have? What food is best for him? How can he be helped to build good habits?

Remember that the job of bringing up a family should not be left to the mother alone. It is the biggest and most important job in the world and both parents should combine their efforts and work together to bring out the best in their children and to help them to good health habits so that the minds and bodies with which they are born will develop to their full capacity.

Teaching a child to carry out habitually and without conscious effort the things which make for good health is one of the first duties of this mother-father partnership.

As you know, habit is a tendency to repeat what has been done before. It is a way of behaving, thinking or feeling that once established is easily followed. Remember—habits are *learned* not inherited.

The first health habits to establish are concerned with the fundamental daily activities of the child—eating, sleeping, playing, eliminating and keeping the body clean and suitably clothed. Good habits in these activities should be learned in the first three or four years of a child's life. Once learned they are likely to last a lifetime.

Many people think of habits only as ways of acting and forget the even more important habits of thought and feeling. A child may be taught not only to dress himself, but to like suitable and attractive colours and to dislike a dirty blouse or a torn stocking. So he develops habits of good or bad taste, neatness or untidness as the case may be.

Even his attitude to life is partly a matter of habit. A child learns to be cheerful and happy or sulky and cross according to the habits he forms in his early years.

More about good health habits next month. In the meantime any information or advice on the subject of this article or any other matter concerning mother's and child's health may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Afternoon Tea Loaves.

Half pound flour, pinch of salt, heaped-up teaspoon of baking powder, little milk. Sift the flour free from lumps, put it into a bowl with the salt and baking powder mix these dry ingredients thoroughly, then add just sufficient milk to form a dough. Be careful not to add too much milk, as if the dough is sticky the loaves will be heavy. Turn it out on to a floured board and, as quickly as possible, form it into little cottage loaves. Put them on to a greased baking tin and bake immediately in a hot oven. They will take 15 minutes. Just before they are done brush them over with a little milk.

White or Wholemeal Scones.

This is a good average recipe for either white or wholemeal scones. Both are made in the same way. Two breakfast cups self-raising white or wholemeal flour, a good pinch of salt, about 2 tablespoons butter, and about 1 cup cold milk. Have a hot oven ready before you think of mixing the scones, and then sift flour and salt (wholemeal is not sifted, of course), and rub in the butter, lifting the flour high as you work. Make a depression in the centre, and gradually pour in the milk, mixing with the blade of a pliable knife. Mix quickly and lightly to a rather soft dough, softer than you would make for pastry. Knead this lightly into a round shape (really, it is just a quick tidying), and then press the dough out lightly to about 1 in. in thickness. Cut into rounds or squares, place on cold floured tray, and brush over the tops with a spot of beaten egg to give a glossy finish. Bake at once in a very hot oven for about eight minutes. If the scones take longer than 10 minutes to cook and brown nicely, you will know that the oven is not sufficiently hot for the best results. With wholemeal, see that the dough is a little softer than that used for white scones, and give it a few minutes longer in the oven.

Mock Duck.

One pound blade bone (or rump) steak, 1 cup breadcrumbs, 1 teaspoon chopped parsley, 1 teaspoon mixed spice, 1 chopped onion, 1 tablespoon melted butter, salt and pepper to taste, good dripping and hot water. Pound the meat a little and rub with lemon. Mix breadcrumbs and seasoning, and add melted butter. Place over the meat, roll up and tie into shape. Place in casserole with some good dripping and a cup of hot water. Bake about two hours in a moderate oven, then remove cover from dish and allow 20 minutes more cooking to allow "duck" to brown. Serve with good gravy.

Sugarless Gingerbread.

Two teacups sifted flour, ¼ teaspoon salt, 3 teaspoons baking powder, ½ teaspoon ground ginger, 2 oz. beef, lamb, pork or poultry dripping, 1 egg, ¼ teaspoon ground cloves, 4 tablespoons milk, ¾ teacup golden syrup, 2 oz. chopped dates, raisins or candied peel, ¼ teaspoon ground cinnamon. Sift dry ingredients into a basin. Melt fat. Stir in milk and beaten egg. Gradually beat into dry ingredients, then stir in syrup and fruit, or peel. Bake in a shallow greased baking tin in a moderate oven for 30 to 40 minutes.

Apple and Cheese Scallops.

Three-quarters teacup stale breadcrumbs, 4 large apples, 2 teacups grated cheese, salt to taste, milk as required, 2 tablespoons butter. Grease a baking dish well, then line it with quarter teacup of the crumbs. Peel, core and cut apples into thin slices. Place a layer of apple in the bottom of a dish. Cover with about half a cup of cheese. Season with salt. Repeat three more layers of apple and cheese. Season each layer with salt. Cover with milk. Sprinkle with remainder of crumbs. Dab here and there with butter. Bake in a moderate oven for about half an hour or until apples are soft. Enough for six persons.

Quick Fish Cakes.

One jar fish paste, 2-3 drops anchovy essence, 2 breakfastcups mashed potatoes, 1 tablespoon chopped parsley, pepper to taste, 1 egg, 2-3 tablespoons fine breadcrumbs, 2 walnuts of fat. Beat the fish paste and anchovy essence to gether, then mix in with the potatoes and parsley. Season with pepper. Taste, and if necessary, add a little salt. Add the egg, or enough of it to bind the mixture together. Form into round cakes, less than ½ in. thick, dip in milk, roll in the crumbs, and fry both sides to a golden brown in the hot fat.

QUEENSLAND WEATHER IN OCTOBER.

Rainfall distribution was above average in the Central Coast West, Central Lowlands and Highlands, Darling Downs, Maranoa, and Far South-west. Other districts aggregates ranged from slightly under normal to deficiencies of 50 per cent. and over in the Central Coast East, North Coast Herbert and Peninsula. The Central Coast East district with an average of only 23 points was 82 per cent. below normal, and several stations had no rain. In the Carpentaria and Peninsula, distribution also ranged from Nil to scattered storms, but in general pastoral prospects continue to be very favourable, especially in central and southern districts. In the dairying and agricultural areas of the south-east and coastal divisions, the central coast received the least benefit in the otherwise bountiful September rain distribution. During October the Maranoa and Downs areas averaged from over 2 to 3 inches, as the result of a succession of variable storms. Intervening finer spells were somewhat humid, and with harvesting already commencing in some districts dry weather is required to decrease risk of possible rust and storm damage and relieve anxiety with regard to the anticipated record of over a 10,000,000-bushel wheat crop.

Pressure controls showed the seasonal succession of east to west movement of fairly substantial highs separated by inland troughs and southern low combinations. The southern centres showed considerable activity at times, but in Queensland most of the rain production from trough and associated cold front action was confined to the south-east districts of the State, and local afternoon and evening thunderstorm periods accompanied the seaward movement of the trough.

Moderate south-east weather was experienced along the coast 8th, 13th and 14th, 18th to 20th, with moderate to rather rough patches 25th to 27th.

Temperatures.—Maximum temperatures were generally well below average, from 1.8 degrees at Palmerville, to 4.6 degrees at Mitchell, and 4.7 degrees at Longreach. Minimum figures were about normal, from minus 0.7 degrees at Georgetown to plus 1.3 degrees at Boulia. The highest daily maximum temperature 103 degrees was recorded at Normanton 11th and 12th and Camooweal and Urandangie 13th. Lowest terrestrial readings were at Stanthorpe—29 degrees (6th), 31 degrees (7), 30 degrees (11th).

Brisbane.—Mean pressure 30.029 inches (normal 30.008 inches). *Temperature.*—Mean maximum 76.3 degrees (normal 79.1 degrees), second lowest on record; 75.0 degrees in 1934, 76.4 degrees in 1946. Mean minimum 59.3 degrees (normal 60 degrees). Mean temperature 67.8 degrees (normal 69.7 degrees). Highest daily 85.7 degrees on 8th. Lowest daily 54.3 degrees on 8th. *Rainfall.*—366 points on 11 days. (Average 259 points on 9 days). *Sunshine.*—260.0 hours (normal 215 hours). *Highest Wind Gust.*—S.S.W. 55 miles per hour on 9th.

The rain position is summarised below—

Division.	Normal Mean.	Mean October, 1947.	Departure from Normal.
	Points.	Points.	Per. Cent.
Peninsula North	45	15	67 below
Peninsula South	70	25	64 ,,
Lower Carpentaria	52	30	42 ,,
Upper Carpentaria	76	58	24 ,,
North Coast Barron	133	126	5 ,,
North Coast Herbert	178	93	48 ,,
Central Coast East	129	23	82 ,,
Central Coast West	77	91	18 above
Central Highlands	146	169	16 ,,
Central Lowlands	98	167	70 ,,
Upper Western	60	49	18 below
Lower Western	71	61	14 ,,
South Coast, Port Curtis	208	158	24 ,,
South Coast, Moreton	274	237	14 ,,
Darling Downs, East	223	297	33 above
Darling Downs, West	165	225	36 ,,
Maranoa	161	287	78 ,,
Warrego	110	88	20 below
Far South-West	86	105	22 above

Commonwealth of Australia, Meterological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

DECEMBER.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.45	6.28	Cairns	51	7	Longreach	44	26
6	4.46	6.32	Charleville ..	30	24	Quilpie	33	37
11	4.47	6.35	Cloncurry	65	35	Rockhampton ..	19	1
16	4.49	6.38	Cunnamulla ..	27	32	Roma	19	15
21	4.51	6.41	Dirranbandi ..	16	22	Townsville ..	42	8
26	4.54	6.43	Emerald	28	11	Winton	52	29
31	4.56	6.46	Hughenden ..	49	21	Warwick	2	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	p.m.	a.m.
1	9.43	7.04
2	10.38	8.12
3	11.25	9.21
4	..	10.28
	a.m.	
5	12.06	11.33
	p.m.	
6	12.42	12.35
7	1.15	1.35
8	1.47	2.33
9	2.20	3.31
10	2.54	4.30
11	3.30	5.29
12	4.11	6.27
13	4.56	7.13
14	5.45	8.16
15	6.37	9.04
16	7.31	9.46
17	8.26	10.23
18	9.21	10.57
19	10.15	11.29
20	11.09	11.59
	p.m.	
21	12.02	..
		a.m.
22	12.57	12.28
23	1.54	12.58
24	2.55	1.31
25	4.00	2.09
26	5.09	2.52
27	6.19	3.43
28	7.25	4.43
29	8.26	5.51
30	9.18	7.03
31	10.03	8.14

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27 ; Cunnamulla 29; Dirranbandi 19 ;
Quilpie 35 ; Roma 17 ; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	10	30	25	45	0	21	27	53
6	16	21	31	37	7	12	36	43
11	27	12	43	26	18	1	50	29
16	29	11	45	26	20	1	52	29
21	19	19	36	35	10	10	41	40
26	11	28	26	43	0	19	28	51
31	13	26	29	42	3	18	32	50

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	5	55	35	67	19	52	5	45
3	12	49	38	63	23	49	11	41
5	17	44	41	60	26	46	15	37
7	27	28	49	49	33	34	23	24
9	38	17	56	42	41	27	45	16
11	47	8	63	36	47	21	39	8
13	54	3	67	32	51	18	44	4
15	54	4	67	33	51	19	44	5
17	50	10	64	37	48	23	41	10
19	42	19	58	43	43	28	35	17
21	32	29	52	50	36	35	26	25
23	21	34	44	54	29	39	18	29
25	11	44	38	60	23	46	10	37
27	5	52	35	65	19	50	5	44
29	6	53	35	66	20	51	6	44
31	15	46	40	61	25	47	14	38

Phases of the Moon.—Last Quarter, December 5th, 10.55 a.m.; New Moon, December 12th, 10.53 p.m.; First Quarter, December 21st, 3.43 a.m.; Full Moon, December 28th, 6.27 a.m.

Solstice, December 23rd.—The Sun will then have reached its maximum angle south of the Equator and will rise and set about 25 degrees south of true east and true west respectively.

On December 7th and 21st the Moon will rise and set approximately at true east and true west respectively.

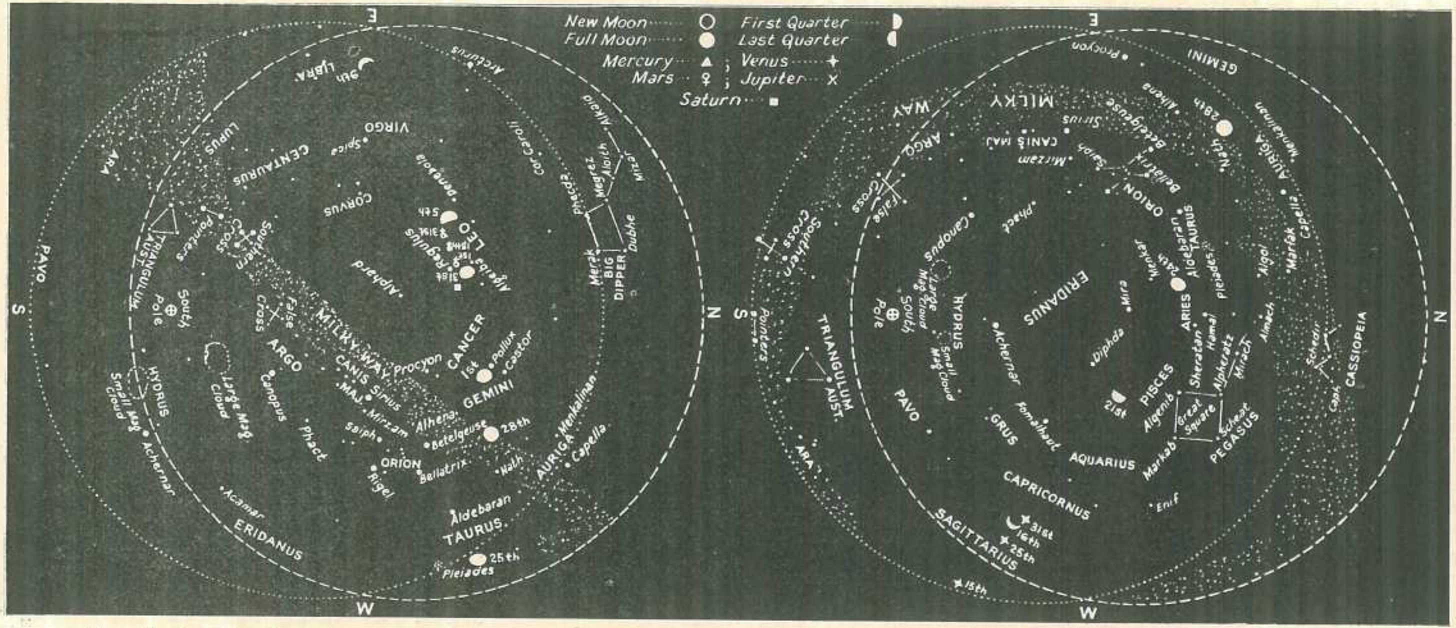
Mercury.—A morning object all this month. At the beginning of December, in the constellation of Libra, will rise about 1 hour before the Sun, and on the 13th will pass about 5 degrees to the north of Antares, while on the 15th it will pass less than 1 degree south of Jupiter. At the end of the month it will rise about 15 minutes before the Sun.

Venus.—Now a brilliant object in the western evening sky. At the beginning of December, in the constellation of Sagittarius, will set between 8 p.m. and 9.15 p.m., and at the end of the month, in the constellation of Capricornus, will set between 8.30 p.m. and 9.45 p.m.

Mars.—In the constellation of Leo, will rise about midnight at the beginning of December and between 10.15 and 11.15 at the end of the month.

Jupiter.—Will be in line with the Sun on December 1st and will not be visible until the end of the month, when it will rise one and a half hours before the Sun and may be seen low in the east during morning twilight.

Saturn.—In the constellation of Leo, will rise about midnight on the 1st and between 9.15 p.m. and 10.30 p.m. on the 31st.



Star Charts.—The chart on the right is for 8.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th December. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 7 hours later. On each chart the dashed circle is the horizon as viewed from Cape York, and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month, the stars will be in the positions shown about 1 hour later than the time stated for the 15th, and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

OCTOBER RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1946.	Oct., 1947.		Oct.	No. of years' records.	Oct., 1946.	Oct., 1947
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	0·90	42	1·26	2·57	Caboolture	2·73	67	3·28	2·68
Cairns	2·06	61	0·17	2·44	Childers	2·71	48	1·05	1·31
Cardwell	1·35	71	0·63	2·35	Crohamhurst	3·38	50	5·33	..
Cooktown	1·00	67	Nil	0·53	Esk	2·60	56	1·92	2·15
Herberton	0·93	57	0·93	0·81	Gatton College ..	2·06	44	1·78	1·99
Ingham	1·80	51	0·38	0·66	Gayndah	2·37	72	1·78	2·83
Innisfail	3·12	62	0·37	1·53	Gympie	2·73	73	2·62	1·70
Mossman	2·59	19	0·69	2·74	Kilkivan	2·68	62	1·99	1·69
Townsville	1·25	72	0·06	0·11	Maryborough ..	2·73	72	1·24	1·44
Central Coast.					Nambour	3·23	47	3·46	1·94
Ayr	0·87	56	0·06	0·11	Nanango	2·19	61	1·80	3·51
Bowen	0·97	72	0·09	0·24	Rockhampton ..	1·78	72	1·80	0·85
Charters Towers ..	0·71	61	Nil	0·19	Woodford	2·53	55	3·45	2·84
Mackay	1·76	72	0·38	0·90	*Darling Downs.*				
Proserpine	1·53	40	0.31	0·80	Dalby	2·01	73	0·32	2·77
St. Lawrence ..	1·76	72	0·33	0·15	Emu Vale	2·18	47	1·75	2·45
Central Highlands.					Jimbour	1·88	64	0·55	2·27
Clermont	1·28	72	0·23	1·27	Miles	2·00	58	0·61	2·77
Springsure	1·62	74	0·07	1·85	Stanthorpe	2·50	70	2·11	3·99
South Coast.					Toowoomba	2·54	71	2·21	2·52
Biggenden	2·49	44	2·28	2·99	Warwick	2·32	78	2·04	3·79
Bundaberg	2·07	60	2·13	1·22	*Maranoa.*				
Brisbane Bureau ..	2·59	94	2·51	3·66	Roma	1·73	69	0·87	2.27
					St. George	1·29	62	0·09	3·31

CLIMATOLOGICAL DATA FOR OCTOBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	83	68	89	25	59	7	244	7
Herberton	..	79	59	90	9	43	6	81	8
Townsville	..	83	67	89	24	55	7	11	3
Rockhampton ..	30·05	83	61	91	9	48	6	85	4
Brisbane	30·08	76	59	86	8	54	8	366	11
Darling Downs.									
Dalby	..	78	53	88	2	44	6	277	6
Stanthorpe	..	70	46	79	22	34	6	399	7
Toowoomba	..	72	52	84	22	38	25	252	7
Mid-Interior.									
Georgetown	29·94	94	67	98	10, 11	50	6	11	2
Longreach	30·03	88	62	97	9	42	6	197	6
Mitchell	30·04	80	54	91	1	42	6	315	10
Western.									
Burketown	..	92	69	102	11	54	6, 7	Nil	Nil
Boulia	29·94	91	65	102	13	48	6	22	3
Thargomindah	29·98	83	61	95	19	48	5	98	4

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.