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Event and Comment.

The Year in Agriculture.

A GENERAL survey of the agricultural position in Queensland is made by the Under Secretary for Agriculture and Stock, Mr. E. Graham, in his annual report which was recently presented to Parliament. In it he states that the general average yield of wheat crops was not as heavy as in the previous year, which was remarkable for an extraordinarily good season; but, on the whole, for the period under review the returns were satisfactory. A steady improvement in methods of cultivation was noticeable, especially on the Downs, where the practice of summer fallowing is becoming more general. Wheat-growing is now allied to dairying and sheep-raising to a much larger extent than formerly, and the value of this economic combination is becoming evident to many more farmers in the districts where the conditions are suitable for all three branches of husbandry. The wheat-breeding and extension work of the Department is proceeding satisfactorily. Experimental and general observation plots have been established in different districts. The systematic breeding and selection of wheats adaptable to our conditions of summer rainfall, which are carried on at the Roma State Farm and have continued over a long period, have been of material benefit to the grain-grower. About a hundred new Roma crossbred wheats are tested each season, and in these field trials the Department has had the co-operation of the farmers and also of the Wheat Board. As a stimulus to the application of scientific principles to primary production, the usual annual wheat crop competitions were held in the course of the

year in the Warwick and Toowoomba districts. That the educational value of these competitions is widely recognised is evident by the keen interest taken in them by grain-growers.

Maize-growers are feeling the effects of a lessening demand, due to the ever-increasing use of motors on the road and tractors in the field. A depression in the industry was relieved to some extent by the necessity of hand-feeding sheep, for which maize is being more extensively used as a supplementary stock food in districts affected by prolonged dry spells.

Northern growers are handicapped by their geographical position, which involves heavy charges in the transport of grain to available markets. Farmers there are, however, appreciating the economy of retaining, when practicable, their grain on the farm for feeding and fattening stock.

In the seed maize improvement work satisfactory progress is being made, and the demand for seed of improved varieties selected by the Department is constant.

The maize exhibits at the Royal National and at many country shows, in the course of the year, illustrated the marked improvement in the types and quality of Queensland-grown grain, and it is satisfactory to observe that in the more important maize-growing districts the principal varieties are of departmental origin. The educational scheme initiated and carried on by the Department, and which covers the systematic breeding and regular distribution of pure seed, is the main contributing factor in bringing about this result. Three-fourths of the maize production of the State is raised in the Southern Division, which had the benefit of a fairly good season, and the Queensland yield for the year is estimated to exceed 4,000,000 bushels. Of other field crops a similar story of steady progress and satisfactory yield is related.

Improvement of paspalum and other pastures engaged the attention of the field staff in the course of the year. Results so far show that ploughing is the most effective means of resuscitating paspalum grass-lands. Top-dressing of pastures is a subject of continuous research, but from an analytical standpoint results so far have been largely negative. As a counter to the effect of these findings and as a measure of economy, the more extensive use of suitable stock lies is generally advocated.

Grass experiment plots have been established in suitable localities, and in these a number of imported grasses are being tested with varying results.

The Sugar Industry.

THE sugar industry of Queensland established fresh records during the 1928 season, when 520,620 tons of raw sugar were produced. Conditions favourable for cane growth were general throughout the growing season. The autumn and winter were unusually dry, however, and portions of the crop were affected adversely before the close of the crushing season. This caused a reduction in the early cane estimate, but probably favoured the sweetening of the crop, for it required only 7½ tons of cane to produce 1 ton of sugar—the lowest ratio yet recorded in Queensland. The heavy production resulted in a very considerable surplus over and above Australian requirements. The question of curtailment of plantings has been an important one during the past year, and it is expected that definite steps will be taken in the near future to restrict the area devoted to cane and hence reduce the surplus.

The exploitation of by-products of the industry continues to receive attention, and alcohol produced by the Sarina Distillery from molasses has been made available this year as a motor fuel. Mixed with petrol in suitable proportion, it is now marketed in Queensland under the name of "Shellkol."

With continued low export values, the Bureau of Sugar Experiment Stations finds growers taking a keener interest in its activities. Advice on the use of correct fertilisers to bring about a more intensive system of cultivation and the consequent reduction in production costs is widely sought. A more active programme of co-operative experimental work has been planned. A system of farm fertility trials has been initiated, and growers are showing a great interest in the project. By this method of field trial work much valuable information should be gained, which will assist the farmers directly concerned and also allow recommendations to be made with a greater degree of confidence. The plan will be extended to varietal trials and cultural experiments. The raising of seedling canes at South Johnstone has

been continued, and all these and similar activities in the scientific field give emphasis to the high standards that have been established in the industry, and these would have been, of course, very difficult of attainment without the intelligent co-operation of the growers.

Cotton.

IT was possible this season to dispose of the lower grades of cotton in Australia at prospective satisfactory prices. This advantage, together with the arrangement of the Cotton Board for higher first advance on seed cotton at the ginmery, helped the industry very materially. Interest in cotton-growing had definitely increased in the Southern areas prior to the time of planting, but absence of spring rains diverted attention to the necessity of concentrating on the production of fodder crops; and as a result cotton acreages were limited. Good returns have, however, revived interest in cotton-growing, and its extension in the coming year is a reasonable anticipation.

In the South Burnett interest in cotton has been stimulated by the good crops picked on departmental experiment plots in the district, several yielding around 1,500 lb. an acre of high-quality fibre.

Only moderate returns have been obtained in the Central Burnett, where, however, yields up to 1,500 lb. an acre on experimental plots are influencing a substantial extension of cotton cultivation. The experience of the year is on the side of early planting, and this has impressed growers with the necessity of early and thorough preparation of the seed-bed, a practice ensuring a successful strike after the first planting rains. The year's results have, however, not disheartened growers, and an increased planting is planned for 1930.

There was a decline in the standard of cultivation, but this may be ascribed to the various factors, weather included, that affected the year's operations. Notwithstanding seasonal variability, however, the value of timely and systematic cultivation was demonstrated clearly by those growers who realise that it pays to grow cotton in accordance with the principles and practice advocated by the officers of the Cotton Branch.

There was a substantial reduction in the aggregate yield of cotton on last year's returns, and this was due to lower production in the Dawson Valley and smaller acreages in the Upper Burnett. There was, however, a considerable improvement in the general quality of the crop as compared with that of last year. The work of the research station was continued, and results clearly demonstrated the value of early planting.

Seasonal vagaries were against the securing of the best results from our pure seed development work, though considerable success attended seed acclimatisation efforts. The work of developing acclimatised strains of introduced varieties also proceeded satisfactorily, although no remarkable results were obtained.

Varietal tests, fertiliser trials, and cultural methods are receiving the close attention of the Department, to the general advantage of the industry.

Adding to the Attractions of Country Life.

CONCLUDING his comprehensive review of the year's activities of the Department, which is ever widening its range and extending its influence, Mr. Graham added that, though temporary checks were experienced in some directions, there are good grounds for satisfaction with the progress made. We have to remember that agriculture is not the only industry passing through the stress and strain of a transitional period; it is not the only industry that has had to adapt its methods to modern ideas, modern market requirements, and, in the disposal of some commodities at least, keener competition. The economic side of the business is being tackled resolutely in this State. Through our system of organised marketing of commodity by commodity we are moving gradually, but surely, to the position when we can offer the consumer a better and standardised article more regularly under proper control, and thus earn for the producer a larger proportion of what the consumer has to pay. It will take time, of course, to perfect such a system, but its complete success would mean a more attractive country life, a bigger rural population, decentralisation of economic and commercial interests, and a more rational national development.

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

The Entomologist at Meringa, near Cairns, Mr. Edmund Jarvis, has submitted to the Director of the Bureau of Sugar Experiment Station, Mr. H. T. Easterby, the following report, embracing the period of October to November, 1929:—

ASSOCIATION BETWEEN THE ENTOMOLOGIST AND CANEGROWER.

In the present report I have attempted to define the true meaning of the term "Economic Entomologist," and to outline the nature of certain activities which should tend to promote the establishment of cordial relationship between the scientist and cane farmer.

The importance of this close association between entomology and agriculture in Queensland was first recognised as early as the year 1886, which was about the time when Mr. Henry Tryon published his valuable report on the insects and fungus pests of the Toowoomba district; while more than forty years have passed since the Victorian Department of Agriculture began to realise the advisability of appointing a Government Entomologist to fight such destructive insects as the codlin moth, woolly aphis, and apple-root borer, which had then gained a footing in several orchards around Melbourne.

In the year 1889, when the present writer first arrived in Australia, the study of control methods against leaf-eating beetles, caterpillars, and other mandibulate or chewing insects was chiefly confined to various kinds of arsenical sprays; the sap-sucking insects, like aphides, scale insects, plant bugs, &c., being combated in those early days by the use of such well-known contact solutions as resin compound, kerosene emulsion, &c.

At the present time, however, our knowledge of economic entomology has naturally increased, so that, although still continuing to devise more deadly and cheaper poison-baits and sprays, we have now pressed into the warfare numerous species of the parasitic and predaceous enemies of many different insect pests of primary economic consequence; with the result that some of these are now being held in control biologically.

In North Queensland, for instance, the much dreaded "weevil borer" (*Rhabdocnemis obscurus* Boisid.) is at present being kept well in check by a small Tachinid fly-parasite, hundreds of which are regularly propagated at Meringa Experiment Station for free distribution in any canefield chancing to be invaded by the beetle-borer.

It is gratifying to note that this phase of activity—which calls for concerted action on the part of both grower and entomologist—has been instrumental, in our own case, in establishing those harmonious relations which are so necessary to the welfare of all parties concerned.

In this connection it should be mentioned that apart from biological control work, several additional fields of entomological research have been opened up of late years; the most fascinating of these being, perhaps, that dealing with the study of so-called tropic reactions, of a positive or negative kind, which are believed to be manifested by insects in response to influences exerted by various stimuli, affecting the olfactory, auditory, or other complex sense organs.

As already pointed out by the present writer (Proc. Pan. Pac. Se. Congress, vol. 1, pp. 367-68, 1923), we have good reason for assuming that the movements of our principal cane beetle (*Lepidoderma albobirtum* Waterh.) are sensibly influenced by forces of a chemotropic nature; which probably determine to some extent the direction of flight of the female cockchafer during the fortnight preceding egg laying.

It is pleasing to note that the help afforded by this Sugar Experiment Station, to farmers of the Cairns district, appears to have won recognition, and during recent years there have been many applications for assistance in fighting "army worms" and other caterpillars which sometimes strip the leaves of cane plants. Our mode of procedure in such cases is not merely to give advice by letter, but to go into the affected field when possible, taking the necessary spraying apparatus, and to show the grower how to prepare and apply the remedy.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

When to Expect Appearance of "Greyback" Beetles.

Cane beetles are likely to emerge from the ground about the middle of this month (November). Owing to the prolonged spell of dry weather experienced in many cane districts, transformation from the pupa or chrysalis condition to the adult winged form of this insect occurred in most places early in October. Should a few inches of rain, however, chance to fall during the second or third week in November, such downpour would be followed at once by an emergence of these cockchafer beetles. On the other hand, a continuance of drought conditions throughout November and half way through December should operate as a decided check to the increase of our notorious cane pest.

Arrange about Collecting Cockchafers.

On cane areas known to be subject to grub attack it is advisable to start collecting the beetles from the foliage of their feeding-trees as soon as they are noticed on the wing.

Now is the time to locate the position of favourite food-plants such as Weeping Figs, 'Moreton Bay Ash' trees, &c., chancing to grow close to headlands of your cane field.

To facilitate the work of collecting, the surface of the ground under these trees should be cleared of vegetation, in order that all beetles falling upon it may be easily seen and picked up. Such collecting should be carried on throughout a period of about three weeks, dating from the day on which "greybacks" emerge from the ground. A careful note should be made of this date of commencement of the fighting season, as in the event of any farmer wishing later on to fumigate his soil for cane grubs, such information would enable him to determine the age of the grubs present together with the correct time for starting control measures.

Keep the Ground Moving during the Flying Season.

Common-sense control methods of keeping the soil moving between cane rows as much as possible during those periods occupied by the egg and early larval conditions of our "greyback" cockchafer are within reach of all growers, and have already been advocated as being advantageous (Bull. No. 19, pp. 59, 60). A dense growth of weeds between cane rows attracts egg-laden females of both *albohirtum* and *frenchi* ("greyback," and "frenchi beetle"), the latter cockchafer being very prone to oviposit in such places.

Do not allow the surface to remain caked after heavy rain longer than can be helped. Every time the ground is stirred to a depth of about 3 inches soil-moisture is conserved, and a certain percentage of unhatched beetle eggs or small grubs of the first-stage of growth is destroyed, together with germinating seeds and tiny plants of different weeds.

How to Store Insecticides and Spraying Apparatus.

Carbon bisulphide.—Drums containing this fumigant should be locked up in some cool, dry shed. Before storing same, examine each drum for possible leakage. When a drum is opened do not bring a light of any kind near it or even a lighted pipe or cigarette.

Paradichlorobenzene.—Keep receptacles containing this chemical, such as barrels or tin canisters, as airtight as possible to prevent needless evaporation of the crystals. This fumigant is not inflammable, and being non-poisonous can be freely handled without the slightest danger.

Lead Arsenate.—If purchased in stoneware receptacles it is a good plan to cover the cork and edges of any jars intended for storage with melted paraffin wax, as this will prevent the arsenate paste from drying too quickly.

Paris green.—Being a violent poison this should be kept under lock and key and out of reach of children.

Care of Hand Injectors.—Keep clean from dirt or corrosive matter; examine working parts at intervals and replace defective washers, &c.

Spray Pump.—Thoroughly rinse out the container with clean water before putting the pump away, and run plenty of water through the hose and nozzle. Keep clean and carefully oiled. Repair any leakage to hosing or defective washers.



PLATE 194.—MR. HARRY T. EASTERBY, DIRECTOR OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

(From a photograph taken a few years ago).

Born in 1867 at Echuea, Victoria, Mr. Easterby studied at the Horsham (Victoria) Public School, and applied himself to chemistry and microscopical science, including sugar chemistry, and entered the Sugar Factory at Maffra in 1897, where he studied the technology of sugar under Dr. Riesen, afterwards moving on to take up the position of Chemist with Messrs. Gibson and Howes, owners of the Bingera Sugar Plantation at Bundaberg.

Mr. Easterby was engaged by the Victorian Government to make investigations into the beet sugar industry in 1900 and part of 1901, after which he was appointed Assistant Director to Dr. Walter Maxwell.

Mr. Easterby subsequently became Director of Sugar Experiment Stations, which position he still holds.

The Sugar Experiment Stations during Mr. Easterby's long term of office have developed amazingly. At the time he joined the service there was only one Experiment Station in Queensland. Now there are three Experiment Stations, three Entomological Laboratories, a Sugar-cane Pathological Laboratory, a Sugar Soils Laboratory, and a Sugar Mill Technologists' Laboratory, while the staff has increased from six to twenty-one, including Chemists, Entomologists, Pathologists, and Agriculturists, while the yield of sugar has increased from 120,858 tons in 1901 to 520,620 tons in 1928.

SUGAR CROP PROSPECTS.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, has returned to Brisbane from a visit to some of the sugar areas comprising Cairns, the Johnstone and Herbert Rivers, Mackay, and Bundaberg.

Conditions in Northern areas were exceptionally dry following a prolonged and cold winter. Rain is badly needed in every sugar district. In spite, however, of the dry weather and grub damage the Cairns crop will be the largest ever harvested, the aggregate tonnage for the three mills—Hambleton, Mulgrave, and Babinda—being expected to reach 630,000 tons of cane, which will produce 90,000

tons of sugar. The young cane is standing up well to the dry conditions, and provided rain falls shortly the prospects for next year are excellent.

The crops at the Johnstone and Tully are also good this year, though Mourilyan is somewhat behind its usual tonnage. Here also the young cane looks well.

The commercial cane sugar in the cane is the highest ever experienced in the districts from Mossman to Lower Burdekin, due to the long spell of dry cold weather following the wet season. It is confidently anticipated that the tons of cane required to make a ton of sugar will be well under 7 in the North, and should be somewhere about this figure for the whole of Queensland. Last year it was 7.18, which was the lowest on record.

In the Herbert River district the farmers earlier in the year suffered from heavy and continuous rain which promoted a heavy growth of weeds, which they were unable to cope with in time.

The dry conditions appear to be much worse at Mackay than in other districts, and, with a good deal of frost, have caused a considerable reduction in the crop. It is now anticipated that the sugar yield for the seven mills will not be more than 75,000 tons.

CANE PESTS AND DISEASES.

The following report upon the Mossman sugar district has been submitted by Mr. J. H. Buzacott to the Entomologist at Meringa, Mr. Jarvis, and is now made available by the Bureau of Sugar Experiment Stations:—

From the economic entomological point of view, the Mossman district visited this month proved most interesting. The duration of this trip was mainly occupied in making a comprehensive survey of the area, and locating those parts most affected by grubs and other serious pests.

It is interesting to note that the weevil borer, which eight or ten years ago occurred commonly, has now practically vanished, presumably due to the efficient control exerted by the Tachinid fly parasite which was liberated in Mossman by Muir about the year 1910.

The distribution of the cane grub is diverse, but undoubtedly the most severe infestation occurs at Cassowary, where, on some farms, the damage has amounted to nearly half the crop, and, similarly to our experience in other districts, the cane suffers most on reddish volcanic soils. A fact which Mossman growers have noted, and which also fits in with former observations, is that the damage is usually more severe in fields that carry the highest standing cane at the time of beetle flight. The principal feeding trees of the beetle are the figs and the cocoanut palm, and very probably the guava, on which they have been seen clustering in great numbers. The flight occurs after the first heavy rain in November or early December, and seems to present no unusual aspects.

The frenchi grub does not appear to cause a great deal of damage, although it apparently has not yet risen to feed again after moulting. Wireworms are responsible for very considerable damage to germinating sets, and there appear to be two principal species, one of which is very slender, and the other being shaped more like the typical click-beetle larva. These wireworms were found burrowing all through young shoots under the surface of the ground, and some of the larger ones were boring in the main set like the beetle borer. On one farm over half an acre of plants died off owing to wireworms, and the block had to be replanted.

False wireworms (Tenebrionidæ) occurred commonly in the region of young plants, and were usually found just under the surface of the soil. Whether they were causing appreciable damage, however, is problematical.

The only other pests causing notable damage were moth borers and army worms. Of the former, both the large moth borer (*Phragmatiphila truncata*) and the small raton borer (*Ephysteris chersæa*) were much in evidence, and the cause of numerous "dead-hearts" among young raton cane. These borers were usually present where weeds were growing through the cane and on the headlands. At one place a curious type of damage occasionally associated with the large moth borer was seen; the caterpillars had gnawed a deep depression through the rind of the stick, and where this occurred the stick would frequently snap off. This was noted in a standing crop of Clark's Seedling, and the injury was as often to be seen at the base of the stick as at the top where the moth borer usually dwells.

With regard to the army worm, several fields of young plant cane had been well stripped, and the fact of the caterpillars having lived in the centre leaves of

the plant and of their main feeding taking place at night, points to the agent being *Cirphis unipuncta*, which is the commonest of the army worms affecting sugar-cane.

Of the minor pests aphides and linear bugs were the only ones occurring in large numbers.

It is intended if possible to fumigate a small plot of grub-infested cane early next year to demonstrate to Mossman growers the efficacy of fumigation as a means of combating the cane grub.

Thanks are due to the Mossman mill staff, representatives of associations, and farmers, who gave every assistance during the visit.

The Director of the Bureau of Sugar Experiment Stations has received the following report covering the period September to October, 1929, from the Entomologist at Meringa, Mr. Edmund Jarvis:—

Notes on the Oviposition of *Lepidoderma albohirtum* Waterh.

During last December some original research work was carried out at this experiment station in connection with the egg-stage of our "greyback" cockchafer. This interesting study which was commenced at the beginning of the aerial life of the beetle in question, consisted of collecting quantities of living cockchafers from the foliage of their feeding-trees, separating the sexes and confining each female specimen in a suitable cage containing about 16 cubic inches of moist soil, prepared in a manner calculated to induce the captive to lay eggs.

About 500 females were treated in this way between the dates 19th November to 29th December; such collecting—coupled with that of several hundred additional specimens made use of for other experiments during the same period—affording opportunity for acquiring further data on percentages of the sexes in *albohirtum* occurring at different times in the flying season.

It was found that beetles captured from six to ten days after emergence from the ground oviposited more freely than those which had not been allowed to remain more than three or four days upon their food-plants. Many specimens which had been confined in cages a day or so after leaving the soil died without laying any eggs; these being replaced about a week later by females which had been on the wing for nearly a fortnight. Eggs were first noticed amongst the soil in cages about 12th December, these hatching twelve to fourteen days later; while the total number of tiny grubs procured by this method of rearing was 1,226. During the fourteen days occupied by the egg condition the average shade temperature at our laboratory was 80.25 degrees Fahr.

As a result of investigations made by the writer it appears that tiny grubs of *albohirtum* during their first instar are very easily killed by abnormal earth pressure, such as that brought about by cultivation of the soil in their immediate vicinity. Possibly, sudden pressure of coarse particles of earth on all sides of the body not only tend to prevent movement through the soil but would also be likely to cause more or less injury to the skin, which at this early stage of growth is softer and more delicate than that of grubs of the third instar.

Under natural conditions these tiny newly-hatched grubs enter the soil overhead by gradually tunnelling through the wall of their egg-chamber, so that, during the course of such subterranean progression in compact earth, they would not at any time be subjected to earth pressure.

Grubs Destroyed by Cultural Operations.

Some years ago, when quantities of grubs were collected from canefields almost every day throughout a period of about seven months (December to June) for experimental work at Gordonvale laboratory, I found that no matter how carefully they were handled during transference from the freshly ploughed furrows to large tins containing moist earth, a fairly large percentage (fifteen to twenty) of apparently healthy-looking and uninjured third-stage grubs did not live more than a day or two in confinement. It was concluded that those dying in this manner had been subjected to more or less soil pressure, or received a severe jar to the body during the breaking up of the ground. An additional number (about 8 per cent) of those which happened to lie close to the path of the plough-share, and were either cut or badly squeezed, died almost at once, and were, of course, left in the furrow after identification of the species concerned.

In a report made by Mr. Tryon twenty years ago (1909) with regard to the occurrence of dead grubs in the Isis district, he points out that a certain percentage

of fatality amongst cane grubs "invariably attends the use of agricultural implements," and that "a number are also injured by simple percussion and bruising without any actual contact having taken place." Needless to say, the opinion of such an authority as Mr. Tryon on this matter is of exceptional value. Seeing that his remarks applied to fully-grown, third-stage grubs of *Lepidoderma albohirtum*, we may rest assured that the mortality noticed by him at the time would have been considerably higher had these larvæ been in the first instar or stage of development.

Common-sense control methods of keeping the soil moving between cane rows as much as possible during those periods taken up by the egg and early larval conditions of our "greyback" cockchafer are within the reach of all farmers, and have already been advocated as being advantageous (Bul. No. 19, pp. 58, 59).

One of the most important factors associated with ideal development of plant life, no matter whether of fruit, vegetable, or sugar-cane, is that of conservation of moisture, and this can only be secured by a systematic cultivation of the upper 3 or 4 inches of soil about a couple of days after each downpour of heavy rain, in order to break up the freshly caked surface and so form a layer of loose, fine earth to act as a mulch and stop evaporation of the moisture lying below it. Each time the ground is disturbed in this manner a certain number of cockchafer eggs or small grubs are likely to be destroyed by soil pressure, &c., while, at the same time, when breaking tunnels containing uninjured grubs, several of these are in danger of falling a prey to ants or other enemies before they are able to barricade themselves against such danger.

In this connection I would also remind growers of a fact, already alluded to in previous monthly reports, that egg-laden female cockchafers are disinclined to oviposit in well-worked soil having a surface composed of loose particles, since such scarabæid beetles, while living under natural conditions, are accustomed to tunnelling into hard ground, which, by affording a kind of fulcrum to work against, enables these insects to maintain a correct position during the course of digging in. (See Bul. No. 19, p. 58.)

The Assistant Entomologist at Mackay, Mr. A. N. Burns, has submitted the following report for the month ended 12th November, 1929, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Greyback Beetles Fully Developed (*Lepidoderma albohirtum* Waterh.).

Observations made during the past two weeks have shown that greyback beetles are now fully developed and resting in their cells awaiting the advent of favourable rains to enable them to emerge from the ground. The long continued dry season has rendered the ground very hard and dry in many places, therefore the emergence of beetles may not be expected until fairly substantial rains have fallen. On the other hand, if the dry weather should continue for a further few weeks, it will very likely exercise some degree of natural check over this pest in that many beetles may die through being confined in their cells too long.

In the far northern cane areas this form of natural check occurs every few years, but usually after a comparatively small flight of beetles, grub damage the following season is severe. This is explained in the restoration of natural balance—i.e., when an insect is plentiful its parasites are also plentiful, and thus a control takes place; but in seasons of comparative scarcity parasites too are scarce, and so the species tends to increase. This is supplemented by many other factors, such as more equal division of sexes, which produces a greater proportion of fertile eggs, and weather conditions, &c.

Growers are recommended to collect and destroy beetles from feeding trees, also to clear away from headlands and near canefields, any feeding trees. The principal trees that are most attractive to beetles are wild figs (*Ficus* spp.) of all species, Moreton Bay Ash (*Eucalyptus tessellaris*), Blue Gum (*E. tereticornis*), and the swamp "Beetle Tree" (*Philanthus* sp.), as well as wattles or acacias of all species (*Acacia* sp.). Judicious collecting of beetles and clearing out of feeding trees from the immediate vicinities of canefields is a very helpful factor in reducing the numbers of this pest. High grass on headlands and canefield roads is particularly attractive to beetles, and as is usually the case, the ground in these situations is very hard and consolidated which prevents the beetles from entering to lay their eggs in those spots, therefore they enter the loose cultivated ground immediately adjoining. This is not intended to mean that the cane would not be affected at all if the grass was cut down, but high grass is a great attraction to beetles and would no doubt tend to greatly increase the subsequent grub infestation, therefore it may be seen that such precautionary measures are helpful.

False Wireworms (*Gonecephalum carpentariae?* Fam. *Tenebrionidae*).

Many growers may have noticed during the past two or three months large numbers of small, dirty, blackish-brown beetles running about the canefields and headlands. The larvæ or grubs of this beetle are of the "wireworm" type, and are at present very numerous in some canefields in the Mackay district, and several farmers have recently brought under notice their occurrence in large numbers amongst young cane, where they were found to be destroying the buds or eyes on the sets. They enter the eyes and eat out the whole interior, thus producing many misses in the cane. In consequence, many farmers have had to supply parts of their cane, in some cases as many as three times. When supplying by hand, dipping the sets in a solution of sodium arsenite, molasses, and water in the proportions of sod. ars. 1 lb., molasses 8 lb., and water from 8 to 10 gallons, is recommended as a control measure. The dipped sets should be planted wet so that the earth will adhere to them; this soil then becomes impregnated with the poison, thus any insect attacking the sets will first come in contact with a small amount of poisoned soil before actually reaching the set, and will thus be influenced by the solution. The cut ends of the sets will absorb the poison to a depth of a quarter of an inch or thereabouts.

The false wireworm may be briefly described as follows:—When fully grown about three-fifths of an inch in length (1.5 cms.), elongate, and cylindrical. Colour dirty yellowish-brown, the head and first two segments smoky brown, also the anal and pre-anal segment. If seen under a magnifying glass the edges of the anal segment will be seen to have a row of small black bristle-like spines which are slightly curved upwards, bordering its outer edge. The head is small, dark brown, and semi-retractile. The first three body segments each carry a pair of short legs, which are also dirty yellowish-brown in colour. The body is twelve segmented. These larvæ are able to move fairly rapidly on their ventral surfaces; sometimes when dug up they partly curl up and remain motionless for a couple of seconds, or else wriggle themselves with a lashing motion several times before attempting to re-enter the soil. The duration of the larval or wireworm stage of this insect occupies from six to eight weeks during the spring months.

The pupa is a dirty cream colour, and measures about two-fifths of an inch in length (9 cms.). It resembles the adult beetle in shape, with the legs and antennæ neatly folded on the ventral surface, the elytra or wing covers are enclosed in two bud-like processes which are also directed towards the ventral surface. The anal segment bears two fairly long outwardly curved spin-like processes. Just before emergence the eyes darken and the body assumes a dark-brown colour. The duration of this stage is from ten to twelve days, and the pupa is enclosed in a small oval cell in the soil.

The beetles appear to be fond of congregating under rubbish, &c., and heaps of freshly-pulled weeds have been recommended as being effective traps for attracting them. Night time has been recommended as being the best time to remove the beetles from the traps; any thus collected may be destroyed.

Linear Bugs (*Phaenacantha australicus* Kirk.).

The spring generation of these bugs is now beginning to appear; very small nymphs being observed during the last two weeks. These slender almost mosquito-like active insects are very plentiful in many parts of the district in the late summer months, but it was not definitely known how many broods of this bug were produced in a year.

The presence of very young nymphs at the present time appears to indicate that there are three broods normally—there may be slight overlapping into a fourth brood—but nymphs have now been observed freely during the months of November, January and February, and May and June. Examples bred at the Laboratory have shown that the adults hibernate under cover of trash, &c., during the winter months, eggs are laid about October, the young bugs from them hatching during the latter part of that month and early November. The young nymphs noted in January and February are the offspring from the spring generation, whilst those found in May and June are the brood following the summer generation; these hibernate until the following spring and produce the spring brood.

The eggs are recorded as being dropped loosely and unattached on the surface of the ground; examples caged at the Laboratory invariably laid their eggs singly and attached to various objects, some being laid on the sides of the breeding cage. The eggs are much longer than broad, being a little over 1.5 mm. in length by 0.4 mm. in width. They are of a dark red-brown colour, and the incubation period occupies about twelve days.

This cane insect, although at times very abundant in canefields, has so far not called for control measures; it appears to be fairly free from natural parasites and other enemies. Occasionally, the apices of cane leaves in fields where the bugs are abundant assume a yellowish colour due to the continual drain of sap as a result of the bugs feeding.

The Assistant Entomologist, Bundaberg, Mr. R. N. Montgomery, has submitted the following notes for publication, on the emergence and collection of certain injurious cane beetles, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Beetle Emergence Expected.

During either November or December, as soon as we have received sufficient rain to penetrate to the harder subsoil, we may anticipate the emergence of the various beetles whose grubs attack our cane crops. In Southern Queensland the three worst grub pests with which we have to contend are the Childers, Bundaberg, and "Frenchi" cane grubs, which, of course, result from eggs laid by their respective beetles soon after their emergence and flying period.

Up to the present our investigations have shown the many difficulties involved in the wholesale collection of female beetles of the two former species, and although further investigation work is in progress, with a view to trapping the females before they can fly away to lay their eggs, past experience in this connection has shown that the number that can be caught is by far too small to have any appreciable effect in diminishing the degree of infestation from year to year. Accordingly, the following remarks on the collection of beetles are not applicable to the Childers or Bundaberg beetles, but concern chiefly the "Frenchi" beetles. In controlling the two former pests, we aim at cleaning the fields thoroughly by hand picking previous to planting, and if the crop becomes subsequently infested, this practice is then supplemented by soil fumigation.

"Frenchi" Beetles.

"Frenchi" beetles are about 1 inch in length, and less than half an inch at their greatest width. They are of a pale reddish colour, and are covered with whitish scales which give the beetles a silvery lustre. On account of this silvery appearance they have been sometimes erroneously called "greyback" beetles, but it should be here noted that the "greyback" beetle, which does such a vast amount of damage to cane in North Queensland, does not occur here, and therefore to avoid confusion the term "frenchi" beetle should be rigidly adhered to. In collecting this species advantage is taken of certain peculiarities in their habits.

How they are Collected.

In this case the female beetles fly to low shrubs, fences, and even to the young cane stools, where they are followed by the males, and mating then takes place. The beetles then remain suspended from the objects to which they have flown, and they may be collected without any difficulty. After mating, if unmolested, they may feed on the foliage of such trees as the Moreton Bay Ash, bloodwood, &c., and before dawn they fly back to the canefields to enter the soil and deposit their eggs.

"Frenchi" beetles are not attracted to lights in large numbers like some of the other common beetles, and lights are necessary chiefly as a means of locating and collecting mating pairs. If such collecting is carried out, the collector is assured that equal proportions of the sexes are present, with the additional satisfaction of knowing that every pair destroyed means at least thirty potential grubs less to feed on his crops in the following years. Although the life cycle of "Frenchi" is of two years' duration, there is an annual emergence of beetles, and in some areas there appears to be a larger emergence every second year, with a corresponding heavier infestation of grubs in the succeeding year.

Where to Look for Beetles.

This year, in some of the sub-districts of Bundaberg, there should be a fairly heavy emergence of "frenchi" beetles, and it behoves growers to collect these beetles as thoroughly as possible in order to minimise damage during the 1930-31 spring and summer. In past years grubs from these beetles have been found on a few farms at Elliott Heads, Avoca, Oakwood, and Gin Gin, and this note of warning is issued with the view that farmers might take the necessary precautions to prevent their fields again becoming infested.

PATHOLOGICAL INQUIRIES.*

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

Of the many specimens submitted for report a considerable number are found on opening up to be more or less unfit for enabling a proper determination of the cause of the trouble. This position usually arises from one or more of the three following causes:—

1. The specimens have rotted during transit and are unfit for examination.
2. The portion of the plant in which the causal agent might be found is not included.
3. There is not sufficient data given regarding the general growing conditions of the plant, in which conditions, in many cases, is found the origin of the trouble.

To aid those desirous of seeking advice, a few hints regarding the submission of specimens are given below:—

The method of packing will depend largely on the nature of the specimen and the time that it will take on its journey.

When the parcel may be expected to reach its destination in not longer than two days, the specimens, whether of foliage or fruit, can be wrapped separately in clean newspaper and packed in a cardboard box to avoid crushing. An airtight container must be avoided, as the material sweats and quickly rots under such conditions.

For long-distance consignment, foliage is best pressed between sheets of blotting paper, which can be posted enclosed between two pieces of cardboard. When wishing to send succulent fruit, such as are liable to arrive in a state of decomposition, it is sometimes possible to cut off the diseased portion in a thin layer and send this wrapped in clean blotting paper as in the case of foliage.

When possible, specimens illustrating the disease in all stages, including both early and late symptoms, should be sent.

If the disease consists of a definite leaf or fruit spot, only that portion of the plant affected need be included. However, in the case of diseases of a more general nature, such as a wilt or dieback, it is necessary to forward specimens of the whole plant, including especially the roots. It is always best to include whole specimens when dealing with small herbaceous plants or seedlings.

A covering letter should be sent indicating the date on which the specimens were posted, and stating the nature of the information required. As far as possible, the following details should be included also, to facilitate a correct diagnosis of the trouble:—

- (a) A short description of the disease as it appears in the field; the varieties of plant affected; the date of first appearance; and nature of subsequent spread, &c.
- (b) Nature of the soil and subsoil and drainage; details of any manurial application; and date of application.
- (c) Particulars regarding rainfall, frosts, &c., occurring during the life of the crop.
- (d) The strength and time of application of any sprays used.
- (e) Any contributing cause which might suggest itself to the grower.

* Reprinted from "Pests and Diseases of Queensland Fruits and Vegetables," by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc., published by the Department of Agriculture and Stock, Brisbane, 1929.

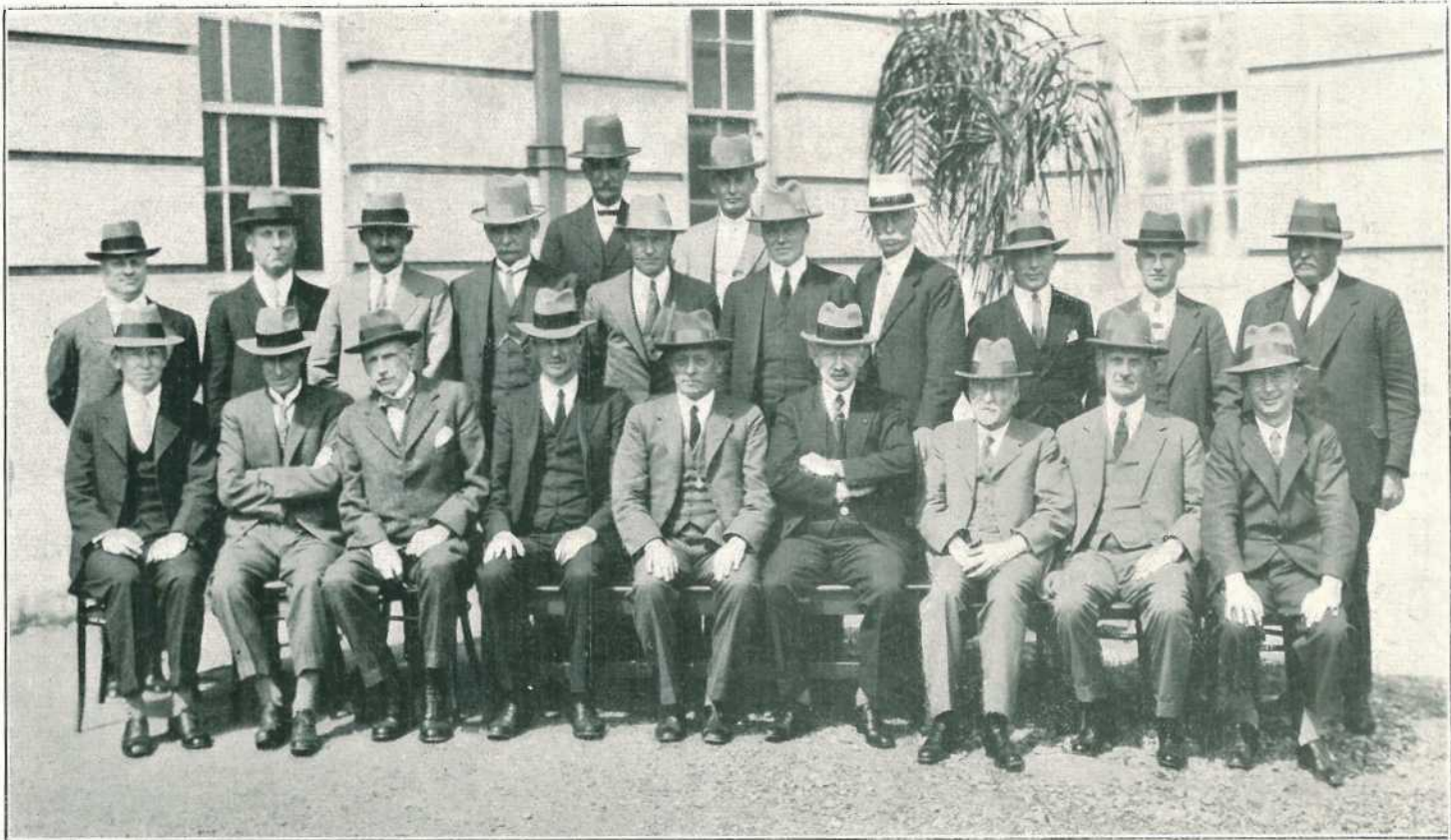


PLATE 195.—CONFERENCE BETWEEN QUEENSLAND WHEAT BOARD AND FLOUR MILLERS, SEPTEMBER, 1929.

Top :—Messrs. W. Binns and J. H. Allison.

Standing :—Messrs. R. M. White, W. R. Dean, A. C. Krieg, B. C. C. Kirkegaard, R. T. Phelps, J. Archibald, A. Hoskin, E. F. O'Brien, W. D. Phie and J. Canavan.

Sitting :—Messrs. W. G. Hamilton (Assistant Crown Solicitor); L. R. Macgregor (Director of Marketing); J. T. Tod, Hon. W. A. Deacon, M.L.A. (Minister for Public Lands); Hon. H. F. Walker, M.L.A. (Minister for Agriculture and Stock); Messrs. R. J. Archibald, G. P. Barnes, M.L.A.; W. H. Luya and T. P. O'Brien.

RURAL ROUTES IN QUEENSLAND.

THE WORK OF THE MAIN ROADS COMMISSION.

The Eighth Annual Report of the Main Roads Commission commends itself strongly to all concerned with the progress of country life in Queensland.

This survey of a year's achievements leaves the impression that the Commission is one of the most important factors in our rural development. It is a record of well-organised work, and through the courtesy of the Commission we are able to reproduce the series of excellent plates with which the Report is illustrated, and which indicate to some extent the immense value of a great community service.—EDITOR.

THE ROAD AND THE NATION.

ONE of the most important aspects of the history of civilisation is the development of the road for in a very real sense "transportation is civilisation." Writing in the "Edinburgh Review" some time ago, H. J. Randall tells us that "the literature of the road is curiously scanty. It provides the commonest of metaphors, but is one of the rarest of subjects. Poetry, imaginative prose, religion itself, would lose much if they were deprived of such convenient symbols as the broad road, the narrow path, the beaten track, and the accustomed way." And again, civilisation "begins with wandering trails in the dim mists of pre-history; its present stage is the proposal to erect solid structures of concrete reserved for fast motor traffic; between the two lies the material history of mankind." The same writer goes on to remind us that in the story of our race there have only been three periods of deliberate and systematic road making. "The first was the Roman era, and the Romans, according to universal opinion were the greatest of all road builders. The second great period was that of the industrial revolution at the end of the eighteenth and beginning of the nineteenth centuries. It transformed England as an agricultural country to one primarily industrial, with agriculture as a subordinate industry. It shifted the centres of population from the wheatfields to the coalfields; from the south and east to the north and west. The sparsely populated areas became hives of industry, and the enormous increase in wheeled traffic threw a burden on the mediæval trackways."

"Telford's masterpiece, the great Holyhead road, will probably endure as long as Watling street; and his unexecuted plan for a great north road may be accomplished in our own days. But about 1830 the 'calamity of railways' fell upon the land, and for the remainder of the nineteenth century there was no great road making; in fact, the roads were comparatively neglected. The third great epoch is the present, dating from the perfection of the motor-car in the last years of last century which has filled our roads as they were never filled before"

Writing on the same theme Hilaire Belloc observes that "the Road is one of the great fundamental institutions of mankind. . . . Not only is the Road one of the great human institutions because it is fundamental to human existence, but also because its varied effect appears in every department of the State. It is the Road which determines the sites of many cities and the growth and nourishment of all. It is the Road which controls the development of strategies and fixes the sites of battles. It is the Road that gives its framework to all economic development. It is the Road which is the channel of all trade, and, what is more important, of all ideas. In its most humble function it is a necessary guide without which progress from place to place would be a ceaseless experiment; it is a sustenance without which organised society would be impossible; thus, and with those other characteristics I have mentioned, the Road moves and controls all history."

As a factor in building up the same sort of rural civilisation in Queensland the importance of the Main Roads Commission will be admitted and the following summary of its operations for the year contains much of interest to our readers.

SUMMARY OF OPERATIONS.

Road Gazettals and Works.

In the course of the year a length of 619 miles of Main Roads was gazetted, and of Developmental Roads 54 miles, making the total lengths gazetted at 30th June 6,195 and 416 miles respectively.

Road construction as scheduled and as described in the report of the Chief Engineer, has made substantial progress throughout the State during the year.

Several bridges of very considerable magnitude and importance are in hand, such as Macrossan Bridge over the Burdekin River, in Dalrymple Shire, the length of which is 1,188 ft. and width 16 ft.; Halifax Bridge over the Herbert River at Halifax, in Hinchinbrook Shire, the length of which is 950 ft. and width 12 ft.; Burdekin Bridge, between Ayr and Home Hill, the length of which is 450 ft. and width 12 ft., together with extensive approaches over sandy river bed, upon portion of which chain netting is being fixed; Coocmera River Bridge on the Main South Coast road, the length of which is 735 ft. and width 20 ft. The river spans of this bridge will consist of broad flanged steel beams, surmounted by a reinforced concrete deck, and resting upon concrete piers founded upon cylinders and pile foundations. The southern approach viaduct consists of timber spans. The bridge should be completed during the early part of 1930, and will relieve the congestion caused by the existing ferry. The Albert River Bridge over the Albert River, in Burke Shire, the length of which is 369 ft. and width 12 ft., is well in hand.

Development in the North.

Particular reference is made in the Report to roads under construction on the coastal districts of the North and Central area, such as Daintree-Mossman road. Two important bridges have been completed thereon, the one over Saltwater River being a dual-purpose structure which will carry both the sugar-cane tramway and road traffic. Dairying has now been established in the Daintree area, and the construction of the road in question should greatly help to stabilise the industry. This area is the farthest north in Australia in which dairying is carried on. The river flats are carrying one and a-half cows to the acre, due to the rich pastures of marram grass and the heavy annual rainfall of over 100 in.

The dairying industry is being established in two other tropical districts—viz., at Silkwood, near Innisfail—where a start has been made on roads to feed the factory. It is hoped that a vigorous road and bridge construction policy can be continued in the area which has much undeveloped land suitable for dairying and fruitgrowing, quite apart from sugar-cane.

At Mackay a butter factory is in course of establishment, and the Kungurri-Mount Ossa and Calen-Cameron Pocket roads have received considerable attention, which it is also hoped to continue. These roads serve new settlements devoted to sugar, fruit, and dairying.

A New Link with New South Wales.

The mountain section of Brisbane-Mount Lindesay road, and which is destined to become a most important link with New South Wales, has been completed in Queensland, but the New South Wales section to Woodenbong is yet under construction, having been delayed by wet weather.

Very considerable benefit will accrue to both States when the road is finally opened.

Kingaroy to Bell.

The completion of the Bunya Mountain section of the Kingaroy-Bell road has removed one of the greatest difficulties to traffic on this important link between the Downs and the Burnett, but the metalling of some miles of black soil in Wambo Shire to Haly's Bore is very necessary, whilst the construction of about 5 miles between Kumbia and Porter's Gap, in Kingaroy Shire, is equally urgent. The necessary bridges over the Boyne River and Mannum Creek are in hand.

On the South Coast.

The completion of the Main South Coast deviation leading into Southport is eagerly awaited, but the opening of the first section has alleviated the difficulty of travel between Saltwater Creek and Southport very considerably.

Serious coast erosion has taken place at Currumbin, and steps are being taken to give reasonable access pending the construction of the permanent road, which deviates from the existing road at Currumbin Bridge, and after crossing a spur rejoins the existing road near Tugun.

Considerable expense has been caused by erosion at the Narrow Neck, south of Southport Bridge, but the effect of the brush fences and groyne minimised the erosion to a considerable extent.

Other Important Highways.

The Brisbane-Toowoomba road construction has proceeded continually throughout the year, and it is hoped that all serious bogs on the road will have been eliminated in another eighteen months.

This road is of a highly useful character to the agriculturist and dairyman throughout its whole length.

Further works on the Clifton-Hirstvale-Grantham road will be completed as far as King's Creek, some miles from Clifton, before the end of the financial year 1929-30. This road, whilst being of great assistance in development of the adjacent area, has a very considerable value as a link between the Downs and Lockyer districts.

A number of important bridges more fully described in the report of the Chief Engineer have been completed and opened for traffic during the year under review, including that over the Don River, near Bowen, 730 ft. long, which gives road access to Bowen Port and Railway to the country on the north bank of the river.

Other completed bridges of importance in the pastoral areas are Bulloo River Bridge, near Thargomindah; Warrego River Bridge, near Wyandra; and Barcoo River Bridge, near Isisford—all of reinforced concrete.

The composite road and sugar tramway bridge over the Haughton River, on the Ayr-Townsville road, has been completed, and withstood a severe flood.

Kolan River Bridge, on the Gin Gin-Miriam Vale road, gives relief from a difficult and often uncrossable ford.

The low-level timber bridge and concrete causeway over the Burnett River at Mingo is one of the most important works constructed in the Burnett area this year.

In most instances tenders have been called by Shire Councils whose recommendations are subject to review before approval is granted by the Commission and confirmed by the Minister.

The standard of work which has been achieved is very close to that aimed at in the specifications, and in general the shire officials and Commission's officers are to be commended upon the result.

Maintenance.

Maintenance works have been carried on over 6,000 miles of road, including the bridges thereon, the total expenditure being £180,596 in 122 local authority areas.

A considerable amount of road-widening has been carried out under this heading on roads in the vicinity of the metropolitan and some of the provincial city areas, owing to the great increase in traffic.

The maintenance of a number of roads is carried out under direct supervision of the Commission in cases where a number of local authorities are interested in the road.

Road Construction Investigation.

The policy of experimenting with new methods of construction and investigating and trying out various types of road is being continued.

Further experimental sections of penetration macadam roads, using emulsified bitumen and native asphalts in varying quantities and with different treatment, were laid down upon the main Ipswich road.

A small section of the old river gravel on the main Gympie road near North Pine railway bridge was scarified and treated with bitumen, the mixing being carried out by a power grader, and the consolidation being partly by power roller and partly by traffic. The results have been encouraging, and a further section will be laid to confirm the results.

Arrangements have been made for the construction of a heavy trafficked section of the Ipswich road by the Sunderland cement penetration method, particularly with a view to ascertaining the minimum thickness which can be utilised without risk of early failure (a good foundation will be insured).

The Chief Engineer made extensive investigation during the year of road construction in the States of New South Wales, Victoria, and South Australia, the results of which have been disseminated to the staff and shire councils.

Tourist Roads.

Provision has been made for the declaration, construction, and maintenance of tourist roads upon terms to be agreed upon between the Commissioner and the local authorities concerned, provided that in certain instances no charge might be made to the local authorities—all subject to the approval of the Governor in Council.

It may be mentioned in passing as an example that the Public Highways Department of the Province of Ontario, Canada, estimates the value of the tourist traffic from other countries at £7,000,000 for the year 1926.

Commissioner's Inspections.

In the course of the year visits of inspection were made to a number of local authority areas, with whose representatives the future road requirements were discussed, and as the result of which plans have been developed. These included Herberton, Tinaroo, Eacham, Cairns City and Cairns Shire, Johnstone, Cardwell, Hinchinbrook, Thuringowa, Townsville City, Dalrymple, Ayr, Pioneer, Sarina, Fitzroy and Livingstone, Maryborough, Burrum, Woongarra, Kolan, Bundaberg City, and Isis.



PLATE 196.

MECHANICAL NAVY IN USE BY THE COMMISSIONER ON MAIN ROADS WORKS.

The important decision as to the route of the connection between Bundaberg and Childers was finalised as the result of this inspection.

The Shires of Pine, Caboolture, Landsborough, and Maroochy were visited, and also the whole of the shires south from Brisbane to the Border and westward to the Range.

An inspection through Kingaroy, Wambo, Chinchilla, Taroom, Bendemere, Murilla, Bungil, and Roma was made during the summer, and also the whole of the Darling Downs area.

Visits of inspection to remote areas not included above have been made by senior officers.

It will thus be seen that the Commission is fully in touch with the road needs of the State and the views of the local authorities.



PLATE 197.

UPPER HERBERT RIVER BRIDGE, HINCHINBROOK SHIRE, NORTH QUEENSLAND. LOOKING FROM THE NORTH SIDE.

This bridge has been subjected to heavy flooding without damage.



PLATE 198.

WAMBO SHIRE, KINGAROY—BELL ROAD. CROSSING OF THE BUNYA MOUNTAINS AT PORTER'S GAP.

This important section connects the Darling Downs with the Burnett, facilitating trade interchange between two of the richest provinces in Australia.

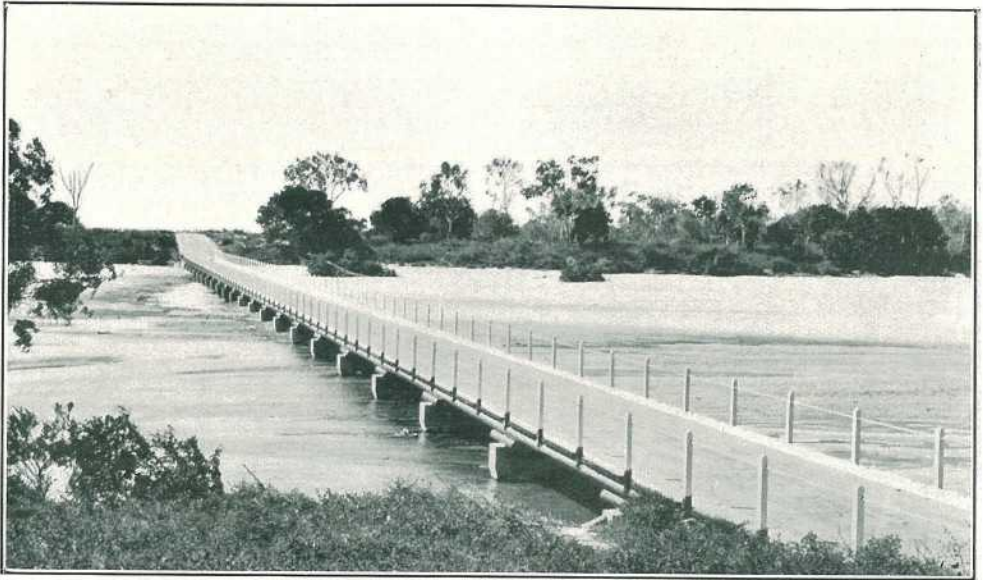


PLATE 199.

WANGARATTA SHIRE. LOW-LEVEL BRIDGE OVER THE DON RIVER, NEAR BOWEN. REINFORCED CONCRETE SUBSTRUCTURE AND TIMBER SUPERSTRUCTURE.

This bridge gives connection to all country north of Bowen. Length, 730 feet; width, 18 feet.



PLATE 200.

THE OLD DON RIVER CROSSING NOW REPLACED BY THE BRIDGE SHOWN ABOVE. THE FLOOD LEVEL REACHES THE TOP OF THE BANK.



PLATE 201.

CUNNAMULLA—THARGOMINDAH ROAD, BULLOO SHIRE. MULTIPLE OPENING REINFORCED CONCRETE CULVERT OVER THE WESTERN CHANNEL OF THE BULLOO RIVER.

A flood section of native bitumen road extends for approximately a mile adjacent to the main Bulloo River.



PLATE 202.

REINFORCED CONCRETE BRIDGE OVER THE MAIN CHANNEL OF THE BULLOO RIVER, ON THE CUNNAMULLA—THARGOMINDAH ROAD AT THARGOMINDAH.

It is interesting to note that this point is almost equidistant from Townsville, Rockhampton, Brisbane, Sydney, Melbourne, and Adelaide.



PLATE 203.

MAIN SOUTH COAST ROAD. PENETRATION BITUMINOUS MACADAM ON THE SOUTHPORT DEVIATION, WHICH ELIMINATES A VERY HILLY SECTION.



PLATE 204.

REINFORCED CONCRETE BRIDGE OVER THE WARREGO RIVER, AT WYANDRA, WHICH WILL BE OF GREAT VALUE TO PASTORALISTS.

Length, 300 feet; width, 18 feet.



PLATE 205.

PIONEER SHIRE. CUTTING ON KUNGURRI RANGE, ON THE MOUNT OSSA—KUNGURRI DEVELOPMENTAL ROAD, IN THE MACKAY DISTRICT.

This road serves sugar, fruit, and dairy farmers.



PLATE 206.

PART OF MARYVALE FLATS SECTION. FARNBOROUGH—BYFIELD ROAD, IN LIVINGSTONE SHIRE, ROCKHAMPTON DISTRICT.

This road serves a rising fruit-growing district, the products of which are in demand on the Melbourne and Sydney markets.

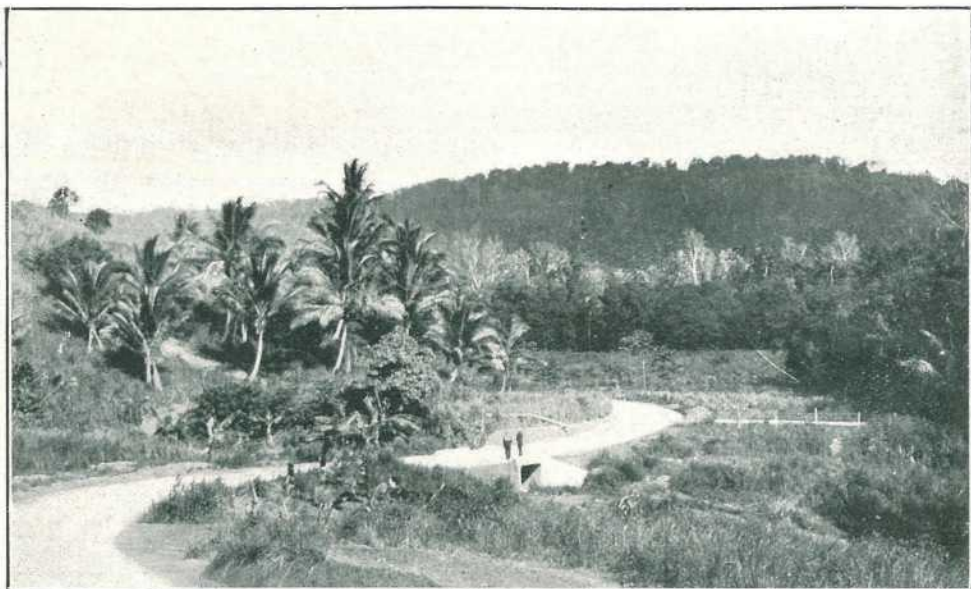


PLATE 207.

DOUGLAS SHIRE. MOSSMAN—DAINTREE ROAD, NORTH QUEENSLAND, LOOKING DOWN ON BARRATT'S CREEK.

The road will serve the most northerly dairying settlement in Australia (latitude 16 deg South), with an average annual rainfall of 80 inches. A coconut plantation is seen in the left foreground.



PLATE 208.

TINAROO SHIRE. ATHERTON—BOAR POCKET ROAD, NORTH QUEENSLAND, LOOKING TOWARDS ATHERTON FROM BRIDGE APPROACHES.

This road and bridge serve a red volcanic dairying area in latitude 17 deg. South

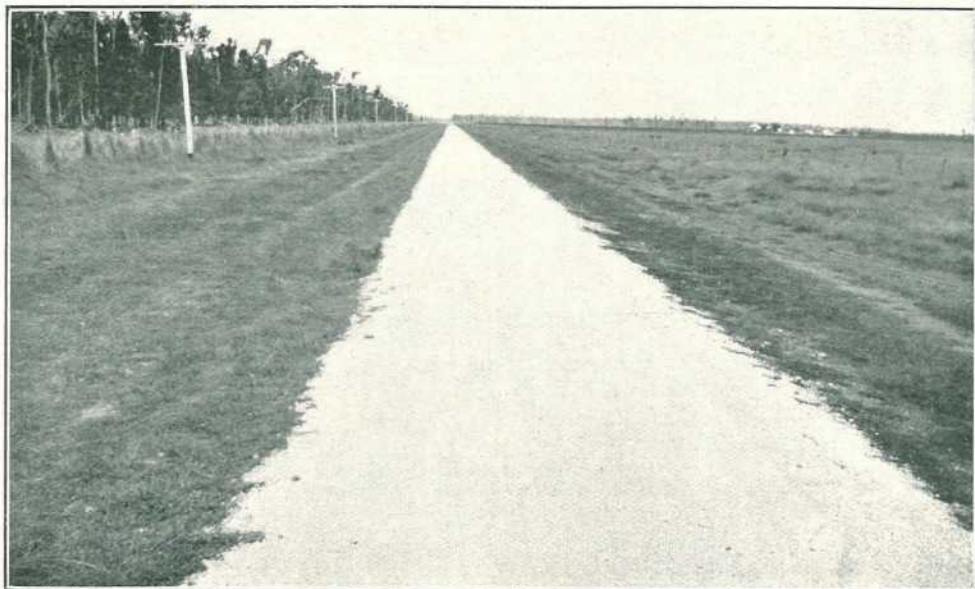


PLATE 209.

WAMBO SHIRE, DALBY DISTRICT. WARRA—INVERAI ROAD. BURNT SHALE PAVEMENT.
Serving a good dairying district.



PLATE 210.

CERATODUS—NEW CANNINDAH ROAD, UPPER BURNETT. THREE MOON CREEK, SHOWING
CONCRETE KERBING ON A TIMBER BRIDGE.



PLATE 211.

CAVES—CHARCOAL SCRUB ROAD, ROCKHAMPTON DISTRICT—SERVING AGRICULTURAL AND DAIRYING SETTLEMENTS. MOUNT ETNA (LIMESTONE) IN THE DISTANCE.



PLATE 212.

LIVINGSTONE SHIRE. SECTION OF CAVES—CHARCOAL SCRUB ROAD BEFORE CONSTRUCTION.

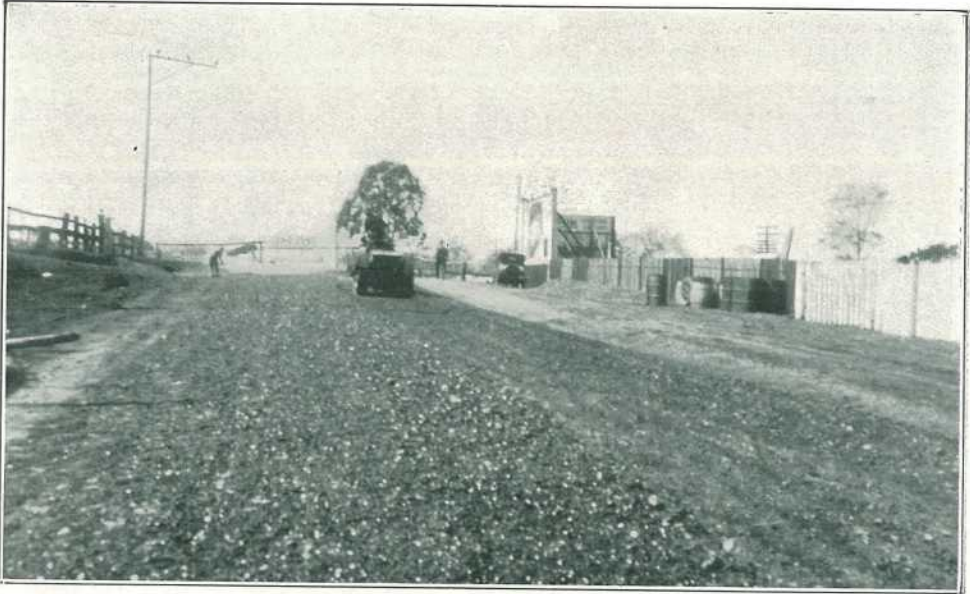


PLATE 213.

MAIN GYMPIE ROAD, PETRIE SECTION. GRAVEL TREATED WITH BITUMEN. FIRST BLADING.



PLATE 214.

MAIN GYMPIE ROAD, PETRIE SECTION. GRAVEL TREATED WITH BITUMEN. SECOND BLADING.

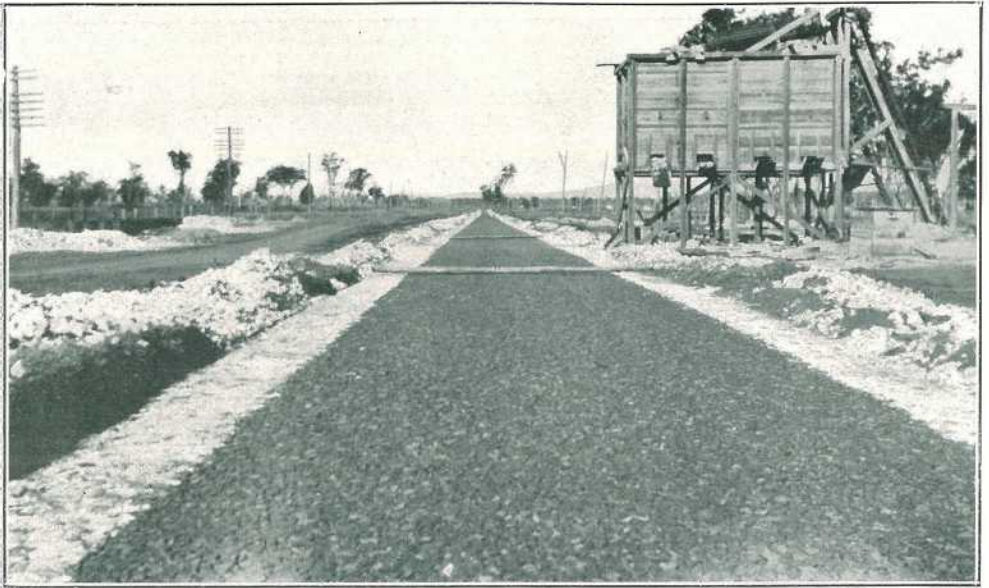


PLATE 215.

PENETRATION BITUMINOUS MACADAM ROAD UNDER CONSTRUCTION AT GATTON ON BLACK SOIL ROAD. THE FLANKING IS LOCAL SANDSTONE, AND THE CENTRAL PORTION BASALT. The top course had not been completed when the photograph was taken.



PLATE 216.

MAIN GYMPIE ROAD, NEAR BRISBANE. GRAVEL ROAD TREATED WITH BITUMEN. This is the first experimental section completed in November, 1928. No maintenance to date.



PLATE 217.

BULLGOO SHIRE. QUILPIE—EROMANGA ROAD. METALLED ROADWAY OVER SWAMP COUNTRY. This carries traffic from as far out as the South Australian border to the railhead at Quilpie



PLATE 218.

BRISBANE—TOOWCOMBEA ROAD. 20-FEET CONCRETE SECTION AT MOOROOKA, NEAR BRISBANE.



PLATE 219.

THALLON—ST. GEORGE ROAD, IN THE BALONNE SHIRE. PARTLY ROLLED INDURATED MARL.

St. George is a thriving township of about 1,200 people, situated in a rich pastoral district distant about 50 miles from the South-Western Railway, and has a fine frontage to a beautiful reach of the Balonne River.



PLATE 220.

PAROO RIVER BRIDGE APPROACHES, SOUTH-WESTERN AREA. THIS FLOOD SECTION IS PAVED WITH PENETRATION TRINIDAD ASPHALT.



PLATE 221.

MURGON—GAYNDAH ROAD. LAMB STREET REINFORCED CONCRETE CULVERT IN MURGON TOWNSHIP.



PLATE 222.

KINGAROY SHIRE. BRIDGE OVER THE BOYNE RIVER ON KINGAROY—BURRANDOWAN ROAD.

TROPICAL FRUIT CULTURE IN NORTH QUEENSLAND.

By W. J. ROSS, Senior Instructor in Fruit Culture.

NORTH QUEENSLAND, though situated well within the tropics, with its altitudinal differences, possesses a great diversity of climate, varying from hot and moist on the coastal area to the bracing atmosphere of the higher tablelands west of the coastal range. The following notes refer, however, to the narrow strip of country east of the range, between Townsville and Cooktown. The climatic conditions existing within even this area, vary from comparatively arid districts—e.g., between Townsville and Rollingstone—to regions of very heavy rainfall. The most humid portion is that between Ingham and Port Douglas. North and south of these centres the normal precipitations decrease in volume. The rainfall, in regular seasons, concentrated within the early months of the year, varies in different parts from more than 150 inches to less than 50. Precipitations are heaviest under the Bellenden-Ker Range in the vicinity of the Russell River. Cool conditions persist from May to August, the remainder of the year being characterised by the usual tropical summer weather.

Suitable Soils.

A variety of soils suitable for many agricultural and horticultural purposes, including the cultivation of tropical and sub-tropical fruits, occur within the area. Included in this fertile region is a great tract of land not at present utilised, whilst the best of the remainder is devoted to sugar-growing. In view of the restrictions at present limiting the extension of this crop, economic considerations emphasise the need for the introduction of new, and the furtherance of existing agricultural pursuits in the North. That fruitgrowing on a reasonably extensive scale could assist in this direction is fairly well assured, hence the question: What fruits, other than pineapples and bananas, may be considered to offer commercial possibilities under existing conditions? This discussion therefore will be confined to those tropical fruits whose known characteristics merit serious attention.

Present Position of Tropical Fruit Cultivation in the North.

Although considerable quantities of bananas, pineapples, and citrus were exported from North to South in earlier times, the development of other varieties of fruit received but scant attention. Excepting the mango, the granadilla, the papaw, and some of the anonaceous fruits—all of which, for reasons discussed later, have not attained to commercial dimensions—little has been accomplished beyond the introduction of odd trees of other fruits. Experimental work has been of a somewhat indeterminate nature, and reliable data concerning the behaviour under Northern conditions of such trees as were introduced is rather scanty. Innumerable mango trees are found growing mostly in a semi-wild state throughout the North, and, generally speaking, the fruit of these is of an inferior quality, containing much fibre and having large seeds. These characteristics of existing North Queensland mangoes explains to some extent why they do not hold a better position commercially, for such qualities do not commend themselves to the Southern taste. Certain types, however, have little fibre and can be used for dessert equally with other fruits, both temperate and tropical. Instances of attention having been given to selection are few though not entirely absent, hence it is that few mangoes are exported to Southern markets. Where selection has been practised—at Bowen for instance, it has been demonstrated that fruit of good quality and suitable for long distance transport can be grown on a profitable basis. When grown in the North, fruits of both the papaw and the granadilla require to almost mature before picking, hence in the absence of adequate transport facilities the large scale culture of these fruits is at present a hazardous undertaking from an economic viewpoint. The passion fruit (*Passiflora edulis*) also has distinct possibilities. A few trees of the Litchi group introduced to the Mossman and Cairns districts have demonstrated that certain of these grow well and bear fruit under cultural conditions not altogether conducive to best results. The mangosteen has not been fairly tested in the area, but evidence derived from observations on the only bearing tree growing in the old nursery at Kamerunga, warrants attention to the culture of this fruit. As regards citrus, it has been decisively shown that excellent fruit can be successfully produced in several districts, particularly in the vicinity of Cooktown, where, with the aid of irrigation judiciously applied, trees may be made to crop at almost any period of the year.

Scope for Cultivation—Soils.

Since it has been mentioned that the soils of the tropical coastal area are of a diversified nature, varying from the richest alluvial and scrub soils to those of low fertility found more or less on undulating and flat country, it is considered appropriate for the purposes of these notes to divide them as follows:—

A.—The red and chocolate volcanic soils occurring extensively in what is known as the "wet area" from Ingham to Port Douglas, on more or less elevated country.

B.—The alluvial loams that also occur largely in the "wet area."

C.—The free sandy loams of various colours, either scrub or forest, in areas of lighter rainfall—viz., at Rollingstone and Cooktown.

Almost everywhere these soils possess good natural drainage, a considerable advantage to any projected development of fruit growing in the North. Soils exhibiting any tendency to water-logging or consequent souring during periods of heavy rainfall, had better be passed over in the selection of orchard sites. Deep rooting is a habit to be encouraged in relation to the growing of fruit trees, and unless soil conditions are, or can be made, favourable for its attainment, the location may not be considered as suitable.

Volcanic Soils.

Group A.—Of the three classes of soils, those in Group A are usually fairly deep, though in some cases covered to a greater or lesser extent with basaltic boulders. The surface soil is friable and the subsoil, as a rule, corresponding in colour with the surface, is usually easily penetrable by the roots of trees. Occasionally subsoils of a compact character are found and such hardly satisfy the standard of conditions generally considered favourable to the production of tree growth. Soils of basaltic origin are usually fertile and in their virgin state covered with dense tropical jungle characterised by a rank growth of lawyer vines amongst timbers, many of which are of high commercial value. These soils are especially adapted for the growth of an extensive range of tropical and sub-tropical fruits. Areas of forest soils or inferior scrub soils may be basaltic in origin, and though scarcely so rich as those bearing dense jungle, when well cultivated, permit the growth of similar fruits.

Alluvial Loams.

Group B.—These may occur in proximity to rivers and creeks, in extensive flats at bases of mountain ranges, or between them and the coast-line. They figure prominently in the constitution of the richest sugar districts such as Herbert River, Tully, Johnstone River, Babinda, Gordonvale, Cairns, and Mossman. These soils are exceedingly fertile, deep, well drained, and capable of growing any tropical or sub-tropical product tolerant of the prevailing climatic influences—i.e., abundant moisture and humidity.

Free Sandy Loams.

Group C.—The third series of soils mentioned varies in density from light sandy loams to medium loams. They are well drained and make good fruit soils when subjected to efficient cultivation. They are easy to work and retain moisture well when kept in good tilth. By the addition of green manures and the judicious application of irrigation, excellent results may be obtained from them, especially with citrus and other sub-tropical fruits.

SELECTED LIST OF FRUITS.

In considering the possibilities of fruits that may be grown commercially, three points have been kept in view, viz.:—

1. That suitable climatic and soil conditions meet the requirements of the plant.
2. That with existing transport facilities the fruit may be marketed without undue difficulty. (See note on Avocado.)
3. That edible qualities should command ready sale in all parts of the Commonwealth.

In compiling the following list as being worthy of consideration in relation to fruitgrowing projects in this area, due regard has been given to the opinions of investigators of these matters in other countries.

Avocado (*Persea gratissima* Guertin).

Tree growth variable according to species, but mostly vigorous. Fruit of many shapes, from oblate to bottle-shaped. Colour light green, dark green, purple, brown, and red. The centre occupied by single large seed. The rind may be thin and delicate to thick and leathery. Edible portion situate between rind and seed, and when properly ripened is of the consistency of firm butter; texture should be smooth and free from fibre, but many seedling fruits are quite the reverse. Productivity is as variable as other characters mentioned among seedling trees.

Soils.—The tree is not exacting in its requirements so long as good drainage is afforded. Loamy soils rich in organic matter (humus) and capable of retaining moisture are preferable.

Varieties.—Trapp, Dickinson, Taft, Pollock, Meserve, Murrieta, Solano, Colorado, Lyon, Cardinal, Quality, El. Presidenti, and Puebla.

Propagation.—Budding desirable varieties on to seedling stocks resulting from seed taken from well grown fruits off healthy and vigorous trees.

Carrying Capabilities.—In some varieties keeping qualities are much better than in others. Thick-skinned varieties are, if of a slow-ripening character, best suited for distant markets. Refrigeration offers possibilities in regard to long-distance carriage.

Mango (*Mangifera indica* L.).

Growth strong among seedlings, but not so much so in worked trees. Fruit varies in size and character. Skin smooth, and in some highly coloured, the latter depending on climate in which they are grown. Flesh yellow to orange in colour, juicy and often fibrous in seedlings and inferior budded varieties, but in the best sorts entirely free from fibre; texture smooth and melting, rich and luscious in the best varieties.

Soils.—Sandy loams capable of retaining abundant moisture.

Varieties.—Alphonse group—"Bennett," "Amini," "Cambodiana," "Pari." Mulgoba group—"Haden," "Mulgoba." Sandersha group—"Sandersha." Philippine type—"Carabao," "Pico." Bowen type—"Kensington Pride," "K.P.A." (H. B. Lott).

Propagation.—Shield budding desirable varieties and top-working inferior kinds.

Carrying Capabilities.—Reasonably good when properly treated and packed.

Mangosteen (*Garcinia mangostana* L.).

Tree of medium size, slow grower, and slow to produce fruit. Fruit round, 2½ to 3 inches in diameter. Rind thick and tough; colour dark purple to almost black. Edible portion surrounding seeds in centre of fruit consists of a white substance of delicious flavour.

Soil.—The mangosteen prefers a rich, moist, and well-drained soil, and sheltered locations in districts of great humidity.

Propagation.—Offers a field for experiment in relation to budding, grafting, and air-layering to hasten fruiting.

Varieties.—Available stocks are *Garcinia Xanthocymus*, *Garcinia Mestoni*, and *Garcinia Gibsi*, the latter two being indigenous to the Bellenden-Ker and Booje areas, North Queensland.

Litchi (*Litchi chinensis* Sonnes *Nephelium litchi* Bailey).

A handsome tree of medium size. Fruit about the size of a small plum, produced in loose bunches; the translucent, pleasantly acid, juicy aril, enclosing seed, is contained in a red, warty, thin shell. Of good quality eaten out of hand or dried.

Soils.—Deep loamy soils rich in humus in areas of heavy rainfall and humidity.

Propagation.—Grafting, air-layering, and by seed. Budding should be tried. Stocks: Litchi and Loongan (*Euphoria longana*).

Carrying Capabilities.—Reasonably good with refrigeration. Fruit can be preserved or dried. Imported into the Commonwealth in latter form.

Varieties.—(Indian) "Bedana," "McLean's," "Rose" (Chinese), Lohmaichi.

Rambutan (*Nephelium lappaceum* L.).

Tree vigorous and erect. Fruit resembles the Litchi in character. Borne in clusters, shape oval, 2 inches long, covered with soft fleshy spines. Colour red, sometimes orange-yellow. The outer covering of fruit from which the spines arise is thin and leathery, and when removed exposes a white translucent juicy aril which adheres to an oblong-pointed flattened seed. The flavour is acidulous, suggesting that of the grape.

Soil.—Deep rich loams, well drained, in moist hot areas.

Varieties.—Malayan and Ceylon.

Propagation.—Similar to the Litchi.

Brazil Nut (*Bertholletia excelsa*).

Large growing tree. Fruit large, containing eighteen or more nuts.

Soil.—Rich deep loams and scrub soils in areas of abundant rainfall and great humidity. Imported into the Commonwealth.

THE STATE NURSERY, RUSSELL RIVER.

The institution of an Experimental Station on Russell River is an important step towards the development of tropical fruit culture. The economies of production in connection with land settlement warrants attention to research. In order that such research should have economic and practical value, a broad field of operations should be provided to admit of experimental work in relation to plant production, including propagation, acclimatisation, plant breeding, soil investigations, and protective work in relation to diseases and pests. That there is a field offering for investigation of stocks and scions is generally recognised, especially in the case of the mangosteen. The introduction of plants and the testing of them under North Queensland conditions presents an important aspect, as it would furnish tangible evidence on the possibilities of successfully producing many tropical products in this area. Plant-breeding is an inviting field for the production of new, resistant, and more productive varieties. It is obvious that a research and experimental station could assist very largely in the development of tropical fruit-growing, especially of those fruits discussed in these notes.

SUMMARY.

1. The areas suited for the growth of tropical fruits are outlined.
2. Suitable soils are classified and necessary modifications on cultural procedure with each fruit considered.
3. The fruits with potentialities are listed and include Mango (*Mangifera indica* L.), Avocado (*Persea gratissima* Guertin), Mangosteen (*Garcinia mangostana* L.), Litchi (*Litchi Chinensis* Sonnes), Rambutan (*Nephelium lappaceum* L.).
4. The functions of an experimental and research station at Russell River in relation to these fruits are discussed.

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SUBSIDIARY INDUSTRIES FOR WESTERN QUEENSLAND.

By WILLIAM LESLIE, Assistant Instructor in Fruit Culture.

The time seems opportune for the consideration of other means of utilising land in Western Queensland. The success attained by the Prickly-pear Commission is setting free large areas, some of which are already cleared of pear and on which ringbarking is proceeding, particularly between Warra and Miles.

Several kinds of economic plants deserve attention in this regard, including:—

Fruit.

The cultivation of citrus fruits might well be extended to this region, because the finest quality of oranges, mandarins, and lemons can be grown and are being grown. Grapes of the finest quality do very well, and with a largely increased production a dried fruits industry might be established. Olives are already growing well on a small scale in Western Queensland, and the date palm also thrives there. There is a risk, however, in some districts of fruit trees and vines being attacked by white ants.

Fodder Trees.

In this comparatively dry area it seems reasonable to look to fairly deep-rooted edible trees and shrubs as a stock food standby.

A tree which has claimed attention recently is the carob bean (*Ceratonia siliqua*). It has been observed thriving and fruiting in isolated places in the West,* and indications point to its fitness for withstanding a prolonged dry spell. It yields an abundance of sweet pods and it is for the sake of these that it is cultivated in the Mediterranean region, and large quantities are imported into the United Kingdom as a concentrated cattle food. The pods could probably be desiccated and the seeds extracted readily. It could probably be best grown in the form of groves or wide shelter belts. The latter could be formed on the boundaries of paddocks and securely fenced to prevent the trees being injured and the pods, as they fall, being eaten by stock. Deep sandy soil, preferably on a ridge, would probably be most suitable. Trees could be planted at about 15 feet apart in rows 30 feet apart with a view to cutting out alternate trees in the rows in later years as required. The only cultivation appearing necessary after clearing and planting would be to run a disc cultivator between the rows several times a year and so keep down weeds and maintain subsoil moisture. The seedlings do not transplant readily, but a system of sowing a few seeds at each peg, *in situ*, might prove successful. The first crops would consist of few pods, but as the trees grow older increasing quantities would be harvested.† They could be raked off the ground and put in bags or if desiccating machinery were available they could be carted off loose to the machine. The desiccated pods could probably be readily stored in bags or in large tanks like maize. Some special use might be found for the seeds.‡

If this tree could be cheaply and extensively grown in Western Queensland, it would probably prove of immense value to the grazing industry. Seeds of this tree have already been distributed on a small scale and several stockmen are interested.

Fibres.

Among fibre-yielding plants there are some which are reputed to be drought-resisting. The Sisal Hemp (*Agave rigida var sisalana*) is one, and from isolated instances it would prove hardy and prolific. A number of plantations could be grouped round a factory in a position where water would be available for retting the leaves and washing the fibre. It might also be possible to extract the fibre by a dry method. The freshly cut leaves might be dried in the sun before being sent to the factory.

* Crystal Brook, via Bowenville, Mr. R. H. Fuller. Guluguba, Wandoan Line, Mr. P. F. Stiller. Palm Grove, Guluguba, Wandoan Line, Mr. E. W. Stiller.

† 800 to 900 pods per tree (Chamber's Encyclopædia).

‡ The bark and leaves of the Carob are used for tanning (Ibid.).

Several species of Bowstring Hemp (*Sansevieria*) might also be exploited. Some species have leaves of a succulent nature and are likely to be drought-resistant. With Queensland-grown fibre available, rope and sack-making might be considered as economic possibilities.

Rubber.

The only rubber-yielding tree which would be likely to adapt itself to the climate of Western Queensland is *Manihot Glaziovii*—the Ceara rubber tree. It is reputed to thrive in dry barren soil on the east of South America. It is tuberous-rooted to some extent, indicating the possibility of its being drought-resistant.

THE BANANA INDUSTRY.

PREVENTION OF THE SPREAD OF DISEASE.

The Minister of Agriculture, Mr. H. F. Walker, announced recently that a special committee of the Provisional Banana Industry Protection Board had been at work during the preceding week on the North Coast. Among matters that engaged attention was the investigation of the practicability of establishing a buffer area by the eradication of all bananas in a suitable strip of territory in the hope of preventing the spread of Bunchy Top northwards to disease-free districts. The committee traversed the area between Eumundi and Nambour, and reports that in the region between Eumundi and Yandina there are approximately 150 growers, and between Yandina and Nambour approximately seventy growers. The probable cost of compensation to banana-growers would be from £25,000 to £50,000 apart from the cost of eradication. The effect of eradication would be to create a buffer area of not more than 10 miles wide. According to scientists there is considerable doubt as to whether a buffer area of this width would be sufficient to achieve the objective with a reasonable guarantee of efficacy. Having regard to all the considerations the full board has endorsed the committee's finding to the effect that a buffer area in the locality in question must be regarded as impracticable.

The board has recommended, however, that intensified inspection be provided for in the northern part of the area of slight infection and the southern part of the area which is believed to be free from Bunchy Top. It also recommends that special inspectors be located in the Buderim and Hunchy area, in the district between Nambour and Yandina, and in the territory between Yandina and Eumundi. The latter two districts are believed to be free from Bunchy Top, and the first mentioned is one in which Bunchy Top is present. Active steps are being taken to clean up the area already affected. Certain properties in the hands of the Agricultural Bank have been thoroughly cleaned, and growers are being called upon to do their part in eradicating the diseased plants on their properties. With the advent of the summer rains the danger of the spread of the disease is greater than in winter, and it is desired to do everything possible to control the disease and prevent its further spread northwards. The idea underlying intensified inspection in the two special districts between Nambour and Eumundi is to enable the immediate detection of any spread of the disease into clean territory.

The Minister also stated that he had arranged for the immediate carrying into effect of the recommendations of the Provisional Board. He added that the board had found that the past practice of giving an order for the cleaning up of diseased plantations within ninety days from the date of the issue of the order by inspectors had been taken advantage of unfairly by growers who, in many instances, deferred action until the end of the period, and even then, in some cases, allowing the ninety-day term to expire without undertaking the eradication or cleaning-up work required. Henceforward eradication orders would be limited to a period of twenty-eight days with power to the board to grant an extension, provided there was reasonable evidence that during the initial period of twenty-eight days the grower had made a reasonable effort to do what was required.

Mr. Walker stated further that, as the banana industry is of very great value to the State, every possible endeavour should be made to protect it. He hoped that it would be possible for the board to secure the co-operation of growers without the necessity of taking legal proceedings for breaches of the regulations. Such proceedings, however, would have to be taken against owners of plantations whose properties constituted a menace to the industry as a whole.

RURAL LIFE IN OTHER LANDS.—VII.

By the EDITOR.*

JOURNEYINGS IN GERMANY.

IN our last talk we gave some consideration to the development of agriculture in Germany. We showed that this was largely due to improved methods of agriculture, more intense cultivation, and closer attention to the economics of agriculture. For purposes of convenient comparison we took the production figures of Great Britain and placed them side by side with the figures of German output. This comparison showed that the volume of production was in favour of the German farmer; but we were also careful to point out that the difference was accounted for by the fact that in Great Britain the lesser volume of production was due, primarily, to so much more arable land being allowed to go into and remain in grass than was the case in Germany, and not to any superiority in skill and methods employed by the German farmer. As a matter of fact, in this respect, in my opinion, the British farmer more than holds his own, and as a live stock breeder particularly, as everyone knows, he has no superior. The comparative lesser volume of output in Great Britain was secondarily due to causes, economic and otherwise, which it is not our purpose at the moment to discuss. It is proposed now to give some time to a consideration of one or two of the economic phases of German agriculture, particularly in relation to co-operative associations, in respect to which I was able to make some small inquiry during my short stay in Germany.

Co-operative Sale of Live Stock.

One thing that impressed an enquirer particularly was the extent to which the co-operative principle is applied by the German producer to the sale of live stock. A study of available literature† helped one to understand this.

While the beginnings of the modern co-operative movement may be traced to the middle of last century, the co-operative sale of live stock only dates from the eighteenth century. Co-operation in this form was forced on the German farmer as a consequence of serious difficulties encountered in live stock dealing and in meat distribution.

In the rural districts the butcher buys his fat stock direct from the farmer. Direct purchase is not, however, possible in the large towns and industrial centres, where the demand for meat is enormous. Live stock dealing had become essential, and the trade had come increasingly to employ agents, while the live stock was sold on the markets by commission salesmen. In the larger cities a new intermediary element was introduced, the wholesale butchers coming into the market as buyers and slaughtering to sell to the retail dealers according to their individual requirements and extent of custom. Thus, in order to reach the consumer from the producer, the meat passed through the hands of the agent, the dealer, the salesman, and the wholesale and retail butchers. Such a system naturally created difficulties, due largely to the fact that the producer lost whatever influence he might have on the sale of his own produce. In particular, the small farmer was completely at the mercy of the dealer, who was favoured especially by the circumstance that, if losses were to be avoided, the producer's stock which was ready for market had to be sold at once. The fact, too, that the market price was known by the dealer before the farmer knew it was a further cause of trouble; there were no means of finding out precisely the prices actually paid, and the market reports were not always quite reliable.

Although money-lending in connection with live stock dealing—a curse in the Rhine Provinces and also in Hesse—had been checked effectively by the action of the co-operative societies, the dependence of the small occupying owner on the dealer continued, though he was not fully aware of the fact. On the other hand, the interests of the consumer were also disregarded by the live stock dealer, who in this case also made full use of his power.

These difficulties have a ring of familiarity to the Queensland farmer; as a matter of fact, they are common to most countries. The price of many of the most important articles of food is often determined by chance, want of means, and a system that, in practice, is often quite unfair. A well-considered organisation of the live stock trade along enlightened lines has not been very evident anywhere.

Other difficulties were noticed in Germany which, on occasion, provided some striking examples of disorganisation in respect to the disposal of rural products. No co-operative activity has ever been spared the "ailments of babyhood"; it must go

* In a Radio Address from 4QG.

† International Review of the Science and Practice of Agriculture.

through its teething and measles periods. That was our experience in Queensland, and it was no less so in Germany. In the co-operative sale of live stock mistakes were made and heavy handicaps carried. The trade waged an extraordinarily keen fight against the co-operative societies, and used every available weapon. The co-operative movement constituted a challenge to the existing order, and the challenge was accepted immediately. Large sums were sacrificed by the dealers with the object of defeating the farmers' efforts to control their own industry. Unfortunately, bad faith among the co-operators, a condition of disloyalty with which we are quite familiar, proved a valuable auxiliary to the trade in its war on the co-operative sale of cattle. The societies had to embark upon a direct campaign in which the main argument was that co-operation is based on the proper discipline of the members, and the farmer cannot shake off this painful dependence on the middleman except by a cheerful acceptance of the obligations he owes towards his co-operative society and his fellow farmers. But, despite all the difficulties in the way, these societies eventually by efficient service won through to success.

Price Regulation.

The importance of the local societies for the sale of live stock was shown in their influence in regulating prices and the stand they took against trade manœuvring and manipulation. For example, to quote one instance, after the formation of such a society in one district in Germany from which all the fat stock were sent to Berlin, the prices paid to the farmers went up 25 to 30 per cent. in consequence of the competition set up with the dealers.

The object of the co-operative sale of live stock was first and foremost to check unfair trade and to eliminate the superfluous middleman. But there were also wider aims, among them being the desire to secure to farmers a proper influence in price movements which had hitherto been dominated wholly and solely by the trade.

These co-operative societies developed remarkably up to the outbreak of the Great War. The war and war economy schemes put an end to the unrestricted co-operative sale of live stock, and the societies were merged in the general war economy organisation.

After the war, in October, 1920, the industry was decontrolled. Checks to free productive activity were removed, but the scarcity of all goods and the depreciation of the currency, with all its consequences, made co-operative selling difficult.

Growth of the Co-operative Idea.

The co-operative idea generally has gained much ground in Germany, as shown by the large increase in the number of co-operative societies in recent years. The number of co-operative live stock societies, for instance, has risen from 228 before the war to well over 400.

In the time at my disposal it has only been possible to touch the fringe of this interesting subject, but a closer study of this phase of agricultural organisation in Germany would, I think, well compensate for the time devoted to it. To sum up, in respect to co-operative live stock selling, the German farmers found that their work demanded the employment of a staff with high professional and technical qualifications. As I have pointed out before in a similar discussion, brains had to be matched with brains. To fall below their standard of efficiency was simply to court defeat, and that the German farmer could not afford. It was also found that a staff with purely business experience only was not sufficient. The staff must be permeated with the co-operative idea, and must bring to bear co-operative influence as strongly as possible in order to maintain the movement in full vigour; otherwise co-operative selling would become a mere counterpart of the trade, and the co-operative societies themselves would lose their economic and social character which made them so valuable in the national interest.

The difficult economic conditions of the present day demand the displacement of all unnecessary middlemen. That was the feeling among the German farmers, from what I could gather. In that respect it seemed to me that their viewpoint was identical with our own. It need not involve unreasonable claims on the part of the co-operative movement, nor any failure to recognise the right of honest trade to exist. There is plenty of scope for the activities of both, and the monopoly of either is a thing, I think, to be avoided. As in all co-operative work, the object of co-operation cannot be fulfilled unless individual farmers understand the necessity of maintaining in their own interest, and by means of active personal support, the institutions set up by their own industrial organisations. In effect co-operation means simply good discipline and good order.

A Word for Queensland.

If time had permitted I should have liked to have said something about what one was able to learn of the workings of the co-operative banks established by agricultural co-operative societies in Germany, and also something of their remarkable system of instruction in farm household economy. As regards farm household economy, however, for evidences of efficient instruction we have no need to go beyond the borders of Queensland. Our own State-wide system of public instruction, departmentally and otherwise, which, by means of travelling domestic science and technical instruction cars and rural schools, take the technical college from the city to the farm, compares, in my opinion, very favourably with similar systems, the operations of which I was able to observe in a necessarily restricted way, in the older countries of Europe which it was my good fortune to visit.

Back Through Rhineland.

Continuing our journey along the Rhine we passed on to Mayence, through Rheingau, a rich and beautiful district which produces some of the most famous wines of the world; past the Niedervald, clothed with vineyards at the point where the celebrated river quits the Rheingau, on to Wiesbaden, the famous watering place, surrounded with productive orchards and vineyards and beautiful public gardens.

The extraordinary exploitation of natural mineral waters in Wiesbaden and in Germany generally set one thinking of the possibilities of our own artesian wells in this regard. Looking ahead one can easily imagine the great asset Queensland will have in its bore waters, apart altogether from their inestimable value for stock purposes. For the moment I am thinking of the wells at Dalby and Muckadilla which—and this is only a layman's opinion—warrant far wider advertisement than they have yet received.

It was interesting to pass Rolandseck again and revive the memories of its tragedy; to pass the rock of Lorelei; the castle of Stolzenfels with its many turrets and beautiful oriel windows; to come to Boppard, where the river curves again and the ranges recede, giving a view of fair fields, fertile wheatlands, and vine-clad slopes; to pass St. Goar and the wonderful mediæval castle of Rheinfels, where the river broadens out into a lake-like expanse; to pass Bacharach, the island on which an old fortress stands and where, in the bad old days, all the ships that went by were compelled to pay tribute; and arrive at Mayence or Mainz, at the junction of the Main and the Rhine, a great commercial and manufacturing city in the midst of gardens and vineyards. It was there, in the reign of Augustus, the old Roman Mussolini, that Drusus drove in his tent pegs.

The Black Forest.

Having come so far, an excursion to the Black Forest, the home of history and legend, both weird and beautiful, could not be missed. The Rhine forms its natural boundaries on the south and west, its eastern mountain ranges are bordered by the plains of the Neckar, while its northern limit is marked by Baden Baden.

One can get to the heart of the Black Forest from a town called Freudenstadt, a place with something like 15,000 people, and situated on one of the outer mountain ridges. From there the railway descends into one of the most beautiful valleys of the whole region. There is a country where life may be observed in all its rustic simplicity, a community disturbed very little by modern discoveries and inventions, a remnant of the ancient Swabian race, whose political importance is long lost. There one found a people holding to much the same customs as their fathers and grandfathers did back through the centuries. The dominant impression of this district, which covers an area of something like 2,000 square miles, is of the forest which crowns every hill and borders every valley. It has no large towns, no large estates, and therefore no splendid country houses that are such a delightful feature of rural England. But there is scarcely a valley or mountain that has not furnished a legend or a tale of romance and high adventure to German literature.

From high up on one of the crests the silvered surface of a mountain lake reflects the castle on its opposite bank, while beyond and below lies the Rhine Valley, dotted with villages and tiny homesteads, and away in the distance, beyond Appenweier, the cathedral tower of Strasbourg, veiled with smoke and haze. To the east an array of mountain peaks, divided by deep valleys, break the skyline, while a little to the right some of the peaks of the distant Alps are faintly seen, while the great ranges of the Black Forest extend in parallel ridges to the south.

A short journey south-west of a place called Baierstrom brought us to the head of the Murg River and to the famous high road celebrated during the wars of the French Revolution. This road, paved and graded to bear the heaviest artillery, and extending for miles along the crest of the highest mountain ridge, connects the Rhine Valley with the Neckar.

Apart from the Forest itself, one of the most striking features of this part of Southern Germany is the magnificent system of country roads.

The average home of the Black Forest farmer exhibits the utmost in domestic economy. Furniture and conveniences are reduced to the limit of necessity. The same roof which protects the family shelters the live stock, hay, grain, and farm implements. Neither youth nor age exempts the women and girls from man's labour on the farm. One could see young girls alongside their grandmothers swinging the scythe to rhythmic measure. But the beauty of their country is beyond description, especially as we saw it in those days of a glorious June, when we were to go from the devastated fields of Northern France to the green meadows and murmuring streams in those delightful forest-bordered valleys in Southern Germany, and also to mark the grim and painful contrast. And so we took leave of a delightful province in Germany and its industrious and kindly people.

Though in this series it has only been possible to skim the surface, one finds that though much may be learnt from even such a fleeting observation of rural conditions in Germany, a strong impression remains that in general and economic progress in which points of similarity exist, the Australian farmer can well hold his own.

ON THE AIR.

LIST OF AGRICULTURAL LECTURES.

Following is a list of lectures on rural subjects which will be broadcast by the Queensland Radio Service from Station 4QG, Brisbane, from 2nd December until 31st January, 1930:—

- Monday, 2nd December, 7.45 p.m.—“The Battle of the Breeds,” by Mr. E. J. Shelton.
- Tuesday, 3rd December, 7.45 p.m.—“Poultry,” by Mr. P. Rumball.
- Wednesday, 4th December, 7.45 p.m.—From the Queensland Agricultural College.
- Thursday, 5th December, 7.45 p.m.—“Our Rural Resources,” No. 2, by Mr. J. F. F. Reid.
- Wednesday, 11th December, 7.45 p.m.—From the Queensland Agricultural College.
- Monday, 16th December, 7.45 p.m.—“Marketing Pigs,” by Mr. E. J. Shelton.
- Tuesday, 17th December, 7.45 p.m.—“Sheep and Wool,” Department of Agriculture and Stock.
- Wednesday, 18th December, 7.45 p.m.—From the Queensland Agricultural College.
- Thursday, 19th December, 7.45 p.m.—“Our Rural Resources,” No. 3, by Mr. J. F. F. Reid.
- Monday, 23rd December, 7.45 p.m.—“Christmas Day on the Pig Farm,” by Mr. E. J. Shelton.
- Tuesday, 31st December, 7.45 p.m.—“A Talk on Poultry,” by Mr. J. J. McLachlan (Assistant Instructor in Poultry Raising).
- Thursday, 2nd January, 7.45 p.m.—“An Organised Rural Industry,” No. 1, by Mr. J. F. F. Reid.
- Wednesday, 8th January, 7.45 p.m.—From the Queensland Agricultural College.
- Monday, 13th January, 7.45 p.m.—“Prospects for the Pig Industry in 1930,” by Mr. E. J. Shelton.
- Tuesday, 14th January, 7.45 p.m.—“An Organised Rural Industry, No. 2, by Mr. J. F. F. Reid.
- Wednesday, 15th January, 7.45 p.m.—From the Queensland Agricultural College.
- Thursday, 16th January, 7.45 p.m.—“A Talk on Poultry,” by Mr. P. Rumball.
- Wednesday, 22nd January, 7.45 p.m.—From the Queensland Agricultural College.
- Monday, 27th January, 7.45 p.m.—“Autumn Crops for Pigs,” by Mr. E. J. Shelton.
- Tuesday, 28th January, 7.45 p.m.—“Sheep and Wool,” Department of Agriculture and Stock.
- Wednesday, 29th January, 7.45 p.m.—From the Queensland Agricultural College.
- Thursday, 30th January, 7.45 p.m.—“An Organised Rural Industry,” No. 3, by Mr. J. F. F. Reid.

CLIMATOLOGICAL TABLE—OCTOBER, 1929.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA, METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	SHADE TEMPERATURE.						RAINFALL.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
<i>Coastal.</i>									
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29-98	85	75	89	28	72	6, 7, 10	Nil	..
Herberton .. ..	.. ..	83	57	91	25	47	9	58	2
Rockhampton ..	30-02	86	65	96	28	54	1	207	7
Brisbane	30-05	79	60	88	27	53	23	258	10
<i>Darling Downs.</i>									
Dalby	30-02	84	54	95	28	43	23	137	7
Stanthorpe .. ..	.. ..	73	48	85	8	38	23, 27	361	7
Toowoomba .. ..	.. ..	75	53	87	28	43	23	326	6
<i>Mid-interior.</i>									
Georgetown	29-92	97	65	102	27	56	3	46	1
Longreach	29-94	95	64	104	24	48	11	Nil	..
Mitchell	30-00	86	54	97	18	43	23	75	3
<i>Western.</i>									
Burketown	29-93	94	69	102	21	62	16	Nil	..
Boula	29-97	92	55	106	23	46	11	Nil	..
Thargomindah ..	29-99	85	61	101	17	52	10, 26	Nil	..

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1929, AND 1928, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Oct.	No. of Years' Records.	Oct., 1929.	Oct., 1928.		Oct.	No. of Years' Records.	Oct., 1929.	Oct., 1928.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
	In.		In.	In.		In.	In.	In.	In.
Atherton	0-85	28	0-22	0-07	Nambour	2-91	33	5-64	0-72
Cairns	1-80	47	0-15	0-05	Nanango	2-28	47	2-63	1-26
Cardwell	1-92	57	0-21	0-13	Rockhampton ..	1-79	42	2-07	1-26
Cooktown	1-01	53	0	0	Woodford	2-43	42	2-97	0-78
Herberton	0-87	42	3-58	0-04	<i>Darling Downs.</i>				
Ingham	1-51	37	0-07	0	Dalby	2-02	59	1-37	1-07
Innisfail	2-83	48	0-30	0-08	Emu Vale	2-17	33	2-14	1-60
Mossman	2-68	16	0-89	0-34	Jimbour	1-88	41	2-00	2-25
Townsville	1-23	58	0-12	0-62	Miles	1-96	44	1-78	0-27
<i>Central Coast.</i>					Stanthorpe	2-53	56	3-61	1-83
Ayr	0-95	42	0	0	Toowoomba	2-55	57	3-26	1-85
Bowen	1-04	58	2-93	0-04	Warwick	2-27	64	3-50	1-55
Charters Towers	0-67	47	0-38	0-19	<i>Maranoa.</i>				
Mackay	1-75	58	0-08	0	Roma	1-74	55	1-41	0
Proserpine	1-81	26	0-56	2-09	<i>State Farms, &c.</i>				
St. Lawrence ..	1-79	58	0-13	3-21	Bungeworai ..	1-39	15	0-77	0-25
<i>South Coast.</i>					Gatton College ..	2-01	30	2-73	1-39
Biggenden	2-23	30	2-08	0-49	Gindie	1-41	30	1-94	..
Bundaberg	1-98	46	2-39	0-45	Hermitage	1-87	23	..	1-26
Brisbane	2-56	78	2-58	1-30	Kairi	0-96	15	0	0-28
Caboolture	2-47	42	2-59	1-44	Mackay Sugar Experiment Station	1-49	32	0-56	0
Childers	2-40	34	5-72	0-27	Warren	2-02	14	..	0-47
Crohamhurst ..	3-28	36	5-09	1-53					
Esk	2-45	42	4-05	1-79					
Gayndah	2-34	58	3-77	0-44					
Gympie	2-69	59	3-06	2-25					
Kilkivan	2-60	50	4-48	3-14					
Maryborough ..	2-64	57	4-06	0-48					

GEORGE G. BOND, Divisional Meteorologist

CORRECTION.

In our reprint from "Hansard" in our last issue of the second reading speech of the Minister of Agriculture and Stock, Hon. Harry F. Walker, on the Diseases in Plants Bill, certain errors, due to an original mistake in the transcript, appeared.

The pink boll worm was obviously confused with the boll weevil, from which Queensland cotton fields are fortunately free.

On page 520 of the November Journal, in the last sentence at the bottom of the page and continuing on page 521 and thereon for two more sentences the Minister is reported to have said:—

"When cotton was introduced here and the question of ratooning came up, it was a debatable question whether the boll weevil, commonly called the corn-ear worm, which attacks similar plants, backed up by many other weevils, was responsible for enormous loss, and in some parts of the world would not practically annihilate the industry here. Through the care of the farmers in Queensland we are now producing cotton almost free from the diseases which affect many other countries. When cotton was produced in the Lockyer district the boll-weevil almost wiped it out."

Those sentences should have read:—

"When cotton was introduced here, and the question of ratooning came up, it was a debatable question whether the pink boll worm and the pest commonly called the corn-ear worm, which attacks cotton and many crop plants, backed up by other insects, which have caused severe losses in other parts of the world, would not practically annihilate the cotton-growing industry here. Through the care of the farmers in Queensland we are now producing cotton free from many of the pests and diseases which exist in many other countries. When cotton was first produced in the Lockyer district the boll worm, or corn-ear worm, almost wiped the industry out."



Photo.: E. Gottke.]

PLATE 223.—MONSTERIA DELICIOSA, GROWN BY MR. BARLOW BLAIKE, YEPPON.

WORMS IN SHEEP. DRENCHING TESTS.

BY J. CAREW, Instructor in Sheep and Wool.

In the course of the last few seasons losses of sheep, caused by stomach and intestinal worm infestation, have occurred in many districts in Queensland. Most of the losses sustained were among weaners, but sheep, both wethers and ewes, up to and including full mouths, were also lost in large numbers. Many growers complained that after giving the usual drenches to control stomach worms, the sheep did not show any improvement, consequently they blamed the drenches used and tried new ones. In most obstinate cases investigated it was found that besides the ordinary stomach worms (*Strongylus contortus*) found in the fourth stomach there were also several bent-head round worms in the large intestines. These are very difficult to dislodge owing to the strength of any drench being diminished or absorbed in its passage through the stomachs and small intestines before reaching these worms, which occupy the caecum close to the colon.

Drenching under the most favourable circumstances necessitates a considerable amount of extra work and expense as well as being hard on the sheep. If they are wormy and given a good drench they improve quickly, but if given a drench that will not kill even the worms in the fourth stomach much work and expense is incurred without any benefit.

Tests at Milmerran.

In order to test some of the recognised drenches in use, and check up on other recent introductions for which satisfactory results were claimed, forty-eight sheep were selected from the wether flock on a property near Milmerran, which were yarded on the evening of 7th October last.

On 8th October they were formed into six groups, each group being branded with a distinguishing mark and dosed between 12 and 2 p.m. The mixing of ingredients, the preparation of drenches, the dosing of each group, and the post-mortem examination was carried out in the presence and with the assistance of Messrs. Euston King, S. Goodsen, and P. J. Bailey.

Group No. 1 was drenched with a 2 fluid ounce dose of a formula containing 2 oz. avoird. arsenic and 5½ lb. Epsom salts to 5 gallons of water. One sheep from this group was killed twenty-four hours after drenching, which on examination showed several stomach worms (*Strongylus contortus*) alive and a few dead in the abomasum or fourth stomach. Several bent-head round worms were found alive in the large intestines. Most of these were located, as is usual, in the caecum close to the colon.

Forty-eight hours after drenching another sheep from this group was killed. No stomach worms dead or alive could be found in the fourth stomach, but numerous bent-head round worms were found alive in the large intestines. During the test these sheep showed no difference in appearance to the control sheep on the first day, but were better and brighter on the second day.

Group No. 2 was drenched with a 4-oz. dose of a formula containing 1 lb. bluestone, and 1 lb. mustard to 10 gallons of water. One sheep from this group was killed twenty-four hours after drenching which showed a few stomach worms alive and several dead in the fourth stomach. Several bent-head round worms were found alive in the large intestines. The coating of the fourth stomach was somewhat inflamed, but the group was normal as compared with the control lot.

Forty-eight hours after drenching another sheep from this group was killed. Examination revealed no worms dead or alive in the fourth stomach, which showed no signs of inflammation. Some bent-head round worms were found alive in the large intestines.

Group No. 3 was drenched with a 2-oz. dose of a formula containing 2 oz. arsenic, 5½ lb. Epsom salts, and 8 oz. bluestone to 5 gallons water. The sheep which was killed from this group twenty-four hours after drenching showed no worms in the fourth stomach either dead or alive, but a few stomach worms were found dead in the bowels. Bent-head round forms were found both alive and dead in the large intestines. The lining of the fourth stomach was found to be inflamed. This group appeared to be more tucked up and weakened as compared with other groups and controls.

Forty-eight hours after drenching, another sheep from this group was killed which showed no stomach worms dead or alive in the fourth stomach. There was

no sign of inflammation on the lining of this stomach, which appeared quite normal. A few bent-head round worms were found alive in the large intestines. This group was much improved and quite equal in condition to any of the other groups.

Group No. 4 was dosed with 5 cubic centimetres of a formula composed of two parts carbon tetrachloride to three parts of paraffin oil. One sheep from this group killed twenty-four hours after dosing showed large numbers of stomach worms alive in the fourth stomach, but no dead worms could be found. Another sheep from this group was killed forty-eight hours after dosing, when only a few worms were found alive in the fourth stomach. Several bent-head round worms were found alive in the large intestines. The dose was given with a syringe fitted with a long nozzle which was inserted behind the tongue before being ejected, the mouth of the sheep being held open by an assistant. Immediately following the administration of the dose the sheep generally coughed in distress, but no evil effects followed and all the sheep in the group compared at par with other groups. A double dose was given to one sheep without causing any noticeable difference during the test, but was not killed to ascertain results.

Group No. 5 was dosed with 5 cubic centimetres through a syringe fitted with a long nozzle. The formula was prepared by Mr. Brünlich, Agricultural Chemist. One sheep from this group killed twenty-four hours after dosing was found to contain large numbers of dead stomach worms in the fourth stomach and a few alive. Some bent-head round worms were found alive in the large intestines, but appeared very "dopey." Forty-eight hours after drenching another sheep from this group was killed, when a few stomach worms were found alive and a few dead in the fourth stomach. A few bent-head round worms were found alive in the large intestines. The space where these worms are usually found was free, which would indicate that they had been passed out, although no dead worms could be found.

A double dose of this mixture was given to one sheep of this group. Twenty-four hours after dosing this sheep looked distressed and distended, forty-eight hours after dosing he was on a par with the remainder of the sheep in this or any of the other groups.

Group No. 6 was branded but received no treatment. This group was kept with the sheep which were treated in order to check up on them during the test. These sheep showed about the same as the best of the treated groups twenty-four hours after the other groups had been dosed, but did not brighten up to the same extent during the following day. Forty-eight hours after the other groups were dosed two sheep from this group were picked out to be slaughtered. The first one killed was in good condition, one of the best in the flock and suitable for mutton. On examination several stomach worms were found alive in the fourth stomach. The intestines did not show many nodules or lumps, while the bent-head round worms in the intestines were very few as compared with all other sheep examined. The second sheep killed from this group was in poor condition and similar to those killed from the treated groups. In the fourth stomach large numbers of stomach worms were found, the contents showing a seething mass. Nodules on the intestines were very numerous, while in the large intestines the bent-head round worms were very numerous.

In all the sheep killed a fair quantity of sand was found which may have been taken in while eating short grass from sandy ground, but usually the wormy sheep will lick up earth of some description and, incidentally, the control sheep that showed the greatest number of worms contained the greatest quantity of sand.

Twenty-four hours after drenching the weather turned very cold, and when the sheep were turned out they looked hollow and miserable. Early in the night it commenced to rain, yielding 35 points. It would have caused no surprise if a few of the weaker sheep, and especially those that received a double dose, had died during the night, but their quick recovery and bright appearance was very noticeable when brought to the yard at midday.

Summary.

As a result of the tests the arsenic and Epsom salts had killed only a few stomach worms at the end of twenty-four hours, but no living worms could be found at the end of forty-eight hours after drenching. The worms in the intestines were not affected.

The bluestone and mustard had killed nearly all the stomach worms at the end of twenty-four hours, and no worms could be found alive in the fourth stomach after forty-eight hours. The effect on the intestinal worms was not distinct or decided.

The arsenic, Epsom salts, and bluestone formula acted quicker than either of the above. Besides killing all the stomach worms within twenty-four hours it also killed many of the bent-head round worms in the intestines. By the appearance of the lining of the fourth stomach the dose is rather strong.

The carbon tetrachloride seemed to be quick in its action on the sheep when administered, but slower than either of those drenches containing bluestone in killing the stomach worms. No effect was apparent on the intestinal worms.

Mr. Brünnich's mixture showed the greatest number of dead worms in the fourth stomach twenty-four hours after dosing, although a few were still alive forty-eight hours after dosing.

Bent-head round worms were very "dopey" twenty-four hours after dosing, but as the dead worms were very difficult to find under the conditions prevailing, a definite kill could not be determined.

It will be noticed that the ingredients in Mr. Brünnich's mixture is not set out. As this is the first occasion on which it has been used by this department the test was only a trial which will act as a guide for further experiments.

Owing to the difficulty to correctly determine the result of the two drenches which acted on the intestinal worms, arrangements were made to carry out further tests in order to secure more definite results.

DRENCHING TESTS AT YEERONGPILLY.

Later tests were carried out at the Yeerongpilly Stock Experimental Station and following are the results:—

Eleven sheep were secured from the same flock at Milmerran. The sheep were drenched on 26th October and taken off good grass just prior to drenching. They had no water for sixteen hours.

Sheep No. 1.—Formula: 30 grams dichloro benzol, 100 cc. paraffin. Dose 5 cc., with a long-nozzled syringe. Post mortem forty-eight hours later revealed several stomach forms alive in the fourth stomach and bent-head round worms in the large intestine.

Sheep No. 2.—Drenched 26th October. Formula same as above. Dose, 10 cc. Post mortem seventy-two hours later. Several stomach worms alive in the fourth stomach, also bent-head round worms in the large intestines.

Sheep No. 3.—Formula: 30 grms dichloro benzol, 20 cc. benzol, 20 cc. petrol, 40 cc. castor oil. Dose, 5 cc. Post mortem seventy-two hours after dosing revealed both stomach and bent-head round forms alive in large numbers.

Sheep No. 4.—Formula: 20 grms dichloro benzol, 30 cc. benzol, 20 cc. croton oil, 60 cc. paraffin. Dose, 10 cc. Post mortem seventy-two hours after dosing. A few stomach forms were found alive in the fourth stomach, also a few bent-head round worms in the cæcum. The contents of the fourth stomach was below the usual quantity and soft, while the contents of the small and large intestines were also soft and contained much mucus.

Sheep No. 5.—Formula: 2 oz. (avoir.) arsenic, 6 lb. Epsom salts, 5 oz. bluestone, 5 gallons water. Dose, 2 fluid ounces. Post mortem seventy-two hours later. A few stomach worms were found alive in the fourth stomach. Bent-head round worms were found in the cæcum, but not in large numbers. Those which were present were not close to the colon as is usual, which would indicate that the drench had dislodged at least some of them. On this occasion the sheep were on good grass, which was green and carried a heavy dew during the early hours on the day they were drenched.

To secure the most reliable results a further batch of three sheep were selected and placed in a loose box at 4 p.m. on the 31st October. They were without food or water from then until 11 a.m. on the 1st November, when they were drenched with the following:—

Sheep No. 8.—Formula: 30 grms dichloro benzol, 100 cc. paraffin. Dose, 10 cc. Post mortem revealed plenty worms alive in fourth stomach. Worms of two varieties, specimens of which have been taken. Sheep killed seventy-two hours after drenching.

Sheep No. 9.—Formula: 20 grms dichloro benzol, 30 cc. benzol, 20 cc. croton oil, 60 cc. paraffin. Dose, 10 cc. No worms anywhere, dead or alive. Experiment chiefly remarkable for very inflamed membrane of fourth stomach and big gut. Consider that, recollecting seventy-two hours had elapsed since drenching, inflammation excessive and possibly dangerous.

Sheep No. 10.—Formula: 2 oz. arsenic, 6 lb. Epsom salts, 5 oz. bluestone, 5 gallons water. Dose, 2 fluid ounces. Many dead worms of two varieties in fourth stomach. No live worms. No live worms in either the fourth stomach or in the large intestines. No indications of inflammation. A fact to note in connection with this sheep was the extremely black blood when killing. This is not associated with the drench, but merely the fact is noted.

The cost of the different drenches is a matter of much importance as also is the time of preparation and the convenience of administration.

The cost of the ingredients to make sufficient arsenic and Epsom salts drench to dose 1,000 adult sheep would be approximately 4s.

This mixture must be boiled until the arsenic is dissolved, which generally takes about three-quarters of an hour. To add 5 oz. of bluestone to this drench would increase the cost to 4s. 6d. per 1,000 adult sheep.

Two and a-half pounds each of bluestone and mustard are required to drench 1,000 adult sheep at a cost of about 9s.

Carbon tetrachloride, two parts, and paraffin oil three parts, mixed together and given in a five cubic centimetres dose works out according to the price of the materials used at 20s. per 1,000 adult sheep.

The mixture which was used, as prepared by Mr. Brünnich worked out at a low cost, but as he is still working on it, for the purpose of further tests, the final results will be decided when these tests are completed.

Summary of the Yeerongpilly Test.

When the sheep were allowed on good grass up to the time of drenching the results were not so satisfactory as when starved from eighteen to nineteen hours at Milmerran, and in the case of sheep No. 10 at Yeerongpilly.

The quantity of bluestone in the arsenic and Epsom salts was reduced from 8 to 5 oz., at which strength it proved more satisfactory against both stomach and bent-head round worms than any other drench tried.

CATTLE BREEDING AND MANAGEMENT.

By H. ANNING, Wetherby, via Richmond, Queensland.*

When the cattle which have just been banded, drafted, and delivered have been turned out and started well away, "Algy's" job is to hand the bullocks over to the drover, after first of all taking the ages and jotting them down. The drover takes them out to his camp, and starts herding them. It is handy to know the ages of the bullocks which are being sent away. These can be given to the agents to hand on to probable buyers, who will know just what they are going to inspect.

The drover who knows his work will hang up a lighted lamp on a tree in the yard. Bullocks get used to this, and look for it on the road, as it means a camp for them, and they will walk straight for it at night, round up and lie down. It seems to have a steadying effect on them as well. The object of having the bullocks well away from the branding yard is because the grass all round for a mile or so will be trampled down during the delivery, and it is essential that bullocks get a decent feed and drink every day, as then by the time they are ready to go on the road they will have been thoroughly broken in, and no trouble to handle. A good drover loves the job of herding bullocks, and "Algy" will find the extra expense of holding them preparatory to starting may be reflected later in the price he gets.

While in hand they will be fed down to the camp on the main creek, or probably there may be two camps, and these can be utilised week about. Of course, they will not be driven over the same bit of country each day. By the time they get back at night, they will be content to go straight in, find their night's camp and lie down, after a heavy sigh, and not stir again till daylight. Every day they get a bit quieter, and will let the drover ride through them without taking any notice. Of course, the fresh bullocks coming in every day stir them up a bit, but these soon settle down.

* In the "Pastoral Review" for September. (Previous notes by the same writer were reprinted from the "Review" in the July issue of the "Queensland Agricultural Journal.")

When 1,000 are in hand it is time to start them south. In case of pleuro showing, it is essential to inoculate, which, properly done, speedily knocks the disease out of them. No doubt the bullocks will be headed for the nearest market, offered for inspection and sale on the road, and if not sold it is a good plan to offer by auction at a good centre after classing them. Failing that, it is well to get a bit of good agistment, let them freshen up and sell when rain creates a better demand. Exactly the same procedure is followed with the second lot.

It is always a relief to get a mob well away with a good drover. So many things can happen, and if they start rushing for any reason that makes things bad. Rushing (which American cattlemen call stampeding) is one of the worst and most nerve wracking businesses imaginable. It can start in a dozen different ways, but usually it commences with the bullocks getting a sudden start. They all jump up, panic-stricken, and start galloping. It generally ends (the first time) with "ringing," the cattle galloping around and around in one place till the ground is all cut up like a ploughed field. In some herds cattle can be counted on to rush for certain. Where they are run about and speared by blacks they are generally bad. Blacks run them into bogs, up blind gorges, and over rough country. What cattle escape never forget the experience, and the slightest thing starts them at night.

Since the bullocks keep rushing every time a mob is mustered, often a wing gets away, and these are mustered the following year, and being roguish start the next mob going, and so it continues from year to year. The longer cattle in hand rush the more terrified they get of one another. Many are killed, others are lamed, their horns knocked off, and it is most difficult to know what to do. If they start on the run the best thing is to box them up with a lot of mixed cattle, watch them in a good open place, and build a lot of fires around them. Mixed cattle won't rush like bullocks, and they act as a brake on operations. If they rush much at night, they want a long spell in the day. On watch, the men want good night horses and whips. Every time the bullocks rush off camp they should be flogged back to it. After a while they get to understand they musn't leave the camp.

On watch the more noise the men make the better. Bush classics like "The Wild Colonial Boy," "On the Banks of the Reedy Lagoon," and "The Branding of the Bunyip" may be sung to popular accompaniments. It helps to steady the cattle, keeps the men awake, and helps to educate newchums. Getting off to replenish fires (which should be kept burning freely) men must be warned not to get between the fire and the cattle, as the gigantic shadow suddenly thrown over the sleeping mob may cause a bad rush. One has to be careful when striking matches, especially on a dark night, and it is best to use a firestick. Plenty of light, good music, and good feed and water by night, and the cattle may settle down.

I remember one enterprising youth who had joined up with a rushing mob, saying to his boss who was taking a pack-horse into town for some sundries, when asked if he wanted anything, replied: "I'll get you to get me an accordion to play on me watch—that'll quieten 'm down a bit," "Oh, I'll get you a peanner," responded the boss, and the youth understood and kept quiet himself in future.

Cattle are most dangerous when all are lying down (or nearly all). There are generally two or three standing, and when these lie down others get up. Cattle accustomed to rushing offer give utterance to one or more "shivers" before jumping up. It can hardly be described, and must be heard to be appreciated. It is something like an electric thrill, which runs through the whole mob. It also runs through horse and man on watch. Old night horses know it, and prick up their ears at the deadly ominous murmur (although it can hardly be called a murmur), and one can feel their hearts thumping the saddle flap. They are all keyed up for an instantaneous start and a midnight gallop. Sometimes, after a few shivers, the cattle settle down and camp. Some drovers ride in amongst them, and stir them up, as cattle are not so likely to rush when moving about.

Few things make a man realise his pathetic futility more than a big rush on a dark night in timbered country. Everything may be peaceful, when a stick cracks, or the sudden flare of a match starts them going. In a split second they are off. The trained night horse races immediately for the leaders. He loves the game, even if the rider does not. The peaceful scene of a second before is changed to one of wild uproar, with men shouting and yelling, whips cracking, horses galloping, and high over everything the roar of the rush, as a thousand panic-stricken, maddened bullocks take a beeline through the timber, smashing undergrowth, tearing up trees, and crippling, maiming, and killing one another.

One advantage has the man on watch, and only one. His horse can gallop faster than the cattle, and he will, if the rider lets his head go. He can't see anything, but the horse will take him to the lead, and swing round with the leaders

as soon as they are turned. Once on to the leaders the man must use his whip and try and swing them around. Once turned, they must be kept going back, as fast as they have left, if possible. It sounds easy enough on paper, but it must be remembered that the bullocks, under the influence of panic, will go anywhere, and the horse will surely follow, through scrub, over holes and antbeds, gullies or creeks—where a fall means sudden death—as the cattle will keep galloping straight ahead. If the men on watch are able to swing the mob around quickly (and time is surely the essence of the contract here), and flog the cattle straight back to camp, and do this each time, it seems to cow the bullocks, and in a while, after a few shivers, they will merely jump up and surge around the camp.

It is no harm, even then, to let the whips speak, and the bullocks will feel and know they can't get away, and it seems to give them more confidence in the watchers and in themselves. Rushing is simply fear of something unknown, and it speedily develops into fear of one beast for another. Old bullocks are hard to check, but young ones are not so bad. It is a bad business with either, though.

CAUSE OF LOW PRICES.

The prime cause of low wool prices is the high cost of the finished article, says the "Sydney Mail." There can be no doubt about that. If woollen clothing could be purchased cheaply enough it would sell without the slightest difficulty—and it is not the growers who are making the big profits out of it. Where are they going? Apparently there is an unreasonable rake-off between the manufacturer and the user. If that could be appreciably reduced there would be little need for a "use more wool" campaign. The same argument applies in the case of meat. For years now stockowners have been pointing out that the retail price of both beef and mutton is out of all proportion to the prices they are paid for their fat stock. Prices in the wholesale market conform with reasonable closeness to stock values, but after that there is a big difference.

With prices down for wool, and the mutton export markets disorganised, this disparity becomes of greater moment to producers. Obviously the bigger the disparity the more difficult it is for producers to get reasonable prices. A rise of 2d. or 3d. a pound in the wool market should not make any substantial difference to the ultimate consumer, but with our present costs of distribution it apparently does. The stating of the problem is easy, but the solving of it is difficult.

SOME CORRIEDALE HISTORY.

The origin of the Corriedale breed of sheep is usually credited to New Zealand, says the "Australasian" (Melbourne), but perhaps the first colonist to conceive the idea of establishing a fixed crossbred type of Lincoln-Merino was a South Australian pioneer. In the year 1872 Dr. Browne had some correspondence with the wool supply committee of the Bradford Chamber of Commerce in reference to his sheepbreeding operations at Moorak. Dr. Browne claimed to be the first in Australia to use the pure Lincoln with a Merino ewe, and one letter went on to say—"I sent them out in 1858, and even that is not sufficient time to produce a regular flock of any considerable number. But that it is possible all my efforts assure me, and I fully believe that I shall continue to grow long wools finer and with more lustre than any I have had the honour of submitting to your inspection. I have a stud flock sufficiently large to breed from by crossing one with the other, and the result of such breeding is to increase the lustre and not diminish the length of the fleece or the size of the sheep. . . . I use the longest fleeced and largest Merino ewes to put with the old, glossily-fleeced Lincoln ram. Hundreds of Merino ewes from this flock when dressed by the butcher weigh 80 lb. and more. The small Merino ewe has great difficulty in bearing to the pure Lincoln ram. The lamb is too large. So that if a breeder cannot get large Merino ewes he should begin with a Lincoln and Merino crossbred ram, and put the Lincoln ram with the increase. The Merino ewe possesses extreme fineness of fibre compared to the Leicester, and another valuable quality—closeness. This my Moorak sheep have in a great degree beyond the English Leicester, consequently you are correct in advising me to continue the use of the pure old lustrous Lincoln ram."

MALNUTRITION.*

By J. C. BRÜNNICH, Agricultural Chemist.

A GREAT majority of our pastoralists had during the last few years a very serious setback on account of drought conditions, and therefore it became necessary to give some advice as to how such conditions may be mitigated, by drawing attention to mistakes made by many and beneficial results obtained by others through the use of licks, &c., during the past season.

The great aim of all animal husbandry is increased production, and this again depends almost entirely on the feeding of stock. Any errors in the feeding will cause malnutrition and disease.

Food Constituents.

Every one is familiar with the chief constituents of foods, which are—

- (1) Proteins, nitrogenous compounds, the important flesh-forming nutrients;
- (2) Carbohydrates (as sugar, starch, &c.) and fats, all nitrogen-free compounds which build up fatty matter and produce heat and energy;
- (3) Mineral matters, which enter into the formation of bones, teeth, blood, and other fluids of the body; and finally
- (4) "Vitamines," accessory foodstuffs of which very minute quantities are required for a complete maintenance of health and normal development of the animals, and generally well supplied in green pasture.

The requirement of mineral matter or salts received but very scanty attention until recent times.

The fact that all foodstuffs contain certain amounts of mineral matter, left in the form of ash when fodders are burned, was well known, and it was generally accepted that any animal fed in a natural way on common ordinary rations like grass, hay, and grain, would receive a sufficient amount of the mineral constituents with the food, which supplied the necessary amounts of proteins, fat, and carbohydrates for its maintenance and growth.

In all living matter the following inorganic constituents are found:—The non-metallic elements—Phosphorus, sulphur, silicon, chlorine, iodine, and fluorine. The metallic elements—Potassium, sodium, calcium, magnesium, iron, manganese, and aluminium; and probably traces of several other elements.

It is a false idea to think that the minerals are required for bone formation only. The inorganic constituents are as essential to animal life as the ordinary organic food constituents, proteins, fat, and carbohydrates. The most important function of the food minerals are performed in the soft tissue and in the blood, where they are essential constituents of living matter, and therefore they stimulate and control directly or indirectly all vital processes.

Functions of Mineral Constituents.

The chief functions of the mineral constituents performed in the animal body are the following:—

1. They are necessary for the maintenance of a proper physiological balance between the mineral elements in the body fluids. Any excess or deficiency of any one of the mineral constituents will affect the vital processes. A deficiency of potassium in the blood will act on the heart muscle and prevent it from relaxing properly, while an excess makes it relax so much that it stops beating. Common salt is an absolute necessity for nutrition, but given in excess will act as a poison and cause serious troubles. The mineral constituents maintain the practically neutral reaction of the blood.

2. They are necessary for the process of digestion. The digestive processes are affected by acidity and alkalinity of the digesting fluids. In the stomach an acid reaction must exist to aid in the pepsin digestion, whereas in the small intestine an alkaline reaction is necessary to allow the trypsin to act. The absorption of the digested products again is controlled by the concentration of the salts, and this concentration will also affect the passage of digested and undigested material along the intestines.

3. Mineral constituents are required as constructive material for the formation of new tissue and building up of the bone skeleton.

4. Milking animals require larger supplies of mineral matters to keep up the yield and average composition of the milk secreted.

*A summary of lectures delivered to the pastoralists in different centres along the Great Northern and Central Railway Lines.

Considerations of Modern Research.

Modern research dealing with the mineral nutrition of farm animals has to consider—

1. Mineral requirement of the various species of farm animals.
2. The correct balance or proportion between the different constituents.
3. Relationship between the inorganic and organic portions of the ration.
4. Effect of outside factors, like sunlight and exercise on the mineral metabolism.
5. Study of diseases caused by faulty mineral nutrition.
6. Mineral constituents of various food stuffs.

1. Of the mineral elements required in the largest amounts for growth, &c., calcium or lime and phosphorus or phosphoric acid stands out on their own, and this is very clearly indicated by the large amounts of both found in the milk of the lactating animals. It will be noticed that the faster the growth of the young animal, the greater the amount of mineral matter required and supplied by its mother's milk.

Species.	Time Required to Double Weight.	COMPOSITION OF MILK.					
		Protein.	Fat.	Sugar.	CaO.	P ₂ O ₅ .	Ash.
	Days.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Woman	180	1·6	3·3	6·2	0·049	0·056	0·25
Horse	60	1·8	1·2	6·9	0·120	0·130	0·30
Cow	47	3·5	3·8	4·8	0·161	0·189	0·75
Sheep	15	6·7	8·6	4·3	0·250	0·290	0·97
Pig	10	7·2	4·6	3·1	0·395	0·357	1·05
Rabbit	6	15·5	10·5	2·0	0·89	0·99	2·56

For every 100 lb. of live weight a sheep or a pig requires about 1 lb. of lime and nearly 1 lb. of phosphoric acid, a calf requires about double these amounts and rather more phosphoric acid than lime. As a rule only about one-half of the lime and phosphoric acid supplied in the food can be assimilated and retained, and therefore the actual amount of food consumed should contain at least double the quantities absolutely necessary.

2. The balance or proportion between the different mineral constituents is now recognised to be of importance, and any serious alteration in the balance between two or more elements may affect assimilation, not only of these elements, but also of other constituents of the ration.

3. The relationship between inorganic and organic constituents of rations is shown by the fact that a ration which contains ample amounts of protein fat and carbohydrates may fail to produce normal growth if it is deficient in one or more of the mineral constituents. Addition of such will at once give increased growth and a much better utilisation of the food stuff.

4. Experiments have shown that sunlight and even artificial irradiation, lead to an improved lime and phosphorus assimilation, and may even make up for the want of vitamin D.

5. Diseases due to deficiencies of mineral matters have been reported from all parts of the world, and a concentrated attack to deal with such diseases is being made the last few years throughout the Empire.

Investigations on Phosphorus Deficiency.

Sir Arnold Theiler, with a large staff of workers, made a very complete investigation on phosphorus deficiency as the cause of several diseases in South Africa, which were completely checked by giving the cattle liberal doses of bonemeal.

A full copy of his report appeared three years ago in the "Queensland Agricultural Journal" for March, 1925, and was reprinted in the Journal for September, 1928. Unfortunately, not much notice of the importance of his discovery was taken by readers at the time, and only his personal visit to the Commonwealth gave a fresh stimulus to this matter, more particularly as both he and Dr. J. B. Orr, Director of the Rowett Research Institute, Aberdeen, another oversea visitor to our States, clearly recognised similar wants in our

pasture as well as clear signs of malnutrition. The principal sickness due to phosphorus deficiency in South Africa, is the *Styfsiekte* or stiffness, with its most obvious outward sign of bone chewing, or osteophagia. This is a specific form of depraved appetite, showing by cattle having a predilection for bones, chiefly bleached bones. In more aggravated cases even putrifying bones and rotten carcasses are eaten. The animals are easily tested in practice if they are marked cravers, slight cravers, or non-cravers, which is very useful for experimental purposes. The osteophagia is a precursor of serious diseases, stunted growth, poor condition, and heavy mortality. Feeding the animals with 3 oz. of bonemeal per head per day absolutely controls the disease, and enormously improves the condition of the cattle.

A few diagrams shown in Sir Arnold Theiler's report, which was republished in full in September (1928) number of the Journal, clearly demonstrate the improvement in growth, increase of food consumed, &c. Particularly interesting is the quick change which takes place when batches of the experimental animals have their treatment reversed, the controls receiving bonemeal, and the bonemeal withdrawn from others. The change in the animals manifests itself in a very short time, and the recovery of some is simply marvellous.

Seasonal changes should also be noted, and the quick improvement in cattle following spring rains.

The phosphorus was supplied in various forms, but the results obtained were the same. Addition of lime did not prevent osteophagia, but rather increased the evil. Bonemeal as the best and cheapest form of phosphatic available in South Africa was chosen for general use. Mineral phosphates were tried, but were found too costly and rather difficult of digestion; superphosphate was found to cause digestive troubles. Precipitated calcium phosphate behaved very much like bone phosphate.

We are very fortunate in Queensland that we have in finely-crushed Nauru and Ocean Island phosphate, a comparatively cheap natural, pure, tricalcic phosphate which can be safely and successfully used in place of bonemeal.

Unfortunately, manufacturers of proprietary licks, a great number of which were sold at exorbitant prices, although consisting chiefly of common salt, spread pernicious and what proved to be absolutely unfounded reports on the ill effects alleged to follow the use of finely-ground Nauru phosphate, which I generally recommend as the chief ingredient of a lick, stating that this phosphate causes ulceration of the bowels, causes the teeth to become loose, detrimentally affects the quality of the wool clip, and is actually harmful on account of the small amount of calcium fluoride found in Nauru phosphate. The authors of these statements overlooked the fact that even in bones as much as 2 per cent. of calcium fluoride exists, and they quoted absurd experiments in which doses of the highly soluble sodium fluoride were given to rats with their food, producing ill effects. It is well known that sodium fluoride is a powerful insecticide and germicide, and therefore poisonous, but the practically insoluble calcium fluoride is quite harmless. As a matter of fact, on one station where the manager was ordered by his directors, scared by these reports, to substitute bonemeal for the Nauru phosphate, which had been successfully used hitherto, it was found that the sheep refused to take the bonemeal-salt lick, and they had to return to the Nauru phosphate-salt lick. On another large station where Nauru phosphate-salt lick was used for over three years with the most beneficial results, increasing the flocks by over 50 per cent. and improving the percentage of lambing and the health of sheep which all had excellent teeth, the last wool clip was of particularly high quality, obtaining top prices in the market. Experiments made in America twenty years ago supplying pigs with various forms of phosphate proved clearly that the form in which phosphorus was supplied in the food was practically immaterial and all gave equally good results.*

There is practically no difference in the solubility in weak acids of finely-crushed Nauru phosphate and bonemeal, but the latter should always be specially sterilised when used as lick. Bone char, bone ash could also be used, but the use of superphosphate must be generally condemned, and Sir Arnold Theiler distinctly states that superphosphate used as lick produces digestive disturbances.

Application of phosphatic fertilisers to pasture, in South Africa using 500 lb. superphosphate per acre, produced the same results as bonemeal feeding, but, of course, this is of not much practical value to our pastoralists, as phosphatic manuring on a large scale would not be an economical proposition.

*Research Bulletin, No. 1 of the Agricultural Research Station of the University of Wisconsin, U.S.A., June, 1909.

The want of phosphorus was traced by Sir Arnold Theiler and his co-workers to the pastures and to the soil itself, and in all the affected areas, the soil showed a great lack in available phosphoric acid, being generally less than .001 per cent.

There can be no doubt that our stock suffer to some extent, more so in certain districts, from a phosphorus deficiency, which becomes more evident and pronounced in drought periods. A supply of phosphorus just or barely sufficient for maintenance is quite inadequate for reproduction and growth. Sir Arnold Theiler's results showed that a breeding cow requires in the earliest stage of pregnancy only about 2 oz. of bonemeal per head per week more than an ox, whereas in an advanced stag of pregnancy as much as 28 oz. bonemeal per week were required to prevent osteophagia.

Comparison of Composition of Pasture Grasses.

Of particular interest is the study of the following table giving the composition of pasture grasses as found in South Africa, in Queensland, &c., as compared with good European pasture.

	ANALYSIS OF WATER-FREE MATERIAL.				
	Protein.	Fibre.	Ash.	CaO.	P ₂ O ₅ .
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Fattening Pasture, Romney Marsh, eaten ..	22.9	20.2	8.7	0.99	1.01
Fattening Pasture, Romney Marsh, non-eaten ..	13.5	28.2	5.6	0.75	0.65
Non-fattening Romney Marsh, eaten ..	21.1	20.2	7.6	0.90	0.89
Non-fattening Romney Marsh, non-eaten ..	12.3	29.2	5.6	0.73	0.58
Poor Average Pasture, England, eaten ..	15.9	25.2	5.5	0.56	0.60
Poor Average Pasture, England, non-eaten ..	11.4	29.3	3.1	0.30	0.37
Pasture, Falkland Island, eaten ..	12.2	..	4.6	0.29	0.54
Pasture, Falkland Island, non-eaten ..	7.0	..	2.5	0.14	0.25
Mixed Pasture, South Africa, November ..	19.4	22.5	11.6	0.31	0.60
Mixed Pasture, South Africa, January ..	13.8	25.0	7.7	0.50	0.22
Mixed Pasture, South Africa, March ..	7.2	33.7	5.9	0.43	0.24
Mixed Pasture, South Africa, May ..	4.1	34.9	5.9	0.50	0.07
Mitchell Grass, Queensland, green, 1926-27 ..	7.9	31.7	10.9	0.62	0.38
Mitchell Grass, Queensland, yellow, 1926-27 ..	6.0	28.9	10.7	0.44	0.20
Mitchell Grass, Queensland, roughage, 1926-27 ..	2.8	32.9	10.0	0.38	0.12
Mitchell Grass, Queensland, young, 12in. long, 1929 ..	18.8	27.6	12.6	1.09	0.51
Mitchell Grass, Queensland, young, 18in. long, 1929 ..	17.1	30.9	14.7	1.07	0.53
Mixed Pasture, Queensland, average of 15 samples, 1914 ..	6.3	41.2	11.9	0.49	0.45
Roughage, Queensland, average of 40 samples, 1928 ..	3.3	33.2	10.2	0.44	0.16
Young Grasses, Queensland, average of 40 samples, 1929 ..	10.0	32.7	11.3	0.69	0.46
Paspalum, Queensland, unfertilised, 9 days old, 1927-28 ..	8.2	25.4	12.7	0.72	0.55
Paspalum, Queensland, unfertilised, 44 days old, 1927-28 ..	6.8	29.8	11.9	1.15	0.37
Paspalum, Queensland, fertilised, 9 days old, 1927-28 ..	15.5	24.1	13.3	0.50	0.66
Paspalum, Queensland, fertilised, 44 days old, 1927-28 ..	7.4	35.9	10.2	0.63	0.40
Rhodes Grass, Queensland, 6 weeks old ..	13.7	33.9	9.4	0.49	0.39
Rhodes Grass, Queensland, 3 months old ..	7.1	34.8	9.7	0.41	0.23
Kikuya Grass, Queensland, old ..	5.2	26.9	12.3	0.75	0.55
Kikuya Grass, Queensland, 4 weeks old ..	15.8	25.5	8.9	0.59	0.71

The most striking feature is the high percentage of protein, lime, and phosphoric acid, calculated on the water free material, found in the pastures readily eaten by sheep on Romney Marsh, England. The pasture not eaten is still very much richer than the best of our own pastures. On Falkland Island, which is heavily stocked, a considerable falling off in the stamina of the sheep has been noted and is due to the fact that the pasture was never fertilised. The mineral constituents

lime and phosphoric acid are very low. The great falling off in nutritious quality of the South African pastures with age is clearly shown, more particularly the great reduction in the phosphoric acid contents of the ash, which is quite good in November, becomes already low in January and March, and falls away to practically nothing in May.

A similar condition exists in the Mitchell grass pasture and a distinct want of phosphoric acid in the older growth is to be noticed.

The great increase in the protein contents of paspalum pasture due to application of a complete fertiliser, with an extra supply of nitrogenous manure, is also worth noting.

Lack of Protein.

It has been found that the supply of lick will lead to greater consumption of fodder, and greatly help in the digestion and assimilation of all nutrients, but after all it cannot create protein if it is not there, and the actual value of a feed must depend principally on the amount of protein it supplies. I have repeatedly expressed the opinion that our stock are suffering for long periods of their existence of a protein starvation, with or without lime and phosphorus deficiencies. Lime itself is but very rarely deficient, but phosphorus is, although not in such a pronounced degree as found by Sir Arnold Theiler in South Africa. Only in very isolated cases our soils contain less than 0.01 per cent. of available phosphoric acid, which means about 300 lb. per acre foot, whereas the soils in South Africa, showing disease, have only .001 per cent. or 30 lb. per acre foot. For years very full analyses of grasses, fodders, &c., have been carried out in our agricultural laboratory, and only in a very few cases such low amounts of phosphoric acid have been found in the samples as are recorded in South Africa.

Sheep Affected by Malnutrition.

Sheep will be affected by malnutrition in a similar manner, although the outward symptoms are rarely so pronounced as with cattle. Bone chewing, and more frequently licking up of earth, are noticed; an excessive liking for salt is also an indication of depraved appetite. The fact of sheep licking certain soil does not indicate that such soil would make a good lick, as many a correspondent to this Department has asserted, but is simply a sign of depraved appetite due to malnutrition. The far-reaching results of malnutrition are shown by stunted growths, loss of fecundity, poor percentage of lambing, great mortality among young lambs, greater liability to suffer from worms, and attack by blow flies. Of course all these symptoms become more pronounced during periods of drought. A large number of pastoralists tried to save their sheep from starvation by giving them salt licks, and in many cases where the drinking water was also saline, actually killed the sheep through salt poisoning. The actual amount of salt required by sheep is extremely small, only about 4 to 5 lb. of salt are required per annum, and this quantity is generally fully supplied in the pasture grass, and drinking water. The other mineral constituents, lime and phosphoric acid necessary for the maintenance of an adult sheep, are generally supplied by good natural pasturage, but in the case of ewes the requirements increase rapidly during pregnancy and remains high during the lactating period, so that the amounts supplied by pasturage are in a great number of places not sufficient to cover the demand. The requirements of a young growing lamb are equally high, and from two to three times greater than those of an adult sheep.

The actual amounts of lime and phosphoric acid removed from the soil by wool and sheep are very small, amounting to a few ounces per acre annually; even with fairly heavy stocking of, say, one sheep to 2½ acres, the amount of lime phosphate removed would be approximately only 1 lb. per acre per annum; so that, with an average amount of one-hundredth of a per cent. of available phosphoric acid in a soil, the supply would last many hundred years. Unfortunately, the situation is not quite as favourable as it appears at first sight. Stock naturally prefer the best and most succulent fodders and remain in such localities, and as a consequence the best and most nutritious grasses are eaten out continually and are likely to disappear and be replaced by coarse, poor varieties. As previously pointed out, amounts of mineral constituents must be available in large excess, both for vegetable and animal growth.

Analyses of Soil.

Mr. J. E. Thomas, when making his investigation on the feeding of sheep under drought condition, drew particular attention to the great difference between the pebbly and rolling downs in Central Queensland with regard to nutritive value and palatability of the grasses. The pebbly downs always show a much higher lambing

percentage, better growth and yield of wool. These facts were explained by analyses of the soils made in our laboratory. The physical condition of the pebbly downs soil was much better than that of the clayey downs, showing much better capillarity. Humus and nitrogen contents of both soils were rather low, lime plentiful both total and available amounts, the amount of available phosphoric .0195 per cent. in pebbly downs soil against .0014 per cent. in clayey down soil, which is dangerously low. The actual amount of feed grown in good seasons is much larger on the rolling downs soil, but the fodder is not so well relished as the sparser growth, but more varied and palatable feed of the pebbly downs.

The principal fodder grass in the western country is Mitchell grass, which is the most drought resistant of our grasses, but its nutritive value is generally very much overrated. The quality varies very much according to seasons, as shown by a great number of analyses, but is at its best in its young growth.

Flinders grass requires a better rainfall than Mitchell grass, but is a more nutritious and more palatable grass, even in the drying-off stage.

Blue grasses require a still heavier and more evenly distributed rainfall and are highly nutritious in their earliest stages of growth, but lose their nutrition value very quickly when drying off.

Edible herbs and shrubs are available in most districts, although restricted in the main areas of Central and Northern-West Queensland.

Looking over the list of analyses of such fodder plants published in the annual report, it will be noted many of them are of high food value. The prickly acacia bush and trefoil, Medick burr, stand out on their own on account of high protein contents, and are therefore greatly relished by stock.

Food Supply in Time of Drought.

The greatest problem facing the stockowner is the feeding during drought periods. From the previous remarks it is quite evident that the roughage available in such periods is of exceedingly low feeding value, and therefore the problem resolves itself into supplies of proteins, minerals, and roughage itself.

Proteins can be supplied principally in forms of maize and other grains, and prepared concentrated fodders in the form of nuts or cubes, in which mixtures of all sorts of grains, by-products, and milling offals can be utilised with advantage.

Lucerne hay is of great value, being high in protein and minerals, and at the same time is a palatable roughage, but, unfortunately, high cost limits extensive use. The supply of roughage is the most serious problem in drought time, as it is quite impossible to maintain sheep on licks or grains alone.

What could be done with regard to conservation of fodder for roughage, bush hay, and perhaps in some cases fodder crops, chiefly sorghums, are problems of the future. In the meantime the liberal use of phosphatic licks will improve matters, and stock should be allowed to make the best use of poor coarse fodders, this being advantageous to the grazier in good and bad seasons.

Licks Recommended.

The lick at present recommended, and already successfully used in several places, is made by mixing one part of coarse salt (free from large lumps) with two parts finely ground Nauru or Ocean Island phosphate.

Nauru phosphate is an excellent substitute for bonemeal, as it is cheaper and contains a much higher percentage of lime and phosphoric acid than bonemeal.

The use of phosphatic licks is of particular importance when feeding on scrub, as practically all our western scrub trees contain in the ash of their leaves a very large amount of lime and very little phosphoric acid. Any large excess of lime accentuates the want and deficiency of phosphorus.

When feeding very dry, coarse roughage, the addition of small amounts of Epsom salts, about 10 lb. to every 100 lb. of lick, is advisable. In very rare cases the addition of about 3 to 5 per cent. of flowers of sulphur, and/or 2 to 3 per cent. of iron sulphate (green vitriol) may have a beneficial effect.

Quantity of Licks to be Supplied.

It is of importance that the stockowner has a rough idea how much lick the animals actually consume; a lamb or a wether should get about 2 oz. of phosphate, or 3 oz. of the mixed lick per week; a ewe with lamb can get up to 6 oz. of phosphate per week. As the Nauru phosphate has neither taste nor odour, the animals in some cases do not take readily to the lick, and in such cases sprinkling the lick with a

little molasses, or adding about 5 to 10 per cent. of linseed meal, or any other meal to the lick will induce the animals to eat the lick more readily. The addition of these materials is discontinued or reduced when a sufficient amount of lick is consumed. An extra amount of phosphate will not hurt the sheep, but an increased amount of salt may do serious harm. Keep a supply of lick going the whole year round, so that the animals can get it any time they want it.

If the drinking water is distinctly saline, the use of salt in the lick should be omitted altogether, and a small amount of meal or molasses used in its place.



PLATE 224.—MR. JAMES A. HEADING, D.C.M., M.M.,
OF CLOYNA, MURGON.

At a meeting of the Board of Directors of the Queensland Co-operative Bacon Association, Limited, Murarrie, Queensland, recently, Mr. Heading was re-elected Chairman of Directors. He is also a Director of the Farmers' Co-operative Distributing Association, Limited, and of the South Burnett Co-operative Dairy Company, Limited, besides being Chairman of the Murgon Shire Council and a member of the executive of the Local Producers' Association of Queensland.

A progressive and successful farmer, Mr. Heading is a keen advocate of co-operation, and is one of our best known leaders in agricultural organisation. He is also associated with the Australian Pig Industry Council and is a member of the Queensland Pig Industry Committee.

RATIONS FOR DAIRY COWS.

E. H. GURNEY, Senior Analyst.

Feeders of dairy stock frequently forward to the Department lists of feed materials available to them, desiring to know how to make balanced rations from such material. On account of this it was thought that examples of rations made up with various feeds might prove useful, some of the examples being composed of feed-stuffs named in the lists mentioned above.

The Agricultural Chemist, Mr. J. C. Brünnich, has written a pamphlet entitled "Stock Foods," in which the objects of feeding, description and analyses of various stock foods, and the making up of rations are all very fully detailed, and with this information the dairy farmer can judge how to feed to the best advantage.

Modern experience has shown that rations with somewhat lower protein content than was previously considered necessary can be successfully used.

Examples of rations computed from analyses of feedstuffs contained in "Stock Foods" are given below, and are in accordance with the feeding standards for dairy cows published in "Feeds and Feeding Abridged," by Henry and Morrison.

Professor J. K. Murray states that this standard is referred to in lectures in the Agricultural Course at the Queensland University.

HENRY AND MORRISON FEEDING STANDARD.

	Digestible Crude Protein.	Total Digestible Nutrients.
<i>Dairy Cows.</i>		
For maintenance of a 1,000-lb. cow	0.700	7.925
To allowance for maintenance add—		
For each 1 lb. of 2.5 per cent. milk ..	0.045—0.053	0.230—0.256
For each 1 lb. of 3.0 per cent. milk ..	0.047—0.057	0.257—0.286
For each 1 lb. of 3.5 per cent. milk ..	0.049—0.061	0.284—0.316
For each 1 lb. of 4.0 per cent. milk ..	0.054—0.065	0.311—0.346
For each 1 lb. of 4.5 per cent. milk ..	0.057—0.069	0.338—0.376
For each 1 lb. of 5.0 per cent. milk ..	0.060—0.073	0.362—0.402
For each 1 lb. of 5.5 per cent. milk ..	0.064—0.077	0.385—0.428
For each 1 lb. of 6.0 per cent. milk ..	0.067—0.081	0.409—0.454
For each 1 lb. of 6.5 per cent. milk ..	0.072—0.085	0.434—0.482
For each 1 lb. of 7.0 per cent. milk ..	0.074—0.089	0.454—0.505

Then upon this standard, a 1,000-lb. cow, yielding 25 lb. of milk of 3.5 per cent. fat, would require from a minimum amount of digestible crude protein $0.049 \times 25 = 1.225 + 0.7 = 1.925$ lb. to a maximum amount $0.061 \times 25 = 1.527 + 0.7 = 2.225$ lb.; and this cow would require from a minimum amount of total digestible nutrients $0.284 \times 25 = 7.1 + 7.925 = 15.025$ lb. to a maximum amount $0.316 \times 25 = 7.900 + 7.925 = 15.825$ lb.

Again, a 1,000-lb. cow, yielding 25 lb. of milk of 4.0 per cent. fat, would require from 2.05 lb. to 2.325 lb. digestible crude protein, and from 15.7 lb. to 17.57 lb. total digestible nutrients.

The term "nutritive ratio" means that amount of digestible protein that exists in a feed compared with the amount of non-nitrogenous digestible nutrients in that feed. As fat is capable of producing more heat when digested than the other nutrients, the fat content in the following rations has been multiplied by 2.3, and the product added to the amount of digestible carbohydrate and fibre—this total divided by the digestible protein gives the "nutritive ratio" of the ration. Thus in No. 1 ration, there is one part of digestible protein to six parts of other digestible nutrients.

When considering rations for animals it must be understood that other factors, beside the digestible crude protein and total digestive nutrients supplied to the animal, must be taken into account, such as succulence, palatability, and variety of feeds.

Proteins are very complex bodies, and different proteins yield different substances when digested, and a number of these different substances have to be supplied by the food for satisfactory nutrition. Therefore there is less chance of feeding an unbalanced protein content by using several feedstuffs, than by using only one or two.

Rations are useful guides in feeding, but it must be noted that the analyses of the feedstuffs from which they are computed are averages only—that is to say, the composition of the feedstuffs varies according to soil and climate wherein grown, and particularly to the age of growth when harvested.

The legumes, such as lucerne, cowpea, clover, &c., are characterised by the high amount of phosphorus and lime (particularly lime) they contain. Therefore, when animals graze on grass pastures growing upon soils deficient in phosphoric acid and lime, the inclusion of a legume in a ration is of particular value to these animals supplying both protein and mineral matter. Bran is also relatively rich in phosphorus.

There is in very many cases a deficiency of phosphoric acid in the pasture grazed by dairy stock. Where such deficiency occurs the rations should be supplemented by the addition of from 2 to 4 oz. of a mixture of finely ground Nauru phosphate and salt. The mixture is in the proportion of two parts by weight of finely ground Nauru phosphate to one part by weight of salt.

Another consideration is the cost of a particular ration—whether it pays, when it is compared with the price obtained from the milk produced. But care should be taken that blame for unprofitable feeding is not placed upon the ration, when the fault is due to the cow. Some cows are capable of producing a large amount of milk, other cows are only capable of yielding a small amount of milk, even when supplied with ample well-balanced feed; such poor producers do not pay, and should be culled out from the herd.

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK.

	Dry Matter.	DIGESTIBLE NUTRIENTS.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
1.—							
40 lb. Green Sorghum ..	8.0	0.48	0.08	2.32	1.36		
60 lb. Mixed Pasture (average)	12.0	0.53	0.12	3.48	3.01		
8 lb. Lucerne Chaff ..	7.4	1.24	0.05	2.22	0.67		
	27.4	2.25	0.25	8.02	5.04	15.5	1 ÷ 6.0
2.—							
65 lb. Green Sorghum ..	13.0	0.78	0.13	3.76	2.14		
7 lb. Lucerne Chaff ..	6.4	1.08	0.04	1.95	0.58		
7 lb. Maize Meal ..	6.0	0.35	0.21	4.20	0.07		
	25.4	2.21	0.38	9.91	2.79	15.3	1 ÷ 6.1
3.—							
45 lb. Green Sorghum ..	9.0	0.54	0.09	2.61	1.49		
13 lb. Wheat Chaff ..	11.3	0.27	0.12	3.39	2.04		
3 lb. Bran ..	2.6	0.37	0.05	1.21	0.10		
2½ lb. Cotton Seed Meal (decorticated)	2.5	0.96	0.17	0.54	0.06		
2 lb. Molasses ..	1.5	0.02	..	1.15	..		
	27.9	2.16	0.43	8.90	3.69	15.2	1 ÷ 6.2

RATIONS FOR DAIRY COWS—*continued.*RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

	Dry Matter.	DIGESTIBLE NUTRIENTS.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.		
4—							
50 lb. Green Sorghum ..	10.0	0.60	0.10	2.90	1.70		
40 lb. Green Cowpea ..	8.8	0.64	0.12	2.92	1.14		
3 lb. Bran ..	2.6	0.37	0.05	1.21	0.10		
1½ lb. Cotton Seed Meal (decorticated)	1.6	0.61	0.11	0.34	0.03		
4 lb. Molasses ..	3.0	0.04	..	2.29	..		
	26.0	2.26	0.38	9.66	2.97	15.3	1 ÷ 5.5
5—							
42 lb. Sorghum Silage ..	10.7	0.38	0.08	3.06	2.06		
9 lb. Lucerne Chaff ..	8.3	1.39	0.06	2.49	0.75		
7 lb. Maize Meal ..	6.0	0.35	0.21	4.20	0.07		
	25.0	2.12	0.35	9.75	2.88	15.1	1 ÷ 6.3
6—							
35 lb. Sorghum Silage ..	8.9	0.31	0.07	2.55	1.71		
5 lb. Lucerne Chaff ..	4.6	0.77	0.03	1.38	0.42		
6 lb. Wheat Chaff ..	5.3	0.12	0.05	1.56	0.96		
2 lb. Linseed Oil Meal ..	1.8	0.44	0.15	0.63	0.09		
3 lb. Pollard ..	2.7	0.41	0.09	1.62	0.06		
3 lb. Rice Meal ..	2.7	0.20	0.28	1.50	0.06		
	26.0	2.25	0.67	9.24	3.30	15.5	1 ÷ 6.2
7—							
65 lb. Green Maize ..	11.7	0.65	0.19	3.90	2.01		
8 lb. Lucerne Chaff ..	7.4	1.24	0.05	2.22	0.67		
7 lb. Maize Meal ..	6.0	0.35	0.21	4.20	0.07		
	25.1	2.24	0.45	10.32	2.75	15.7	1 ÷ 6.3
8—							
54 lb. Green Maize ..	9.7	0.54	0.16	3.24	1.67		
10 lb. Wheat Chaff ..	8.7	0.21	0.09	2.61	1.57		
3 lb. Maize Meal ..	2.6	0.15	0.09	1.80	0.03		
3 lb. Bran ..	2.6	0.37	0.05	1.21	0.10		
2½ lb. Cotton Seed Meal (decorticated)	2.5	0.96	0.17	0.54	0.06		
	26.1	2.23	0.56	9.40	3.43	5.6	1 ÷ 6.3
9—							
30 lb. Maize Silage ..	9.0	0.30	0.09	3.21	1.56		
5 lb. Good Bush Hay ..	4.6	0.14	0.03	1.20	1.13		
4 lb. Cowpea Chaff ..	3.6	0.45	0.07	0.76	0.54		
5 lb. Maize Meal ..	4.4	0.25	0.15	3.00	0.05		
3 lb. Coconut Cake ..	2.6	0.40	0.21	1.19	0.20		
1 lb. Blood Meal ..	0.9	0.67	0.01	0.05	..		
	25.1	2.21	0.56	9.41	3.48	15.6	1 ÷ 6.4

RATIONS FOR DAIRY COWS—*continued.*RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

	Dry Matter.	DIGESTIBLE NUTRIENTS.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo- hydrates.	Fibre.		
	Lb.	Lb.	Lb.	L.B.	Lb.	Lb.	
10—							
35 lb. Maize Silage ..	10.5	0.35	0.10	3.75	1.82		
8 lb. Lucerne Chaff ..	7.4	1.24	0.05	2.22	0.67		
7 lb. Barley Meal ..	6.2	0.65	0.06	4.27	0.21		
	24.1	2.24	0.21	10.24	2.70	15.4	1 ÷ 6.0
11—							
80 lb. Green Paspalum ..	20.0	1.20	0.16	5.60	4.96		
6 lb. Lucerne Chaff ..	5.5	0.93	0.04	1.67	0.50		
	25.5	2.13	0.20	7.27	5.46	15.0	1 ÷ 1.6
12—							
67 lb. Green Paspalum ..	16.5	1.00	0.13	4.69	4.15		
3 lb. Maize Meal ..	2.6	0.15	0.09	1.80	0.03		
3 lb. Bran ..	2.6	0.37	0.05	1.21	0.10		
2 lb. Cotton Seed Meal (decorticated)	1.8	0.70	0.13	0.39	0.04		
	23.5	2.22	0.40	8.09	4.32	15.0	1 ÷ 6.0
13—							
100 lb. Sudan Grass ..	22.0	1.50	0.10	7.50	3.80		
4½ lb. Lucerne Chaff ..	4.1	0.70	0.03	1.25	0.37		
	26.1	2.20	0.13	8.75	4.17	15.3	1 ÷ 6.0
14—							
100 lb. Sudan Grass ..	22.0	1.50	0.10	7.50	3.80		
3 lb. Bran ..	2.6	0.37	0.05	1.21	0.10		
1 lb. Cotton Seed Meal (decorticated)	0.9	0.35	0.07	0.19	0.02		
	25.5	2.22	0.22	8.90	3.92	15.3	1 ÷ 6.0
15—							
50 lb. Sudan Grass ..	11.0	0.75	0.05	3.75	1.90		
8 lb. Wheat Chaff ..	7.0	0.16	0.07	2.09	1.29		
4 lb. Lucerne Chaff ..	3.7	0.62	0.02	1.11	0.33		
3 lb. Maize Meal ..	2.6	0.15	0.09	1.80	0.03		
2 lb. Linseed Oil Meal ..	1.8	0.44	0.15	0.63	0.09		
	26.1	2.12	0.38	9.38	3.64	15.5	1 ÷ 6.5
16—							
20 lb. Green Oats ..	4.6	0.28	0.08	1.30	0.98		
8 lb. Lucerne Chaff ..	7.4	1.24	0.05	2.22	0.67		
10 lb. Wheat Chaff ..	8.8	0.21	0.09	2.61	1.61		
3 lb. Coconut Cake ..	2.6	0.40	0.22	1.19	0.20		
3 lb. Molasses ..	2.3	0.03	..	1.72	..		
	25.7	1.62	0.45	9.04	3.46	15.1	1 ÷ 6.3

RATIONS FOR DAIRY COWS—*continued.*RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

	Dry Matter.	DIGESTIBLE NUTRIENTS.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
17—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
25 lb. Green Barley ..	5.2	0.45	0.10	1.50	1.07		
13 lb. Wheat Chaff ..	11.4	0.27	0.11	3.40	2.10		
6 lb. Lucerne Chaff ..	5.5	0.93	0.04	1.67	0.50		
2 lb. Linseed Oil Meal ..	1.8	0.44	0.15	0.63	0.09		
3 lb. Molasses ..	2.3	0.03	..	1.72	..		
	26.2	2.12	0.40	8.92	3.76	15.2	1 ÷ 6.4
18—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
60 lb. Sugar-cane Tops ..	16.8	1.02	0.18	5.64	3.90		
10 lb. Cowpea Chaff ..	9.2	1.12	0.19	1.90	1.35		
	26.0	2.12	0.37	7.54	5.25	15.3	1 ÷ 6.4
19—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
50 lb. Sugar-cane Tops ..	14.0	0.85	0.15	4.70	3.25		
30 lb. Green Cowpea ..	6.6	0.48	0.09	2.19	0.84		
5 lb. Lucerne Chaff ..	4.6	0.77	0.04	1.38	0.42		
	25.2	2.10	0.28	8.27	4.51	15.2	1 ÷ 6.3
20—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
35 lb. Elephant Grass ..	7.0	0.32	0.07	2.03	1.75		
35 lb. Imphee ..	7.0	0.42	0.07	2.03	1.15		
8 lb. Lucerne Chaff ..	7.4	1.24	0.05	2.22	0.67		
5 lb. Maize Meal ..	4.4	0.25	0.15	3.00	0.05		
	25.8	2.23	0.34	9.28	3.62	15.5	1 ÷ 6.1
21—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
35 lb. Elephant Grass ..	7.0	0.32	0.07	2.03	1.75		
35 lb. Imphee ..	7.0	0.42	0.07	2.03	1.15		
10 lb. Pumpkins ..	1.7	0.15	0.06	0.80	0.16		
7 lb. Maize Meal ..	6.4	1.08	0.04	1.95	0.58		
5 lb. Maize Meal ..	4.4	0.25	0.15	3.00	0.05		
	26.5	2.22	0.39	9.81	3.69	16.1	1 ÷ 6.4
22—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
65 lb. Mixed Pasture (average)	13.0	0.57	0.13	3.77	3.26		
9 lb. Lucerne Chaff ..	8.3	1.39	0.05	2.50	0.75		
5 lb. Maize Meal ..	4.4	0.25	0.15	3.00	0.05		
	25.7	2.21	0.33	9.27	4.06	15.8	1 ÷ 6.3
23—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
15 lb. Poor Bush Hay ..	14.0	0.21	0.08	2.77	3.03		
10 lb. Pumpkins ..	1.7	0.15	0.06	0.80	0.16		
5 lb. Lucerne Chaff ..	4.6	0.77	0.03	1.38	0.42		
7 lb. Maize Meal ..	6.1	0.35	0.21	4.20	0.07		
1 lb. Blood Meal ..	0.8	0.66	0.02	0.06	..		
	27.2	2.14	0.40	9.21	3.68	15.4	1 ÷ 6.4
24—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
65 lb. Prairie Grass ..	15.1	1.95	0.26	4.29	2.75		
5 lb. Wheat Chaff ..	4.4	0.10	0.04	1.30	0.80		
5 lb. Maize Meal ..	4.4	0.25	0.15	3.00	0.05		
1 lb. Molasses ..	0.7	0.01	..	0.57	..		
	24.6	2.31	0.45	9.16	3.60	15.5	1 ÷ 5.9

It has been mentioned before that better results are obtained from rations composed of a variety of feed ingredients than from a ration made up with only one or two feedstuffs.

A very convenient method is to have on hand a quantity of the concentrates already mixed, and then to feed a certain quantity of this mixture with the roughage that is being used, increasing the quantity of the mixture used until it is noticed that no further increased milk production is obtained. An example of this procedure has been published in the "Live Stock Bulletin" under the heading of "4-2-1" plan; this meaning that a concentrate mixture is made of four parts maize meal, two parts ground oats, and one part linseed meal. The above mentioned paper recommends the following:—3 lb. of silage and 1 lb. of legume hay for every 100 lb. of the animal's body weight, and to gradually increase the amount given of the concentrate mixture until the cow is getting 1 lb. for every 5 lb. of milk produced. Thus a 1,000-lb. cow, yielding 25 lb. of milk, would be given a ration of 30 lb. maize silage, 10 lb. lucerne hay, and 5 lb. of the concentrate mixture—containing 2.26 lb. digestible crude protein and 13.6 lb. total digestible nutrients. This ration has the amount of digestible crude protein required by the Henry and Morrison standard, but has a somewhat lower amount of total digestible nutrients. Other concentrates can be used in this convenient manner.

For instance, a concentrate mixture could be prepared by mixing eight parts maize meal, one part bran, and one part cotton seed meal. This mixture would have the following composition:—

	Dry Matter.	DIGESTIBLE.			
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.
	Lb.	Lb.	Lb.	Lb.	Lb.
1 lb. Concentrate Mixture	0.87	0.088	0.032	0.539	0.014
5 lb. Concentrate Mixture	4.3	0.44	0.16	2.69	0.07

If 4 lb. maize silage and 1 lb. lucerne chaff be used for every 100 lb. live weight, and 1 lb. of the above concentrate mixture for every 5 lb. of milk produced, the following will be the ration for a 1,000-lb. cow yielding 25 lb. of milk:—

	Dry Matter.	DIGESTIBLE.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.		
40 lb. Maize Silage	12.0	0.40	0.12	4.27	2.08		
10 lb. Lucerne Chaff	9.2	1.55	0.07	2.77	0.84		
5 lb. Concentrate Mixture	4.3	0.44	0.16	2.69	0.07		
	25.5	2.39	0.35	9.73	2.99	1 ÷ 5.6	

The amount of digestible crude protein is a little higher in this ration than is required by the standard.

The following extracts from the "Agricultural Gazette" of New South Wales, December, 1927, are given as an illustration of what complete feeding, when combined with high milk-producing power, can accomplish:—

"On 15th October, 1927, Wagga Gladys, the seven-year old Jersey cow of the Hawkesbury Agricultural College herd, completed 365 days' official test for a yield of 20,835 lb. milk, with an average test of 5.52 per cent. and 1,149.385 lb. butter fat, which is equivalent to 1,384.8 lb. commercial butter. This is an official world's record for both milk and butter fat production for the Jersey breed. It was achieved on twice-a-day milking, whereas all the great records in other countries have been made on three and four milkings a day. Wagga Gladys calved on 9th November, 1926, and on the day of her last periodical test she yielded 53.5 lb. milk and 3.694 lb. butter fat in twenty-four hours."

The following is extracted from the "Agricultural Gazette" of New South Wales, October, 1927, and shows the ration fed to Wagga Gladys, together with the record of her 273 days' performance:—

"On her present lactations as a seven-year-old, which is still in progress, she has produced for the first nine-months' period 15,951 lb. milk, of 5.3 per cent. test, 839.814 lb. butter fat, being equal to 1,011.8 lb. commercial butter. . . . On the hypothesis that feeding must be linked with breeding to secure high production, an indication of the ration fed to Wagga Gladys may be given.

"*Concentrates.*—The following mixture was fed daily at the rate of 1 lb. to every 3½ lb. milk produced:—300 lb. maize meal, 200 lb. bran, 100 lb. crushed oats, 50 lb. linseed meal. During March and April the mixture was altered by the substitution of 25 lb. cotton seed meal for 25 lb. of the linseed meal.

"*Bulk Ration.*—The daily bulk ration consisted of:—25 lb. maize silage, 10 lb. lucerne chaff (of poor quality during May), 3 lb. bran, and 1½ lb. linseed meal. During March and April half the linseed meal was replaced by an equal amount of cotton seed meal. During the latter half of the month of March the silage was replaced by an equal amount of green corn stalks chaffed.

"*Grazing.*—The pastures were very poor, except after the Easter rain. In December, Wagga Gladys was grazed on a poor stand of green lucerne for two days prior to test. In January, she was grazed on green lucerne for two hours daily for a week previous to test. In February, March, and April, she was grazed on green lucerne for two hours daily, and in May and June for one hour daily. In July, green oats were given for a week previous to the test; Gladys and the whole herd went off in butter fat yield this month, and the green oats were blamed. In August, she was grazed on green lucerne for two hours daily."

It will be interesting to compare the above mentioned cow's milk production and her feeding, with the standard used in computing the examples of rations previously given. The weight of Wagga Gladys is not known, and though it may not be 1,000 lb. live weight, this figure will be used for the sake of comparison.

The cow produced 15,951 lb. milk in 273 days—that is, 58.4 lb. of milk per day, of 5.3 per cent. fat. Using the minimum requirements of the standard the cow should receive 4.32 lb. digestible crude protein and 29.7 lb. total digestible nutrients.

The cow produced on an average 58.4 lb. of milk per day, and it is stated that for every 3½ lb. of milk produced 1 lb. of the mixed concentrate was given, therefore, 16.6 lb. mixed concentrate was fed daily. The following is the total ration fed:—

	Dry Matter.	DIGESTIBLE NUTRIENTS.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
Bulk Ration—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
25 lb. Maize Ensilage ..	7.5	0.25	0.07	2.67	1.30		
10 lb. Lucerne Chaff ..	9.2	1.55	0.07	2.77	0.84		
3 lb. Bran ..	2.6	0.37	0.05	1.21	0.10		
1.5 lb. Linseed Meal ..	1.3	0.33	0.11	0.47	0.06		
16.6 lb. Mixed Concentrate	14.6	1.50	0.52	8.20	0.37		
	35.2	4.00	0.82	15.32	2.67	22.8	1 ÷ 4.9
Allowing 10 lb. Green Lucerne for one hour's grazing ..	2.4	0.32	0.04	0.63	0.29		
	37.6	4.32	0.86	15.95	2.96	24.0	1 ÷ 4.8
Or							
Allowing 20 lb. Green Lucerne for two hours' grazing ..	4.8	0.64	0.08	1.26	0.58		
	40.0	4.64	0.90	16.58	3.25	25.4	1 ÷ 4.7

It will be seen that the digestible crude protein, 4.32 lb., agrees with that required by the standard, and that the amount of total digestible nutrients of this ration is somewhat lower.

MAMMITIS.

Under this heading may be included all derangements of the udder which are accompanied by inflammatory changes. Of all the domesticated animals the cow suffers most from this complaint, due to the extraordinary development of the mammary glands, as compared with those of the original type. Increased secretory power is accompanied by increased blood supply, and glandular tissue, but a decreased resistance to disease.

Mammitis may be divided into two broad classes—(1) Simple, (2) specific. In the first class would be included all those forms in which the primary cause is mechanical, such as injuries, cold, insect stings, overstocking, irregular or improper milking. In these cases the onset of the disease is ushered in with local inflammation in the area affected. This may be a portion or the whole of a quarter, or even one or more quarters may be involved. Should the affected area be extensive, there will also be constitutional changes, such as rise in temperature and loss of appetite. The local inflammation induces congestion with the accompanying symptoms of heat, pain, hardness, and cessation of normal milk secretion. The secretion from the congested area is watery and acid in reaction. This acid fluid, coming in contact with the normal milk in the teat duct, causes it to curdle, and the milk from that quarter will contain clots of curdled milk. Should proper attention be given to the case at this stage, the disease is arrested, and recovery quickly follows. First give a good active purgative, such as 12 to 16 oz. Epsom salts, mixed with a quart of warm water. To this mixture add a cup of treacle, and a dessertspoonful of ground ginger, and give as a drench. Local treatment consists of hot fomentations to the part, and frequent milking. Fomentations to be of value must be long continued—at least two hours once or twice daily.

If treatment has been omitted at this stage, pus-forming organisms invade the inflamed area, gaining an entrance through the milk ducts. The affected area is now an ideal breeding-place and they multiply very rapidly. Fluids drawn off at this stage will contain pus (matter) in addition to the curdled milk.

In the blood stream are certain cells called phagocytes whose function is to destroy invading bacteria. These phagocytes collect in and around the affected area. If they are not sufficiently numerous to destroy the bacteria, they cluster in the surrounding tissue and prevent the spread of the invading organisms. But during this time the toxins produced by the bacteria have caused a breaking down of the cellular tissue, which when mixed with the toxins has a debilitating action on the organisms which lowers their vitality. To further neutralise the action of the bacteria certain substances known as opsonin or antibodies appear in the blood stream and collect around the affected area and eventually destroy the invaders. The organisms having been destroyed, the temperature of the part is reduced, but the presence of the pus produced by their activity still remains and acts as a mild irritant. Should it be small in quantity it is absorbed into the system, but where the accumulation is considerable an abscess is formed.

Should the seat of the abscess be deeply surrounded by tissue, the fluid portions are absorbed and a fibrous capsule develops around the remainder. Should the abscess be near the surface, an external opening is formed and the contents evacuated and the broken down tissue is replaced by non-secreting tissue. Occasionally the abscess breaks into a milk duct and the pus can be drawn through the opening in the teat.

During what may be termed the secondary stage of the disease, that succeeding bacterial invasion—hot fomentation is of pronounced value, as it assists in reducing temperature by relaxing the tissues, and also induces a freer blood supply to the part. Should pain be severe, apply a mixture of equal parts of Belladonna liniment and soap liniment. Should the weight of the organ cause distress, support it by a broad bandage about 2 feet wide, in which four holes have been made for the teats. Place the teats in the holes, and pass the ends over the loins tying sufficiently tightly to support the weight of the udder.

In the second class called contagious mammitis in which the invasion of specific organisms is the primary factor, there are no constitutional symptoms, and very little local inflammation. The first indication of the presence of the disease is the decrease of normal milk in a quarter or quarters, and the presence of a brownish watery fluid. Rarely is there any curdling of the milk or pus in the milk. As the disease progresses, the quarter shrinks and becomes hard and fibrous and eventually dries up.

In this disease treatment consists of irrigation of the affected area with mild antiseptic solutions by gravitation. Take a small glass funnel, and about 7 feet of small rubber tubing. Fit one end of the tube to the funnel and to the other end attach a small milk tube. After careful sterilisation, insert the milk tube into the teat, using care not to injure the lining of the duct. Then holding the funnel about the level of the cow's back pour the fluid into it. In the funnel should be a loose pad and sterilised cotton wool to act as a strainer. After the quarter has been distended to its full capacity, remove the milk tube. Massage the quarter carefully and then draw the fluid off by ordinary milking. Repeat this treatment daily.

Care must be exercised in the selection of the disinfectant for injection as those which are acid in reaction, or have a tendency to coagulate albumen are unsuitable. Normal salt solution made by dissolving one teaspoonful of table salt to the pint of boiled water is of value or boracic acid 3 per cent. solution.

Treatment consists of introducing into the system of the patient a vaccine prepared from the various organisms which produce the disease. It is easily applied, acts quickly, is not expensive, and proves very satisfactory in cases of recent development. It is injected with an ordinary hypodermic syringe beneath the skin, usually behind the shoulder. It is supplied in small bottles containing 2 doses of 2 c.c. each, the second of which is injected about forty-eight hours after the first. In cases of recent origin two doses are usually sufficient to effect a cure. Treatment is obtainable through this Department, or direct from the Stock Experimental Station, Yeerongpilly.

In dealing with contagious mammitis, the infectious nature of the disease must be borne in mind. All affected animals should be removed from the herd, and, if possible, the person who treats them should not milk the healthy cows. As in small dairies this is not practicable, then these cows should be treated after milking is finished, and care should be taken to thoroughly cleanse the hands immediately after treatment. All fluids drawn from an affected cow should be collected in a vessel and then buried.

FOUNDING A DAIRY HERD.

When laying the foundation of a herd beginners with limited capital should buy females regardless of pedigree. Their selection should be made on the basis of type and production only, getting together animals which show prospect of really being seed stock. Often enough daughters of one sire can be secured, so that the operator's breeding programme can begin one generation ahead of the man who assembles on the basis of type and production alone. When finances are available and the animals can be found, we always recommend that they be line-bred and that all animals be members of the same family.

A Line-bred Sire.

The beginner should start with a herd bull that is the result of the best efforts of our master breeders—a bull that has required many generations of matings to produce. Just how nearly he will be able to do this will depend on his dairy cow sense and his pocket-book. The first sire should be line-bred. When an outcross sire is used and he makes an improvement in the herd it is usually due to the fact that one side of his pedigree contains much of the blood of one or two highly improved animals. In other words, this is undoubtedly the fact that makes him prepotent.

The easiest if not the best way for the breeder with a small herd to line breed is to select a sire from a herd that carries the blood on which he wishes to base his breeding operations. The second sire should be out of a paternal sister. Official testing should be a regular part of the work in the herd from which the herd sire is secured, because records constitute a principal basis of selection. The dam of the bull selected should be better than the best cow in the herd where he is to be used, better in both type and production. With the beginner this usually is not hard to do.

The operator should periodically visit the herd where he bought the first sire, and each time make a careful study of the bull's paternal sisters and of the families in the herd, considered from the female side. An option should be secured on males out of two or three such paternal sisters. The offspring of the second sire in this

case when bred on daughter of the first sire will have the sire of the first bull as their great grandsire on the top and also on the bottom of the pedigree.

If the man from whom the bulls were purchased was a constructive breeder there will be at least one other outstanding animal figuring on both sides of the pedigree. For example, the dam of the first bull may be a full or a half sister to the dam of the second bull—a fine condition to obtain, provided the animals are exceptionally good. When the second herd sire is secured, it is too soon to tell what the characteristic defect or defects of the daughters of the first sire are going to be. Such defects or lack of ability to “come through” must be expected. We have never seen the get of a bull which did not have them. The third bull should come from the same family, but have as his immediate ancestors animals in which there is not in evidence the outstanding defects of the females to which he is to be bred.

Selection must always play a leading role. An animal may have an ideal pedigree, but if he is lacking in type or his dam has an ill-shaped udder, or she has badly winged shoulders or the like, the pedigree must be ignored. There must be a balance, and all things considered, the sire with the line-bred pedigree has the best chance of coming through.

The Sire.

The herd sire is half the herd. The dam of the herd sire is half of him, so the chances are that he will transmit as much from her as he does from his sire. No one man can do it all. He must depend on the breeder from whom he buys to have given similar considerations when he purchased or bred his sires. That is why we said that there is no other sensible conclusion than that we avail ourselves of the best of the best breeder's art. You, however, must be the man who decides which cow will be the dam of your herd sire. She should at least be a cow that even the most casual observer would turn to take a second look at.—“The Guernsey Breeders' Journal.”

HOW OLD IS THE COW?

When a cow is over five years old her age can only be roughly guessed from the condition of the teeth (incisors) and the rings on the horns. But in the case of polled and dishorned stock there is only the teeth and the general appearance of the animals to indicate the age. A horned cow will be found to have a ring on her horns representing the birth of a calf yearly, and two years must generally be added to the number of rings because heifers are generally from two to two and a-half or three years old at the birth of their first calf. Thus a cow with four rings on her horns may be reckoned as six or seven years old.

But the condition of the teeth in reality determines the potential life service of the cow. The cow's molars may or may not be quite serviceable, but if her incisors are worn short, or broken, she may be accepted as ageing. Some cows have really good teeth at ten and twelve years old, but usually the teeth begin to show signs of wear at six or seven years old. It depends a great deal upon the character of the soil, the crops, and the general feeding of the cows. On short, closely-gnawed pastures, especially on stony ground, the teeth of grazing cows wear fast. Fed on whole turnips, in a stone or concrete trough, having a rough, uneven bottom, the cow's teeth wear down faster than when she is fed on sliced turnips. The feeding of treacle and soft mashes hastens the decay of the teeth. The quality of the drinking water also affects the wearing qualities of the teeth.

Only the best milkers are, of course, retained till their teeth wear short. Occasionally a superior milch cow will be found with but a few rusty stumps where white ivories once were. Many an aged cow is reluctantly parted with, if she has been both superior at the pail and at the production of young stock. Many a good cow will well maintain her milk yield beyond twelve years old, but as a general rule cows are at their best after the birth of their third or fourth calf, say five or six years old, and when they arrive at the age of nine years their milk yield generally falls off gradually. Indifferent milkers are generally got rid of before they are five years old. Thus, if a buyer is in quest of a good cow at a market he is generally quite safe to buy a cow over six years, provided she is healthy, correct in the teats, and has fairly good teeth. But don't pay a stiff price for a cow that is past per prime.—The “Livestock Journal” (England).

POULTRY FOR THE FRUITGROWER.

By P. RUMBALL, Poultry Expert.

THE combination of fruitgrowing and poultry-raising presents several features of economic importance. Fowls in the orchard obtain a good deal of natural food and help to maintain the orchard in good condition, thereby reducing the cost of production of both the fruit and the egg.

The advantages of the combination may be set down as follows:—

- (1) Keeping down weeds.
- (2) Keeping down many insect pests.
- (3) The manurial value of poultry ranging in an orchard.
- (4) Additional financial returns.

From the illustrations used in this the absence of weed growth will be noticed. This is not due to intense cultivation that is generally necessary, but to the presence of poultry. The owners of the farms where these photos. were taken assured the writer that before they kept fowls they were constantly cultivating and that now cultivation was only practised to loosen up the soil for the conservation of moisture. The keeping in check of weed growth means a good deal to the orchardist, while to the fowls it serves as an article of diet which is highly necessary for the maintenance of good health.

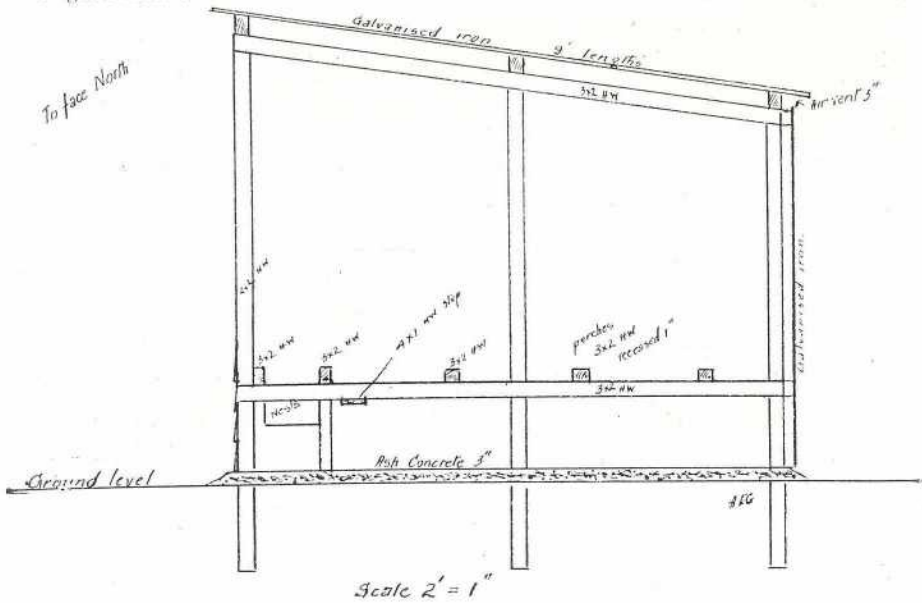


FIG. 1.

Insect Pests.

The fruitgrower knows probably better than the writer, the large numbers of insect pests which are detrimental to his industry, and that many of them, such as pupæ of the fruit fly, &c., hibernate in the soil. These are not safe from poultry owing to their partiality to insect life and their foraging nature. Caterpillars, grasshoppers, crickets, and beetles of many descriptions, which cause damage to fruit trees, fall easy victims to poultry, while the fowls' habits of dust bathing themselves in the shade of the trees, tends to keep the soil loose and prevents the undue growth of surface roots.

Manurial Value.

Possibly the greatest advantage in keeping fowls in conjunction with fruitgrowing is that of the manure distributed throughout the orchard. The grower knows what it costs to manure per acre or what it should cost, but he does not recognise the value of fowl manure. The quantity voided varies to some extent with different types of fowls and the method of feeding.

From a report published in the Journal of the Ministry of Agriculture of Great Britain of data collected at the College Poultry Farm, Theale, Reading, the following figures are taken:—

QUANTITIES VOIDED BY DIFFERENT BIRDS.

Kind of Fowl.	Weight.		Percentage of Body Weight.	Manure Voided per Bird per Annum (Fresh).	Number of Birds to Void One Ton per Annum (Fresh).
	Lb.	oz.			
Wyandotte cock ..	6	12	26.8	94½	24
Faverolle hen ..	5	12	29.6	88½	25
Growing chicken, 14 weeks	3	12	30.8	..	..

The breeds principally used for egg production in Queensland are not shown, but it will be seen that the laying hen and the growing chicken void a greater percentage than an adult male bird, and with high-producing birds, such as the Leghorn and Orpington, a conservative estimate would be 30 per cent. of live weight; therefore, a 4-lb. Leghorn would void per annum 62½ lb. and a 5-lb. Orpington 78, while it would take thirty-seven Leghorns or twenty-nine Orpingtons to void a ton.

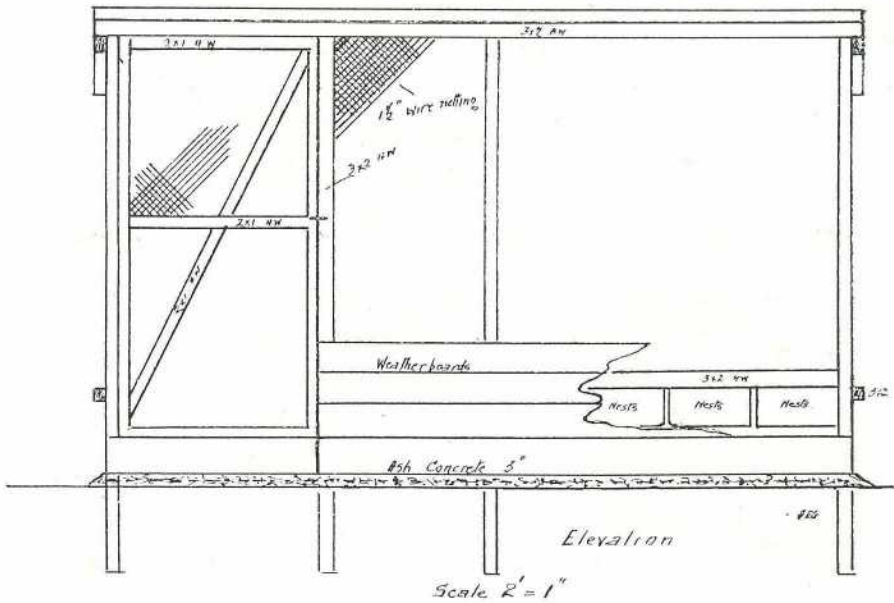


FIG. 2.

Composition of Fresh Poultry Manure.

The analysis of poultry manure varies with feeding, but that from stock fed on lines usually adopted for the maximum production should comply very closely to the following:—

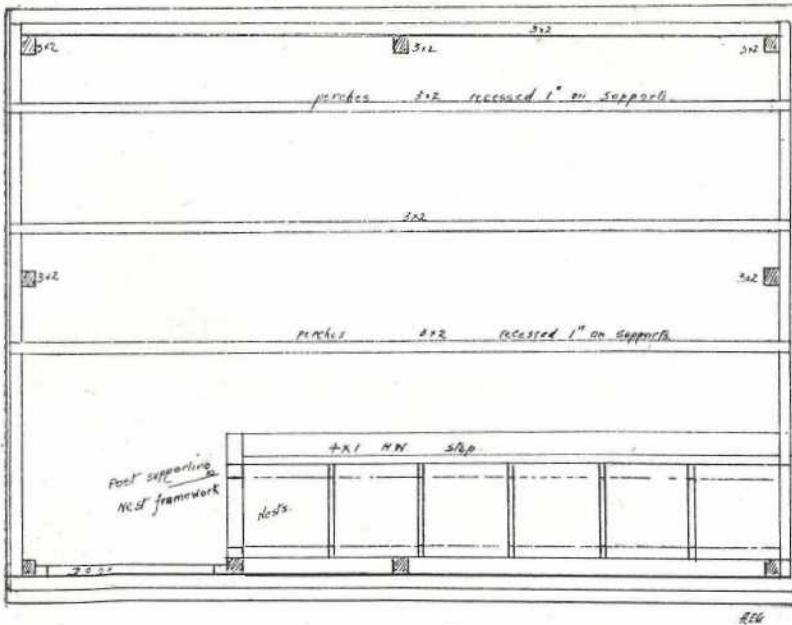
Moisture.	Dry matter.	Nitrogen.	Phosphoric acid.	Potash.
59.50	40.50	1.47	.71	.49

The commercial value of this manure based on its unit value is 39s. 6d. per ton, and the running of 200 fowls or slightly less, per acre, would be the means of manuring the land to the value of £10. However, its principal property being nitrogen some will be lost owing to its volatile nature, but there is in addition to the principal concentrates the organic matter—material which is an improvement to all soils.

Additional financial returns will depend largely upon the class of stock kept and the attention bestowed on them. Although they will save the grower many days labour in cultivation, spraying, &c., they will demand daily attention, and to the producer who is not inclined to give them this attention they are not recommended. Only the best should be kept. The breeding, rearing, and feeding should receive the same attention as the poultry farmer devotes to this work, as it is only by these means that the maximum results will be obtained. Generally speaking, each hen should return a profit over cost of feed, when kept in the vicinity of Brisbane, of about 10s., and 150 to 200 could be run per acre. This in conjunction with the manurial value should prove an incentive to fruitgrowers to work along these lines.

Making a Start.

Although the foregoing may appear attractive, in making a start, caution should be observed. The work of keeping poultry has to be fitted in and the great majority have to gain the experience essential for the rearing of young stock and the feeding of layers. A start should be made by the erection of a poultry house on the lines outlined in the plan, Figs. 1, 2, and 3. This house can be used with the addition of a cold brooder similar to that in Fig. 4 as a brooder house. After the brooding stage it can be used as a rearing house, and ultimately serve its original purpose of housing the adult laying stock. The rearing of chickens in quarters used for adult stock is not usually recommended, but under the conditions of range in the orchard soil contamination does not take place to any great extent.



Ground Plan.

Scale 2" = 1"

FIG. 3.

The purchase of day-old chickens should then be made from some reputable breeder and so save the necessity of buying breeding stock, and the work entailed in incubation. By doing this the number of chickens you have for a start are definite, they will be of the same age, which facilitates rearing and prevents the period of chicken rearing being unduly prolonged and becoming irksome. In making the purchase be sure and go to a reputable breeder who maintains the qualities, of both numbers and size of eggs in his stock.

Possible the best months for securing chickens is during August and September. Earlier chickens can be made use of if it is desired to have two lots during the one season, and so allow the first lot to get off your hands before a second lot is commenced with, say, in September.



PLATE 225 (Fig. 4).—THE MULTIPLE BROODER.



PLATE 226 (Fig. 5).—PAPAWS AND POULTRY.

The luxuriant growth here seen is undoubtedly due to the value of the poultry manure. The soil is of a light loamy nature, and not naturally rich in plant food.



PLATE 227 (Fig. 6).—CUSTARD APPLES AND POULTRY.

This class of fruit tree offers a maximum amount of shade to poultry in summer.

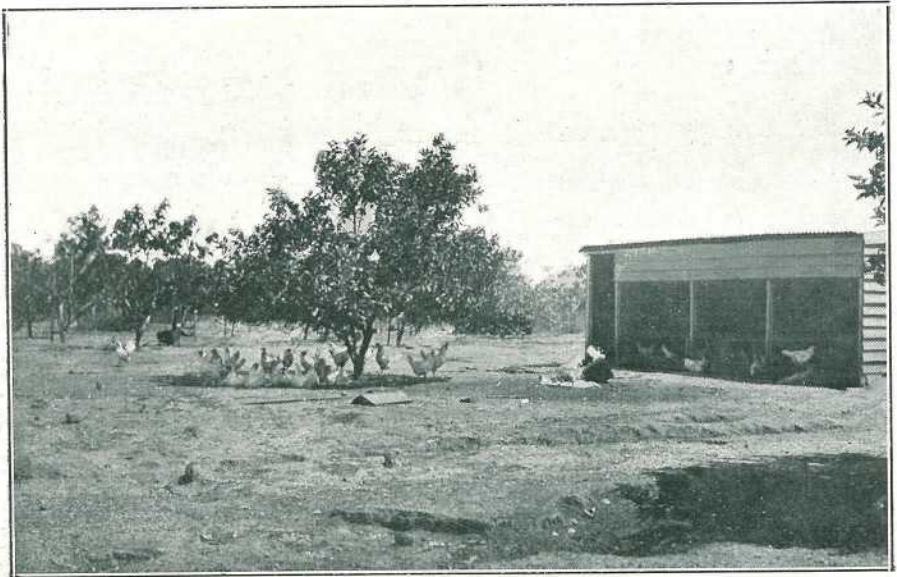


PLATE 228 (Fig. 7).

Citrus fruit growing and poultry keeping is commonly practised in various localities. The benefits to this particular farmer of the combination have been less work and greater returns.

Netting partitions to keep various ages separate can be erected at convenient spaces if desired, but they would interfere with the cultivation of the orchard and are not absolutely essential. If chickens are reared in a special house and confined for the space of two or three weeks with a temporary fence they will invariably return to their own quarters to camp. Larger houses than shown in the plan may be built, but units of fifty placed at intervals about the orchard will ensure a better distribution of the birds' droppings and incidentally will cause the birds to forage over the whole of the orchard.

The system of feeding which is adopted may be either wet mash in the morning and grain at night or dry mash in hoppers which is before the birds all day and grain at night. The latter system especially to the novice and to the grower who desired to reduce his work is recommended. The birds by this means are assured of getting all the food they require for egg production, while the grower is relieved of a good deal of work daily.

Reference to the plan, Figs. 1, 2, and 3, plainly indicate the simple nature of the house suggested for the purpose of housing fifty laying hens. It is simple in structure, being open fronted, roofed, and walled at back and ends with corrugated iron. A 3-inch open space is provided between the top of the back wall and roof to permit of a good circulation of air. In front weather boards are used as a shield to the nests, the balance being netted in to allow of the stock being protected from predatory animals during the night. The nests are made from petrol tins, one side of which, with the exception of 1½ inch, is removed. This is then turned at right angles to prevent the tin falling through the nest frame-work. Three perches are shown, 3 by 2 hardwood being used. This is placed on edge and the top corners slightly chamfered. They are supported on the bottom batten, and by being recessed in to the depth of 1 inch are perfectly firm, at the same time are easily removed for cleaning purposes.

The floor is raised to the extent of 3 inches above ground level to ensure dryness. Concrete is recommended, being readily cleaned and it does not become saturated with droppings. Earthen floors become foul and require renewal at frequent intervals.

The lines suggested on which a start should be made are economical as regards permanent fixtures and equipment, and also relieve the producer for the time being of establishing breeding pens, the necessity of purchasing incubators, and becoming acquainted with the operations of an incubator.

EFFECTS OF INTER-CULTIVATION.

During a farmer's whole lifetime he is constantly at war with weeds, and he cannot hope to receive the full reward of his labour if that warfare ceases, or is spasmodic. To completely eradicate weeds seems to be an impossibility, but at least they can be so held in check that they will not appreciably injure the growth of cultivated farm crops.

Weeds cause much injury in several directions. They rob the desired plants of much of their food supply, resulting in a reduction of their yield, and necessitating an increase of the quantity of fertilisers applied. It has been computed that some annual weeds take more potash and lime from the soil than two good wheat crops. Weeds rob the desired crop of a great deal of moisture, which they evaporate from their leaves; and this robbing the soil of moisture is one of the most serious effects that weeds have on cultivated plants. The secret of keeping weeds in check is to destroy them as soon as they appear, and keep on doing it. If they are allowed to develop seed, the evil is increased a thousand-fold.

Persistent inter-cultivation increases air supply in the soil, which results in a stimulation of the beneficial soil bacteria. Such cultivation also assists in destroying certain soil acids that are injurious to cultivated plants. It also increases the supply of nitrates in the soil. When the surface soil among growing crops is not stirred, the air in it becomes impure through the presence of too much carbonic acid; but cultivation has the effect of dispersing a great deal of the carbonic acid, its place being taken by oxygen, without which no farm plants can thrive. Cultivation—deep or shallow, as the circumstances demand—is the master key which enables the farmer to unlock Nature's stores of fertility and obtain the highest possible results from the fertilisers he may apply.

To quote an old writer on agriculture: "Men much wrong their corn in not giving their land sufficient workmanship; land in good tilth, in good heart, and sound, will cast out its very marrow."—Primrose McConnell in the "New Zealand Farmer."

THE FARM TRACTOR.

By E. T. BROWN.*

The modern carburetter is constructed of such high-class material and is subjected to so little strain that it requires the minimum of attention to maintain it in perfect working order. The controls, however, should be looked to frequently, since owing to the amount of vibration when the outfit is working on the land, there is always a tendency for them to work loose. In the case of a machine running on kerosene the carburetter is a rather more complicated piece of mechanism, but even so there is very little that can go wrong and cause trouble. The parts of the instrument that require the most frequent attention are the fuel filter, the air filter, the needle valve, the float, and the jet.

No matter what grade of kerosene or petrol be bought it always contains a certain amount of impurities. These consist of solid particles and drops of water. The presence of either of these in the carburetter will result in a stoppage of the fuel supply. With care, however, there is no reason why they should be permitted to enter the instrument. Special gauze-fitted funnels are sold for straining the fuel when it is being poured into the tank, but when petrol is the fuel used chamois leather will be found a more satisfactory filtering medium. On no account should the fuel ever be poured direct into the tank. By so doing one is asking for trouble. Every tractor is fitted with a filter between the tank and the carburetter, but, generally speaking, these are inadequate in size. A small filter means that the attendant must pay extra special attention to cleaning it. In many cases this is necessary three and four times a day. There are, however, a number of excellent filters on the market that can be bought and fitted to practically all makes of farm tractors.

A number of tractors are now fitted with an additional device for removing impurities. A narrow trough or sump is provided in the bottom of the fuel tank. The trough is sloped and at the lowest end a drain cock is fitted, this being below the level of the outlet pipe leading to the carburetter. The impurities are heavier than the fuel; hence they sink and collect in the trough. The drain cock should be opened before the day's work starts, since this allows time for the impurities to settle over night. The fuel that is drained off—only a very little is taken away on each occasion—need not be wasted. It can always be used for cleaning purposes.

A stoppage of the flow of fuel is sometimes caused by an accumulation of solid matter in the pipe leading to the carburetter. If the unions be disconnected the obstruction can usually be removed by blowing. Another cause of a stoppage in the fuel supply is what is known as an air-lock. This, as its name implies, is the presence of air in the fuel pipe. It is never experienced when the pipe is bent in the proper manner; therefore, if fitting a new pipe, see that it is curved in exactly the same way as the original one. An air-lock can generally be taken out by removing the filler cap on the tank if the fuel be pressure fed. This must, however, be done slowly, so as to reduce the pressure before it is finally taken off. Failing this the fuel will spurt out in a strong stream. In other cases blowing through the pipe will force out the air. Some tractor operators have a habit of sucking the fuel up through the pipe; this is bad, since neither kerosene nor petrol are wholesome.

Reference has been made before to the air filter; therefore, this part of the system calls for no further comment. The orifice in the jet as supplied by the makers is sufficiently large to allow of an adequate supply of fuel to the vaporiser. A too large jet opening will cause the mixture to be too rich, and, on the other hand, a too small jet will starve the engine. It is seldom necessary to tamper with the jet, excepting to clean it from time to time. If it ever be necessary to fit a new one this should be of the same size as the original. No matter how carefully the fuel be strained it is next to impossible to prevent some dirt or foreign matter reaching the carburetter. A minute speck of dirt may lodge in the jet opening and stop the flow of fuel. A key is provided in the tool kit for removing the jet. This should be cleaned by blowing alone. If an attempt be made to remove the obstruction by means of a piece of Bowden wire the jet opening may easily be increased, in which case the setting of the carburetter is destroyed.

Care should be taken to ascertain the level of the fuel in the float chamber. The correct level is three-sixteenths of an inch below the jet opening. Various makes of carburetter differ, but in the vast majority of cases the position of the float can be corrected quite easily. In some instances the adjustment is made by a special screw acting on the jet, raising it or lowering it according to whether the level is too low or too high.

* In the "Farmer and Settler."

REPAIR JOBS FOR THE FARM WORKSHOP.

The farm tractor operator frequently finds it necessary to use sheet metal of one kind or another when effecting repairs. Sheet metal of various gauges of iron, steel, and brass should be kept on hand. For making washers, clips, packing pieces, and the like they are indispensable. A necessary tool for cutting is a pair of stout metal-cutting shears. Metal, except temper steel, of any thickness up to three thirty-seconds of an inch can be cut with the shears. Heavier gauges of metal should be cut on an iron block or anvil with a cold chisel and heavy hammer. A guiding line should, of course, be made first with a steel scriber point, this being done on both sides of the sheet.

If very thick metal has to be cut it may be sawn in some cases; failing this, a row of small holes should be drilled close together along the cutting line. The metal between can then be cut with the chisel quite easily. The edges of the metal, whether cut by shears or chisel, should be trimmed by filing.

Using a Hacksaw.

Two kinds of blades should be bought for the ever-useful hacksaw. Some should have fine teeth; the others coarse. The former are employed for cutting iron and steel, together with brass tubes; the latter for softer metals, such as brass. Extreme care is necessary when using the hacksaw; otherwise a large number of blades will be broken. The blade must always be kept at right angles to the work and moved in a perfectly straight line. Hacksaw blades cut in one direction only. Pressure should, therefore, only be brought to bear on the blade when moving in the cutting direction, the direction depending, of course, on the way in which the blade has been fitted.

Dies and Taps.

Dies and taps are expensive tools, but the tractor owner is advised to purchase a set, especially if he be at some distance from the nearest stores. Otherwise they should be bought as required. British tractors are invariably fitted with nuts and bolts with what is known as the Whitworth thread. American tractors are fitted with special threads, these generally being 24 to the inch up to $\frac{3}{4}$ -inch bolts, with 20 threads to the inch for larger ones. Other machines make use of the millimetre sizes.

Dies and taps must be used carefully, especially the latter. Plenty of oil is needed when screwing iron or steel and the thread should only be cut in a clockwise direction. If there be a tendency to stick a half turn back should be made and then on again in the right direction, it is a mistake to turn violently in both directions, since this spoils the cutting edges. On no account should an attempt be made to screw or tap a hardened metal. It should be softened by heating before beginning operations.

The Art of Filing.

Filing is one of the most difficult jobs in the tractor garage to do in a proper manner. It is not nearly such an easy task as the majority of novices imagine. The handle of the file should be held in the right hand and the extreme tip by the fingers and thumb of the left hand. Filing should begin from the tip and proceed towards the handle. At the beginning of the stroke the greatest pressure should be applied at the tip and the least at the handle. As the stroke proceeds the pressure should be relieved gradually at the tip and increased at the handle end. At the middle of the stroke the pressure should be equal at each end; at the end of the stroke the bulk of the pressure should be at the handle end. On returning the file to its original position it should be lifted off the work.

The equipment of files should include flat, half-round, square, round, and three-cornered ones of medium and fine cut. A separate set of files should be kept for working with brass and other soft metals, since hard metals, such as iron and steel, soon take off the cutting edge. A file brush of steel wire should be part of the equipment. This is essential for keeping them in proper order.

Removing a Broken Stud.

This is a job that sometimes taxes the ingenuity of the tractor operator. He possesses no special tools for the purpose, and is at a loss to know how to proceed. If there be a part projecting this should be filed flat on two sides and gripped with a pair of pliers or with an adjustable spanner. An alternative to this is to

make a cut across the top with a hacksaw so that it can be removed with a screwdriver. If neither of these plans can be adopted, owing to there not being sufficient of the stud projecting, a hole should be drilled vertically in the stud and the tang of a file inserted. The file can be gripped in a spanner and the stud unscrewed. If a considerable portion project the simplest plan is to screw on a nut and a locknut. By applying a spanner to the lower nut the stud can be unscrewed without any trouble. When inserting a new stud the same method can be followed, but in this case the top nut should be screwed down.

CARE OF THE CAR.

The outstanding advantage of the Duco finish to the motor-car is the ease with which it may be kept clean and "new." Duco is the hardest, toughest, and most durable finish developed, but if the owner desires to keep his car looking as it did when delivered to him, the finish must not be abused, and the following suggestions are offered to the purchaser of a Duco-finished car:—

The car should be cleaned at reasonable intervals. Although it is possible in some instances to clean with a dry cloth, it is usually best to wash the finish if the car is very dirty, particularly if grit or small sand particles be present. Should the finish, after washing, appear gray or white, thorough polishing is required and Duco Polish No. 7 is recommended for this purpose.

Care should be taken that no alcohol or mixture containing alcohol is spilled on the Duco finish, but if this does occur, it should be immediately wiped off.

The Duco finish will usually resist the action of dilute acids such as are present in battery solutions, but it is advisable to exercise care in keeping any acid, dilute or full strength, from the finish.

If the car be only dusty, the dust may be removed with a dry cloth, and the polish then applied. If the car be dirty, however, it should be washed and dried before the polish is applied. A dry, clean cloth should be used in rubbing off the polish, and with thorough rubbing a fine lustre will be obtained. If in cleaning and rubbing traces of the colour remain on the cloth, the owner need not be alarmed, as this represents a weathering or wearing action and does not appreciably affect the life of the finish.

As upholstery material in closed cars is exposed to dirt and weather conditions, it is desirable, at least once a month, or more frequently if necessary, to clean the upholstery with a vacuum cleaner and a stiff hand broom. If the material becomes spotted, a cleaning fluid may be used for removing the spots, and when this has thoroughly evaporated, a hot flat iron wrapped in a wet cloth applied. Steaming the fabric and rubbing lightly against the nap will raise the nap to its normal position. Floor carpets may be cleaned by rubbing with a sponge soaked in petrol.

Leather upholstery may be washed with pure soap and water, rinsing off the soap and drying with a moist chamois. Petrol should not be used on leather upholstery.

To remove dust or dirt on the outside of the top a sponge and soap suds might be used, rinsing with clear water and then drying with chamois. Petrol or oil of any kind should not be used, as these will injure the fabric and dull its lustre. When curtains are wet, they should be allowed to dry before being folded and put away.

The inside of closed model tops may be cleaned by brushing briskly with the nap, using a vacuum-cleaner if available.

AN INFORMATIVE JOURNAL.

A Downs farmer writes (10th November, 1929), appreciatively of

"The informative and instructive matter appearing monthly in the 'Queensland Agricultural Journal.' . . . It is very helpful to those farmers who wish to run their farms on intelligent and scientific lines."

Answers to Correspondents.

FRUITGROWING.

Selected from the outward correspondence of the Director of Fruit Culture, Mr. Geo. Williams:—

A Prolific Lemon Tree.

J.M.A. (Yalleroi) writes—

“Is 251 dozen lemons from one tree (Lisbon) in one season, anyway approaching a record? The lemons were picked between February and September, and were all well above the average-sized lemon bought in shops. Also, is the size of the tree unusual? The spread of the branches is, roughly, 18 feet in diameter. We have had continuous good crops from this particular tree, but this was a record for it. The tree is eighteen years old.”

We cannot say that this production from one tree is a “record,” but it is a very remarkable yield.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Fodder Trees and Shrubs.

V.J.B. (Oakey)—

Some of the most useful fodder trees are—Portuguese Elm (*Celtis sinensis*), Bellasombre Tree (*Phytolacca dioica*), Kurrajong (*Sterculia diversifolia*), and Weeping Myall (*Acacia pendula*). We believe seeds of the Bellasombre Tree may be obtained from Mr. R. Dick, Purga, via Ipswich. The seeds of Kurrajong and Weeping Myall may be obtained from Messrs. A. Murphy and Sons, Woy Woy, New South Wales. The seeds of the Portuguese Elm are not available this season.

Twiggy Mullein.

E.T. (Maleny)—

Your specimen is known as the Twiggy Mullein (*Verbascum virgatum*). It is a stiff, erect-growing plant of an annual duration; it is a native of the Mediterranean regions and Western Europe, and is now naturalised in Australia. It is a fairly common weed in Queensland but is not very aggressive. It has no particular value.

Prickly Poppy (*Argemone mexicana*).

A.J.C. (Yarraman, Brisbane Valley Line)—

Your specimen is the Prickly Poppy (*Argemone mexicana*). It is a weed, and sometimes a serious pest, and has been suspected at times of poisoning stock. It would be as well to eradicate it from your lucerne patch as it might become a harmful ingredient in hay cut from the cultivation in which it occurs.

Plants from the Eungella Range.

W.G.H. (Mackay)—

The specimen you send is *Crinum pedunculatum*. We have no data as to the regularity of the flowering of *Albizia toona*. Some years ago when we visited the Eungella Range we saw one large tree of this species at the foot of the range. It was leafless at that time (October). Is this common to the species or do you think the tree we saw was exceptional in being deciduous?

Fertiliser Mixtures.

T.M. (The Summit, Southern Line)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—4-8-10 means that the mixed fertiliser contains 4 per cent. of nitrogen, 8 per cent. of phosphoric acid, and 10 per cent. of potash. See page 18 of pamphlet “Complete Fertilisers.” There is very little gained by making your own mixtures, as all fertilisers are strictly charged for on the percentage of fertilising constituents they contain (page 53).

Plants Identified.

G.R. (Beechmont)—Your specimens are—

The little shrub with rather strongly-scented leaves and lavender flowers, *Prostanthera ovalifolia*.

The twining plant with blue flowers is *Comesperma volubile*.

The little shrub with yellowish flowers is *Pomaderris elliptica*. These *Pomaderris* shrubs are very handsome when in flower and a number of species occur in Queensland. We were very glad to see the specimens, as we intend to revise the Queensland species of the genus when we get enough material, as we think there are more than one species that go under the specific name of *elliptica*.

The Hop Bush is *Dodonaea megazyga*. We were also very glad to get this, as we only had specimens once before, collected by the late Mr. Schneider, from the Upper Nerang.

G.M. (Rabaul, Territory of New Guinea)—

1. *Flemingia strobilifera*. Family Leguminosæ. A shrub common in India, the Malayan Archipelago, and New Guinea. I was interested to hear of the value as food to stock.
2. Two specimens were included in this parcel; the larger was *Stachytarpheta dichotoma*, very common in Queensland and known here as Snake Weed. The smaller specimen was *Hyptis suaveolens*, a common tropical weed of the family Labiateæ. It is a native of tropical America and is now found in most tropical countries, including Queensland and New Guinea.
3. *Alysicarpus vaginalis* (syn. *A. munnaulariæfolius*).

A Text-book on Botany.

A.F.S. (North Isis)—

A book you might find useful is Mr. C. T. White's elementary text-book of Australian Forest Botany, published by the Government Printer, New South Wales, price 7s. 6d. This may be useful to you, as the examples quoted, illustrating various terms, are mostly Queensland species. Other Australian text-books are—one by Dende and Lucas, and another by Mrs. Brewster and Le Plastrier. Any bookseller could be able to supply you with them. The price is about 4s. or 5s. for each book.

Of text-books published outside Australia, one of the best is F. W. Oliver's Elementary Botany. The one used by the Queensland University is Lowson's text-book.

If you wish to get a knowledge of the local plants we should say a good plan would be for you to collect specimens and forward them here for identification.

Later, if you feel inclined, you could obtain a copy of the Queensland Flora, by the late F. M. Bailey, price 30s. a set of six volumes. This contains descriptions of all Queensland plants known up to the date of publication.

Plants Suspected of being Poisonous to Stock.

Some time ago we received some specimens suspected of poisoning a cow and heifer on a Toowoomba property. The specimens are—

1. *Jacaranda mimosefolia*. The common jacaranda, native of South America, widely cultivated in Brisbane as a garden tree. It is not known to be poisonous in any way.
2. *Acacia* sp. Not specifically determinable without flowers or pods. The wattles or acacias are not generally regarded as poisonous except the pods of some species containing a saponin and regarded then as being poisonous, but no pods were borne on your specimens.
3. *Owenia acidula*. Emu Apple or Colane. A very handsome native tree common to the Downs; is not poisonous.
4. *Ligustrum lucidum*, the common species of privet, cultivated as an ornamental tree on the Downs. If the beasts were really poisoned, this may have been the cause of the trouble, as privets are generally regarded as poisonous, containing a bitter poison, glucoside. It is, however, a very common tree, cultivated everywhere on the Downs, and we have had no cases brought under our notice previously of stock eating it with fatal effect.

Analysis of "Native Pomegranate."

A.C.C. (Barcaldine)—

The parcel of creeping vines was handed to the Agricultural Chemist, Mr. J. C. Brännich, whose analysis is as follows:—

Analysis of shrub *Capparis Mitchellii*, sometimes known as Native Pomegranate—Crude fat (on water-free material) = 3.0 per cent. Contains no appreciable amounts of essential oils and no motor spirit or oil.

Heart-Leaf Poison Bush.

"COREENA" (Barcaldine, C.Q.)—

We received your specimens of Heart-Leaf Poison Bush and regret to state that we are not in a position to be able to inform you definitely at what stage of the plant's growth it is not poisonous. A good deal has been said about this plant's being poisonous only at certain times, but up to the present we have no definite proof of the correctness of such statements.

The question of the poisonous character of this and many other plants is an exceedingly complex one. Mr. Brännich, the Agricultural Chemist, has found an alkaloid in the Heart-Leaf Poison Bush, but so far the conditions which govern the appearance in the plant of this alkaloid are obscure. The botanical name of the Heart-Leaf Poison Bush is *Gastrolobium grandiflorum*.

The other specimen you sent, similar to Heart-Leaf Poison Bush, but with a long leaf which is silky on the under side, is *Greville Goodii*. This plant has been sent in here as a poison plant. There is a possibility, however, that it has been mistaken for the Heart-Leaf Poison Bush.

PIG RAISING.

(Selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.)

Pig Feeding.

H.E.J. (Upper Caboolture)—

Apparently your pigs are suffering from a severe form of constipation and from lack of a regular and sufficient green food and clean drinking water. It is evident your system of feeding is at fault somewhere, and we believe the balancing up of concentrates with a sufficiency of green foods and drinking water will overcome the trouble.

Asphalt.

O.S.W. (Mondure)—The City Engineer, in answer to a similar query some time ago, favoured us with this reply:—

The term asphalt has a wide range, and is used to denote bitumen. Asphalt, which is composed of bitumen as a binder used to hold or cement the aggregate (particles of sand, stone, chips, &c.) together, and even when tar is used as a binder the resultant mixture is termed asphalt.

If the word tarpaving is substituted it makes the necessary distinction. I presume tarpaving is what is meant. If your correspondent is in a district where a stone crusher is at work and can get the run of crusher aggregate—i.e., material as it comes from the crusher—and separates sufficient material for his work that will pass through a three-eighth square mesh sieve, the desired grading will be obtained.

If, on the other hand, he has to make up the aggregate it will be necessary to procure 100 per cent. material passing a three-eighth square mesh, 30 per cent. of which shall be retained on one-eighth mesh, 15 per cent. on 20 mesh, and the balance of 45 per cent. will grade down to the finest sand or stone dust procurable to which 10 per cent. of tar shall be added. If the aggregate can be brought to within 10 or 15 per cent. of these figures a good mixture should result.

The tar should be poured into a flattened heap and raked over with a stiff rake till properly mixed. The tar should be boiled to the proper consistency or, better, distilled or prepared tar purchased.

The mixture will require from 18 to 23 gallons of tar per cubic yard of aggregate, depending upon the amount of fines contained therein. The finished surface should be dusted with dust or fine sand.

General Notes.

Staff Changes and Appointments.

The Officer in Charge of Police, Wondai, has been relieved of the appointment of Acting Inspector of Stock as from the 9th November, 1929.

The Officer in Charge of Police, Milmerran, has been appointed an Acting Inspector of Stock as from the 2nd November, 1929.

Constable M. Bourke, of Mount Molloy, has been appointed a Slaughtering Inspector as from the 19th October.

Mr. E. Rowlings, of Inglewood, has been appointed Government Representative on the Dingo Board for the Western Downs District, vice Mr. A. R. Charles, resigned.

Constable J. J. Codde, of Eulo, has been appointed a Slaughtering Inspector as from the 28th October, 1929.

Messrs. L. A. Dollery, G. Barber, and H. Holzappel, of Cleveland, have been appointed Honorary Rangers under the Animals and Birds Acts.

The District Inspector of Stock, Rockhampton, has been reappointed Government Representative on the Gogango Dingo Board.

Mr. E. N. Goldsworthy, Superintendent of the Lazaret, Peel Island, has been appointed an Honorary Ranger under the Animals and Birds Acts as from the 2nd November, 1929.

Messrs. J. J. Tracey, R. Craig, and G. F. Moorhouse, of Currumbin, have been appointed Inspectors under the Diseases in Plants Acts as from the 2nd November, 1929.

Mr. L. F. Mandelson, of the Queensland University, has been appointed Assistant Pathologist, on probation, Department of Agriculture and Stock, as from 1st January, 1930.

Mr. P. J. McCauley, of Neurum Creek, has been appointed an officer under and for the purposes of the Animals and Birds Acts for the newly-proclaimed Sanctuary at Neurum Creek.

Messrs. A. C. P. Nurcombe, E. Widdup, D. F. Kay, P. J. Mannell, J. Byron, and W. J. White, of the Cotton Section, Department of Agriculture and Stock, have been appointed Assistant Graders (Senior) of the Cotton Section. Mr. W. A. R. Cowdry has been appointed Field Assistant, Cotton Section, as from 1st July, 1929.

Beware of Disease.

"Typhoid inoculation is no substitute for sanitary precautions, and the more highly civilised the community and the better use made of the knowledge of sanitation the less typhoid fever results.

"A warning note must again be sounded against the inactivity of rat prevention work and the ever present danger of plague visiting our shores. One match can start a conflagration, and one plague rat can start an epidemic."—From Annual Report of the Commissioner of Public Health.

Sugar-cane Growers' Defence Fund Levy.

A referendum to decide the question of the making of a levy for defence fund purposes by the Queensland Canegrowers' Council on all growers of sugar-cane, at the rate of 1d. per ton of sugar-cane harvested during the season ending on the 28th February, 1930, was conducted at the Department of Agriculture and Stock to-day with the following result:—

	Votes.
For the levy	1,914
Against the levy	1,591

This levy will be deducted by the managers of the respective sugar-mills from cane payments due by such mills to growers delivering their cane to such mills. The levy will be utilised in the following manner:—

Seventy-five per cent. for a defence fund to be used in assisting growers in cases of serious industrial trouble; in advertising; in compensation for injury caused by arson; and for other purposes such as legal expenses of vital importance to the sugar industry. The other 25 per cent. will be distributed amongst the various District Canegrowers' Executives to be utilised by them for local defence purposes.

Soil Surveys.

The Minister for Agriculture and Stock (Mr. H. F. Walker) has given notice in the Legislative Assembly that he would ask the House to consider the desirableness of introducing a Bill to authorise the entry of certain persons on to land for the purpose of making soil surveys of the State.

Foxes in Captivity—Penalty Imposed.

The Minister of Agriculture and Stock (Mr. H. F. Walker) has drawn attention to a practice which constitutes a distinct breach of a regulation under "*The Dingo and Marsupial Destruction Acts, 1918-1923*," for which a substantial penalty is provided. This refers to the keeping of foxes in captivity, and the insertion of newspaper advertisements to the effect that they are held for sale.

In view of the menace of the fox, particularly to the poultry industry, a bonus is offered by Dingo Boards for their destruction, and their capture for sale is therefore a matter which is viewed seriously by the Department of Agriculture and Stock, who will take the necessary action to deal with any further breaches of the regulation.

Mammitis—Departmental Service Appreciated.

Mr. J. W. Newbery, Clovelly, Kowguran, writes:—" . . . Many dairy farmers suffer great loss through contagious mammitis, about the worst scourge that can befall his dairy herd. I was badly hit by this scourge two or three seasons ago, but stamped it out of my herd by inoculating all my cows—about 100 altogether—with an autogenous serum prepared from milk from affected cows in my herd by the Government Bacteriologist, Mr. C. J. Pound, and I would strongly advise any dairy farmer similarly afflicted to adopt this remedy. The Agricultural Department acts most generously in supplying the serum at a nominal cost, and the inoculating process is so simple that any farmer can do it if he takes ordinary precautions as to sterilisation and follows the instructions so clearly set out in the leaflet supplied with the serum."

Is this a Fact? A Point for Fruitgrowers.

A guest at a Canberra hotel, who recently asked to be supplied with Australian preserved fruit instead of imported fruit, has informed the Minister for Trade and Customs (Mr. Fenton) that he was told that the hotel stocked only foreign preserved fruit. Mr. Fenton's informant added that it was rarely that Australian fruit was served in Australian hotels. Mr. Fenton, discussing the matter, said that it seemed extraordinary that in a country such as Australia, which grew some of the best fruit in the world, and where the preserving industry was so well advanced, the proprietors of hotels preferred to serve fruit brought from overseas. He would even be in favour of a boycott of the establishments which were so unpatriotic. If people would adopt a more Australian point of view there would be no difficulty in disposing of Australian preserved fruit. He could not understand the view taken by people who demanded the foreign product.

The Royal Society of Queensland.

The Ordinary Monthly Meeting of the Royal Society was held in the Geology Lecture Theatre of the University on Monday, 28th October. Professor J. P. Lowson, M.D., was in the chair, and about thirty members were present.

Miss D. Hill, B.Sc., read a paper entitled "The Stratigraphical Relationship of the Shales about Esk." The work indicated that the Esk Shales of the Ipswich coal measures represent closely related phases in a shallow fresh water basin, with but a slight chronological difference. For in effect the Basal Conglomerate of the Ipswich series changes laterally into the highest of the Esk series—the Esk shales. Both these are conformably overlaid by a volcanic stage. The Ipswich coal measure shales thin out rapidly northward and are missing from the basin north of Bellevue, where the overlying Bundamba comes to rest without apparent unconformity on the Esk Shales. The paper was discussed by Professor Richards, Drs. Bryan, Marks, and Whitehouse, and Messrs. Jones, Reid, and Tommerup.

Mr. Inigo Jones exhibited slides of the 1893 flood of the Brisbane River and maps of the area affected.

Dr. F. W. Whitehouse exhibited Bryozoa from the Lower Carboniferous limestones of Riverleigh, near Mundubbera. These included two species of *Archimedes* (genus new to Australia) and one of *Evactinopora* (genus new to E. Australia). The limestone with *Archimedes* contains the *Amygdalophyllum* coral fauna. The *Evactinopora* limestone is probably somewhat higher in the section.

Salt for Pigs—Warning against an Excessive Supply.

A warning against allowing pigs access to unlimited quantities of salt was given a few days ago by the Stock Inspector for the Casino district (N.S.W.), Mr. L. W. Devlin, who stated that he was called in recently to inspect a sow that subsequently died. Mr. Devlin found that a pig skin that had been salted in the process of tanning had been stretched over a log in the pig yard, and the sow had licked off a large quantity of salt, thus causing her death.

Southern Agents—A Business Hint to Fruitgrowers.

The Department of Agriculture, New South Wales, advises that instances have recently come before its notice in which Queensland fruitgrowers have consigned fruit for disposal in New South Wales, and have subsequently had difficulty in receiving the proceeds due to them.

Before consigning fruit to New South Wales agents, growers may, by communicating with the Registrar of Farm Produce Agents at Sydney, obtain information as to whether such agents are licensed under the Farm Produce Agents Act.

Hail Insurance Fund.

An amendment has been made to the Hail Insurance Reserve Fund and Hail Insurance Scheme Regulations under the Wheat Pool Acts. The object of these alterations is that the maximum of the reserve fund provided for in the original regulations which were passed in July, 1926, be increased from £10,000 to £20,000. In the old regulations it was provided that every grower should carry his own hail risk to the extent of the first 10 per cent. of the crop on the area damaged. This regulation has now been amended to read that every grower shall carry his own hail risk to the extent of the first 5 per cent. of the crop on the area damaged on each individual plot.

Provision is made to give wheatgrowers the opportunity of demanding a poll as to whether or not either or both of the above amendments shall be carried. In that connection a petition signed by at least 200 growers of wheat who delivered wheat to the Board for the 1927-28 or 1928-29 seasons must reach the Minister on or before the 17th December, 1929.

Fruit Drink Standards—Analyst's Comments.

The following excerpt from the Annual Report of the Government Analyst, Mr. J. B. Henderson, will interest citrus growers particularly:—

Of twelve samples of orange cordials examined, seven passed the fruit cordial standard, which requires the presence of not less than 20 per cent. of fruit juice. The aerated orange beverages on the market contained from nil to 10 per cent. of orange juice. The orange drink stalls were found to be dispensing a beverage containing about 10 per cent. of orange juice. The present popular demand for pure fruit drinks is one of the most beneficial national dietetic advances of recent years. Our most important fruits from the standpoint of vitamins are tomatoes, lemons, oranges, and bananas. Every one of these fruits contains at least four vitamins—namely, A, B, C, and D. These vitamins are the antirachitic, growth, antiscorbutic, and antineuritic "factors." It is important from the aspect of national health and the interests of our orchardists that the use of pure fruit drinks should be fostered in every possible way. A regulation appears to be necessary stipulating for a minimum proportion of, say, 5 per cent. of orange juice in orange beverages and the elimination of preservative and artificial colouring from all drinks sold over the counter for immediate consumption and purporting to be made on the premises from fresh fruit juice.

Other Points from the Analyst's Report—A Fat Reducer at about £5 a Pint.

Of twenty-two samples of minced meat and sausages examined thirteen samples failed to meet the standard in regard to preservative, the excess of sulphur dioxide in the sausages ranging from 2 to 243 per cent. Preservative is now forbidden in minced meat.

Three samples of chewing gum contained drugs in the form of acetylsalicylic acid and phenolphthalein. This method of administering drugs is undoubtedly dangerous.

A sample of soap, sold at a fabulous price, and described as flesh reducing, was found to be ordinary toilet soap adulterated with talc. A liquid preparation for reducing adipose tissue consisted of alcohol, soap, and camphor. The selling price of this simple mixture worked out at nearly £5 per pint.

Animals and Birds Sanctuary at Neurum Creek.

An Order in Council has been issued under the Animals and Birds Acts declaring that the Camping and Water Reserve 169, parish of Durundur, and an area of one-quarter of a mile on each side of that portion of Neurum Creek situated in the reserve and in portion 4, parish of Byron, shall be a sanctuary under the Animals and Birds Acts. This camping and water reserve is at Neurum Creek on the main Kileoy-Woodford road, and is a favourite picnic spot.

Colour Standards for Tomatoes.

The Regulations under the Fruit and Vegetables Act have been added to by the making of provision for standards for the colour requirements for tomatoes. The amendment provides that the following colour definitions shall apply to this fruit:—

“Ripe”: To include tomatoes fully coloured;

“Coloured”: To include tomatoes showing colour but not fully coloured;

“Green”: To include tomatoes showing no colour but conforming to the prescribed maturity standards.

The object of the Regulations is to insure that all the tomatoes in each individual case shall be of a uniform degree of ripeness.

The Millaa Millaa District.

Mr. H. Mure Robertson, formerly Auditor-General, has been spending six weeks' holiday with his son at Millaa Millaa, and speaks highly of the potentialities of that district. “During my twenty years' service as an audit inspector,” he writes, “I visited every town and district in this State many times, and I consider that in respect to climate, soil, permanent mountain streams, liberal rainfall, and natural advantages the Millaa Millaa district is unsurpassed in this State. The average altitude of 3,000 feet ensures a favourable climate with cool nights. Bartle Frere and Bellenden-Ker on the left and Father Clausey on the right attract a generous rainfall, with the result that this district always enjoys a bountiful supply of green feed and water for stock. As a tourist or health resort Millaa Millaa has many attractions—one could dwell indefinitely on the beauties of the district. At present tourists do not come further than Yungaburra, or Malanda, yet as regards scenery I think that the drive from Millaa Millaa to Ravenshoe over the range is equal to the famous drive over the coastal range from Yungaburra to Gordonvale. Although by rail the distance from Millaa Millaa to Innisfail is 155 miles, it is only about 30 miles in a direct line, and when the road now under construction is completed the Millaa Millaa district will then come into its own both as a dairying centre and as a tourist and health resort.”—“The Courier.”

Contamination of Cabbages—Dangers of Arsenate of Lead.

From the last Annual Report of the Government Analyst, Mr. J. B. Henderson:—In last year's annual report it was noted that arsenate of lead had been found in cabbages in dangerous proportion. The Food and Drug Regulations provide for no arsenic or lead in vegetables. A number of growers, particularly in one district, took no notice of the warnings given, and a number of consignments of cabbage contaminated with arsenate of lead have been seized in the markets and destroyed. Many of these cabbages contained comparatively high amounts of arsenate of lead, four containing between fifteen grains and seventeen grains of arsenate of lead. One on which the white stains of arsenate of lead were freely visible was boiled with salt and a little soda exactly as in an ordinary household. After straining it was found on analysis that the arsenate of lead as a result of the boiling had become evenly distributed throughout the cabbage and the water. The total arsenate of lead present was 15 grains. An ordinary helping of about 3 oz. of this cabbage would contain 0.25 grain of lead (calculated as metal) and 0.375 grain of arsenic (calculated as As_2O_3). Children are being advised at school to drink a cupful of cabbage water when they get the chance—probably for the vitamin content. A cupful (say 9 oz.) of water from this cabbage would contain 1.1 grain of lead (calculated as metal) and 0.6 grain of arsenic (calculated as As_2O_3), and the maximum medicinal dose of arsenic for an adult is only 0.06 grain. It is quite evident that there must have been cases of fairly acute poisoning from some of these cabbages. The symptoms of gastric and intestinal irritation in such cases occurring after a meal would not unlikely and not unnaturally be classed as “ptomaine poisoning.” There would also be a certainty of chronic lead poisoning if such contaminated cabbages were regularly used as a food. The drastic but necessary destruction of contaminated consignments will probably put an end to this highly dangerous practice.

Lead in Soda Water.

From the same report: Of 119 samples of soda water examined, sixty-nine samples contained lead at the rate of $\frac{1}{100}$ th grain or more per gallon. While the proportion of lead has been markedly reduced since 1926-27, it is important from a health standpoint that soda water should be entirely free from such a toxic substance as lead. It would be interesting to know if the country that is supplying carbonators containing lead solder to Australia is also providing its own inhabitants with soda fountain drinks containing lead in solution. Queensland and Palestine are the only countries so far where we have seen the presence of lead in soda water reported.

Soil Biology—A Successful Research Worker.

Mr. E. C. Tommerup, B.Sc., A.A.C.I., Forest Assistant in the Queensland Forest Service, has been awarded the Commonwealth Research Scholarship in Soil Biology by the trustees of the Commonwealth Science and Industry Endowment Fund.

Mr. Tommerup joined the Queensland Forest Service in 1926, and completed a year's post graduate work in forestry subjects at the University of Queensland. He matriculated in 1922 from the Brisbane State High School. He secured his Degree in Science at the University of Queensland, majoring in zoology, chemistry, and geology. In 1923 he gained the Thomas Morrow prize for a thesis on the application of science to increase agricultural production.

He will commence his studies at the University of Sydney next January, at the completion of which he will proceed to the Rothamsted Experiment Station, in England. He will be absent from Australia for about two years.

Mr. Tommerup is the eldest son of Mr. H. G. Tommerup, of Brisbane and Beaudesert.

"There is no Finer Workman than the Australian."

"It is somebody's job to strike a note of optimism in Australia," declared Mr. S. McKay, chairman of directors of H. V. McKay Proprietary Limited, Sunshine, Victoria, on his return from overseas recently. "Other countries have their worries, but they do not proclaim them to the world as we do. Australia is certainly passing through a very difficult period, but she can make a good recovery. She has wonderful powers of recuperation. She has been suffering from dry conditions and general depression, but so have other countries. The experience in Australia, however, has shown that good seasons invariably follow bad." Mr. McKay said that Australia possessed the right quality of materials, her steel, leather, and timber, particularly if the last-named were properly seasoned, more than met the requirements for the manufacture of harvesters, as far as quality was concerned. Australian workmen were efficient, skilful, and hardworking, notwithstanding what some people had said to the contrary. "There is no finer workman than the Australian, and, moreover, he possesses initiative. I would not change my staff at Sunshine for any staff that I have seen in America," continued Mr. McKay. The fundamental difficulty is the higher cost of the materials.

Does the Pioneer Spirit Survive?

Who will deny that Queensland is the land of opportunities or that the pioneering spirit is dead? A letter to the "Brisbane Courier," from Mr. Mure H. Robertson, former Auditor-General of Queensland, who is spending a holiday with his son at Millaa Millaa, North Queensland, is an effective reply to the pessimists concerning the future of the State. Ample room, he declares, is available in the Palmerston district for new settlers, who will have before them the example of many pioneers of recent years. Recently Mr. Robertson visited the homes of a number of settlers, amongst whom were a man and his wife—both accomplished and most intelligent—who, twelve years ago, left Sydney and selected 160 acres of dense scrub land in the Far North. The husband had never before had an axe in his hand, yet he set about to clear just sufficient land to accommodate a tent, in the meantime sleeping in a neighbouring barn. Later, with sufficient clearance, he planted grass to enable a horse to be maintained. In the absence of road communication all supplies had to be carried to the selection by the man and his wife. With the help of aborigines the man cut or sawed all the timber required for the building of a house, and carried from the town all the galvanised iron necessary for a roof and a tank. By dint only of hard work the settler was able to clear all the land and acquire an additional 40 acres, which is now all under grass, supporting a sleek herd of milkers. The couple enjoy excellent health, and have no desire to return to city life. Such are the rewards of grit and hard work.

Dirty Milk and Cheesemaking.

Dirty milk is one cause of trouble in the butter or cheesemaking dairy. Dairy products of prime quality cannot be made if the milk utilised for them is unclean, because the species of germs that prevail in dirty milk always taint it. It is only the kinds bacteria that are present in clean milk that are of assistance in the manufacture of dairy products. As dirty milk is due to carelessness with the milking cans and other utensils and appliances, this can easily be avoided.

Girls in Industry.

"I think girls will be used more and more for routine work instead of boys; first because they are less susceptible to monotony than the latter, and next, because the so-called blind-alley job is less of a menace to them than to the boys," declared the Chief Railway Commissioner for New South Wales (Mr. W. J. Cleary), in a paper which he read before the Economic Society. He added that he was not afraid of the economic effect of the invasion of industry by girls, because the eventual effect of this would not be unemployment of men, but a stimulus to men to fit themselves by training for more important work. The result would be a considerable improvement in the standard and quantity of output.

Aviation in Queensland.

During October machines of the Queensland and Northern Territory Aerial Services Limited carried 242 persons, and freight weighing 2,929 lb., the miles flown being 19,180, making a total mileage since the inception of the service of 968,948. The report of the company states that passengers on the regular route are coming forward steadily, and a useful service is being provided. Passengers between Brisbane and Mount Isa are carried each month; three days' travel time being saved by using the air service. Amongst freights carried for the month were newspapers, fruit, ice, and butter, besides medicines, flowers, car batteries, tubes and tyres, groceries, books, photographs, toy balloons, a gramophone, serum, and dental goods.

To Protect Haystacks from Mice.

Replying to a correspondent who inquired as to the best method of protecting a hay shed from rats and mice, the Supervising Architect of the N.S.W. Department of Agriculture stated that a barrier of plain iron, fixed on the outside of a wood frame, let into the ground 9 to 12 inches and projecting about 2 feet 9 inches above it, would have the desired effect. Let into the ground as described (in order to prevent the vermin tunnelling underneath it), the barrier is more or less a fixture—that is, it could not be moved to permit vehicles being drawn into the shed except at great trouble. It was recommended, therefore, that gates—comprising merely a panel about 10 feet long and fixed in such a way that they can readily be moved—be made in the barrier where necessary, and that underneath these gates a concrete wall 3 inches thick and 9 inches deep be constructed, the top of this wall to be flush with the bottom of the gate—the whole of the wall, that is to say, being below ground level.

The barrier should be constructed so that only a plain iron surface appears on the outside; therefore attention must be given to the construction at the corners and gate posts. If corrugated iron is employed in lieu of plain iron, curved sheets should be used at the corners, otherwise it is difficult to make a mouse-proof junction.

Care of the Working Horse.

In most orchards the horse is the main source of power used for drawing the various types of cultural implements used, and in order that such power be at its best (this is quite apart from, but not more important than, the question of ordinary humanity) every care should be taken of the horse, which should never be neglected, as he plays a very important part in orchard economy. Proper and regular feeding, watering, grooming, and stabling should all be attended to, otherwise the animal cannot reasonably be expected to do a satisfactory day's work.

Occasionally some discomfort is caused the animal through want of thought. Some orchardists place a piece of hessian over the mouth of the horse during cultural operations to prevent his biting the trees as he passes along the rows. This hessian muzzle may prove very distressing to the animal, especially in hot weather, and the discomfort can be obviated or minimised by using coarse gauze or netting instead of hessian. The horse is then able to breathe more freely, even when labouring under a heavy load.

Attention should also be paid to the harness, which should fit neatly, and steps taken to prevent any rubbing that may result in painful sores. Special care should be taken in choosing a collar, as one that is too tight is very distressing, while one that is too large is apt to chafe.

Agricultural Organisation—Minister's Remarks.

Addressing a representative gathering of Lockyer farmers at the Queensland Agricultural College at Gatton on 18th November, the Minister of Agriculture and Stock (Mr. Harry F. Walker) expressed his pleasure at being afforded an opportunity of addressing the farmers of the district. He remembered the early days when, as a result of want of organisation, farmers had to accept low prices and work under adverse conditions. As a result of organisation they had moved along, and, backed up by the departmental experts and research work, there was nothing to prevent them, as a concentrated body of farmers, getting the best out of their industry. He was out to push the organised marketing and selling of their products. Fifteen industries were now controlled by the Commodity Boards that had done splendid work. He asked where would the butter industry be but for the Butter Board or the Paterson scheme? The excellent marketing of wheat, due to the efforts of the Wheat Board, was responsible for the increased areas grown. Speaking of the Agricultural Department, Mr. Walker said he thought farmers did not make use of the department in the way they should. Civilisation had brought many problems to the agriculturist, and the work of the Department of Agriculture was to assist the farmer to solve those problems.

Home Projects—Work in Gayndah District.

Recently the Director of Education (Mr. B. J. McKenna) attended the Home Projects Club day at the Gayndah Rural School, and he expressed high appreciation of the work which was being done by the club. Mr. McKenna was accompanied by the Assistant Chief Inspector of Schools (Mr. R. McL. Riddell).

Mr. McKenna said that they were met by the school committee and taken by motor-car to the homes of some of the pupils enrolled as club members. The object was to see at first hand the work being carried out in the homes. The arrangements made by the boys were exceedingly creditable, and the housing of poultry and pigs and other farm stock there was on the most approved lines. The ingenuity displayed by some in providing drinking troughs was a tribute to the work being done on the vocational side of the rural school's activity. The various displays at the school were next inspected, a feature being a cupboard project by the girls, which was made at a cost of 7s. 6d. Its contents included jams, preserves, and confectionery, as well as ordinary household requirements, such as bread, scones, and cakes.

Luncheon, cooked by the rural school domestic science section, was served to the visitors. The various exhibits were judged by experts in the different sections, and prizes awarded. The gathering was one of the largest seen in Gayndah. Interesting features were addresses by four boys who were undertaking projects work. Speeches were also delivered by Mr. R. L. Boyd, M.L.A., and departmental officers.

Mr. McKenna said that the club work was having an effect in the district in the way of introducing better breeds of animals and the latest methods of housing and feeding. At the same time, the training in civics was a valuable aid to the pupil.

A Simple Abortion Preventive.

Mr. A. Levie, county veterinary officer for Derbyshire, reviewing in the "Handbook of the East Devon Milk Recording Society" the information available with regard to contagious abortion, arrives at the conclusion that the predisposing cause of the disease is a shortage of the necessary amount of salts in the blood and tissues of the body, thereby weakening the body resistance to disease. Put this right, he says, and the cause is inoperative. In this he claims to be supported by the success of the following measures adopted at all centres. They consist of giving in the food crude carbolic acid, iodine, rock salt, ground limestone, and cod liver oil, as follows:—

For twenty-four cows take 24 drachms (3 oz.) of a mixture of crude carbolic acid and iodine. Put this quantity in 24 pints (3 gallons) of boiling water; mix thoroughly, then sprinkle this solution from a watering-can all over the food for one meal for twenty-four cows, and mix thoroughly by turning the food over three times. Then give each animal her portion of this medicated food. Do this twice a week.

Put a piece of rock salt in front of each animal to lick at pleasure; a tablespoonful of ground limestone and a tablespoonful of cod liver oil in each cow's food twice a week, but not on the days the carbolic mixture is given. The crude carbolic acid and iodine mixture consists of adding 1 drachm of iodine resublimed to 16 oz. crude carbolic acid.

It will be seen that an endeavour is thus made to supply the required mineral of the body and at the same time to stimulate the activity of the thyroid glands. This gland secretes thyroxin; it is an essential to life. Lacking it the body cannot grow, and if already grown will degenerate and perish.

The Varying Feeding Value of Chaff.

The feeding value of wheaten chaff depends largely on the class of soil on which it is grown, a rich soil generally producing a chaff of high feeding value. At Coonamble Experiment Farm, New South Wales, it was observed that chaff from hay grown on the rich black soil required very little grain added to make it a sufficient ration for horses. Chaff produced on good soils has not always such an attractive appearance as that which comes from the lighter soils, but if the feeding qualities were better understood the former would be appreciated more highly. To convince the Sydney market that this is so will take time, no doubt, but meanwhile the farmer who has a strong soil can console himself that he can feed his horses well with less grain than if he were located on lighter land.

The Demand for Good Farm Horses.

We have frequently stressed the fact that, whatever may happen on the big farms and in the cities, there will always, in our time at least, be a demand for good draught horses. Even the tractor manufacturers are now admitting that fact. There was a period in the early history of power-farming when the most extravagant claims were made for the tractor. Now that it has worked its way into a more or less definite niche and has proved its value by means of experiment and trial its sponsors realise that, great as its utility is, it is not economically suitable for scores of the smaller jobs for which the horse is specially adapted.

The only factor that may lead to the ultimate displacement of the horse on the farm is the failure of breeders to keep up its standard. So long as sound, flat-boned types are bred, the type that can step out well and keep the plough, the cultivator, or the drill moving at a good pace without tiring on a reasonable day's work, the place of the draught horse is assured. Those who possess the right stamp of mares should not hesitate to breed from them, for they will find that the demand is there provided they can deliver "the goods."—The "New Zealand Farmer."

Downy Mildew in Vines.

Where attention has not yet been given to spraying for downy mildew, the operation should no longer be overlooked.

Downy mildew can be controlled by careful and systematic spraying with Bordeaux mixture, and no grower should neglect this excellent type of insurance for his crop. An endeavour should be made to keep a coating of the fungicide continuously on the vine to prevent infection taking place. The principal formula for Bordeaux mixture is as follows:—Bluestone (copper sulphate) 6 lb., lime (freshly burnt) 4 lb., water 40 or 50 gallons. Details of its preparation are the subject of a free departmental leaflet.

It is important to remember that Bordeaux mixture should be applied *before* the disease makes its appearance, in order to ensure adequate protection.

No hard-and-fast rule as to the time of spraying can be laid down. The outbreak of downy mildew is largely dependent upon prevailing weather conditions. In districts liable to black spot the Bordeaux spray (6—4—40) given when the early buds are bursting will also protect the vines for a short period against a very early attack of downy mildew. If the grower finds it unnecessary to take measures against black spot he should apply his first spray for downy mildew (Bordeaux mixture at 6—4—50 strength) when the shoots are about 9 inches long—not later. As new growth appears the vines should be resprayed—roughly at intervals of about two weeks. Generally speaking, downy mildew attacks vines later in the season than black spot, chiefly when the fruit is set. In some vineyards as many as six applications of spray are made. It is important that the Bordeaux should be freshly made when applied.

In abnormally bad seasons Bordeaux mixture made to a strength of 10—5—50 may prove an advantage.

Although sulphur is the recognised treatment for prevention of oidium or powdery mildew, systematic spraying with Bordeaux mixture will prevent this disease from becoming established.

In districts where good lime is hard to procure, washing soda can be substituted and Burgundy mixture made instead of Bordeaux. This spray is made according to the following formula:—Bluestone, 4 lb.; common washing soda, 6 lb.; water, 50 gallons. Burgundy mixture should be carefully made. It is important that it be applied *fresh*.

Burgundy mixture does not adhere to the foliage quite as well as Bordeaux; therefore, wherever possible, Bordeaux mixture should be used.

Milk Recording in England.

Volume 12 of the "Register of Dairy Cows" has been published by the Ministry of Agriculture and Fisheries (England). In 1917, the first year of the register, 478 members recorded 13,838 cows, of which 572 qualified for entry. Last year 4,862 members recorded 149,971 cows, of which 13,539 qualified. In the first volume the highest yield was 19,646 lb. milk; in the last it was 24,512 lb. milk. In eleven years the number of cows recorded has increased nearly elevenfold, while the percentage of cows that have qualified for the register has more than doubled. Not only has the progress of milk recording been phenomenal, but production has steadily increased, as a result of the lessons taught by the project. The standards for entry in the register vary for the different breeds, and are:—British Friesians (10,000 lb. milk), Shorthorns, Lincoln Reds, Ayrshires, Blue Albions, and Red Polls (9,000 lb. milk); Jerseys, Guernseys, Devons, South Devons, and Welsh (8,000 lb. milk). The milk yields of the leading cows of each breed are as follows:—Friesians (24,512 $\frac{1}{2}$ lb.), Shorthorn (22,868 $\frac{1}{2}$ lb.), Blue Albion (22,533 $\frac{1}{2}$ lb.), Devon (22,135 lb.), Lincoln Red (18,920 $\frac{1}{2}$ lb.), Red Poll (17,965 lb.), Hereford (15,510 lb.), South Devon (15,378 $\frac{1}{2}$ lb.), Welsh Black (15,263 $\frac{1}{2}$ lb.), Jersey (15,028 lb.), Guernsey (14,743 $\frac{1}{2}$ lb.), Ayrshire (14,449 lb.), Kerry (13,053 lb.), Park (12,739 $\frac{1}{2}$ lb.), Gloucester (11,993 $\frac{1}{2}$ lb.), Dexter 11,130 $\frac{1}{2}$ lb.), Aberdeen-Angus (10,802 $\frac{1}{2}$ lb.), Sussex (10,110 $\frac{1}{2}$ lb.), Longhorn (9,660 $\frac{1}{2}$ lb.), Galloway (9,305 lb.). The register is issued (1) to provide dairymen with lists of milk recorded cows with high yields, and of dairy bulls, particulars of which are available under the Ministry's milk recording project; (2) to encourage the keeping of authentic milk records, and the breeding of high-class dairy cattle; (3) to encourage dairymen to use pedigree bulls bred from a proven milking strain. The testing of pedigree herds by the Department of Agriculture of the various States of the Commonwealth has similar objects in view, and is proving equally efficacious.

Summer Fodders—Effect on Subsequent Wheat Yields.

Details of an experiment to determine the effect of summer fodder crops on the yields of subsequent wheat crops are given in a recent "Agricultural Gazette" of New South Wales.

In the Cumnock district, where farms are comparatively small and land values comparatively high, and where the rainfall is sound and above the average for wheat-growing districts, and climatic conditions are not severe, the soil could, in some opinions, be made to yield greater returns than those obtainable from wheat alternated with bare fallow in conjunction with sheep grazed on the stubbles and fallows. A fodder crop, it is contended, could safely and profitably be grown before the wheat. With the object of determining this question a departmental trial was commenced in 1925-26 in co-operation with Mrs. J. Berney, of Kildara, Eurimbla, in which certain areas were sown with summer fodders, grazed off, and followed by wheat, in order to ascertain the effect of the summer fodders on wheat yields in comparison with an area of bare fallow.

The total yields for the three seasons, 1926-28, were as follows:—

	Yield per acre.	
	bus.	lb.
Wheat after Japanese millet	53	55
Wheat after Sudan grass	60	13
Wheat on bare fallow	63	36

The aggregate yields for three years, it will be seen, showed a difference of 3 $\frac{1}{2}$ and 9 $\frac{1}{2}$ bushels in favour of bare fallow as compared with Sudan grass and Japanese millet respectively, which, at 5s. per bushel, represent monetary losses in wheat returns of 16s. 3d. and 48s. 9d. per acre. While the results of the trial extending over a period of three years show that the growing of summer fodders on a fallow prior to the sowing of the wheat or main profit crop has a retarding effect on subsequent wheat yields, states the Senior Agricultural Instructor who describes the trials, the amount of grazing or greenstuff for silage purposes which is obtained from the sowing of quick-growing summer fodders such as Sudan grass or Japanese millet in average seasons more than compensates landowners for the apparent monetary losses previously quoted, particularly in view of fluctuating wheat prices, and the greater attention being paid to the production of fat lambs, &c.

The question as to whether a system such as this would tend to encourage weed growth and the spread of diseases was not considered.

Colostrum—or “First Milk.”

Colostrum, which is sometimes known as “First Milk” or “Beastings,” is the milk secreted immediately preceding and directly after calving. It forms the best and only natural kind of nourishment for newly-born calves, and they should never be denied the “first milk,” as it has a special action on the intestinal canals.

Colostrum has a yellowish colour, peculiar smell, and a slimy appearance. After a lapse of from three to five days it assumes the characters of normal milk. During the first few hours after calving colostrum is very rich in solids, and contains characteristic organisms known as colostrum corpuscles, which do not wholly disappear until three weeks after calving.

The percentage of milk sugar is very small, its place being taken by other sugars, while the fat content is extremely variable. Colostrum coagulates on heating, which is due to the high percentage of proteid matter and albumin. The heat test is a reliable one, if doubtful as to the fitness of milk for use in the dairy soon after calving.

The mineral ash in colostrum is present to a greater extent than in normal milk, while the specific gravity is also higher, and varies from 1.046 to 1.079. (Normal milk 1.032). The milk given by cows after calving should not be used for at least four days if for butter-making, or ten days if for making cream cheese. As the composition of colostrum varies so considerably, until it finally assumes the characters of ordinary milk, no two analyses read exactly the same.

Comparing the analyses of colostrum with the average analysis of normal milk, a large percentage of proteids is found. Although the fat content is sometimes more than that in the ordinary milk, yet this is not always the case, the percentage of fat being often similar. Continuing the comparison, average milk contains from 6.60 to 11.80 per cent. more water than colostrum, and less mineral ash.

To Remove Foreign Bodies from the Eye.

The commonest foreign bodies in the eye met with in our farm animals are small pieces of straw and chaff. They are light, easily carried and blown into the eyes by the wind, or by snorting or coughing when the animal is feeding.

The foreign body lodging on the surface of the eye (the cornea) sets up an intense irritation and extra secretion of tears. This copious flow of tears from the affected eye is a common primary symptom. If the eye is not attended to at this stage new inflammatory tissue is laid down, and the straw or chaff becomes covered and embedded in this new deposit. As the irritation continues, so does the deposition of this new tissue, until the whole of the surface of the eye is covered with a whitish, opaque film. This is known as opacity of the cornea.

Later, if this irritation does not subside, actual ulceration of the cornea occurs with the discharge of pus. The whole eyeball may now become involved, the pus spreading to the deeper structures and permanently ruining the sight. The eyeball at this stage may become a dirty discharging mass of proud flesh assuming a tumourlike growth.

Treatment.—Of the old time treatments none were so barbarous as the plugging into the affected eye of ground glass, sugar or powdered alum. This cruel irrational practice, which caused great pain and suffering to the animal and often resulted in permanent injury, is now happily rarely practised.

The modern method is as follows:—A chaff or straw on the eye, if noticed in its earliest stages, can as a rule be easily removed. Take a piece of clean, soft rag, a handkerchief will answer the purpose, wrap this around the index finger so that about half an inch of the rag projects in a roll from the tip of the finger. A small quantity of vaseline or castor oil is smeared on the tip of the handkerchief. The animal's head is held in position, and at a suitable opportunity, with a bold stroke, the clothed fingertip is brought smartly across the eyeball over the chaff or straw. As a rule the offending particle will be found adhering to the handkerchief.

The after treatment consists of flushing the eye with a 2 per cent. solution of zinc sulphate, two or three times daily. The animal should be kept out of brilliant sunshine and away from draughts. Solutions of silver nitrate are also used with beneficial results. If the foreign body cannot be located continue flushing the eye with the solution, and in the majority of cases the white opaque film will disappear within the course of a few days.

When foreign bodies such as thorns have lodged in the depth of the eye, or in the case of valuable stock, it is best to seek the services of a qualified veterinarian.—“Practice” in the “New Zealand Farmer.”

Concrete on the Farm.

Mixing.—Concrete should be mixed on a wood, concrete, or other paved floor. If mixed on the ground, soil, grass, and other foreign matter is shovelled up with it and the concrete is weakened; the same result obtains if the mixer walks across the mixing floor with muddy boots.

The mixing floor should be reasonably water-tight, otherwise the liquid cement will escape and impoverish the concrete. Mixing should be done as near the work as possible to expedite the job, and also because wheeling concrete long distances in barrows causes the water and cement to rise to the top and the metal to settle hard in the bottom, necessitating a good deal of scraping out, particularly when the metal and sand are poorly graded.

The proportions of cement, sand, and metal vary according to the work in hand and, to a great extent, with the quality of the sand and metal. For foundations of a cottage, bases for engines, thick retaining walls and the like, use one part cement, three parts sand, and six parts metal of $1\frac{1}{2}$ -inch gauge; for walls of a cottage, floors of sheds, verandahs, &c., one part cement, three parts sand, six parts metal of 1-inch gauge; for fence posts, fodder silos, water tanks, &c., one part cement, $2\frac{1}{2}$ parts sand, and five of metal of $\frac{3}{4}$ -inch gauge.

Gauge Boxes.—It is unwise and uneconomical to guess at the proportions. For small jobs the ubiquitous petrol or kerosene tin may be used for measuring the cement, sand, and metal. For large jobs, however, it pays to make wooden gauge boxes, which are not difficult to construct. Cement is now usually received in paper bags containing 1 cubic foot. A useful gauge box for a 1-2½-5 mix is 2 feet 6 inches wide, 4 feet long and 12 inches deep. This is filled with metal, and as the amount of sand used is half that of the metal the same gauge box can be used by half filling it with sand. This quantity of metal and sand will require exactly two bags of cement. For a 1-3-6 mix a useful size is 2 feet 8 inches wide, 4 feet 6 inches long, and 12 inches deep. This may be used for the sand by half filling it, and the batch will require two bags of cement.

The gauge box is placed at one end of the mixing floor, and filled with metal; it is then lifted off, and the metal spread out to a depth of about 6 inches. The gauge box is then placed on top of the metal and half filled with sand; it is again lifted off and the sand spread evenly over the metal. The required amount of cement is then emptied on to and evenly spread over the sand, and the whole is turned over with a shovel, not throwing it into a heap but rather spreading it out in a thin layer. By turning back once more, the cement, sand, and metal will, if the turning is correctly done, be well mixed together in a dry state.

The mixture should then be turned twice more while the water is sprinkled on through the rose of a watering can or hose. It is important to add only sufficient water to make a workable mixture. Too much water weakens the concrete; it tends to separate the cement and sand from the metal. When wheeling it in barrows the slurry rises to the top and the metal consolidates on the bottom. Immediately it is tipped, the slurry runs away to the lowest level, leaving a mass of impoverished metal. If the mix is too dry it is hard to spread and pack in position, particularly in moulds.

Well-mixed concrete is spongy, quakes like jelly, leaves the barrows and buckets freely, and is easily spread and worked into position. It does not require tamping; in fact it cannot be tamped or rammed, rather is it consolidated by spading. It tends to consolidate itself, and when cast in moulds will, with a minimum of spading, present a clean, even surface when the moulds are removed.

Placing in Position.—Immediately the concrete is mixed it should be placed in its final position. It is necessary to prepare for it by excavating, grading, levelling off, &c., or if it is to be placed in moulds these should be all ready to receive it. The ground should be well sprinkled with water just prior to placing the concrete. Moulds should be painted with a cheap grade of oil so that they will leave the concrete freely when taken down. Concrete will become quite useless if allowed to remain on the mixing board for hours.

It is often necessary to place new concrete or concrete that has set hard on top of the old, as for instance, when building a wall. The joining of new work to old is called bonding, and should be understood—particularly when constructing water tanks, silos, and the like, where a water-tight junction is necessary. It is better to leave the top fairly level and even to sweep it clean, and after flushing it at intervals with water to spread a layer over it $\frac{1}{2}$ -inch thick with mortar, consisting of one part of cement to two parts sand. This mortar will lie evenly on the old work and the stones of the new concrete will bed down into it. If the surface of the old work is left rough and only a coat of slurry spread over it, the stones or metal of the old and new work will meet without any matrix or mortar between to bind them together, and a weak and leaky junction is the result.

Curing.—In the process of setting or hardening, concrete uses up water, and its ultimate strength will be seriously impaired if this vital constituent is allowed to evaporate through exposure to a hot dry atmosphere induced by the sun, hot winds, or artificially by lighting of a fire in a furnace, oven, &c., before the concrete is quite hard. To counteract the action of the sun and hot winds, concrete floors and similar structures should be covered with bags or sand and kept wet for several days. Walls and the like, are, of course, protected by the moulds for some time, and it is not usual in ordinary structures to take special precautions with these except where severe frost is likely. Frost will interfere with the setting of concrete until it is at least forty-eight hours' old. It is therefore necessary to protect it with dry bags or iron, timber, and the like.

Rendering.—Rendering is the term applied to plastering or surfacing with cement mortar, i.e., sand and cement. For floors, the proportions are one part cement to two parts sand. For walls it may be one part cement to three parts sand, but will not then be waterproof; for water tanks, dips, &c., it should be one to two. Rendering is generally laid on from $\frac{3}{8}$ to $\frac{1}{2}$ -inch thick. If required to be more than $\frac{1}{2}$ -inch thick it should be done in two-coat work, the first coat being scratched in criss-cross fashion to provide a key for the next coat.

Rendering must always be applied to well-moistened surfaces. For floors it should be put down a few hours after the concrete is laid, otherwise it will lift off the concrete, and be what is known as "drummy." If it is found necessary to render floors of concrete that is old or has dried hard, or even of brick, it is necessary to soak the surface with water for some hours and to brush over it a slurry of equal parts cement and sand immediately before applying the rendering.

Faith in the Farm Horse.

With just on forty years' experience as a breeder and user of horses, Mr. William Guskett, of Corowa, New South Wales, expresses the opinion that the horse has no equal for furnishing power for the farm. He cited the case of a neighbour who disposed of his horses and purchased a tractor, but towards the close of his first cropping season he was obliged to put it aside and get a team of horses together to finish his work. As an instance of the economy and long service of the horse, Mr. Guskett stated that he recently lost a mare by death, from which he had had twenty-one years' service, and he has another still going strong at the age of twenty-four. He wonders where a tractor would be at these ages. From the mare that died he had reared several foals, two of which he had sold for £50.

The Mating Age for Dairy Stock.

Old-time breeders never thought of allowing animals to breed until they had reached full maturity, and consequently they were never stunted in growth by reason of having to perform maternal duties before they had completed their growth, so that they developed bigger frames and produced stronger and better developed progeny.

Breeding from young stock is, of course, a great stimulant to early maturity, and by starting animals to breed young, there is not only a saving of time, but they become better mothers and more regular breeders.

The old custom was never to mate a heifer until she was from twenty-seven to thirty months' old, so that she would be three years' old when she gave birth to her first calf. By that time she had completed her growth, and had all the advantage of age and strength to perform her maternal duties.

Heifers that are put to breed at that early age would suffer no harm if they were allowed a rest between the first and second calf, but as a rule no rest is allowed, and they are kept on breeding as fast as they can, so that they never get any opportunity to make up for lost growth, and, besides, there is a big drain on the constitution.

TO FARMERS AND ORCHARDISTS.

"I should like to see every farmer and every orchardist take the 'Queensland Agricultural Journal.'"—Hon. Harry F. Walker, Minister of Agriculture and Stock, in the course of the debate on the Diseases in Plants Bill.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

CARE OF BABIES IN HOT WEATHER.

As the weather grows warmer babies need less clothing. In some parts of Queensland the weather is changeable at this season, and the baby's clothing should be regulated by the temperature, not by the calendar. Over-clothing causes sweating, and may lead to irritation and inflammation of the skin. Waterproof coverings over wet napkins are very likely to do this, and they should not be used. When it becomes really hot, the baby will be happier if he wears little or nothing besides a napkin and singlet with all his limbs free, but protected by mosquito-netting against flies and mosquitoes. He enjoys kicking his legs and waving his arms freely, and this is one of the advantages Queensland babies have.

In hot weather babies need rather less food but more water. Let them have water to drink between their feeds. A baby may be thirsty without being hungry, and if you try to satisfy his thirst with milk, which is a food, you may upset him. Be careful in increasing his diet at this season. If he is being fed on cow's milk this should be clean and fresh. As soon as possible after delivery put the milk in a small saucepan, which should be used for this purpose only, and bring it to the boiling point. Unless the milk has been properly pasteurised by a trustworthy process, this should always be done. Freshly boiled or pasteurised milk will keep quite fresh in an icebox for twenty-four hours, but without ice it cannot be expected to keep fresh for more than twelve hours. An icebox can be made of a kerosene tin placed in a box with 3 or 4 inches of dry sawdust all round, and covered by a lid.

Diarrhoea.

Babies who are being artificially fed very easily get diarrhoea in hot weather. It may be caused by overfeeding, by unsuitable food or by milk which is stale or dirty. If an artificially fed baby begins to have loose motions, all his food and all his milk should be stopped. He should be given one dose of castor oil to clear out any undigested food, and after that he should have nothing but thin barley water slightly sweetened for twenty-four hours. If then he is not quite well you should get medical advice or take him to the nearest Baby Clinic.

Gastro-Enteritis or Dysentery.

This is a serious disease which may begin gradually with loose motions, but sometimes comes on suddenly with fever and much weakness and irritability. The motions may be simply loose at first, but after a time they are seen to contain slime tinged with blood, may be very frequent and attended by much straining. Next month there will be many cases of this disease in Queensland, and some of these babies will die, for this has been so every year. If all our mothers understood how the disease is caused, and why it spreads from house to house, there would be much less dysentery and very few deaths from this cause among our babies.

Dysentery is not caused by the heat. Usually the worst of the epidemic is over before the hottest weather begins, though sometimes it continues right through the summer. Dysentery is not caused by feeding babies on cow's milk, for all disease germs in the milk are killed by boiling or pasteurising. But it is much more common among bottle-fed babies, whatever food they are getting, than among babies on the breast. The disease is caused by dysentery bacilli, and these disease germs are conveyed by flies from closet-pans or other filth to the babies' food. Not only must the food be most carefully protected from flies, but so must the bottles and teats after they have been scalded. Even breast-fed babies are not safe if they have dummies pinned on to their frocks to invite the disease-bearing flies to settle on them.

Protect your baby against this enfeebling, painful, dangerous, and often fatal disease by natural feeding, by avoiding the dangerous dummy, and by carefully protecting its artificial food from infection by flies.

Barley-water.

To make barley-water, take one tablespoonful of pearl barley, wash it carefully, add to 1 pint of water, and simmer for one hour. Then make up to 1 pint from the kettle, and strain carefully. Prepare fresh twice daily.

CONSTIPATION IN BABIES.

Breast-fed babies are never really constipated. Their motions are always soft, though they may be passed at long and irregular intervals. This sluggishness of the bowels arises from two causes—(1) Giving castor oil to the baby; (2) want of proper training.

Castor Oil Not Necessary for the Newborn Baby.

The first effect of castor oil is to empty the bowels. Its second effect is to prevent them from acting. The harmful and unnecessary practice of giving castor oil to a newborn baby starts an irregularity which is kept up and increased by repeated doses of castor oil. There results a condition artificially manufactured by the mother or nurse, which she calls "constipation."

Once or twice a day the baby should be allowed to lie without his clothes, or with only a singlet, and exercise his legs and abdominal muscles by freely kicking, for fifteen or twenty minutes in warm weather. This will often induce a motion. If necessary he must be held out over a pan, just touching its rim. It is a good plan to hold out a baby after each feed. He will pass water, thus keeping his napkin dry, and will often pass a motion. If the baby's training has been long neglected, these methods may not suffice. It may then be necessary to pass a soap pencil dipped in oil, or inject a few teaspoonfuls of plain boiled water into the bowel. Gently kneading the abdomen, beginning low on the right side, upwards to the ribs, across, and down on the left side, should help. Medicines should not be necessary.

Bottle-fed Babies.

Bottle-fed babies suffer from the same mismanagement and need the same treatment. With them the condition is more troublesome, for cow's milk is often constipating and causes firmer motions, often in solid masses, and sometimes in small round lumps like pebbles. The food may need adjusting, and it would be wise to consult a clinic nurse if possible. See that the baby drinks enough water. He may be taking more milk, especially if this is dried milk, than he should. The substitution of malt-sugar in the form of Mellin's Food, Maltogen, or Extract of Malt, for some or all of the sugar in his food, is often helpful. So is prune juice given as a medicine. If drugs are necessary, fluid magnesia, milk of magnesia, and liquid petroleum oil may be given in teaspoonful doses once or twice a day. No other medicines should be given except on medical advice.

A Very Important Point.

This is very important. Whatever medicines are given for constipation, much depends on the way the medicine is given. If too large a dose is given, or if it is given every second or third day, or once or twice a week, the irregularity of the bowels is increased, and the constipation may become permanent. The medicine should be given every day at the same time, in just sufficient doses to produce its effect and no more. The dose must be determined by trial. Once a daily regular action has been established, the dose should be slowly made less, and after a time may be left off. Used rightly, the medicine will help to cure constipation; used wrongly, the same medicine will make it worse.

THREADWORMS.

Children with threadworms generally suffer from an itchiness at the seat especially at bedtime. This may make them restless and prevent them from going to sleep. The itchiness is caused by the worms coming out of the anus and crawling about. More serious symptoms from threadworms are extremely rare in Queensland. "Picking at the nose" is not a sign of worms.

The only way to be sure that a child has threadworms is to see them in the motions. This is not difficult. They are about the size of cotton thread, about half an inch long, and are probably alive and wriggle. All sorts of things in the

motions, for instance the stringy parts of bananas, are sometimes mistaken by mothers for worms. If you are in doubt, put the things into a small bottle with methylated spirits and show them to your doctor. Children should not be given medicines for worms that they have not got.

Causes.

Every threadworm grows from an egg which has been swallowed. These eggs are very small and can be seen only with a microscope. The young child swallows some of these eggs accidentally, perhaps from the fingers of another child. When the worms crawl out to lay their eggs and so cause itchiness, he crushes them with his fingers, which become covered with these invisible eggs. Even though the hands are washed clean, there remain many eggs under the finger nails. All young children put their fingers into their mouths at times, and so they are continually reinfesting themselves, and increasing the number of their worms. Older children who suffer from worms will be found nearly always to have the habit of biting their nails.

Treatment.

If the worms are numerous, medical treatment will give relief. Strong medicines are necessary, and as these may be dangerous, they should be given only under medical direction. Injections of strong salt and water (as much salt as the water will dissolve) given after the bowel has been emptied will often bring away many worms, and these injections are harmless. Though many worms may be brought away by medical treatment, there are nearly always a few left behind. From these the child will probably reinfest himself, and in a few months may have as many as before.

The real cure of threadworms depends on the mother. Make the child sleep in good thick "combinations," so that his fingers cannot get at the worms to crush them. Smear some vaseline around the anus before he goes to bed to prevent the worms crawling and causing itching, or ask your doctor for some ointment which will kill the worms when they come out. If reinfection is prevented, the few worms left will die out of themselves.

MARKET GARDENING.

PARSNIPS.

The culture of the parsnip is easy, and is precisely the same as that of the carrot. Depth of soil is of primary importance, and new seed should always be obtained. The seed may be sown in March or April for the main crop, in drills from 2 to 3 ft. apart, the plants being afterwards thinned out to 6 in. They should be ready for use in about six months after sowing.

PEANUTS.

The peanut prefers a rather light sandy loam which contains enough vegetable matter to make it light and porous to prevent the soil from becoming too dry.

Peanuts, however, can be grown over a fairly wide range of soils, provided they contain a sufficient quantity of lime.

The plant thrives under a great variety of climatic conditions, provided there is a season of at least five months free from frosts; but a greater percentage of oil is contained in the nut when grown under tropical or semi-tropical conditions.

Cultivation of the peanut is a comparatively simple matter. The seed-bed should be well worked to a depth of 5 in. Reduce to a fine tilth by means of harrow and roller in order to obtain a fine mulch.

The object of shallow cultivation will be apparent when it is explained that, after the embryo nuts are fertilised, the stalks to which they are attached will continue to push into the ground until a firm bed is reached for the nuts to mature on.

When the nuts are ripened near the surface of the soil harvesting operations will be facilitated, and the less number of nuts left in the ground.

Sowing may be carried out during spring and early summer. On large areas a corn-planter may be used, either single or double row, suitably-sized plates being chosen for the purpose, but it must be understood that only shelled nuts can be dealt with in this manner; where the shells are only broken, hand-planting must be resorted to.

The selection of suitable seed is most important, the nuts being carefully shelled and hand-picked, only plump and perfect ones with unbroken skins being used for sowing. Neglect in this direction will lead to blanks throughout the crop.

The rows should be 3 ft. apart, with about 15 in. between the nuts.

Cultivation should take place as early as possible, and every endeavour made to keep the ground loose and free from weeds until the flowering period, when all cultivation should cease owing to the likelihood of damage accruing to the plants. When the haulms have quite died down the nuts may be lifted. In America certain implements are used for lifting the nuts more or less successfully, but on friable soils the ordinary mouldboard plough may be used with advantage. Smaller areas are usually dealt with by the ordinary digging-fork.

When lifted, the nuts are allowed to lie in shallow windrows until dry enough to shake off all surplus soil adhering to them. Providing the weather is suitable, they can then be allowed to dry in the open, if some form of protection is given to them from dews; but it will be necessary to prevent their direct contact with the soil by laying down straw or other suitable material. When sufficiently dry they may be carted and stacked in a barn or shed that is protected from weather, and the nuts picked from the stems at the grower's convenience.

Varieties—Virginia Bunch; Red Tennessee; White Spanish.

PEAS.

This is an important and profitable market garden crop, deserving of more attention than is frequently given. Like broad beans, it is essentially a plant for temperate districts, but is readily grown in the cool months of the year in warmer localities.

The water requirements of the crop are considerable; therefore the preparation of the land should be commenced early enough to bring the soil into good working order, and to conserve the moisture. Both from a market gardener's and farmer's point of view, peas add to the fertility of the land, and may be followed by nearly any crop that he desires to grow.

Any stable, or other well-decayed farm manure may be used in preparing the soil. If the land is in good heart and has been manured for the preceding crop, this will not be necessary, providing a light dressing of phosphates or, if obtainable, potash be used.

In planting, some forms of maize drills can be adapted for sowing peas. For small areas, shallow drills can be opened and the seed dropped by hand, and then covered over by a light harrow, cultivator, or by hand hoe. Do not hesitate to get the horse to work between the rows; it may also be necessary to hand hoe the rows in order to eradicate the weeds that the cultivator does not touch.

The principal market varieties are—Yorkshire Hero, Dairy, Dwarf, Defiance, and Stratagem. As many stocks of so-called Yorkshire Hero peas contain a large proportion of stragglers, mostly a run-out, round, blue pea, it is essential that the grower gives a little care to the selection of his seed, which should be a hand-picked sample, and true to name. Those, who up to the present have only grown Yorkshire Hero are recommended to put in a small area of one or more of the other varieties named, all of which produce much larger pods, consequently they are easier to pick, fetch a better price, and are more uniform in appearance when cooked.

Peas lend themselves well to transport and marketing in bags.

POTATOES.

Require a deep and friable loam, rich in humus. Such soils are frequently met with along creek or river flats and among the many scrub acres of this State. Where river or creek flats, however, are nutgrass infested, root crops are difficult to cultivate and keep clean.

Under Southern Queensland conditions two crops of potatoes can be grown each year—*i.e.*, spring and autumn—plantings being made in the months of February, and from August to October, according to frost prevalence, although in certain coastal areas plantings can be successfully made of the spring crop during the latter part of July.

In the tropical North, in districts where this crop can be grown, planting takes place immediately after the wet season, the crop developing during the cool months.

The first cultivation for potatoes requires to be deep. Land intended for this crop should receive a thorough preparation several weeks before the planting

season and be allowed to lie and sweeten, during which frequent cultivation should be given to ensure the destruction of weed-growths and to bring about a fine tilth of the soil.

Seed should be selected as free as possible from disease, of uniform medium size, preferably not larger than 2 in. in diameter.

All seed should be well sprouted or shot before planting. This can be effectively carried out by storing in shallow layers in a shed having an even temperature, and covering with straw or other suitable material.

As soon as the tubers show signs of sufficient growth (preferably not longer than one-eighth of an inch) they should be hardened off by exposure to the light, when less damage will accrue during subsequent handlings prior to and during planting.

As potatoes are highly susceptible to fungoid diseases it is advisable that the seed be treated with some form of fungicide prior to planting, and for this purpose commercial formalin forms one of the easiest and most effective methods. Take of commercial formalin 8 oz. and dilute in 15 gallons of water; immerse the tubers for two hours, drain, and when thoroughly dry, rebag, care being taken to see that all bags used have also been steeped in the solution. When dry, the tubers are fit for planting.

Seed, if not too large, may be planted whole and are to be preferred to cut tubers. If it is found necessary to cut the sets, lime (slaked) or ashes must be thoroughly dusted over the cut parts prior to planting.

Potatoes are planted in drills and are usually put in by means of a single-furrow mouldboard plough, the custom being to plant on every third round when taking a 9-in. furrow. This will give sufficient space between the drills for subsequent cultivation. Sets should be planted in the bottom of the furrow and at one side, at least 4 in. below the surface of the soil, with 12 in. to 15 in. between the sets.

As a preventive of blight a spraying of Bordeaux or Burgundy mixture should be given as soon as the leaves show above ground. A second spraying should be given just as the flowers are beginning to form.

Potatoes should not be lifted before the haulms have died down, unless intended for immediate use. Those intended for keeping should be allowed to thoroughly dry before bagging, and afterwards stored in loose, shallow layers in a somewhat dark but well-ventilated shed, care being taken to go over them occasionally in order to reject all bruised or rotten tubers.

Varieties recommended—Satisfaction, Brownell's Beauty, Carmen No. 1, Up to Date, Scottish Triumph.

PUMPKINS, MARROWS, SQUASHES, AND MELONS.

All members of this family require a rich soil, although pumpkins give fairly good results on comparatively poorer soils than those suited to marrows or melons. The soil should be deeply worked and care taken to add liberal dressings (where required) of manure.

Pumpkins are frequently grown between rows of maize, but where planted by themselves, for cattle use, may be dealt with in drills spaced from 12 to 15 ft. apart and spaced 12 ft. in the rows. The great secret in obtaining success in this crop is to keep the plants moving from the time they show above ground, and frequent cultivation will conserve the moisture, and at the same time check all weed-growths.

Increased returns can be obtained by judicious shortening of the lateral and main vines, which induces the plant to "fruit" and to form thick foliage over the roots, thus enabling it to resist to a greater extent hot and dry conditions.

Marrows and squashes are grown under similar conditions to those of pumpkins, with this exception, the distance between and in the rows being much reduced.

Melons.—Rockmelons like a fairly stiff loam—not the stiffest of soil, but one which responds well to cultivation. The cultivation for rockmelons is similar to that of the cucumber.

Water-melons.—For the production of this crop, on a commercial scale, a warm climate and an assured supply of moisture are essential for market purposes; therefore the crop is practically limited to the coast or to areas which can be watered; however in the inland districts good crops are obtainable when seasons are favourable.

Preserving melons.—From a market gardener's standpoint of profit, these melons are not comparable with watermelons, but a good demand exists for firm-fleshed

preserving melons for jam making. The round-shaped, red-seeded kinds are usually more in favour than the green-seeded varieties.

The cultivation of the melon is similar to that of the pumpkin, but distances between and in the rows may be considerably reduced.

VARIETIES.

Pumpkins, for cattle feed.—Selected Cattle Pumpkins.

Table Pumpkins.—Ironbark, Crown, Triamble, Button, Turk's Cap, Bugle Pumpkins, and Grammas; for general use.

Marrows.—White Bush, White Trailing, and Custard Marrow.

Rockmelons.—Nutmeg, Burpee's Champion Market, and Rocky Ford.

Water-melons.—Cuban Queen, Kleeckley Sweets, McIvor Sugar, Sugarstick, Halbert's Honey, and Kolb's Gem.

Seeds may be sown in early spring, as soon as all danger from frost is over.

KITCHEN GARDEN.

A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in covered seed beds, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

FLOWER GARDEN.

To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle, lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, erotons, colens, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet fox hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

Orchard Notes for January.

THE COASTAL DISTRICTS.

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "wincy" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one sized fruit, of even quality and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of this fruit are to hand, that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then why spoil the ship for a ha'p'orth of tar after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

- (1) That the fruit must be fully developed, but yet quite firm when gathered.
- (2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.
- (3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.
- (4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried

out a number of moths will hatch out and the eggs laid by them will turn to larvae that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

Farm Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstance being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected

to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

CONTROL OF WEEDS—SOME USEFUL MEASURES.

Once some species of weeds become firmly established, eradication is practically impossible; effective control of these is only possible before they have become established. Where weeds have taken possession and landowners realise that cutting is impossible, they look with hope to the use of chemicals as a means of destruction; but the question of cost must be considered, and although chemicals have been found to be effective in destroying weeds, on the whole the cost in such cases is prohibitive.

The old method of destroying plants by hand-hoeing or cultivation still remains as practically the only effective one that can be adopted. Provided the weeds are attacked in time and every care is exercised in cutting out new plants as they appear, weeds can be kept in control by this means at a comparatively low cost. Nevertheless, from various causes, weeds may eventually become so firmly established that other methods must be adopted, and the following suggestions are made so that farmers and graziers may adapt them to their needs in accordance with the severity of the infestation and the means at their disposal.

Destruction by Cultivation.—Certain weeds that are crop pests have roots or underground stems of such a nature that the plant reproduces freely from them, and, as a consequence, these weeds (amongst them are Johnson grass, sorrel, bindweed, &c.) are difficult to control. The most effective means of controlling weeds of this type is to plough the land deeply about September, and to cultivate it in such a way that the soil moisture is dried out. This can usually be done by cultivating the land very deeply with springtooth or rigid tine cultivators.

The object should be to loosen the land as much as possible, and at the same time to bring the roots to the surface. Provided the weather remains dry, this method is fairly effective, and if the weed is not killed entirely it is thinned out to a considerable extent. Obviously, however, the method is only successful when the weather is fairly dry, and it does not give good results in districts with a heavy rainfall.

Smothering Crops.—In conjunction with the cultivation method, smothering crops can be used with excellent results. After cultivating the land thoroughly in the way suggested, a rapid-growing crop such as wheat or oats should be sown. The cultivation of the land puts it in good condition for the crop, and the rapid growth under fairly favourable conditions prevents weed growth and establishes control.

Enforced Germination.—Another method of bringing weeds under control by cultivation is to work the land in such a way that the most favourable conditions are created for the germination of seed, and then to destroy the seedlings. Every farmer knows that when crop seed is being sown the soil must be put into a favourable condition for germination, and if the object is to destroy weeds, similar conditions must prevail.

The time and method of cultivating the soil will depend on the habits of the weed. If the weed is one which grows in the spring the soil workings must be made with the object of having the soil in proper condition at that period, while on the other hand if they are winter-growing seeds the soil must be prepared for favourable germination during the autumn.

Generally the practice should be to plough the land at least a month or two before the period when germination is expected, to allow weathering, and then to work with cultivators and harrows to reduce the soil to a fine tilth. In some cases, especially if the soil is in a loose condition, it may be advisable to use a roller in order to make it firm, as germination always occurs more satisfactorily when the seed is in a firm soil with from 1 inch to 2 inches of loose, fine soil on the surface. The young seedlings are then destroyed by the subsequent cultivations given to preserve the mulch and to prepare the seed-bed for the crop.

For weeds such as saffron thistle, star thistle, and others of a similar character which infest the wheat-growing areas, this is the most effective method, but to control these and other weeds which affect the wheat crop it is necessary to adopt a system of long fallow and to have the land under cultivated fallow for about twelve months—A. and P. Notes, New South Wales Department of Agriculture.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

Date.	December, 1929.		January, 1930.		MOONRISE	
	Rises.	Sets.	Rises.	Sets.	Dec., 1929.	Jan., 1930.
1	4.50	6.32	5.2	6.48	4.24	5.35
2	4.50	6.32	5.2	6.48	5.9	6.28
3	4.50	6.33	5.3	6.48	5.57	7.23
4	4.50	6.34	5.4	6.49	6.48	8.19
5	4.50	6.35	5.4	6.49	7.42	9.14
6	4.50	6.35	5.5	6.49	8.37	10.9
7	4.50	6.36	5.6	6.50	9.31	11.2
8	4.51	6.37	5.7	6.50	10.26	11.57
9	4.51	6.37	5.8	6.50	11.20	12.55
10	4.52	6.38	5.9	6.50	12.16	1.56
11	4.52	6.38	5.10	6.50	1.11	3.2
12	4.53	6.39	5.11	6.50	2.9	4.11
13	4.53	6.39	5.12	6.50	3.10	5.19
14	4.54	6.40	5.13	6.50	4.17	6.27
15	4.54	6.40	5.14	6.50	5.27	7.29
16	4.55	6.41	5.15	6.49	6.36	8.22
17	4.55	6.41	5.15	6.49	7.46	9.5
18	4.55	6.42	5.16	6.49	8.50	9.41
19	4.56	6.43	5.17	6.48	9.47	10.14
20	4.56	6.44	5.18	6.48	10.30	10.46
21	4.56	6.44	5.19	6.48	11.9	11.18
22	4.57	6.45	5.20	6.47	11.43	11.50
23	4.57	6.45	5.21	6.47	...	...
24	4.58	6.46	5.21	6.47	a.m. 12.15	a.m. 12.26
25	4.58	6.46	5.22	6.46	12.46	1.5
26	4.59	6.46	5.23	6.46	1.18	1.50
27	4.59	6.47	5.24	6.46	1.51	2.39
28	5.0	6.47	5.24	6.46	2.27	3.31
29	5.0	6.47	5.25	6.45	3.6	4.24
30	5.1	6.48	5.25	6.45	3.52	5.19
31	5.2	6.48	5.26	6.45	4.43	6.14

Phases of the Moon, Occultations, &c.

1 Dec.	☾	New Moon	2 48 p.m.
"	☾	First Quarter	7 42 p.m.
16	☾	Full Moon	9 38 p.m.
23	☾	Last Quarter	12 27 p.m.
31	☾	New Moon	9 42 a.m.

Apogee, 5th December, at 3.24 p.m.
Perigee, 17th December, at 10.6 p.m.

During the evening of the 15th it will be interesting to notice the Moon approaching nearer and nearer to Jupiter until midnight when Jupiter will be only 3 degrees above it, and both being near the meridian, will be rather more than half-way from the zenith, at Brisbane and Warwick, to the northern horizon. The Moon being nearly full, Jupiter will lose a great deal of its brightness, and for two or three evenings its satellites cannot be observed to advantage.

On the 22nd the Sun will reach the Tropic of Capricorn, rising and setting nearly 23½ degrees south of the points due east and due west. It will be found useful to have these points carefully noted on the eastern or western horizon.

On Christmas Day Saturn will be on the farthest side of its orbit, about 886 million miles beyond the Sun, which will then be passing from west to east between the two planets, but very much nearer to the earth. As the Sun sets on that day the magnificent constellation Orion will be rising.

Later on the whole of Orion, with the two finest fixed stars, Sirius and Canopus, stretching round to the right of it, and the Pleiades and Hyades with the great planet Jupiter on the left will, in the absence of the Moon and clouds, present a most beautiful picture of the starry heavens.

8 Jan.	☾	First Quarter	1 11 p.m.
15	☾	Full Moon	8 21 a.m.
22	☾	Last Quarter	2 7 a.m.
30	☾	New Moon	5 7 a.m.

Apogee, 2nd January, at 1.48 a.m.
Perigee, 15th January, at 10.24 a.m.
Apogee, 29th January, at 2.12 a.m.

On the 3rd the earth will make her nearest approach to the Sun from which its distance will be 91,300,000 miles.

The planets Venus, Mars, and Saturn will be apparently close to one another on the morning of the 3rd: but as they will rise only about one half-hour before the Sun they will be lost in the coming daylight.

On the 6th Mercury will be at its greatest distance, 19 degrees on the east side of the Sun.

The occultation of Tota Geminorum by the Moon, on the 14th instant, which will take place about 11 p.m., will not be visible north of Mackay, where the star will appear very near the northern edge of the Moon. Through binoculars or telescope it will be interesting to watch the star apparently skirting the northern limb of the full Moon. In the southern half of Queensland the star will disappear behind the Moon sooner further south and its reappearance will be proportionately retarded.

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

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

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

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