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Event and Comment

Anzac.

THE commemorating observance of outstanding events of the past, the keeping of memorial days, the recurring testimony of reverence and affection displayed on certain anniversaries—these occasions should be something more than mere opportunities for outpourings of sentimentalism.

Their real significance should be realised in the lessons they bring to us, whether of emulation or of hope, or as examples of high purpose and noble endeavour.

Anzac is synonymous with supreme examples of self-confidence and self-reliance; of an independence of obstacles on a great scale of human action and purpose which was sublime in the depth of its courage and majestic in its disregard of the fear of failure.

The Gallipoli landing was the prologue of a four-year epic of continuous heroism, which expressed itself in countless thousands of incidents of courage and fortitude on the part of those without whose unselfish constancy no battle could have been fought at all, whether of victory or defeat.

That record stands unsurpassed in the history of the world. It still challenges the admiration of all men who respect the qualities which make any people really great, and without which no people can be really free.

The things in men that make great achievements possible is much the same in all ages and for all occasions. Chief among these are vision, courage, self-reliance, the spirit of service.

Something more than wind and sail brought Cook and his crew over trackless seas from the Old World to Australia. Something more than

mere ability to fly carried Kingsford Smith and Ulm, Parer and McIntosh, Hinkler, Ross Smith and his brother, and so many others over vast continents from Europe to Australia, from America to Australia and back again.

The qualities they and the Men of Anzac displayed are the birthright of our people, bequeathed to us by the discoverers and pioneers of a pathless continent.

The coined word Anzac is synonymous also with service in its highest expression. It is service—service in all departments of life—that Australia needs to-day. For the right to give that service, men of the A.I.F. were ready to die. They did die.

Animals and Plants will catch Disease.

THE man on the land is confronted with all sorts of risks, in addition to the ordinary hazards of his calling. He builds up a herd or a flock in the course of years of thought and effort. He studies breeding, feeding, and weeding—that is, culling out the cows and other animals that don't pay. He studies his soils and plans a sound cropping programme. He does all this with the interest, keenness, zest, and well-directed energy of a man devoted to his job. Then, suddenly, he realises that some disease is taking toll of his herd. A farmer working along approved agricultural lines prepares his land, plants and cultivates the resultant crop. A good harvest is in prospect, and his problems diminish to the one of market prices. The crop upon which his hopes are built begins to wilt, and he wakes up to the fact that disease is robbing him insidiously of hard-earned returns. A market gardener applying all the arts of skilful husbandry, coupled with a shrewd study of domestic demand, aims to hit the market with a cash crop, only to see both crop and hope blighted in a night. All that is included among the risks of the game. Animals and plants *will* catch disease.

More is now known about diseases and their causes. The discovery of microbic life marked a tremendous advance in agricultural and veterinary sciences.

For the stockowner, the danger of transmissible disease is never far away. He may have the idea that his country is clean and he has taken every care to keep up the health of his herd; but bacterial or parasitical infection may be present in the soil or in his animals to manifest itself when conditions favour its virulence. On the other hand, his herd and property may be actually free from contamination, yet by means and in ways undreamt of disease makes its appearance. There are germ "carriers" among stock, as among mankind. It is by such "carriers," bought by the farmer in all good faith, that such diseases as pleuro-pneumonia, mammitis, contagious abortion, tuberculosis, and necrotic enteritis of pigs are brought from outside the boundary fence. "Carriers" may bring in animal parasites as well.

Microbes causing some diseases often exist in the soil ready to enter the body of a susceptible animal. A paddock may be contaminated by the discharges of sick stock, and it is in this way that tuberculosis, contagious abortion, and scours in calves may be transmitted from animal to animal. The soil of pig and fowl runs and calf pens may become heavily charged with microbic infection, to be taken in with food or gain entrance to animals through scratches or wounds.

It is now well known that animal parasites spend part of their lives in or on the soil, and many common parasitic diseases are contracted from contaminated pastures. Parasites of the skin may be passed on from one animal to another in crowded yards.

Then there are the air-borne diseases. The water supply may be another source of microbic infection. Insect-borne diseases is another problem of the man on the land. Then we have the non-transmissible diseases of stock, poisoning among them caused by poisonous compounds or poisonous plants. Poisonous plants and fodder crops that are poisonous at certain stages of growth are common causes of stock sickness, of a lingering illness, or of a quick death. Diet deficiency is another cause of serious animal ailments. Dietary trouble is often induced by mineral deficiencies in the soil—shortage of lime, phosphorus, salt, iron, or iodine. Tumourous or cancerous growths constitute another type of disease with which the stockowner has to contend. Much stock sickness is due, too, to fungus diseases, like ergot of paspalum. Stock diseases may, therefore, have their origin inside or outside of the animal, and by far the most important are those that attack externally, for they include all the transmissible disorders by which a whole herd or flock may be attacked.

The tendency to-day in respect of domesticated animals and plants, and in respect of man too, is, however, to give more and more attention to health and to stress less and less disease. Nutrition—animal and plant as well as human—is now receiving deeper study, and physiology is destined to displace in status both pathology and bacteriology. The animal and plant, as well as man, equipped with stamina must be, to a large extent, our safeguard against disease. Animal and plant breeders are planning their work accordingly.

What has been said of animals applies to plants also, at least to a wide extent. Diseases of plants arise largely from land impoverishment. In fact, the basis of plant disease, speaking generally, may be found in worked-out soils. The man on the land realises that safety lies in constant care and caution. His fight against diseases and pests —whether by prevention, control, or eradication—is a never-ending job. He knows that animals and plants will catch disease—a fact that, alas, so often takes the smile off the face of the Income Tax Commissioner.

The farmer is realising, too, that prevention is better and cheaper than cure, although a substantial proportion of men on the land still cling to old habits and traditions, resenting the application of scientific discoveries to the improvement and security of both stock and crops. Old-fashioned beliefs die hard, and it remains for the unbelieving to be convinced that science, although a hard taskmaster, is a sound and enduring friend.

Fortunately for us, agriculture and science to-day are working in double harness. The establishment of a School of Veterinary Science, in addition to the Faculty of Agriculture, within the University of Queensland, is of great importance and should prove of immense value to the stockowner. It is regarded as marking the opening of a new era for animal husbandry in this State. In no industry is there a greater opportunity for co-operation than in our primary industry—the co-operation of the scientist with the man on the land. Our Universities, our Departments of Agriculture and Stock, our Council for Scientific and Industrial Research, and other research institutions, are all contributing to the success of our rural enterprises. This spirit of mutual helpfulness is what makes life worth living. There is immense satisfaction in any success achieved towards the solution of farmers' problems, for success for the investigator means success for the man on the land and, consequently, success for the whole community.

The School of Veterinary Science, University of Queensland.

By Professor E. J. GODDARD, Science Co-ordinating Officer, Department of Agriculture and Stock, Queensland.

THE inauguration of a School of Veterinary Science in association with the University of Queensland represents a very important development in the interests of the animal industries of this State. The necessity for such a school has long been recognised by those who have been brought into intimate contact with the problems confronting our animal industries. The actual attainment of this objective towards which a drive has been made—more particularly during the past five years—is due in no small way to the energetic and sustained interest of the present Minister for Agriculture and Stock, Mr. Frank W. Bulcock.

The School of Veterinary Science will serve for purposes of education and research in the first place. The existence of facilities for education in veterinary science in Brisbane will serve to attract many worthy Queensland students who, for financial reasons, would be unable to undertake such studies if Sydney remained the only centre where such facilities were available. It is hoped now that the assurance of posts in the field of veterinary science will draw students of first-class ability into that avenue of endeavour. The availability of scholarships which, it is understood, the Government intends to create during the coming financial year and the institution of cadetships within the Department of Agriculture and Stock will open the way to students of outstanding ability and aptitude for the work. In the modern attack on the problems associated with animal health and disease there is need for the help that can be rendered by such men, and to the scientific mind there are few problems that have a greater and more alluring interest than those confronting the veterinary scientist in this State.

Until recent years there were two Veterinary Schools operating in the Commonwealth—at Sydney and Melbourne Universities respectively. For various reasons the Melbourne school was closed, and Sydney then became the only centre where facilities for training were within reach of the veterinary student.

The creation of the Council for Scientific and Industrial Research and the development of a Division of Animal Health and a Division of Animal Nutrition gave an impetus to the cause of veterinary science throughout the Commonwealth. There was quickly realised the necessity for a survey of veterinary problems in Australia. The definition of the major problems soon indicated the need for investigations of a fundamental order, and there arose at once in that connection appreciation of the fact that one of the main difficulties was that of available first-class man power. When it became realised that demand exceeded supply of suitable men for veterinary research there began an increased enrolment of students within the Faculty of Veterinary Science at the Sydney University. The Council for Scientific and Industrial Research engaged the interest of Governments and pastoralists in the several States and undertook investigations in the States, these being assisted materially by its laboratories at the Universities of Adelaide and Sydney. Needless to state, the activities of the Council were curtailed considerably by financial considerations.

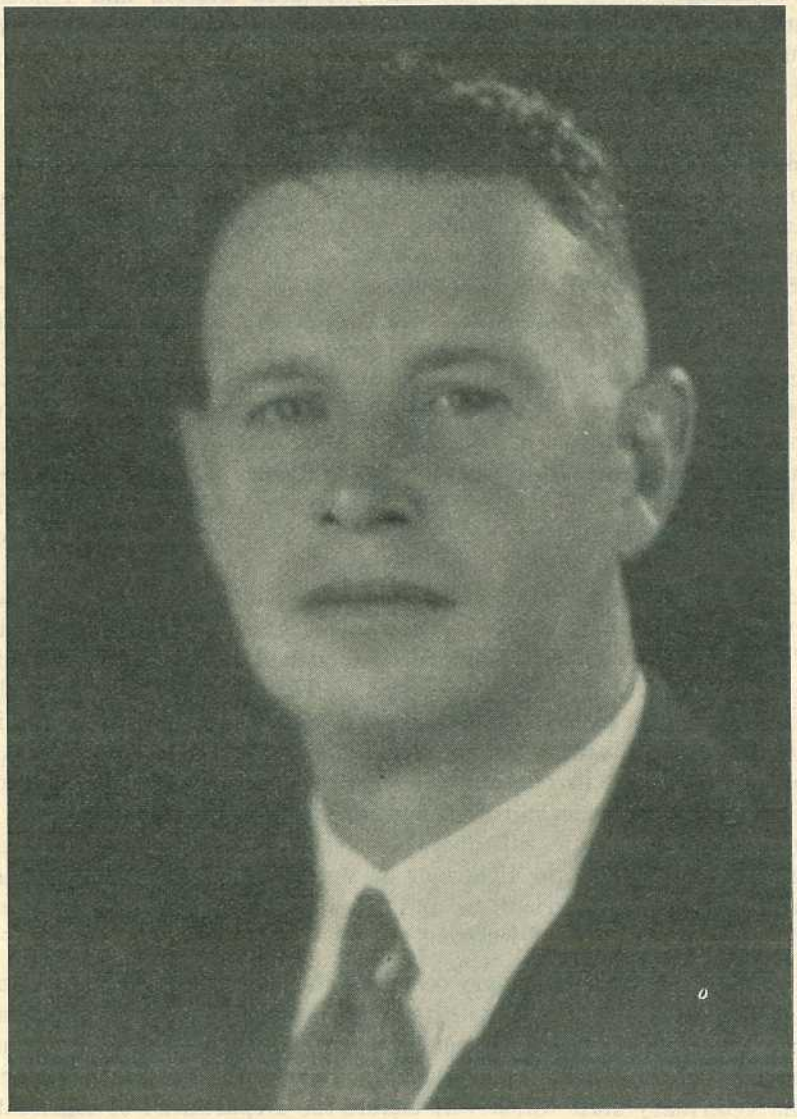

PLATE 165.

PROFESSOR H. R. SEDDON, D.V.Sc.

Dr. Seddon is the first professor of the newly-established Faculty of Veterinary Science within the University of Queensland, and was formerly the Director of Veterinary Research, Department of Agriculture, New South Wales.

In every way Queensland has co-operated with the Council for Scientific and Industrial Research, and has assisted that body materially by making available the Townsville Research Station and rendering financial help in that connection. We may take it as granted that Queensland will continue to co-operate in every way with the Council in its investigations.

There is, however, another aspect to consider. The creation of the Commonwealth Council, and its interest in animal investigations, by no means relieved Queensland of its responsibilities in respect of veterinary problems. It was still necessary for this State to carry out investigations and to maintain a veterinary service. The need for an efficient scientific staff for such purposes became apparent to the present Minister for Agriculture and Stock, who undertook the reorganisation of the Animal Health Station at Yeerongpilly and the creation of an Animal Health Board whose personnel included representatives of the Department of Agriculture and Stock, University, Council for Scientific and Industrial Research, Queensland Meat Board, Council for Agriculture, and medical profession. The difficulty of securing first-class scientific officers to meet the needs, dictated by a more and more serious attitude towards the veterinary problems of the State, gave impetus to the demand for facilities for training our own officers, and at the same time for providing facilities to Queensland students anxious to undertake veterinary studies. It was recognised that the instituting of a veterinary school would, further, stimulate interest in scientific research relating to animal problems and would also itself provide a centre of research. There has always existed a very efficient liaison between the University of Queensland and the Department of Agriculture and Stock in relation to agricultural problems, and it is anticipated that this same spirit of mutual co-operation in relation to the problems of the State will operate in relation to veterinary problems. The appointment of the Professor of Veterinary Science as Adviser to the Department of Agriculture and Stock augurs well for the attainment of that most desirable objective.

The value of a veterinary school to the State of Queensland cannot be exaggerated. Not only will it play an important role in providing a staff of first-class research officers and also itself act as a research centre, but, further, it will be the means for setting up in Queensland a scientific veterinary staff which will enable the Department of Agriculture and Stock to deal efficiently with all aspects of veterinary problems. This vast State includes large areas of varied classes of country with their own specific problems, and consequently arises the need for such decentralisation as shall ensure the presence of scientifically trained officers at numerous centres in the State. There is need not only for men capable of assisting in a scheme of co-ordinated research activities, but also capable of carrying out extension work on an efficient basis. Only a veterinary school in Queensland can properly meet the State's needs in this connection. What the Faculty of Agriculture has done

and will continue to do on a more extended basis for the State of Queensland will be done by the Faculty of Veterinary Science in connection with animal problems.

In passing, mention may be made of fears and criticisms voiced in the South when the idea of organising a veterinary school in Queensland was first seriously mentioned. Reference was made in such quarters to the forced closing-down of the Melbourne Veterinary School; the lack of students; the possibility of an inferior training; the difficulty of securing a high-grade staff; the cost of maintaining a faculty on an efficient basis; the needless overlapping of activities with those of the Sydney school; the need for one school only in Australia; the desire for a national school, &c. It is now recognised, I believe, that these criticisms have lost their weight. There is no fear now in respect of the enrolment of students, and the position in Australia to-day is that the demand for first-class veterinary officers is greater than the supply. The University of Queensland has set up a five-years course, as in other parts of the world—and now Sydney proposes to do the same; we have secured as Professor one of the outstanding men in veterinary science in Australia; the school will be financed on as elaborate a basis as is that of Sydney; no school other than one in Queensland can meet the needs of this State in respect of supply of first-class men for research and extension work, or satisfy the requirements of the State in its influence on the veterinary service of the State.

In these days, the attainment of success in the attack on problems of major importance confronting the scientist is recognised as being dependent on efficient team work, and the organisation of team work is dependent on proper direction. We believe that a Faculty of Veterinary Science, acting in liaison with the Department of Agriculture and Stock, and co-operating with the activities of the Council for Scientific and Industrial Research, will organise team work on a most effective basis in Queensland, and will in years to come be regarded as the means whereby a belated but serious scientific attack on a large and continuous scale on our animal problems was launched in Queensland.

Queensland is in the mood to-day under an energetic Minister to reorganise its activities in relation to agricultural and pastoral problems. Attention is being organised towards a thorough scientific handling of the problems associated with pastures, beef cattle, dairying, &c., and the available talent of the State is being co-ordinated. Without any intention of discounting the excellent work done in the past by officers of the Department of Agriculture and Stock and the University, we may say that we are witnessing the birth of a new epoch. Too long has Queensland remained in respect of agricultural and veterinary science the Cinderella of the Eastern States. We are awake to our needs and there is the mood to respond. We carry heavy national responsibilities in the State of Queensland, and the spirit now operating in an attempt to discharge those responsibilities is gratifying and encouraging.

The existence of a Veterinary School, and the concomitant inauguration of a Medical School providing facilities on the physiological and pharmacological side, will enable us to tackle problems such as those relating to poison plants—wild and domesticated—on an efficient basis. In this connection animal nutrition, so important to our cattle and sheep industries, will receive special attention, and we can look to organisation of team work in connection with our pasture-problems—investigations on a co-operative basis. There is to-day a growing consciousness that we must look to human and animal welfare from the angle of health rather than disease; and the problems of nutrition are looming large on the horizon. The School of Veterinary Science in Queensland will give special attention to such, and thus will function to a considerable extent as a School of Animal Husbandry. It is to be anticipated that the interest and confidence of those concerned in the animal problems of Queensland and the advancement of our animal industries will be engaged in this new and much-needed development.

The University of Queensland is fortunate in having secured the services of Dr. H. R. Seddon as its first Professor of Veterinary Science.

Born in New Zealand, he received his early training in veterinary science at the University of Melbourne, where he graduated as Bachelor of Veterinary Science with first-class honours. He gained his Doctorate in Veterinary Science in 1921, on the presentation of a thesis dealing with contagious abortion. Professor Seddon has been engaged in veterinary scientific work since 1907 in various capacities and, in that connection, has been associated with the New Zealand Department of Agriculture, the University of Melbourne, the Australian Army Veterinary Corps (on active service), the University of Sydney, and the Department of Agriculture, New South Wales. In the Universities of Melbourne and Sydney he has occupied several lectureships. Since 1924 Professor Seddon has been Director of Veterinary Research, Department of Agriculture, New South Wales. In addition to his experience as a lecturer, he has long research experience associated with veterinary institutions—Melbourne, London, and Glenfield (N.S.W.); and has visited the leading institutions in Great Britain, Holland, Denmark, Sweden, Germany, and South Africa.

He has published on his own account or jointly over 130 papers and articles dealing with various diseases of live stock. These include articles embodying research work on tuberculosis, blackleg, contagious abortion, contagious bovine pleuro-pneumonia, tick fever, botulism, mycotic dermatitis, arthritis in sheep and pigs, caseous lymph-adenitis, swine fever, infectious laryngo-tracheitis, and pullorum disease of fowls, &c.; the following parasites—sheep blowfly, liver fluke, tapeworms, stomach and bowel worms, sheep tick, &c.; nutritional studies, including the value of various minerals to stock; and poisonous plants.

Professor Seddon thus comes to us as a veterinary scientist with high academic distinction, very considerable teaching experience, a long record of scientific investigation and scientific administration, a wide experience of Australian conditions and animal problems, a knowledge of veterinary scientific activities in the leading research centres of the world; and with a reputation of high standing in the Commonwealth and other parts of the world.

A Recent Army Worm Outbreak.

By J. A. WEDDELL, Entomologist.

TOWARDS the middle of March inquiries were received regarding the control of caterpillars attacking fodder crops and pasturage in the near Brisbane areas. For a few succeeding days the inquiries increased in numbers, but were still limited to districts within about 12 miles of the city, giving rise to the opinion that the caterpillar outbreak was of somewhat local significance. By the end of the week, however, reports of attacks were streaming in from widely separated districts. Specimens of the caterpillars were submitted by inquirers, and also the insects were personally observed in the field in a number of the districts affected. The caterpillars were provisionally referred to the genus *Spodoptera* and, when adults were later bred out, the species *Spodoptera exempta* Walk. was found to be wholly responsible for the outbreak. The following observations were made during the outbreak.

Distribution.

The species was previously known to be widely distributed, so that it was not particularly surprising from one point of view that serious infestation was recorded in Queensland from districts as widely separated as Rathdowney, near the south-eastern boundary, and Rockhampton, in the central coastal area, and as far west as Jandowae, on the Darling Downs, over 120 miles from the coast. Notes in the public Press also indicated that similar attacks were being experienced in the Northern Rivers district of New South Wales.

The main damage occurred from Gympie southwards, on the Blackall Range, in the farming areas around Brisbane, such as Samford, Strathpine, Brookfield, Moggill, in the Ipswich district, along the Fassifern Line south to Boonah, where large areas were involved, and across to the Beaudesert district.

It is interesting to note that conditions must have been uniformly favourable over a wide belt of country for the almost simultaneous appearance of unusually large populations of this one species. One cannot help attempting an association of ideas in that, during the recent summer, South-eastern Queensland experienced first an epidemic outbreak of the Rutherglen bug, *Nysius vinitor* Berg., attacking mainly market garden crops, which lasted about three months, closely followed by swarms of the red-shouldered leaf beetle, *Monolepta rosea* Blkb., in maize, figs, cotton, and other important crops, not to mention garden and ornamental plants. Now the series has been rounded off by the army worm outbreak.

Damage and Importance.

In most cases the damage first noticed was on fodder crops of recent planting which had been planned to fill the needs of winter feeding of stock. Almost the whole range of graminaceous fodder crops grown in the localities mentioned were recorded as being seriously affected—wheat, maize, giant panicum, sorghum, saccaline, imphee, Japanese millet, and Sudan grass. Young plantings having from 6 to 12 inches of growth were particularly severely damaged owing to the attractiveness of the plants and also to the relatively small amount

of food such a stand represented. As a consequence an invasion of caterpillars was capable of moving rapidly through such a young crop and completely denuding several acres in a few days. Many such examples were seen; one patch of young sorghum, two to three weeks old, 9 inches high, 5½ acres in extent, was wiped out in four days, while an area of 5 acres of giant panicum containing two strips 6 inches

PLATE 166.
Mature Caterpillars invading Sorghum.

and 12 inches high respectively was almost completely eaten in three days. In general such young plants were eaten down to short stalks, many plants being cut to the ground. It is very doubtful whether there could be any satisfactory regrowth even from the less damaged of the plants.

A certain preference for the younger growth is demonstrated in Plate 167, where there are shown, in the area denuded of giant panicum that had attained 6 inches of growth, a few volunteer sorghum plants, approximately 18 inches high, which were passed by the main invasion of caterpillars. Serious damage occurred in crops up to 2 feet in height (Plate 166), but owing to the greater body of feed available to the caterpillars their progress was slower and more time was available to apply arresting measures. In plants of this size the flag was stripped to the midrib and the residue of the crop appeared as strawlike wisps. These plants would give regrowth, but naturally the crop would be greatly reduced. With still older plants the damage tended to be

restricted to the lower leaves, not however without exception, and the severity of loss was somewhat in the nature of an inverse ratio to the age of the crop. Very little damage was seen, for instance, on maize in cob.

Other than the fodder crops abovementioned, no other cultivation was recorded as receiving damage. Freedom from injury was strikingly illustrated in the case of lucerne. Many patches in varying stages of growth through which caterpillars had recently swarmed, or were actually working, were examined. The lucerne was completely unharmed, while the unwanted grass and nut grass growth that was

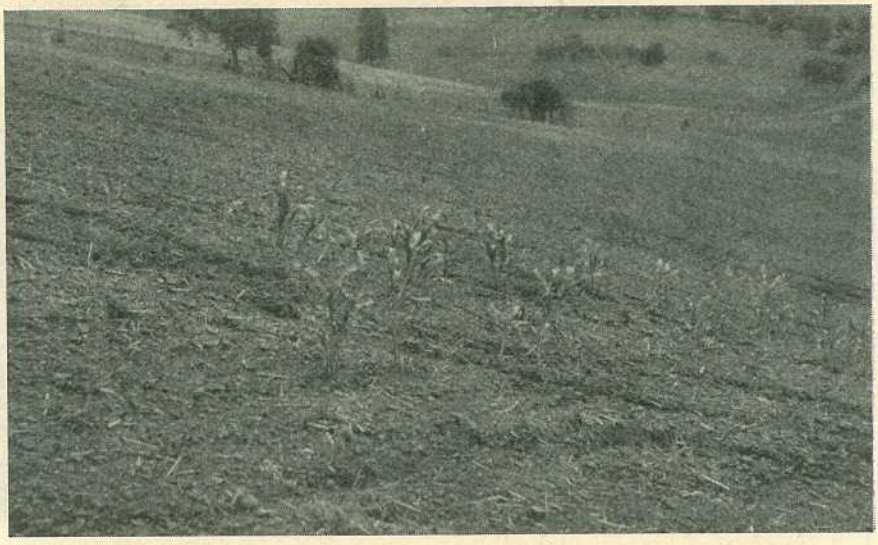

PLATE 167.

Showing the temporary preference for the younger plants. Area denuded of giant panicum 6 inches high; older volunteer sorghum plants, for the time being, undamaged.

diluting the crop was mainly removed by the caterpillars. In several instances where the lucerne was ready to cut the work of the caterpillars ensured a beautifully clean crop. This chance benefit naturally was a very small offset to the widespread damage.

In many localities, particularly the more closely settled, infestation commenced in the cultivation and swarms later migrated to the neighbouring grass paddocks, completely denuding the infested area of edible grass. In the more open grazing paddocks and on larger properties, it appeared that the farmers had noticed spreading yellow spots scattered through the pasture; these were later realised as being due to the caterpillars. As the insects fed outwards the individual areas grew larger and frequently coalesced with neighbouring areas so that large tracts became uniformly bared by the caterpillars. This is well instanced by mentioning one property of about 7,000 acres in the Boonah district, which, prior to the outbreak, had been nicely covered with about 3 inches of grass, mainly paspalum of recent growth—a good promise for the winter. At a conservative estimate not less than 2,000 acres were eaten bare by the caterpillars. (Plate 168.)

Along the Fassifern railway line it was possible during the outbreak to distinguish large areas of pasture slopes, up to 5 miles away, characteristically brown as a result of the attack.

On pastures the green edible grass foliage was taken by the caterpillars. Old grass and hard grass stalks, clumps, and so on were left; most of the weeds were unaffected, but nut grass, *Cyperus rotundus*, whether among grass, in cultivation, or as an almost pure stand on a temporary fallow, was eaten. Clovers, like the lucerne, were not affected.

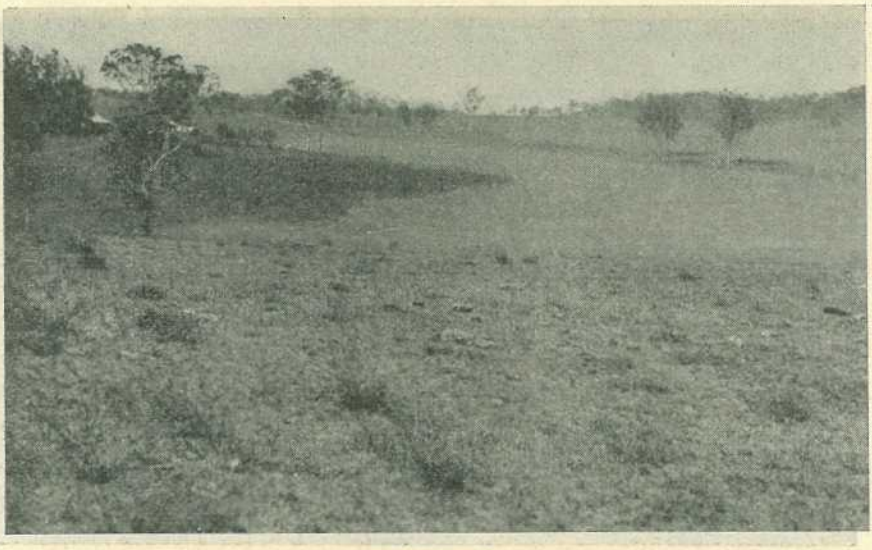

PLATE 168.

The slightly darker area to the left middle distance margining the buildings is undamaged pasture. The remainder of the landscape was denuded; as in the immediate foreground only dry grass tufts and stalks were left.

Had such an invasion occurred during the summer with the promise of regrowth, even the denuding of large tracts would have been of little consequence. This attack took place, however, in the autumn and the chances of the growth of a satisfactory body of feed must be recognised as being very slight, and where young fodder crops were destroyed, insufficient time remained in most cases to allow of preparation and planting to permit of a satisfactory growth before winter. Rain fell during the outbreak, but the immediate regrowth was taken. Since then the weather has become mainly fine and cool, that is, it is seasonably unsuitable for rapid growth of pastures. The attack may therefore be responsible for a shortage of winter feed in a number of dairying and pastoral districts.

Life History and Habits.

Life history studies were not carried out during the present outbreak, but the elements of the life cycle of a very closely allied species, *Spodoptera mauritia* Boisd., were discussed by Smith* following the

* Smith, J. H.—Caterpillar Plagues in Grasslands and Cultivation Paddocks. "Qld. Agr. Jour.," April, 1933.

1931-32 outbreak. For the sake of present completeness his remarks regarding development are summarised as being probably of some interest. The developmental forms of the two species are sufficiently similar to be indistinguishable in general illustrations.

The eggs (Plate 170, fig. 2) are tiny bun-shaped objects, pale white, iridescent. They are laid in clusters of from 100 to 200 eggs, either on the ground or on the flag of the host pasture plant. The egg clusters are sparsely sprinkled with dark hairs detached from the body of the female, giving the egg mass a somewhat dark appearance.

PLATE 169.

Showing the somewhat aimless wandering of caterpillars when crossing a road.

The first stage larvæ are pale in colour. Mature caterpillars (Plate 170; figs. 3 and 4) are typically striped longitudinally in shades of green and sometimes white. Caterpillars in about the third and fourth instar are mainly black. The older larvæ have a characteristic white V marking on the head. Smith recorded the caterpillars as pupating in the soil and sometimes under dung, but during the recent outbreak pupation appeared invariably to take place in the soil although search elsewhere was made.

The adult of *S. exempta* (Plate 170, fig. 5) is a fairly typical Noctuid with forewings and thorax dark-brown, and paler hindwings. It can be recognised from the illustration without further description.

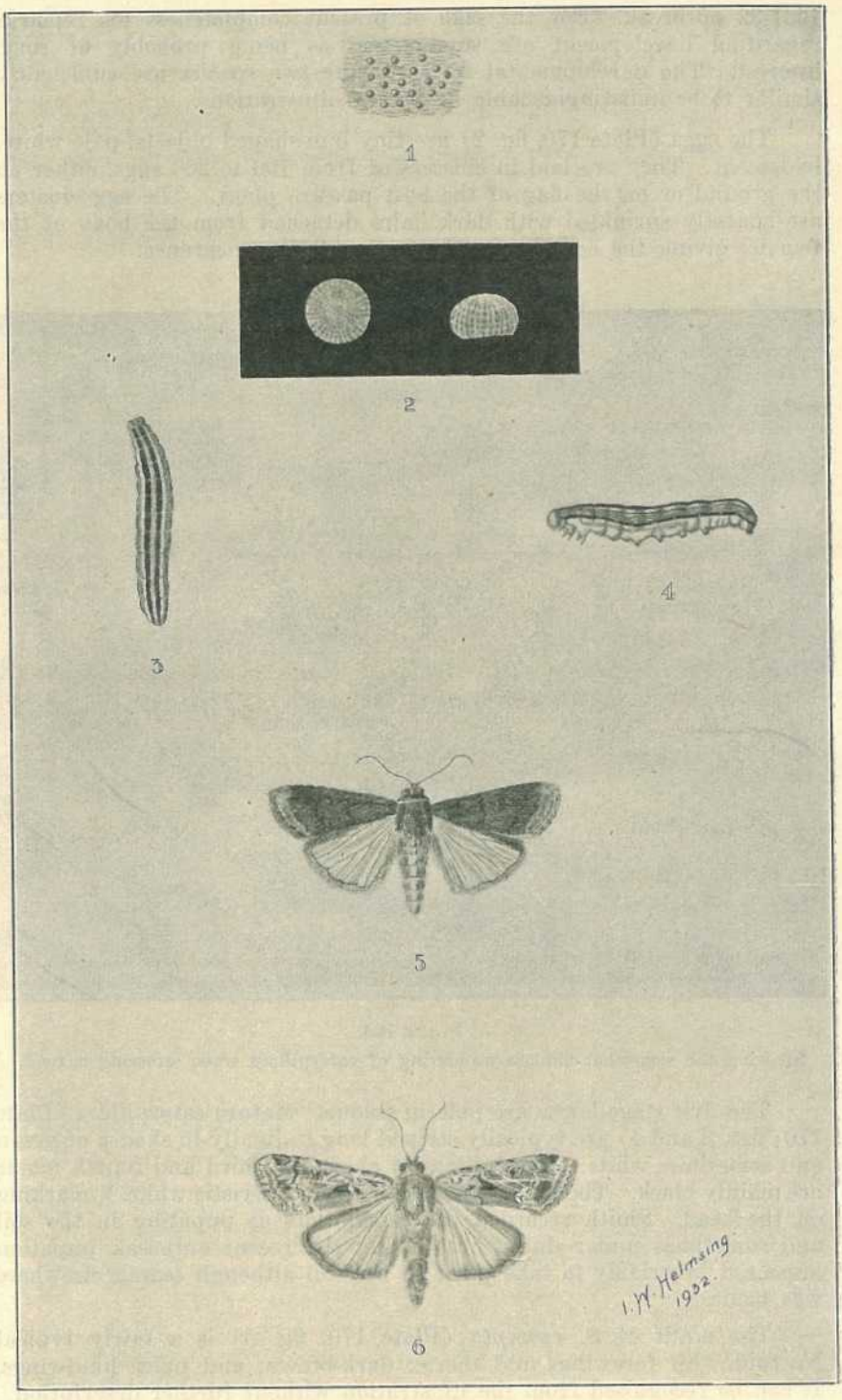

PLATE 170.

Smith found the developmental stages of *S. mauritia* to occupy the following periods, the work being carried out in North Queensland in February:—Egg, 7 days; larva—1st stage, 2 days; 2nd stage, 4 days; 3rd stage, 3 days; 4th stage, 1 day; 5th stage, 3 days; total, 13 days. Pupa, 7 days.

However, it was found in handling insects of the present outbreak that the pupal period was approximately ten days, a 50 per cent. increase that probably was due more to temperature differences caused by time of year and location, than to any slight specific differences. A total larval period of about three weeks was approximately correct for the present outbreak.

Even with the earliest inquiries the caterpillars were then about one-third grown. This is understandable in that grass and fodder crops are not closely examined as are, for instance, vegetables and fruit. It was not until the mass effect of the injury had shown to a noticeable extent and awakened curiosity as to the cause that the caterpillars were discovered. It was not generally realised, or believed, that the insects had originated from eggs laid something over a fortnight earlier and that the caterpillars had been present for some time prior to detection. There was, however, no possibility of overlooking the work of the insects during the later portion of their larval life. Certain farmers in affected districts remembered that some three weeks prior to the first noted appearance of the caterpillars there had been a noticeable influx of brownish moths to lights at night.

The caterpillars usually had spread out well when first seen. Where the growth was relatively short, young fodder crops and short grass, the caterpillars worked forward in a definite line. This line was frequently 12 to 18 inches in width, and in length distances of 100 and 200 yards were measured on small farms. On more than one cattle area almost continuous lines extending a mile or more were seen, these evidently representing the coalescence of many originally separate infestations as earlier described. This linking up of colonies was seen in progress from day to day on one property. The forward movement of a line was imperceptable during short periods, but in one case overnight the line advanced 20 feet over a long front on paspalum. Although there was a general forward movement and the line was maintained fairly continuously, numbers of stragglers yet remained in the rear and these were doubly important; firstly, because insects remained spread over the area in numbers sufficient to deal with any immediate grass regrowth; secondly, because of their relationship to certain control measures suggested or tried by farmers and others. The latter aspect will be touched on again. In support of the first point, an average of ten caterpillars per square yard was found at a distance of several hundred yards behind the then front line, and these were seen to be nibbling the tiny green shoots of otherwise brown grass. Further, while the caterpillars were

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PLATE 170.

Spodoptera mauritia Boisd.

Fig. 1.—Egg mass x 2½ (after Smith).
Fig. 2.—Egg, dorsal and lateral view x 25 (after Smith).
Fig. 3.—Larva, dorsal view, natural size.
Fig. 4.—Larva, lateral view, natural size.
Fig. 6.—Adult, natural size.

Spodoptera exempta Walk.

Fig. 5.—Adult, natural size.

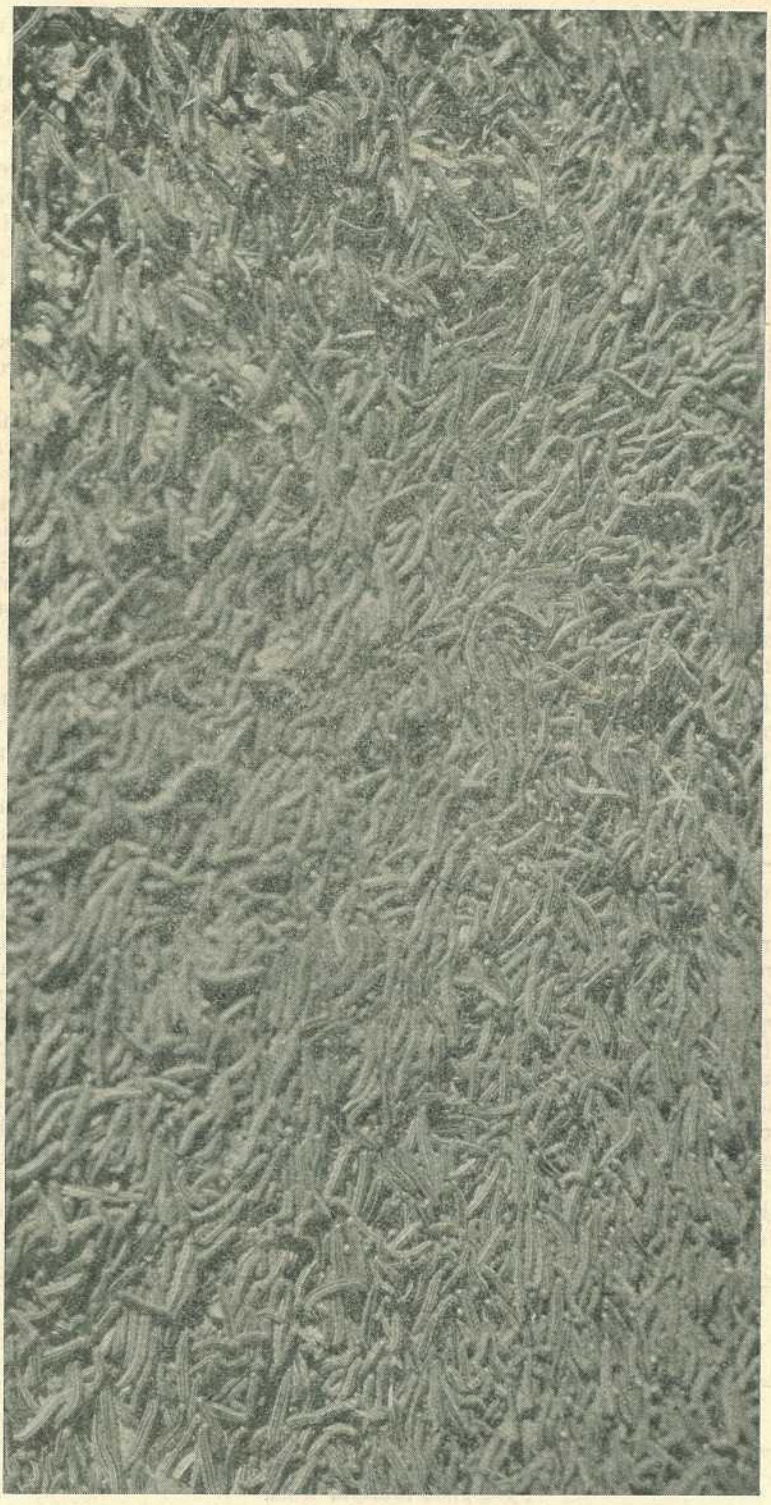


PLATE 171.
Small portion of dense swarm congregated at side of road preparatory to crossing.

present the pasture remained uniformly brown, but on one property on the day following the almost simultaneous disappearance of the caterpillars underground for pupation, a green tint became noticeable over the area.

Natural Control.

Birds are very definitely great friends of man in the control of insect pests, but there are occasions when too much is expected of them. This was rather the case in the present outbreak. Ibis probably did the best work when flocks of them returned every day to the one locality and practically cleaned it up. Other birds—starlings, crows, magpies, peewits, and domestic poultry—fowls, ducks, and turkeys—did good work in that they killed large numbers, but their efforts were too diffuse to be of any practical significance. While birds do invaluable work throughout every year in insect control and every effort should be made for their protection, it is not to be expected that they should be able to have any generally marked effect on a sudden widespread invasion of insects, even such edible and easily captured insects as caterpillars.

Towards the end of the epidemic generation of caterpillars certain insect parasites were seen to be active, in particular a small Braconid wasp, *Apanteles* sp. and a large Ichneumonid wasp, *Lissopimpla semipulata* Kirby. The cocoon masses of Apanteles were readily found, being usually attached to dry grass stalks. These were numerous throughout the infested areas of the Beaudesert, Boonah, Ipswich, and Moggill districts. The adults of Lissopimpla were seen working over the caterpillars, and also over the ground in which mature caterpillars had burrowed for pupation. A Tachinid fly was also recorded. No doubt other species were present also taking toll.

Climatic factors should also operate towards reducing the possibility of any immediate reattack as, with the fall of day and night temperatures, the rate of breeding will be greatly diminished.

Artificial Control.

Artificial control will be discussed under the headings (*a*) bran bait, (*b*) sprays, (*c*) flame thrower, and (*d*) mechanical methods.

Bran Bait.

The standard recommendations for dealing with an army worm outbreak involve the use of a poison bait. The particular mixture recommended in this instance was prepared by thoroughly mixing while dry 1 lb. Paris green with 25 lb. bran. A quart of molasses was then dissolved in a little water and made up to 2 gallons by the addition of further water. That quantity of fluid was usually sufficient when mixed thoroughly into the bran and Paris green to produce a moist but loose and crumbly mash. Where molasses is plentiful the quantity may be increased to ½ gallon to some advantage as the mixture appears then to remain moist for a longer period, thus increasing the period of attractiveness. Almost invariably it is recommended that this bait be laid in the late afternoon, but on the larger holdings where infestation occurred this would not allow sufficient time for the completion of a reasonable proportion of the work before nightfall. Consequently it was suggested that for any bait which had of necessity to be laid during the daytime or in dry weather the total fluid should be increased to 2½ gallons per 25 lb. bran.

Where the caterpillars were advancing as earlier described, the method was to broadcast the bran bait by hand along the line so that of the 6 to 8 feet wide throw about one-half lay in front of the caterpillars and the remainder over and behind the main line. Distributed as recommended the quantities given above were sufficient to bait a line approximately one-third of a mile long at a cost for materials of between 5s. and 6s. Naturally there needs to be some discretion as to quantities, increasing them where the caterpillars are numerous and possibly later rebaiting short strips where some may break through.

Where soil conditions were suitable the drawing of a furrow a few feet in front of the line of caterpillars was recommended as an additional measure, the plough preferably to be returned over the original cut so that the final throw of soil was towards the caterpillars. The caterpillars thus needed to climb a vertical face in order to spread further and bran bait scattered thinly in the furrow was readily accessible to them. This method had particular application in protecting cultivations but could be considered also on many pasture areas.

The bait is definitely poisonous and was therefore handled with care, the mixing utensils and hands being thoroughly cleaned after its preparation and application. So far as farm stock is concerned the bait cannot be guaranteed to be absolutely safe. At the same time any danger can only be regarded as very slight if the recommended thin scatter be applied. The following arguments support this attitude.

1. The bait is applied thinly and it tends to trickle to ground level, out of reach of stock.

2. Stock naturally do not frequent the areas rendered bare or occupied by the caterpillars but feed on the undamaged pasture.

3. Although this and comparable baits have been rather extensively used in the past in Queensland, no cases of stock poisoning have been reported. As an added safeguard, however, stockowners may consider transferring stock to unbaited paddocks for a few days.

The bait was demonstrated to be effective in stopping the advance of the caterpillars on normal pastures, among sorghum, and in thick nutgrass. In the pasture and among the nutgrass, portions of the lines were pegged and baited. In each case on the following and subsequent days the caterpillars on the contiguous unbaited sections had advanced normally, still in a clearly defined line, while on the baited strip the damage had ceased practically on the pegged line and there was a shading off of the damage, the ground being heavily sprinkled with dead and dying caterpillars with few survivors. In sorghum a fine result was seen following baiting on the part of the grower. The sorghum had been planted in drills 2 feet apart and there were 10 to 11 acres 2 to 3 feet high, of which approximately 1 acre was destroyed before the farmer was aware of the attack. The bait was applied in a thin scatter on the ground between the drills. Pegs were inserted to mark the limit of the damage at the time of baiting, and some three days later it was found that the damage had not extended and few living caterpillars remained, dead caterpillars being numerous about the ground.

In grass of somewhat tall or rank growth and in well-grown fodder crops sown broadcast, control was by no means good. Most of the bait trickled to ground level and the caterpillars were able to move from

plant to plant without approaching the bait. The only method of limiting the damage under such conditions was to mow or scythe a strip between the infested and undamaged portions, to rake the cut grass or fodder from that strip, and then preferably to draw one or two furrow lines. The bait broadcast over this cleared strip would be readily accessible to the caterpillars as they migrated.

Sprays.

There were a number of inquiries for a non-poisonous method of control so it was decided to try a spray consisting of a crude oil emulsion. The method of mixing was as follows, being the same as for kerosene emulsion, crude oil being substituted for the kerosene. Half a pound of hard soap was dissolved in a gallon of water by boiling, the container being then removed from the fire and 2 gallons of crude oil immediately added to it. The mixture was then stirred vigorously and churned by means of a spray pump for five to ten minutes. This stock solution, when properly emulsified, has much the appearance of strong milk coffee, and it was found that the emulsion held for a week or more. For use the stock solution was diluted one part of stock to seven parts of water. Mixed ready for use the spray fluid costs something less than ¾d. per gallon.

This spray gave the anticipated good results in that it killed a high percentage of the caterpillars receiving it. A number of sprayed caterpillars were enclosed for observation, and it was found that of 260 individuals, 258 were dead and 2 alive at the end of eighteen hours. Unsprayed larvæ held under similar conditions all survived. The spray similarly gave a kill in rather persistent showery weather, but in this instance the result was not fully satisfactory.

The spraying method is one that could be applied by the man with a small acreage who perhaps could work over and spray the whole of the infested area. The method would be invaluable also for dealing with incipient swarms before the infested area was extensive, and for use while awaiting supplies of baiting materials in the case of a wider infestation. It must be pointed out that all above-ground portions of plants with which the spray came in contact, were killed. These, however, would be eaten down by the caterpillars in any case if no control measures were adopted.

In the case of large swarms it is possible to apply any selected treatment only to the dense marginal strip of caterpillars. It was found, however, that if the "front line" were killed by spraying then by next day those that had seemed mere stragglers had advanced and reformed a line and were working on as before, a line of dead, behind, indicating where the spray was applied. It was thus shown that several repeat sprayings would be necessary in order to deal with a large swarm by marginal spraying. This was in distinct contrast to the almost complete stoppage imposed by broadcasting bran bait on the margins and thus providing a poisoned zone.

Flame Thrower.

This type of apparatus received much publicity for caterpillar control. It was possible to attend a demonstration and later several areas that had been treated were inspected. The results obtained with a flame thrower were disappointingly slow compared with the quite spectacular flame jet emitted by the apparatus. Caterpillars in grass

or herbage were somewhat protected by the moisture of the foliage and only by subjecting them to the fierce direct jet were they satisfactorily dealt with. On contact with the ground the flame spread out to quite a large tail, but this tended to rise and affected only those caterpillars that had climbed grass stalks and so on, becoming thus enveloped in the flame. It appeared that flaming would need as careful and slow work as the spraying above described. Even where quite extensive flaming had occurred it was noticeable that the advance of caterpillars had not been checked even though large numbers of dead were present on the flamed areas, and in this respect also the flame thrower was comparable with the spray pump in its effects. Where, however, a farmer had a flame thrower available it would be capable of good work in dealing with incipient swarms.

Mechanical Methods.

Improvised mechanical methods, attempting to check the caterpillars were seen in many centres. These included the use of tennis court rollers, agricultural rollers, the dragging of weighted branches along the swarms, and running motor vehicles up and down the line. Even where good kills were obtained, in most cases the line was reformed by the congregating of stragglers, and extension of the damage proceeded as before.

General Considerations and Conclusions.

It will be realised that this epidemic occurred at an unfortunate time of year, so far as dairymen and cattlemen were concerned, in that young fodder crops planned for winter, and also a healthy cover of pasture, were destroyed with little prospect of satisfactory regrowth occurring prior to winter. In this connection it appears more than ever desirable for stockowners, where possible, to make some provision for fodder conservation from year to year by stacks and ensilage in order to meet such unpredictable periods of shortage as those caused directly by the weather, such as rain shortage, or indirectly by climatic conditions and other factors favourable to an epidemic such as that recently experienced. Further, in connection with insect pests of fodder plants, it would be wise planning where it is possible, to grow more than one type of fodder crop. For example, it was recently demonstrated that whereas the graminaceous plants were destroyed, lucerne was untouched. By having areas of such different plant types available there would be a much greater safeguard against individual insect epidemics than exists when all the available cultivation is under the one crop.

With regard to epidemic attacks of army worms the control measure that appears most practicable is the use of the poison bran bait. It is cheap, easy to mix and apply, and the results have been satisfactory. Spraying with crude oil emulsion or other similar mixture, and the use of flame throwers may have their place as mentioned. It must be remembered that time is the really important factor, as each day's delay means a greater amount of injury caused, and a wider area to be worked over in order to effect control. A man on a large holding may be depressed, feeling that the task of control is beyond him, but at least he should decide to protect his best areas, and probably the results obtained there will inspire a considerable extension of the original plans.

The Tobacco-growing Industry in the United States of America.

By L. F. MANDELSON, B.Sc.Agr., Plant Pathologist.

DURING the period 9th January to 15th November, 1935, a tour was made of the United States of America with the object of observing various aspects of the tobacco industry in that country. The cost of the trip was met from Queensland's share of the Federal Tobacco Vote. Several reports on general observations and on special subjects were submitted whilst overseas, and the object of this general report is to co-ordinate and summarise the matter contained therein and to incorporate where necessary fresh material in order to give a more complete account of the production of the various classes of American tobacco. An attempt has been made to describe the flue-cured tobacco industry in some detail, since this class of tobacco is cultivated in Australia. Other tobaccos, such as fire-cured, air-cured, and cigar tobaccos, are much more briefly discussed. It is realised, however, that it is difficult to both briefly and accurately discuss an industry as huge as that of tobacco production in America, which involves numerous tobacco types with divers methods of handling, and many classes of soils and variations in cultural practices. Consequently the original reports are probably more strictly accurate where specific subjects are discussed in detail, but the present account may give a more complete picture of the tobacco industry as a whole.

Prior to leaving Sydney the British Australian Tobacco Company's factories were inspected in Sydney. Subsequently cigarette factories were observed in North Carolina and cigar factories and packers' warehouses in Florida and Connecticut. Various stages in the cultivation of flue-cured tobacco were seen mainly in South Carolina, North Carolina, and Georgia. Other types were observed in Virginia, Florida, Tennessee, Kentucky, Maryland, Massachusetts, Connecticut, Pennsylvania, and Wisconsin. Some of the Southern States were visited two or three times in order to follow the progress of the crops. Tobacco sales and redrying plants were inspected. Inquiries into various phases of pathology, entomology, and plant nutrition were made at the United States Department of Agriculture at Washington, and at numerous Universities and Experiment Stations in the above-mentioned States, as well as in others where tobacco was not of great economic importance. At all institutions visited the writer was given the utmost attention and courtesy. Helpful information, office facilities, and transport on many occasions, were made available, and the success of the tour was largely due to the co-operation and kindness of the numerous research workers and tobacco specialists met while engaged in this work.

TOBACCO STATISTICS.

In reviewing American tobacco statistics it appears that over a long period of years the production of some classes has increased tremendously, whereas others have lagged behind according to changes of fashion in tobacco consumption. Thus 141,200,000 lb. of Kentucky and Tennessee fire-cured tobacco, which is used mainly for snuff and smoking mixtures, were produced in 1912, while in 1930 there were 134,800,000

lb. produced, although the figure for the previous year was 155,000,000 lb. Hence apparently the industry has not expanded appreciably during that period. On the other hand, there were 187,540,000 lb. of flue-cured tobacco produced in 1912, and 864,276,000 lb. in 1930. Since the war the tendency has been for tobaccos used in cigarette manufacture, such as flue-cured and Burley, to increase greatly in production at the expense of other classes used for cigars, chewing, and snuff. Manufactured tobacco figures indicate that tobacco used for chewing, smoking, and snuff decreased from 435,000,000 lb. in 1912 to 372,000,000 lb. in 1930, manufactured cigars from 8,099 million to 6,276 million for the same period, whereas the number of cigarettes manufactured increased from 13,173 million to 123,810 million. Other factors, such as the advent of the cotton boll-weevil, have no doubt had the effect of also increasing the area under tobacco.

Production statistics from year to year show rather wide fluctuations. This is mainly due to the fact that there is ample suitable land available for the expansion of the tobacco growing area, and consequently the area under crop had a tendency to fluctuate in direct proportion to the prevailing price paid. For example, 659,500 acres of flue-cured tobacco were planted in 1922 and sold at 27.2 cents per lb. The previous year the price had been 21.9 cents.; consequently 804,800 acres were planted in 1923 and the average price dropped to 20.8 cents.

Abnormal fluctuations in production and prices were very marked during the few years prior to 1934, and were apparently due to farmers planting increased acreages in an endeavour to meet their indebtedness during a period of depressed prices. Such action resulted only in an accumulation of surplus stocks. During the period 1927 to 1930 the average production of flue-cured tobacco was about 750 million lb. and sold for 18 to 20 cents. Subsequently production fluctuated with a crop of 850 million lb. as its peak and with prices steadily dropping to 10 or 11 cents per lb. A similar state of affairs obtained with the production of other classes of tobacco. However, in 1933 the Agricultural Adjustment Administration was formed with the object of adjusting production of agricultural crops in general, since prices for all farm products were then severely depressed, and restoring former purchasing power. During that season it arranged an agreement between tobacco producers and buyers whereby prices were materially improved, and subsequently it has restricted and controlled production.

In 1935 the area planted was reduced to 85 per cent. of the normal or "base acreage," in the case of flue-cured tobacco, to 60 per cent. for Burley tobacco, and to 80 per cent. for both fire-cured and dark air-cured tobaccos. In consequence the prices obtained were considered generally satisfactory. It is considered that it costs about 16 cents to produce 1 lb. of flue-cured tobacco leaf and that the parity market price is about 20 cents. At present flue-cured tobacco is selling at about 25 cents per lb.

Table I. on American Tobacco Statistics gives data on the production of various classes of tobacco in 1933, and indicates the acreage and relative importance of various classes of tobacco and tobacco belts. It will be noted that more than half the total acreage in the United States is flue-cured, and that the average yield for that class in 1933 was 778 lb. per acre. Burley tobacco comes next in importance. During that year about 1,400 million lb. of tobacco of all classes were produced in the United States on approximately 1,754,000 acres.

The proportion of the tobacco crop which was grown in 1930 in the various States is given by Hayes and Lein in "Tobacco Growing in Minnesota," as follows:—North Carolina, 35·8 per cent.; Kentucky, 22·8 per cent.; Virginia, 6·9 per cent.; Tennessee, 7·7 per cent.; South Carolina, 6·0 per cent.; Georgia, 6·4 per cent.; Pennsylvania, 2·4 per cent.; Wisconsin, 3·2 per cent.; Ohio, 2·8 per cent.; Connecticut, 2·0 per cent.; Massachusetts, 0·7 per cent.; New York, 0·05 per cent.; Minnesota, 0·2 per cent. These figures refer to all types of tobacco and it should be noted that while some States produce only one class of tobacco others produce several. The tobacco crop in the United States in 1930 was worth 211,102,000 dollars.

TABLE I.

UNITED STATES TOBACCO STATISTICS.

Preliminary Figures for 1933 extracted from the 1934 "Year Book of Agriculture" of the United States Department of Agriculture.

Class and Type.	Acreage Harvested.	Yield per Acre.	Production.
Flue-cured—	Acres.	Lb.	1,000 lb.
Old Belt	316,100	699	221,029
Eastern North Carolina Belt	357,000	790	282,030
South Carolina Belt	167,200	860	143,775
Georgia-Florida Belt	70,800	871	61,654
Total	911,100	778	708,488
Fire-cured—Total	174,000	796	138,455
Air-cured (light)			
Burley	515,400	808	416,252
Southern Maryland	32,200	550	17,710
Total	547,600	792	433,962
Air-cured (dark)—Total	53,100	787	41,801
Cigar Filler—Total	37,100	944	35,010
Cigar Wrapper—Total	6,000	1,026	6,153
Cigar Binder—Total	24,300	1,316	31,989
Miscellaneous Types—Total	500	636	318
United States	1,753,700	796·1	1,396,174

WHERE TOBACCO IS GROWN.

Tobacco is grown mainly in the south-eastern portion of the United States, but certain types are also grown in various Eastern States and as far west as Wisconsin and Minnesota.

Flue-cured tobacco is grown in northern and eastern North Carolina, eastern South Carolina, southern Virginia, southern Georgia, and to some extent in northern Florida. Dark fire-cured is grown in western Kentucky and Tennessee and also in central Virginia. Dark air-cured types are produced in southern and western Kentucky, northern Tennessee, southern Virginia, and in southern Indiana. Perique tobacco, which is a unique type of little importance, is air-cured and is grown in a restricted area in Louisiana. Of the light air-cured types, Maryland tobacco is grown in southern Maryland, and Burley tobacco in north-central Kentucky, eastern Tennessee, southern Ohio, south-western West Virginia, and south-eastern Indiana. Cigar wrapper tobaccos are produced in the Connecticut Valley of New England, and in northern Florida. Cigar binder tobacco is grown mainly in Wisconsin and in portions of Pennsylvania, New York, and Minnesota Pennsylvania and

certain sections of Ohio and New York produce most of the cigar filler tobacco. A limited amount is also grown in northern Florida and in Georgia.

THE AMERICAN TOBACCO SEASON.

Since the United States lies in the Northern Hemisphere, the incidence of the various seasons is reversed in respect to Australia. With the approach of spring, warm weather gradually progresses from south to north and tobacco planting consequently progresses in a similar fashion.

The seed is sown in the winter, during January or February in the Southern States, and the seedlings are pulled about three months later. With flue-cured tobacco the planting season commences in Florida and Georgia and extends from the third week in March to the 20th April. South Carolina and the New Belt of North Carolina plant during April until 5th May in the more northern sections, and the Old Belt of North Carolina during May and until the 10th June in the north-western areas. In Virginia plants are set from 12th May to the 1st June. The crops are harvested two to three months subsequent to the time of setting plants in the field.

Cigar tobacco is planted in Florida about the same time as the flue-cured tobacco. It has been found that if planted late, such as subsequent to mid April, nematode damage is considerably accentuated. The crop matures in about two months. Cigar filler and binder tobaccos are set out from the latter part of May to mid June in Pennsylvania, and are harvested in September. The season is somewhat similar in the more northern districts.

The Burley and Maryland tobaccos are set out in May or early June and are harvested in August and September.

The preciseness with which tobacco is set out at a definite time for specific districts is remarkable. This is partly due to the severity of the winter, which naturally determines how soon plants will be large enough for transplanting, and also to the long experience of most growers. The time of planting within narrow limits markedly influences the subsequent growth of plants in the field and the quality of the leaf produced.

CLASSES AND TYPES OF TOBACCO.

The characteristics of tobacco are more influenced by environment than those of most other agricultural crops. Since it is grown from the Canadian border to Florida on various types of soil and under different climatic conditions, tobacco naturally varies very considerably in characteristics. Other factors influencing its characteristics are differences in varieties of seed grown, the result of selection or introductions for specific purposes, and different methods of handling the crop. These variations are responsible for its division into a wide range of types. Altogether twenty-five distinct types of tobacco are recognised in the official classification of the United States Department of Agriculture. Manufacturers through long experience know the characteristics of tobacco peculiar to certain districts, and hence buy with complete confidence from specific districts for their various leaf requirements. In short, the tobacco industry in the United States is extremely specialised, and frequently quite small areas, such as Maryland, may produce a type of tobacco which is unique and peculiar to that area.

Tobacco is officially classified into six classes. They are (1) Flue-cured; (2) dark fire-cured; (3a) light air-cured; (3b) dark air-cured; (4) cigar binder; (5) cigar filler; and (6) cigar wrapper. They are further subdivided into many types such as Burley, various cigar and flue-cured types, One Sucker, Maryland, &c., according to their distinctive characteristics, and the districts where they are grown. Each type is given a distinctive number—e.g., U.S. Type 5, U.S. Type 12.

Various classes of tobacco are purchased for specific purposes. Flue-cured and Burley (light air-cured) tobaccos are used in the manufacture of cigarettes, smoking mixtures, and chewing tobacco. Fire-cured tobacco is used for snuff, smoking mixtures, and certain classes of cigars. Dark air-cured is used in chewing tobaccos and smoking mixtures. As indicated by their names, the various cigar classes are used in the manufacture of the filler, binder, or wrapper portions of cigars. Scrap cigar leaf is used for chewing. Certain grades of Maryland are used for cigarette manufacture and about 40 per cent. of this type is exported to Europe.

TOBACCO FARMS.

The size of farms, methods employed, and the crops grown on tobacco farms vary considerably in individual districts, and more so between one section of the country and another where different types of tobacco are grown. Consequently it is difficult to summarise briefly the position and give an accurate picture of the situation.

In the Southern States mules are used entirely in place of horses for farm work although they are relatively expensive. It is said that they stand the hot weather better than horses, do well on poor feed, and require less to keep in good condition. They are particularly well adapted for row cultivated crops, such as tobacco, cotton, and corn, as they have small feet and do not take fright easily and consequently are not so apt to damage the crop. Furthermore, they are more easily handled and so better adapted for negro labour. Mules are mostly bred on the rich grass country of Kentucky and Tennessee and are sent from there to the other tobacco-growing States. Horses are used in Maryland and in the more northern States where tobacco is grown.

Most of the manual work is done by negros in the south. Women and children assist with some work, such as plant-setting, harvesting, and grading. Rates of wages vary somewhat and have been reduced considerably since the depression. At the Oxford Experiment Station adults were being paid from 12 to 15 cents per hour and children about 5 cents per hour. As a general rule coloured labour was worth about 75 cents a day with keep. For special work a dollar a day or $25 a month might be paid. At the present rate of exchange a dollar or 100 cents is worth about 5s.

In the flue-cured districts much of the tobacco is produced on a "share cropping" system, some on relatively small individual farms and a little on large estates. These three methods were observed in South Carolina and for conciseness actual cases will be discussed.

One landlord with 400 acres indicated that he had half a dozen tenant farmers on the property, some of whom were negros and others were white. Usually the landlord would supply the land, fertilizer, and rations, and would halve the returns from the cash crops. Incidentally since corn is not considered a cash crop, tenants endeavour to get as

much land as possible for corn. In other cases the land would be merely rented to the tenant for cash. At the present time rentals are about six dollars per acre, but in the past they have been as high as twenty dollars. The capacity of a farm is usually referred to in terms of so many ploughs, horses, or mules, all of which are synonymous terms. Some tenant farms would be "one-horse farms" and others "two-horse farms." A typical "one-horse farm" would comprise about 20 or 30 acres and would have about 5 acres under tobacco, 12 acres under cotton, 3 acres of oats, and 8 to 10 acres of corn. There would also be a garden plot and some cows and pigs. A "two-horse farm" would, of course, be about twice that size.

The small privately-owned farm is well exemplified in Horry County. This county incidentally is the most important for tobacco production in that State and sells about 24,000,000 lb. annually. The growers are a distinct type of intelligent farmers who specialise in intensive tobacco production. Unlike other counties very little cotton is grown in this section, and tobacco is practically the only cash crop. The farms are relatively small with about 8 or 10 acres planted to tobacco. Most of the work is done by the farmers' families in contrast with other sections which depend largely on negro labour. Farms similar to those of this county are also found to some extent scattered throughout other tobacco-growing areas.

Tobacco is also grown on large farms or plantations. One which was inspected had 60 acres of tobacco planted. The negro labourers were paid wages and given homes and fuel on the plantation. The men were given from 50 cents to a dollar a day according to the work and their ability, and women about 50 cents a day. They usually worked for five and a-half days in the week. In good seasons a bonus of 10 per cent. or 20 per cent. was also given. On other plantations conditions would possibly not be so generous. The management of this property was exceptionally good and the value of efficient cultural methods was appreciated.

In North Carolina a "one-horse farm" was considered to consist of about 5 acres of tobacco, 5 to 10 acres of cotton, and 4 or 5 acres of corn under cultivation. In the eastern portion of the State "three-horse farms" were the general rule, whereas "two-horse farms" were more common in the western part of North Carolina. In the latter case there would be rarely any cotton grown. About 30 per cent. of the farm would be cultivated and this would consist of some 8 or 10 acres of tobacco, the same amount of corn, and usually some wheat.

Tobacco farms in Georgia are very similar to those of South Carolina. Tenant farms are mostly of the "one-horse" type, and share-croppers would plant from 2 to 7 acres of tobacco.

In Virginia tobacco is practically the only cash crop. Properties would vary from 100 to 700 acres and would generally be divided up into "two-horse" tenant farms. There is considerable variation in the size of tobacco crops, which would be anything from 1 to 15 acres in area.

In Tennessee, where Burley tobacco is extensively grown, tobacco is also the main cash crop. Usually 1 or 2 acres would be under tobacco and in rare cases it might be as much as 15 acres. A typical farm would possibly contain 2 acres of tobacco, 20 acres of corn, 10 acres of wheat, 25 acres of pastures, and 15 acres for hay, which might be of cowpeas,

clover, or lespedeza. There would also be four or five cows and some pigs and poultry.

Cigar binder tobacco in Wisconsin is usually grown as a side line on small dairy farms. Individual areas under tobacco would vary from 2 to 20 acres.

In Pennsylvania cigar filler and cigar binder tobaccos are grown in association with a steer-fattening industry and to some extent dairying. Generally a rotational plan which might involve wheat, clover, lucerne, corn, or pastures is practised with the cultivation of cigar filler tobacco, whereas cigar binder tobacco is usually grown on the same land continuously. This type of farming is intensive. Hay, corn, and straw are fed to the cattle and the fertility of the soil is maintained with heavy applications of manure.

Shade grown cigar wrapper tobacco is produced in Florida and in the Connecticut Valley, and is mainly in the hands of large companies. The American-Sumatrin Company alone plants more than half of the total acreage under this tobacco type in Florida. This type of farming is naturally very specialised and very extensive. Seed-beds for such plantations are at times acres in extent.

FLUE-CURED TOBACCO.

Flue-cured tobacco represents more than half the total acreage under tobacco in the United States and is the most important class grown. The production of modern flue-cured tobacco gradually evolved from the type of tobacco culture practised by the early Virginian colonists. Eventually tobacco growing spread westward onto lighter sandy soils and the method of curing was modified. Virginian tobacco was at first cured over open wooden fires which were later superseded by charcoal fires. It was not until about the time of the Civil War that pipes or flues were used as a means of heating the barns. They were at first made of rock and ran straight through the curing barn. Later sheet iron and a more elaborate plan of flues was introduced. The first tobacco cured in this fashion was grown in the Granville and Caswell counties of North Carolina about 1867 to 1869, and the method was generally adopted shortly afterwards. Consequently Virginian tobacco, which is now a trade name to describe this class irrespective of where it is grown, became milder and lighter in colour and lost the smoky flavour characteristic of the early colonial tobacco. The demand for a light type of tobacco was at first the result of an expansion of the chewing tobacco trade. This demand was greatly intensified with the development of the cigarette industry.

There was a rapid development in the production of flue-cured tobacco from about 1890, and its cultivation spread into eastern North Carolina and into South Carolina. More recently the flue-cured belt has been extended in to Georgia and northern Florida. Production increased greatly subsequent to the war and in 1930 there were 864,276,000 lb. of this type produced, and over 1,000,000 acres under crop. During the past few years, in an effort to increase crop values, production has been reduced and controlled by the Agricultural Adjustment Administration, and in 1933 about 700,000,000 lb. were produced.

Bright flue-cured tobacco is used largely in the manufacture of cigarettes, smoking and plug tobacco. Its quality and characteristics

are influenced by climatic conditions and the soil on which it is grown. Consequently flue-cured tobacco is divided into several types by the United States Department of Agriculture. U.S. Type 11 is produced in the Old Belt, which is the hilly Piedmont section of Virginia and western North Carolina. Three other types are grown in the New Belt, which embraces the sandy flat area known as the Coastal Plain. Of these U.S. Type 12 is produced mainly in eastern North Carolina, U.S. Type 13 is produced in eastern South Carolina, and finally U.S. Type 14 is grown in southern Georgia and northern Florida. Generally speaking, the leaf of the Old Belt is of poorer colour than that of the New Belt, but has better aroma, body, and texture.

The production of bright flue-cured tobacco in the United States may be approximately represented as being produced by the various States as follows:—North Carolina 71 per cent., Virginia 10 per cent., South Carolina 10 per cent., Georgia 8 per cent., and Florida 1 per cent. The further production of this crop in America is only limited by its market value, and if the demand arose, a tremendous area of suitable country there could be used for tobacco culture. It is interesting to note that at a conference of tobacco specialists held in Virginia last year it was estimated that production could be increased in various States if desired, by approximately the following amounts:—North Carolina 70 per cent., Virginia 85 per cent., Georgia 85 per cent., and South Carolina 90 per cent., and that "States now producing no bright tobacco could grow an amount equal to the present world consumption."

FLUE-CURED TOBACCO SOILS.

The soils used for the production of flue-cured tobacco may be roughly divided into two groups—namely those of the Old Belt or Piedmont, and the New Belt or Coastal Plain respectively. The former are predominantly loams and sandy loam soils derived from the underlying granite, gneiss, and slate, &c., and usually have a heavy clay subsoil. The latter group are sedimentary soils of marine origin and are more sandy and gravelly. Typical tobacco soils have been described (U.S.D.A. Farmers' Bulletin No. 571) as being "light sands and sandy loams with yellow or red sandy and sandy loam subsoils containing relatively small proportions of clay, except in the Piedmont region, where the subsoil is distinctly clayey." Furthermore, these soils are generally of low fertility.

In the Old Belt tobacco is actually grown on a tremendous variation of soil types although some are not very desirable. In North Carolina there are thirty-six soils officially listed as more or less suitable for tobacco production. In a relatively small area many distinct types may be readily observed, the surface of which varies from sand to pipe clay and the colour from white to various shades of black or red. Since tobacco can apparently be grown profitably in some cases on such a remarkable variation of soil types, it would appear that possibly soil type alone is not such an important factor as might be assumed contributing to the outstanding qualities of American tobacco.

In the New Belt there is not the same degree of variation in tobacco soils. They are mostly light sandy loams varying in depth from about 16 inches to several feet. One of the most desirable types is a fine soft sandy loam, grey on the surface with a bright yellow subsoil. The underlying subsoil, which is found at 18 inches to 3 feet, is a bright yellow sandy clay with a rather crumbly texture. Good tobacco soils

should be well drained but they all have a definite clay subsoil. Deep sands are not desirabe as they do not adequately retain moisture, and the nitrogenous portion of the soil solution, particularly, is apt to be leached out. Such soils can only be expected to give satisfactory results in ideal seasons. Depth and physical characteristics are considered of much greater importance for tobacco culture than the chemial analysis of soils.

Soils in the United States have been extensively surveyed and specific types have been given distinctive names. It is considered that the best soils for bright tobacco in the various States, listed in order of preference, are as follows:—

North Carolina—Piedmont Area: (1) Granville; (2) Durham; (3) Appling; (4) Cecil sandy loam. Coastal Plain Area: (1) Norfolk, (2) Marlboro.

Virginia:—(1) Granville; (2) Durham; (3) Norfolk; (4) Appling; (5) Cecil sandy loam.

Georgia:—(1) Norfolk loamy sand; (2) Tifton, light phase.

South Carolina:—(1) Marlboro; (2) Portsmouth; (3) Dunbar; (4) Norfolk.

The mechanical and chemical characteristics of some typical North Carolina tobacco soils are indicated in Tables II. and III. This data is from "The Bulletin" of the North Carolina Department of Agriculture of January, 1933.

TABLE II.

AVERAGE MECHANICAL ANALYSES OF THE SURFACE SOIL OF TYPICAL FLUE-CURED TOBACCO SOILS.

Soil Series and Type.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
	%	%	%	%	%	%	%
Granville coarse sandy loam	15·3	23·9	10·4	14·3	8·1	19·2	8·0
Durham coarse sandy loam ..	12·9	18·1	12·4	23·2	8·2	19·2	5·8
Cecil sandy loam	5·3	16·7	10·2	24·2	11·2	23·6	8·5
Norfolk sandy loam	2·5	17·3	15·4	19·0	6·3	29·5	9·8

TABLE III.

AVERAGE OF TOTAL PLANT FOOD CONSTITUENTS PER ACRE FOR 6⅔ INCHES OF SURFACE SOIL OF THE FOUR MAJOR BRIGHT TOBACCO SOIL SERIES.

Soil Series.	Nitrogen.	P_2O_5.	K_2O.	CaO.	MgO.
	Lb.	Lb.	Lb.	Lb.	Lb.
Granville	625	899	15,499	2,444	6,558
Durham	635	802	13,281	7,706	1,618
Cecil sandy loam	770	546	45,036	3,100	5,459
Norfolk	618	529	7,717	5,317	1,800

Most tobacco soils have an acid reaction, and those with a range of pH 5·00 to 5·25 are recommended for tobacco culture. Excellent crops have been observed growing on soils with a reaction as low as pH 3·96.

The Coastal Plain, on which the greatest part of the flue-cured tobacco is grown, is mostly very flat low-lying country. Numerous and extensive swamps are typical of this portion of the United States.

Consequently, drainage is an important factor in tobacco growing in this area. Open drainage ditches from 3 to 6 feet deep are frequently constructed around the boundaries of fields for this purpose (Plate 172). Care has to be taken not to have them too deep as there is the danger of unduly lowering the water table.

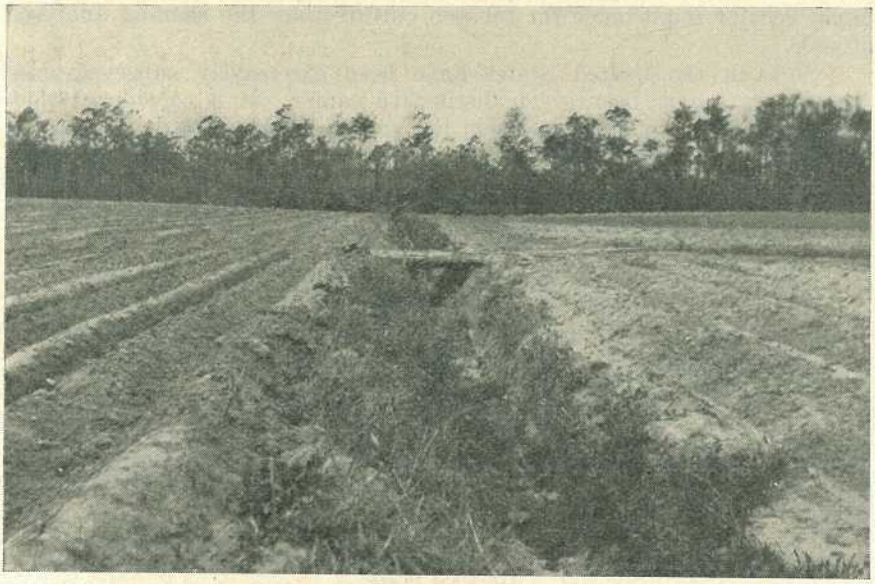


PLATE 172.
OPEN DRAINAGE DITCHES.

A drainage ditch running across a newly planted field of tobacco in South Carolina. Another drain borders the road, which passes over the bridge in the middle foreground.

CLIMATIC CONDITIONS IN THE FLUE-CURED BELT.

Climatic conditions have a considerable influence on the quality of tobacco irrespective of the nature of the soil on which it is grown. As a broad generalisation it would seem that about 4 to 6 inches of rain each month during the growing season is desirable. Heavy rain may be very detrimental particularly towards the end of the season, and best results are obtained when it is distributed in showers of about half an inch. For regular and vigorous growth warm weather day and night, with a range of about 65°F. to 90°F., is necessary when the plants are in the field.

Table IV. gives climatic data for four representative counties in the flue-cured belt. Horry County is near the coast and has a somewhat higher rainfall than most sections of the tobacco-growing area, but it is the most important county in South Carolina for tobacco. Florence County is fairly typical of the rest of the State, and Lenoir County is also on the Coastal Plain and represents the New Belt of North Carolina. It will be noted that these three counties have a first peak of monthly rainfall in February and a second and major peak in July and August. Durham County is representative of the Old Belt. It has a somewhat lower rainfall with a single peak in August, and the temperatures are lower than the more southern and eastern counties.

TABLE IV.

METEOROLOGICAL DATA.

TYPICAL FLUE-CURED TOBACCO AREAS IN THE UNITED STATES.

—	—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Horry County, S.C. (Conway)	Precipitation (ins.)—	3·59	4·12	3·54	3·07	3·66	5·27	6·6	6·61	5·07	3·17	2·26	3·34	50·31
	Temperature (°F)—													
	Maximum	59·5	60·4	68·2	75·3	82·4	87·7	89·8	89·0	85·2	76·7	67·3	59·4	75·1
	Minimum	36·6	37·6	45·1	50·7	59·0	66·8	70·3	69·9	65·2	53·5	42·1	36·8	52·8
	Average	48·2	49·1	56·5	63·1	70·7	77·1	79·9	79·3	75·0	64·9	54·6	48·4	63·9
Florence County, S.C. (Florence)	Precipitation (ins.)	3·04	4·11	3·34	3·00	3·96	5·46	5·84	5·19	4·31	3·00	2·05	3·06	46·36
	Temperature (°F.)—													
	Maximum	56·4	58·0	68·2	75·0	84·2	90·0	92·0	90·9	86·7	76·8	66·8	56·8	75·2
	Minimum	35·2	36·2	43·6	50·0	59·6	66·9	70·4	69·5	64·2	52·4	41·5	35·3	52·1
	Average	45·6	47·2	55·7	62·9	72·0	78·6	81·3	80·2	75·2	64·1	54·1	45·8	63·6
Lenoir County, N.C. (Kinston)	Precipitation (ins.)	3·57	4·00	3·82	3·08	3·81	5·54	6·61	5·43	4·92	2·64	2·23	3·19	48·84
	Temperature (°F.)—													
	Maximum	57·0	57·9	66·6	74·6	83·5	88·5	91·0	90·6	85·7	75·6	64·9	56·6	74·4
	Minimum	34·1	34·2	41·4	48·0	57·6	65·0	69·2	68·2	63·3	50·8	39·8	34·2	50·5
	Average	45·2	45·9	53·5	60·9	70·4	76·7	80·1	79·5	74·4	63·3	51·7	45·0	62·2
Durham County, N.C. (Durham)	Precipitation (ins.)	3·31	3·02	3·69	3·34	3·32	4·15	4·47	4·72	3·13	2·84	2·06	3·16	41·21
	Temperature (°F.)—													
	Maximum	50·4	54·8	61·4	71·1	78·6	86·2	89·4	87·7	84·0	72·3	60·3	52·1	70·7
	Minimum	28·8	32·3	36·7	45·3	53·9	63·4	67·5	65·1	61·5	46·9	37·8	31·4	47·5
	Average	39·6	43·5	49·1	58·1	66·2	74·9	78·4	76·4	72·6	59·6	49·0	41·6	59·1

It will be observed that the rainfall is well distributed throughout the year, which incidentally lessens the difficulty of growing winter crops for rotational purposes. Winter temperatures however are low, the lowest average monthly minimum for the areas under discussion being Durham with 28·8°F. for January. This is advantageous with tobacco culture since it effectively prevents the growing of the crop out of season and tends to control pests and diseases. The higher rainfall in the summer months is more or less offset by the greater plant transpiration during the higher temperatures at that season of the year, and consequently the "precipitation efficiency" is much the same throughout the year.

The tobacco season extends approximately between April and August on the Coastal Plain and about a month later on the Piedmont, and is shown by heavy lines in the table. It will be noted that the rainfall is about 4 inches a month with high average temperatures. Actually the climate is very oppressive during the summer owing to the high relative humidity and warm nights.

For comparison, meteorological data is given for some Queensland tobacco areas. (Table V.) In some cases temperature records are not available. Those for Goondiwindi are given as being more or less representative of the south-western portion of the State. It will be noted in contrast to the United States that there is a very definite dry season during the winter which becomes more pronounced on progressing from south to north. It is most marked at Mareeba, where each of six months in the year has an average of less than an inch of precipitation. Consequently the average annual rainfall is apt to be misleading. The tobacco growing season in Queensland is not, as yet, very well defined, but for comparative purposes is taken as approximately the five months subsequent to the commencement of the wet season in December. Obviously from the table it can be noted that in most cases the average monthly rainfall is much greater in Queensland than in the United States during the growing season. These high rainfalls would be considered excessive under American conditions. The opinion was expressed in the United States that the 1929 season was excessively wet at Oxford, North Carolina, and the tobacco suffered in consequence. The actual registrations for that season were as follows:—May 4·54 inches, June 5·64 inches, July 6·58 inches, August 7·98 inches, September 2·58 inches. The average monthly rainfall recorded for most of the Queensland areas during the growing season are higher than these figures.

In analysing meteorological data it must be borne in mind, however, that average figures are frequently misleading since they do not give a picture of the fluctuations which occur in practice. Variations in soil type and drainage must also be considered. American tobacco areas probably differ most from those in Australia in having greater regularity of both temperature and precipitation and less rainfall during the growing period. In a recent publication from the Duke University ("Flue-cured Tobacco—Factors Determining Type and Seasonal Differences," by F. R. Darkis, L. F. Dixon, and P. M. Gross), analyses of tobacco leaf have been well correlated with climatic data to illustrate the effect of rainfall on tobacco quality and leaf character. It is claimed that excess rainfall results in thin, light-bodied leaf, with increased carbohydrate and lowered nicotine, petroleum ether extract, and total nitrogen determinations. Deficient rainfall on the other hand gives a thick, hard, gummy, dark coloured tobacco, which on analysis is found to have a

TABLE V.

METEOROLOGICAL DATA.

QUEENSLAND TOBACCO-GROWING AREAS.

—	—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Texas	Precipitation (ins.) ..	3·32	2·58	2·27	1·15	1·59	1·93	1·84	1·39	1·62	2·10	2·33	3·10	25·62
Goondiwindi	Temperature (°F.)—													
	Maximum	91·3	92·0	87·6	80·8	72·3	65·8	64·4	68·7	76·2	83·2	89·1	92·3	80·5
	Minimum	66·8	66·3	62·5	54·7	47·3	43·5	40·8	42·2	48·5	55·4	61·8	65·4	54·6
Rockhampton	Precipitation (ins.) ..	7·85	7·89	4·55	2·62	1·63	2·64	1·50	0·85	1·36	1·75	2·32	4·79	39·75
	Temperature (°F.)—													
	Maximum	89·3	88·6	87·2	84·3	79·5	74·6	74·2	77·2	81·7	86·1	88·5	90·3	83·5
	Minimum	71·8	71·7	69·6	64·8	57·5	53·9	50·7	52·6	58·4	63·7	67·6	70·9	62·8
Mackay	Precipitation (ins.) ..	14·49	11·47	12·27	6·56	3·74	2·68	1·63	1·06	1·59	1·70	2·91	7·24	67·34
	Temperature (°F.)—													
	Maximum	85·9	85·3	83·7	80·7	76·2	72·6	71·4	73·1	77·1	81·3	84·1	86·1	79·8
	Minimum	73·3	72·9	70·9	66·4	60·0	56·0	52·7	54·4	59·5	65·1	69·1	72·1	64·4
Bowen	Precipitation (ins.) ..	10·37	8·84	5·76	2·83	1·32	1·64	0·91	0·66	0·83	1·05	1·27	4·40	39·88
	Temperature (°F.)—													
	Maximum	87·8	87·5	86·4	83·9	79·7	76·2	75·2	77·1	80·5	83·7	85·8	87·8	82·6
	Minimum	79·1	74·5	73·1	69·5	63·3	59·3	56·5	58·5	63·0	68·4	71·7	73·9	67·6
Townsville..	Precipitation (ins.) ..	11·4	11·4	7·45	3·48	1·31	1·32	0·62	0·51	0·83	1·37	1·76	5·45	46·9
	Temperature (°F.)—													
	Maximum	86·9	87·0	86·2	84·1	80·4	76·6	75·5	76·8	79·7	82·5	84·5	86·3	82·2
	Minimum	75·8	74·9	73·4	69·6	64·2	60·8	58·4	60·4	65·3	70·5	73·5	75·6	68·5
Miriam Vale	Precipitation (ins.) ..	10·03	8·40	4·97	3·26	2·05	2·82	1·77	1·23	1·56	2·43	2·85	5·86	47·23
Mareeba	Precipitation (ins.) ..	9·48	7·37	6·97	2·72	0·66	0·50	0·31	0·21	0·20	0·61	1·40	4·49	34·86

decreased sugar content, and an increase in nicotine, petroleum ether extract, total nitrogen, and a greater percentage of total soluble nitrogen. When heavy rain occurs after a dry period tobacco makes second growth which is apt to be poor in texture, colour, and smoking quality. The analysis of such tobacco is rather similar to that of tobacco grown under deficient rainfall conditions except that there is a greatly increased amount of amino nitrogen, which is indicative of immaturity.

In reviewing the analyses of typical tobacco from various parts of the flue-cured belt the same general correlation between rainfall and quality are observable, and chemical composition associated with leaf character, as discussed above, also obtains. For instance, on the Coastal Plain where the rainfall is relatively high, the tobacco tends to be light bodied, thin, and with a very yellow colour. Conversely, on the Piedmont with less rainfall, the tobacco is thicker, gummier, heavier bodied, darker coloured, and is more aromatic with fuller smoking quality. On analysis the leaf of the latter is found to contain more total and soluble nitrogen, non-volatile acids, nicotine and petroleum ether extract, and less sugar content than leaf from the Coastal Plain.

ROTATIONS.

Throughout the Coastal Plain section the most general practice is to either grow tobacco continuously on the same land or else to alternate cotton with tobacco culture. In the hilly Piedmont section, however, the danger of losses through erosion necessitates the use of at least a cover crop during the winter. In other sections the presence of soil-borne diseases also makes the practice of crop rotation a necessity. Rotations, however, are also adopted by the more progressive farmers with the object of improving quality and increasing returns.

The best quality tobacco leaf is produced on virgin land or on land which has been "rested" or permitted to grow weeds for one or two years. The fact that no cultivated crop gives such satisfactory results as a weed fallow in rotation with tobacco has lead to an intensive investigation (Plate 173) as to the effect of certain weeds on the subsequent growth of tobacco. Already it has been demonstrated that certain specific weeds, such as horseweed (*Erigeron Canadensis*) and ragweed (*Ambrosia artemisiifolia*), are much more satisfactory than others to precede tobacco, and that some, such as lamb's quarter (*Chenopodium album*), known also as fat-hen in Australia, are detrimental (Plate 174).

The practical value of a weed fallow is being appreciated in the United States and is being generally applied by the most progressive farmers. Some of the best-quality leaf is now being produced after weeds (Plate 175).

In portions of the Old Belt, the presence of Granville Wilt, a serious soil-borne disease, makes a continuous tobacco culture, or the use of a weed rotation, impossible, since certain weeds are also host plants of this disease. In such areas long rotations are recommended, making use of such plants as grains, clovers, cowpeas, and soy beans, which are apparently immune to it.

Probably the most usual practice in the Old Belt is to grow a grain crop, such as wheat or rye, after tobacco (Plate 176). At times red top grass (*Agrostis alba*) is sown with the grain. The grain is harvested

PLATE 173.

WEED ROTATION EXPERIMENTS.

A crop of horseweed (*Erigeron Canadensis*) in a tobacco rotation experimental plot at the Pittsylvania Experimental Station, Virginia.

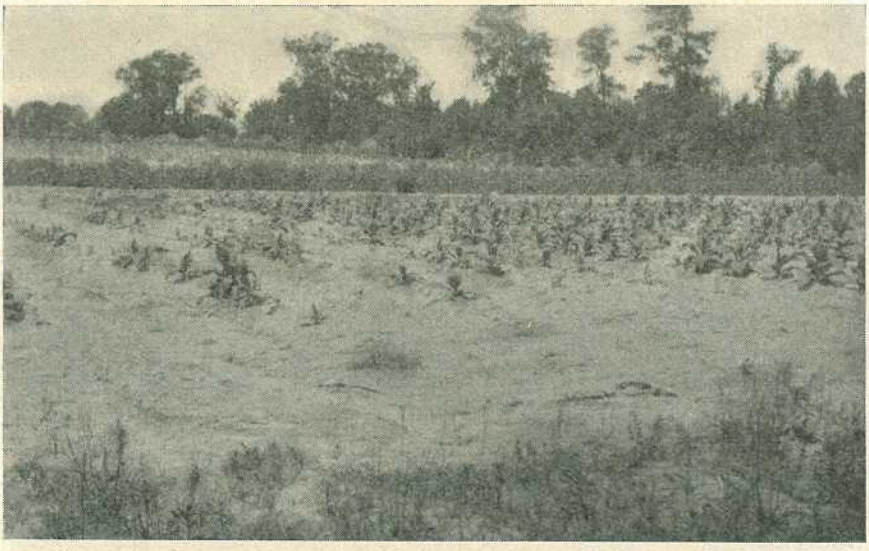


PLATE 174.

THE EFFECT OF WEEDS ON THE SUBSEQUENT GROWTH OF TOBACCO.

Young tobacco growing after pure cultures of weeds at the Pee Dee Experiment Station, South Carolina. The poor stand of tobacco in the foreground was planted after lambs-quarter (*Chenopodium album*). The plot to the right was planted after ragweed (*Ambrosia artemisiifolia*) the previous season.

PLATE 175.

THE PRACTICAL APPLICATION OF WEED FALLOW.

A tobacco field which has been "rested" for a season in order to grow a crop of horse-weed (*Erigeron Canadensis*). The most successful farmers find a weed rotation prior to a tobacco crop a profitable procedure.

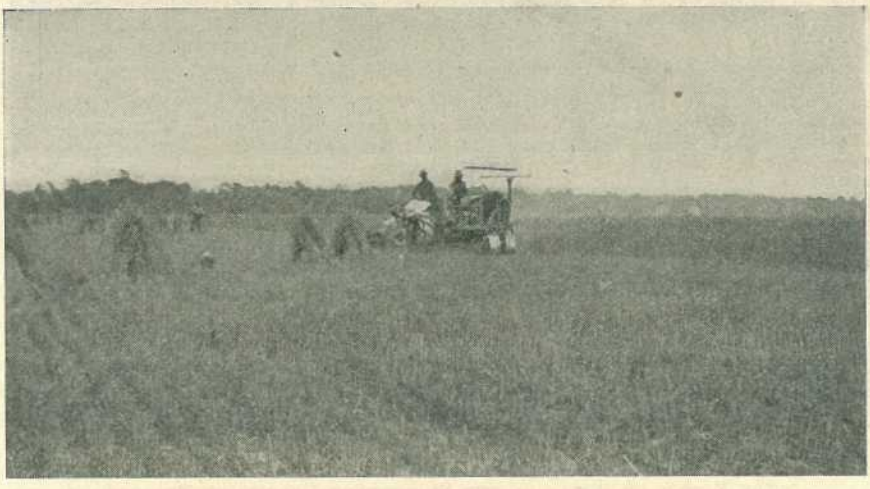


PLATE 176.

HARVESTING A WHEAT CROP IN THE FLUE-CURED BELT.

Wheat being grown as a rotational crop for tobacco.

PLATE 177.
TOBACCO ROTATION EXPERIMENTS.

Tobacco rotation plots at the Coastal Plain Experiment Station, Georgia. On the right a four-year rotation where tobacco was grown after cotton, corn, and velvet beans, and Spanish peanuts. On left tobacco after a crop of mixed weeds.

PLATE 178.
TOBACCO AFTER CROTALARIA.

Plot on left shows tobacco grown continuously on the same land. That on the right illustrates the increased growth of tobacco following oats and Crotalaria. Nematodes were not as severe as usual in 1935. In a more normal season the contrast possibly would have been greater.

in the spring and the grass ploughed under the following autumn or early winter, or the land may be left in sod for a couple of years, particularly where wilt is a problem. Numerous rotations are advocated for this area, but since the land should not be in too rich a condition for tobacco, one underlying principle is that where a legume is used it should follow the tobacco crop and not precede it.

Loss through nematode infestation is becoming an increasingly serious problem on the light soils of the Coastal Plain. Consequently efforts are being made, particularly in Georgia, to control this pest by crop rotation. Possibly the best results are being obtained at the Coastal Plain Experiment Station with a four-year rotation which includes cotton, corn interplanted with velvet beans, Spanish peanuts, and tobacco (Plate 177).

The best quality tobacco is apparently obtained in these experiments where the land is used for oats followed by weeds during the two seasons preceding tobacco. However, the most promising results in nematode control were obtained by maintaining a bare fallow for two years preceding tobacco. Another very satisfactory rotation consists of following peanuts by oats. Weeds are permitted to follow the oats through the succeeding summer and are turned under in the autumn to be followed by tobacco in the spring. It was only at this experiment station that Crotalarias were observed in tobacco rotational experiments. *Crotalaria retusa* is being found more satisfactory than *C. spectabilis,* since the latter usually makes too rank a growth. Satisfactory growth and good-quality leaf has been produced after Crotalaria and after Crotalaria and oats (Plate 178). Rotations for the control of nematodes are further discussed under the "Root-Knot" section of this report.

SEED BEDS.

In the flue-cured tobacco areas seed beds are generally roughly square-shaped structures. They vary considerably in area and may be quite extensive. Frequently each side is about 40 or 50 feet long. The soil is rarely sterilised. The usual practice is to cut out a space in the woods (Plate 179) each year for a seed-bed site and so tend to obviate weed growth and trouble from disease. Where old beds are used they may be burnt over prior to seeding. The beds are covered with cheese cloth supported by wires attached to logs, which form the borders of the beds, or at times by bent twigs dug into the bed.

Where there is danger of frost injury straw is frequently piled over the beds in cold weather and breakwinds may be constructed. A ditch is usually dug around the beds to permit drainage (Plate 180).

Mixed fertilizers are frequently applied in relatively large quantities. Consequently chlorine damage to the young plants is not rare. It is now officially recommended in the United States that such fertilizers should be practically free of chlorides and contain 8 per cent. phosphoric acid, 4 per cent. nitrogen, and 3 per cent. potash. Fertilizers are applied at the rate of about 2 or 3 lb. per square yard of bed.

Seed may be mixed thoroughly with wood ashes, cotton seed meal, fertilizer or soil, and carefully applied in two or four directions over the bed and then firmed into the soil. The rate of seeding is about $\frac{1}{4}$ oz. to $\frac{1}{2}$ oz. of seed for each 100 square yards of bed.

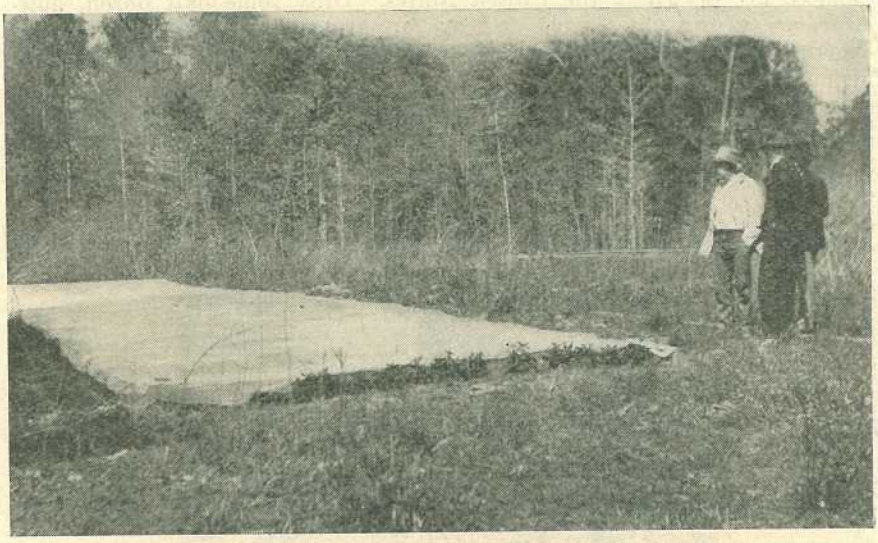


PLATE 179.
SEED BEDS.

A tobacco seed-bed in the woods in South Carolina with the "canvas" or cheese cloth covering in place.

PLATE 180.
TOBACCO SEED BEDS.

A seed-bed in Georgia with the cheese cloth covering removed, showing pegs and wires for the support of cover and drainage ditch around bed.

FLUE-CURED TOBACCO VARIETIES.

As might be expected, a great number of varieties of flue-cured tobacco are grown in the United States. Only some half dozen, however, are grown extensively and are apparently of outstanding merit. North Carolina produces about 75 per cent. of the flue-cured crop, and it has been estimated that 85 per cent. of the tobacco grown there consists of five varieties. They are Cash, White Stem Orinoco, Jamaica Wrapper (including Gold Dollar), Bonanza, and Virginia Bright Leaf.

PLATE 181.

SELECTING TOBACCO PLANTS FOR BAGGING.

When the seed-head has completely elongated, flowers which have opened are pinched out, sucker seed branches are removed, and a brown paper bag is tied over the flower head.

Possibly the most serious attempt in recent years to improve flue-cured tobacco varieties has been made by the Coker Seed Company in South Carolina. Their plant breeders made a careful study of the most promising commercial varieties and made selections from them. Gold Dollar was a selection made in this manner from Jamaica Wrapper. Its excellence is illustrated by the fact that although it has only been distributed since 1929, it is considered that about 80 per cent. of the tobacco now grown in South Carolina consists entirely of this variety. Other varieties grown in that State are Yellow Mammoth, Jamaica Wrapper, Hickory Pryor, Willow Leaf, Cash, and White Stem Orinoco.

In Virginia the two most promising varieties are apparently Jamaica Wrapper and Yellow Mammoth, and in Georgia Gold Dollar and Bonanza are most favoured.

Taking the flue-cured belt generally, it would seem that there has been a tendency to replace varieties such as Warne, Adcock, and Gold Leaf, which have been found in the United States to produce a heavy-bodied, dark-coloured leaf, by a group of a lighter type. The relative popularity of the latter varieties may possibly be placed in the following order:—Jamaica Wrapper (including Gold Dollar), Yellow Mammoth, Cash, and Bonanza.

PLATE 182.

BAGGED FLOWER HEADS.

Selected tobacco plants at the Coker Seed Company, South Carolina, which have been bagged for seed production.

SEED PRODUCTION.

Some individual growers bag the flower-heads of their most promising plants in the field and save the seed so selected each year. The bags should be placed in position when the seed-head has completely elongated (Plate 181). Others purchase their seed from growers who specialise in seed production or from seed companies.

In North Carolina a method of seed certification is in force. Certain farms are selected for the production of the more important tobacco varieties by the staff of the local experiment station. During the growing season the crops are inspected by officers of the United States Department of Agriculture, and if the tobacco is found to be free of disease, true to type, and otherwise satisfactory, a certificate to that effect is issued to the grower. Officially certified seed brings a good price, and consequently seed growers make a conscientious effort to produce seed which will eventually be certified.

The methods adopted by the Coker Seed Company, which is one of the largest seed producing concerns in the United States, were observed in South Carolina. Their procedure is as follows:—The seed from each selected bagged head is collected and planted the following season in two rows. Plants in one row are topped and receive the usual cultural treatment. The middle leaves of these plants are cured and tested for quality. The best plant or plants in the other row are further selected for desirable field characters and the flower-heads of

PLATE 183.
COMMERCIAL PROPAGATION OF TOBACCO SEED.

An isolated field of tobacco grown for seed production. Off type plants, which usually consist of about 10 per cent. of the total, are topped and sucker seed stalks are cut off.

selected plants are bagged (Plate 182). Should it be decided to propagate commercially from these selected plants, their progeny are set out in isolated fields, usually in duplicate. These fields are situated at least half a mile from any other variety. The flower-heads are not bagged (Plate 183), and the top leaves are not stripped, and inter-pollination within the plant family is considered advisable. Off-type plants, which consist of about 10 per cent. of the crop, are topped and sucker seed stalks are cut off. Most of the lower leaves are primed and cured as they mature.

The seed is harvested when ripe, thoroughly cleaned three times in an air machine, disinfected with formalin, and carefully washed in water.

Where seed-heads are bagged, it is a general practice to periodically examine them and to apply a little lead arsenate powder to protect the seed-heads from bud-worm damage (Plate 184).

PLATE 184.

PROTECTING SEED-HEADS FROM INSECT INJURY.

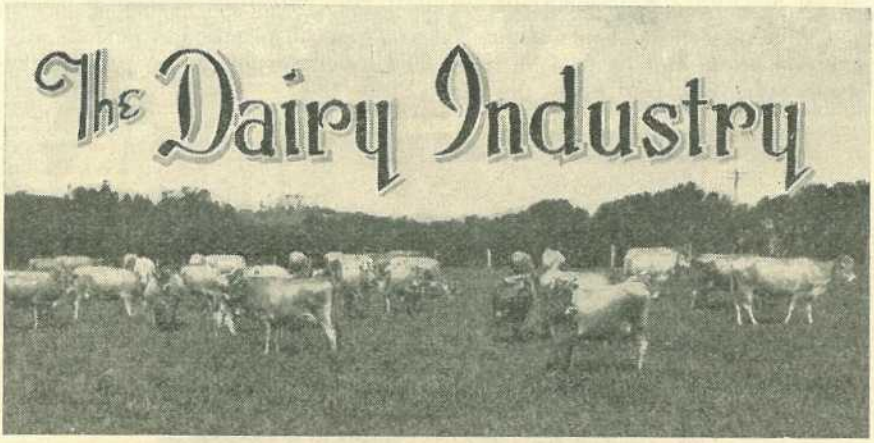
Examining cigar tobacco seed-heads in Florida. Note the cloth bag attached to workman's belt for holding lead arsenate, a little of which is sprinkled over the seed-capsules to control bud-worms.

LONGEVITY OF SEED.

In most parts of the United States tobacco seed will germinate fairly well after at least five years of storage. It has been found in Florida, however, that it apparently deteriorates very rapidly and will not germinate satisfactorily if more than two years old. Since the latitude and weather conditions of Florida more closely approximate those of Queensland than do other localities in the United States, it is possible that seed germination may be similarly affected here.

It is apparently inadvisable to store tobacco seed in air-tight containers, and the usual practice is to keep seed in cloth bags.

[TO BE CONTINUED.]



CURDY AND JUNKETY MILK AND CREAM.

E. B. RICE, Dairy Research Laboratory.

SWEET CURDLING OF MILK.

SINCE the establishment of the Dairy Research Laboratory, a number of milk vendors in the Brisbane district have called to seek advice concerning a defect which manifests itself by a curdling of the milk without the usual souring in taste. This condition, referred to as the sweet curdling fermentation, presents a serious problem to the vendor, for the rapid thickening renders the milk unsaleable, or if it be supplied to householders before that stage is reached complaints about the spoilage in the home ensue with consequent loss of custom.

Sweet curdling is a bacterial defect, the organisms causing the coagulation through the production of an enzyme known as rennet. Enzymes, which are present in all living cells, possess the power of bringing about chemical changes of great magnitude in comparison with the quantitiy of enzyme involved; for example, one part of rennet is able to curdle in a few minutes several million parts of milk. The bacteria capable of secreting rennet are mostly species whose natural habitat is the soil. By reason of the susceptibility of milk to soil contamination soil organisms of various species are of frequent occurrence in dairy products.

Milk affected in this manner is of seasonal occurrence, its incidence being more prevalent in warm weather on account of the most favourable temperature for the growth of the causal organisms being in the vicinity of 80° F. Inquiry almost invariably elicits the information that in dairies troubled with this defect cooling of the milk is not attempted.

Causative Organisms.

1. *Aerobic spore-producing bacteria.*—These bacteria of typically soil forms are very commonly found in milk products. They are often responsible for the sweet curdling of pasteurised milk owing to the spores resisting the heating to which the milk has been subjected, but are only occasionally found in large numbers in samples of raw milk showing the fermentation.

2. *Non-spore-forming rods.*—Among these are the Proteus group of bacteria which are always present on decaying material. They are not troublesome under ordinary conditions, being overgrown by other species.

3. *Micrococcus species.*—These bacteria are the most important causal agents connected with this defect and microscopical and cultural tests generally reveal their presence in large numbers in samples of sweet curdled milk which arrive at the laboratory.

Recommendations for Control.

1. Keep cows clean, regularly brushed, and wash the udders and teats before milking with a clean, recently boiled cloth and a weak solution of potassium permanganate or a chlorine preparation.

2. The milker's hands should be washed before milking each cow.

3. Avoid contamination of the milk by dust in the bails and dairy.

4. Cool milk to below 60° F. as soon as possible after production and maintain in a cool condition until delivery.

JUNKETY CREAM.

A defect of cream of somewhat infrequent occurrence closely resembling the sweet curdling of milk is that described colloquially by farmers and factory employees as "junkety" cream. It seems to make its appearance in epidemic form and at such times the cream from many suppliers in a district will be affected.

The abnormal condition is caused by micrococcus species which secrete rennet and can be induced in fresh cream by adding to it a small portion of affected cream, or, in the laboratory, by inoculating the organisms into sterile milk and cream.

Control.

Contamination appears to take place in the separator and utensils and strict attention to cleanliness becomes an important factor in its elimination. Cooling of the cream will also keep the organisms in check, as their growth is much slower at temperatures below 70° F.

THE CURDLING OF SOUR MILK AND CREAM.

The sour taste acquired by milk which is held for any length of time at ordinary temperatures is familiar to everyone. The curdling which follows this normal souring is due to the acid produced by bacterial growth in the milk resulting in an alteration of the state of the casein. In fresh milk the casein is present partly in solution and partly in a fine suspension, which gives to milk its opaque appearance, but with increasing acidity the physical properties of the casein are altered until finally it forms a smooth, firm clot.

Sour cream showing a tendency to curdiness is often received by butter factories. This also results from the development of excessive acidity bringing about partial precipitation of the casein. With a low testing cream there is a higher percentage of milk sugar than in cream with a higher test, thus favouring the growth of the acid-forming bacteria which convert the milk sugar into lactic acid. The liability to curdiness is increased in the warmer weather by setting the cream screw of the separator to deliver a thin cream, or by failure to replace all skimming discs in the separator bowl. The addition of warm cream to cool cream is another means of inducing curdiness.

Control.

Prevention of this defect in cream lies in adjusting the cream screw of the separator to give a cream containing not less than 34 per cent. of butter-fat between the months of April and September, and not lower than 38 per cent. between October and March; seeing that the skimming discs are tight in the separator, and that the animal heat has been reduced before blending freshly separated cream with that from a previous separation. Ordinarily about an hour must elapse before the cream has cooled sufficiently to mix, but with a cooler it is, of course, ready immediately. The cream should be stirred at least four times daily to ensure that bacterial action takes place uniformly throughout the mass.

PLATE 185.

The first waterfall, source of Coomera River. This is one of the ninety-nine waterfalls in the course of the Coomera in Lamington National Park. There are over 400 falls in the same park.

By H. J. FREEMAN, Senior Instructor in Fruit Culture.

(*Continued from page* 396, *April*, 1936.)

Irrigation.

THE date palm has the ability to adapt itself to a wide range of soil moisture conditions. In its native habitat it is only found growing in places where its roots have access to a constant water supply; it can, however, survive for long periods with very little water. During periods of drought, water is conserved by retardation or cessation of growth. In such cases, when water is again made available to the palm, normal growth is resumed without apparent ill effect upon the future thriftiness of the palm.

The actual amount of water used by a mature palm making a normal growth is only slightly more than that used by a mature citrus tree in full production and could be estimated at 50 acre-inches per annum.

The date palm under normal conditions is a deep rooted plant; it is, therefore, necessary to maintain an adequate supply of soil moisture to a depth of at least 6 feet for maximum growth response. The frequency and depth of irrigation applications to maintain this will depend largely on the soil texture, depth of root penetration, weather conditions, variety and size of palm, and the leaf area. During the summer months, the palms are making a vigorous growth and the fruit is developing rapidly. It is very important that no water stress occur during this period. Sandy soils usually require irrigations at ten to fourteen days' intervals, while a heavy clay loam may be allowed three or more weeks between irrigations.

After the fruit has reached a maximum size, the irrigation interval should be materially lengthened. A warm dry soil encourages more uniform ripening of the fruit on the clusters. The fruit is also subject to greater damage from rain when the soil is wet, following an irrigation, than when the soil is dry.

The variety and prevailing weather conditions influence materially the irrigation practice during the ripening season. With little or no rain and low atmospheric humidity, some varieties have a tendency to shrivel, but by keeping the soil moist, this tendency may be offset to a degree. Other varieties seem to improve in quality with a low soil moisture during this period.

During the first few years after the grove is planted, irrigation water is applied in the original basins. These should be gradually enlarged and supplemented by furrows between the basins. After the offshoots have been removed, the basins are filled in and the entire area irrigated. The system of irrigation will depend on the soil and the slope of the land.

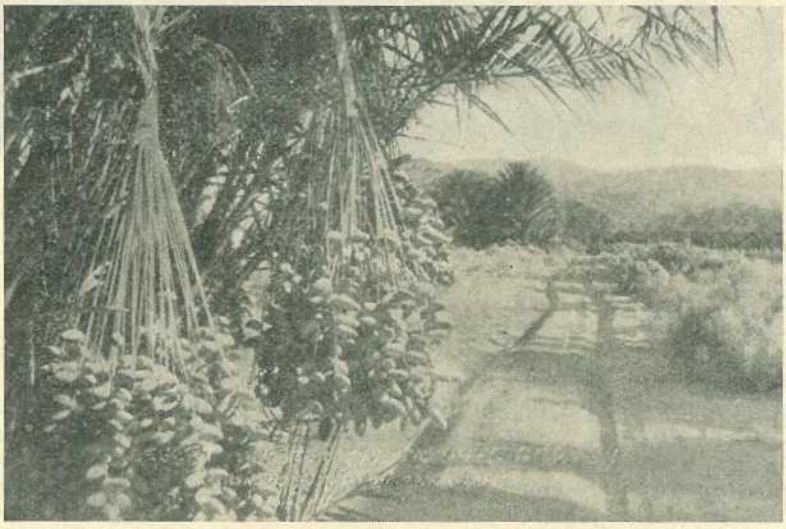


PLATE 186.
Desert wasteland brought into date production, Deglet Noor, California.

Cultivation.

The principles and practices used in the cultivation of other fruit trees can be applied successfully to the date palm. The primary objects of cultivation are to aerate the soil, control weeds, ensure water penetration, and incorporate organic fertilizer into the soil.

The basins around young palms should be spaded at least once each year and new mulch added. The mulch keeps the surface from drying out and prevents grass and weeds from becoming established around the palm. Cultivation between the basins will consist largely in the control of weed growth.

After the offshoots have been removed, the basins are filled in and the entire area between the palms may be cultivated with a suitable farm implement. The type of cultivating tool and the depth of cultivation should be changed occasionally to prevent the formation of a plough sole. It is of particular importance to have the grove cleanly cultivated during the harvesting season. Weeds and grass growing under the palms will increase atmospheric humidity and make it difficult to keep the ground clean of fallen fruit.

Soil Fertility.

Very little experimental evidence is available concerning the fertilizer requirements of the date palm. However, it has been observed that where fertilizer has been applied, other factors being favourable, an increase in growth response and production has resulted. To fertilize intelligently, the grower must be guided by the general condition of the palm. This requires a close study of its growth and production. The palm should be maintained in a sufficiently thrifty condition to promote maximum fruit production with a minimum production of leaves. It is recorded that a palm producing twenty to thirty leaves annually develops a sufficient number of fruit clusters to maintain

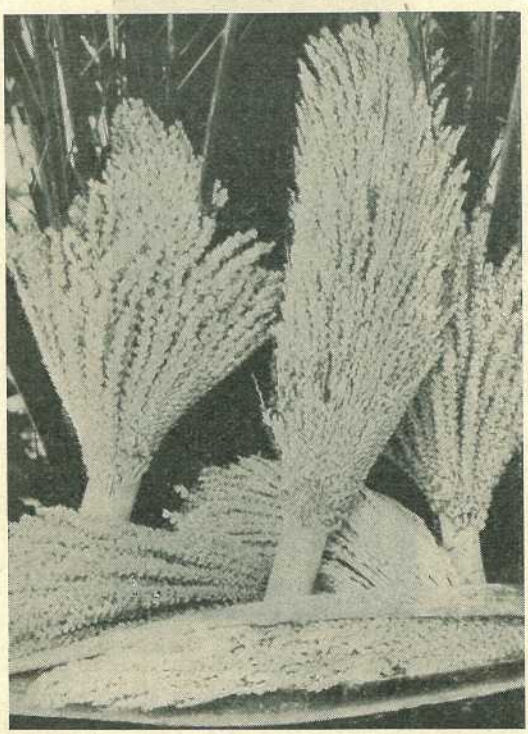


PLATE 187.
Male blossoms, from which the necessary pollen is procured.

maximum production. Palms making a yearly trunk elongation of 18 to 24 inches will have a higher ratio of fruit clusters to leaves produced than a palm making a growth of 36 inches or more per year. This would indicate that there is a maximum beyond which it would not be commercially profitable to force growth.

A study of the soil is necessary before any fertilization programme is adopted and soil analysis may be of some value in this connection. A survey of citrus tree development in the United States of America revealed that groves planted in good soil and unfertilized made more growth than trees growing in poor soils which were heavily fertilized. This doubtless would hold true to a certain extent with the date palm.

Furthermore, the date palm, which has a deep and extensive root system, will be likely to exhaust the original plant food supply in the root area less rapidly that the more shallow rooted citrus tree.

A study of the soils in Western Queensland has established the fact that they are usually deficient in nitrogen and organic matter, both of which can be supplied by liberal applications of farmyard manure. Green cropping is also essential if the fertility of the soil is to

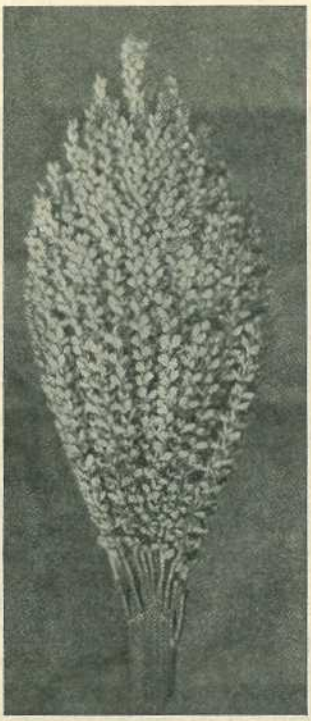


PLATE 188.

A desirable male flower cluster has many large flowers borne on long strands producing an abundance of powdery, viable pollen.

be maintained. As dates make their most rapid growth during the hot summer months, the aim of the date grower should be to have the soil in such a condition as to allow for development to the fullest extent. To do this, the green crops Beerseem, *Melolotus indica* (Sour Clover), Field Peas or Tares (Golden or Black) should be sown to allow for full growth during the winter and then ploughed in to a depth of 11 inches if possible during the late spring. In addition to adding fertility, these cover crops are of value in that the roots place organic matter into the subsoil, this in turn increasing the moisture-holding capacity of the soil as well as aiding water penetration. The application of artificial fertilizers has not been adopted to any extent in America, green cropping and up to one ton of farmyard manure per mature palm per annum always providing satisfactory results. In Queensland, I am of

the opinion that similar results would be achieved but the possible shortage of farmyard manure may warrant that an annual application be made to fully matured palms of the following mixture:—

Ammonium Sulphate	5 lb.
Superphosphates	12 lb.
Muriate of Potash	5 lb.

Systematic and efficient mulching with dry grass or wheaten straw is of very great assistance during the hottest months of summer.

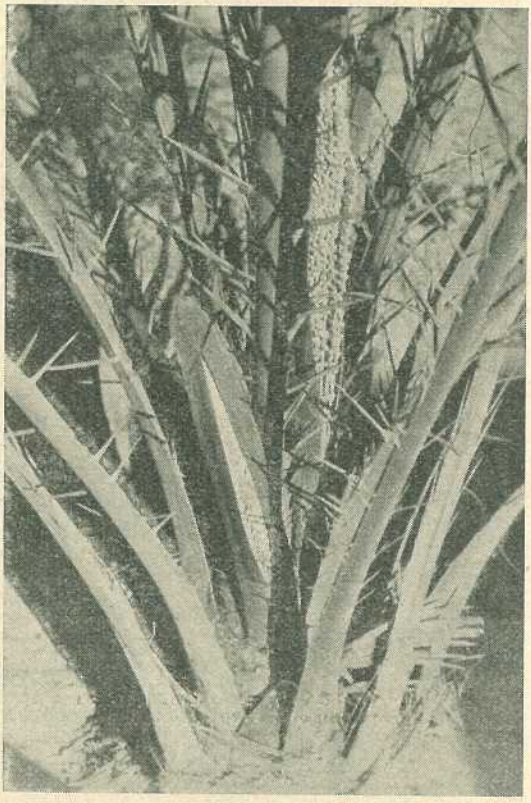


PLATE 189.
Female date palm showing spathe just opening.

Pruning.

Pruning is largely confined to the removal of old leaves and spines. The number of leaves that a mature date palm should carry to secure maximum production is not definitely known. It is generally accepted that a date palm in full bearing should carry from 100 to 125 fully developed leaves. On those palms carrying the desired number of leaves, pruning is confined to the removal annually of a number of old leaves equal to the number of new leaves developed during the preceding year. In pruning leaves, the cut is made at the base fairly close to the fibre. Leaf pruning can be done at any time during the spring or early summer.

Aerial roots may form behind the cut leaf bases on the lower part of the trunk unless particular precautions are observed. These roots develop in the outer tissue of the trunk behind the moist fibres but finally die as they become exposed to the dry atmosphere. These old decaying roots supplemented with soil particles and other decaying organic material lodged between the old roots, stimulate growth on another cycle of roots. Each time a new growth of roots starts, the diameter of the palm is decreased, resulting eventually in the loss of the palm. This may be partially prevented by pruning the old leaf stubs close to the trunk and removing the fibre to a height of 3 to 4 feet from the ground after the offshoots have been removed.

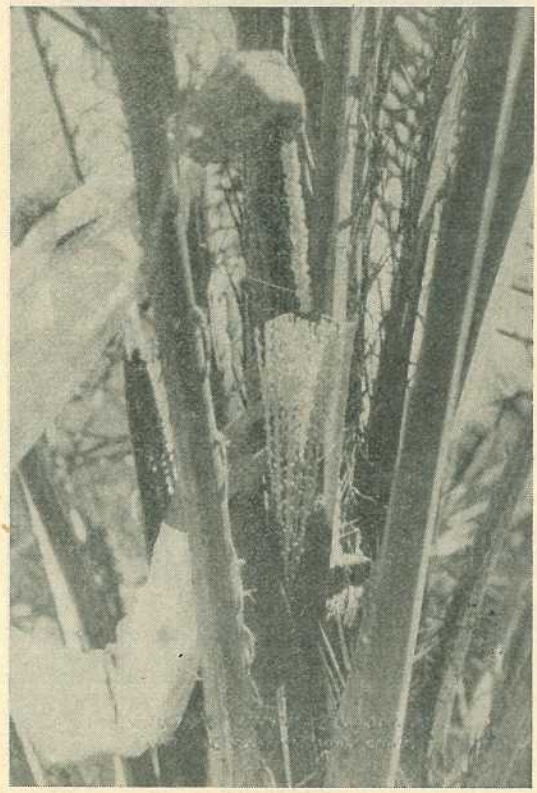


PLATE 190.
Pollinating female date palm inflorescence with strand of male inflorescence.

Each year before blossoming begins, the spines are cut from the leaves produced during the previous year. This is done to facilitate working around the palm during the pollination and fruiting season. A sharp knife designed similarly to a pruning knife, but with a blade 10 to 12 inches long is well adapted for the purpose. Care should be exercised not to injure the midrib of the leaf.

Pollinating Dates.

In a natural or seedling group of date palms approximately an equal number of male and female plants would occur and pollination

would result from wind borne pollen. In commercial groves, where it is desired to produce the maximum amount of fruit on a given cultivated area, it is necessary to limit greatly the male palms and to pollinate artificially. With hand pollination two good male palms will produce sufficient pollen to fertilize the flowers of fifty female palms.

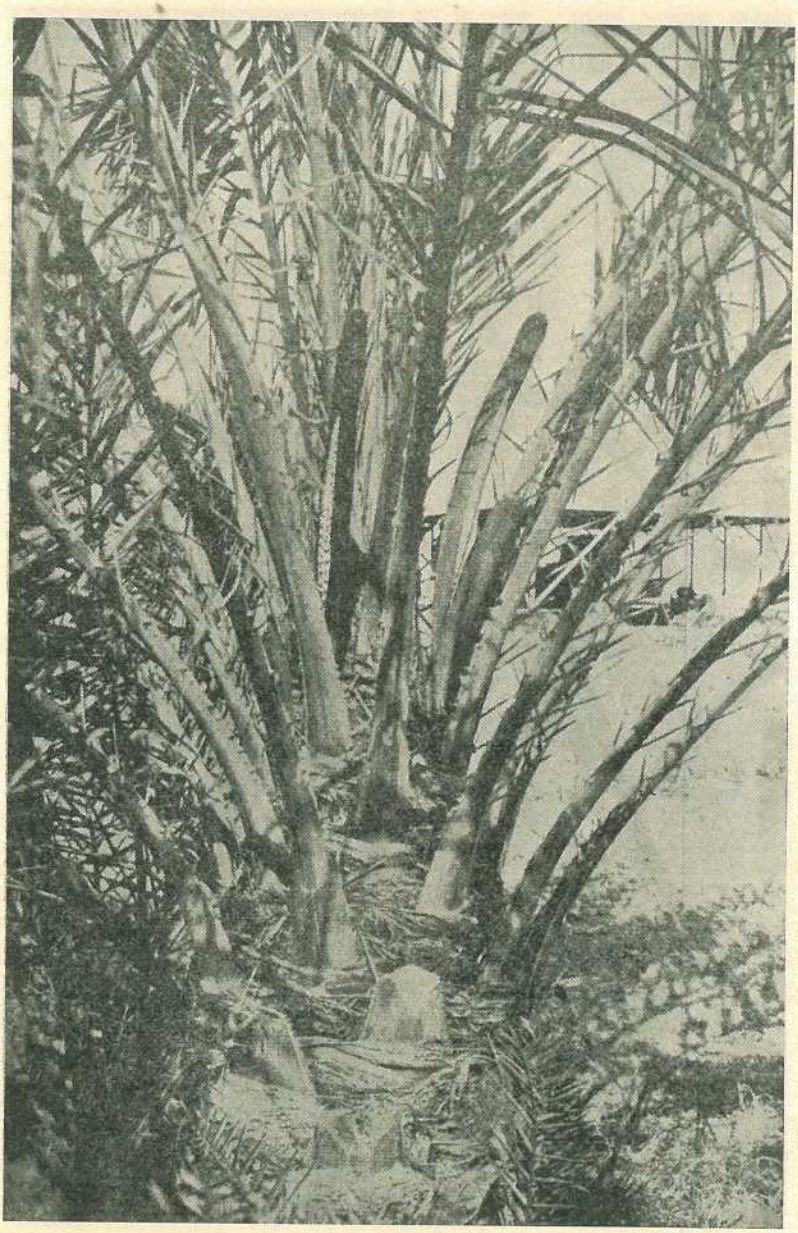


PLATE 191.

The two spathes on the palm illustrated have burst, an indication of the proper time for pollination. This operation should not be delayed more than two or three days beyond the stage indicated.

The selection of male palms should be given careful consideration. There is a great variation between them as to time of blossoming, number of blossoms produced, the size and shape of the blossoms, and the abundance and viability of the pollen. Furthermore, the pollen from different male varieties may influence the size of the fruit, the

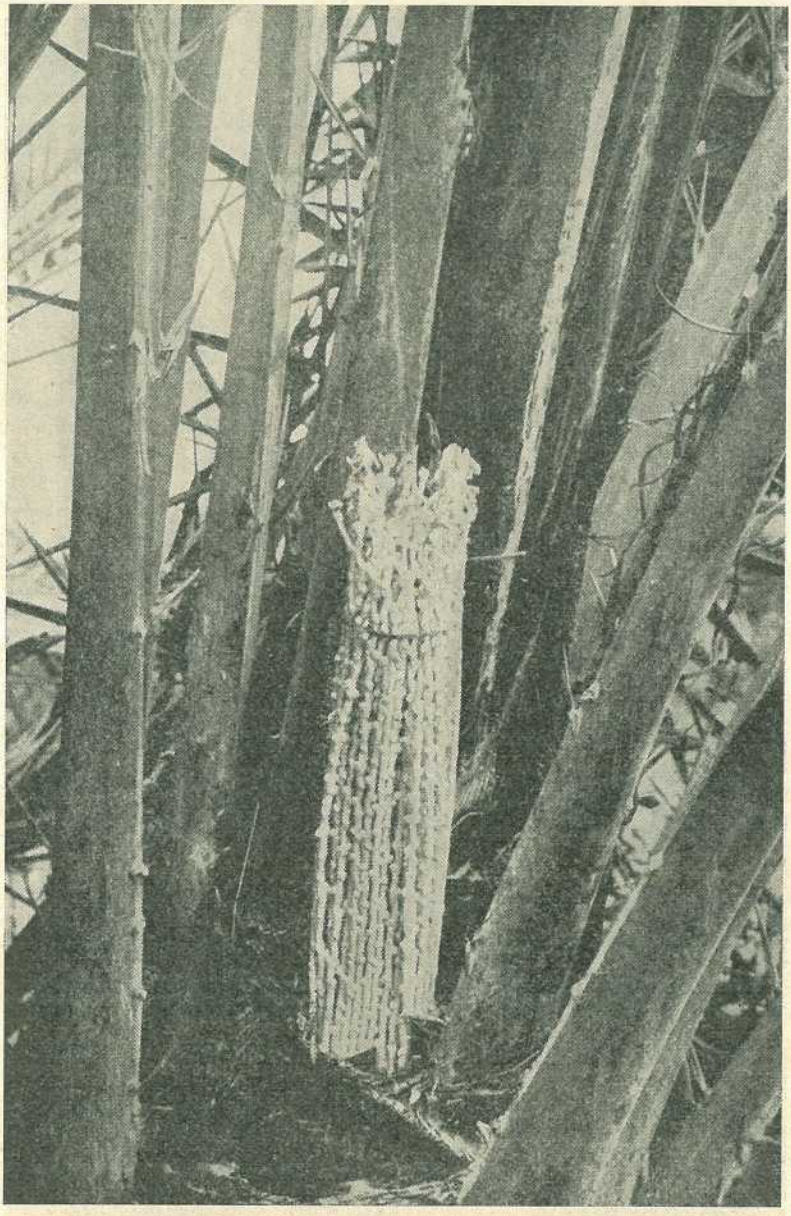


PLATE 192.

The sheath has been cut away from the female flower cluster and a few strands of fresh, male flowers bound in place in the centre of the cluster completes pollination.

size and shape of the seed, and the time of ripening. The chief requisites of a desirable male palm are that it blossoms at the same time or just prior to the female palms, and produces many large blossoms with long strands which have an abundance of yellowish, powdery, viable pollen. Coarse flaky pollen is usually associated with low viability and should be avoided. The final test for any male is the set of fruit produced by its pollen. It should be possible in the future for a prospective grower in Queensland to obtain offshoots from tested palms which will assure him a dependable supply of pollen.

PLATE 193.
Date fruit growth one month after pollinating.

It is desirable to collect the male blossoms within a few hours after the spathes split open. If they remain on the palm for a longer time, the individual flowers open, the pollen sacks are broken, and almost all of the pollen is carried away by the wind and bees. Pollen will remain viable throughout the blossoming period provided the flower clusters are properly handled.

The length of time a female flower is receptive to fertilization depends upon a number of factors and cannot be definitely stated. Differences between varieties, prevailing atmospheric conditions and possibly a physiological difference between the blossoms on the same palm tend to influence this period. Experiments in the United States of America indicate that the longer pollination is delayed after the spathe has burst, the fewer fertilizations will be effected. In commercial practice, where a heavy set of fruit is required, it is desirable to pollinate as soon as possible, never delaying more than two or three days. If rain occurs within twenty-four hours after a pollination has been made, it is advisable to repollinate after the weather clears.

There are several satisfactory methods of applying pollen to the female flowers. The more common and reliable method is to remove the sheath from the female flower cluster and place three to five strands from a recently opened male blossom upside down in the centre of the

female cluster. A piece of strong twine is tied around the upper end of the cluster to hold the male flower strands in place and to keep the cluster in a compact form until the fruiting arm has elongated and the clusters worked down through the leaves into a permanent position. The twine is tied with a slip knot in such a manner that it will gradually loosen as the fruit increases in size.

PLATE 194.
Thinning dates when half matured, California.

Another method involves the removal of the strands from the male flower cluster and placing them on a screen or slatted tray in a dry well-ventilated room. The pollen which falls from the drying flowers may be collected and used for pollinating, either by dusting it directly on the female flowers or by working it into cotton wool and tying a small amount of this into each female cluster. It is desirable to use fresh pollen whenever available. However, a supply of dried pollen should be maintained throughout the season for emergency use in case fresh pollen is not procurable when needed.

Thinning the Fruit.

It has been shown that the fruit of the date palm could be materially increased in size by thinning. Also, it has been observed that heavily thinned clusters ripened their fruit more uniformly than clusters which were not thinned, the size of the dates increasing in proportion to the total number of dates removed from the palm. The amount of thinning required will vary with the variety and vigour of the individual palm. Palms that produce an excessive crop of fruit

one year will bear a very light crop or possibly fail to fruit the following year. No arbitrary rule may be made governing the amount of thinning required to maintain a uniform crop with maximum production from year to year. Careful observations each season on the amount, quality and size of the fruit, correlated with the variety and cultural practices employed, form the only guide by which the grower can estimate the productive capacity of his grove. A reduction of one-third to one-fourth of the total number of fruit set on a given palm is suggested as a basis upon which a grower may start his thinning programme.

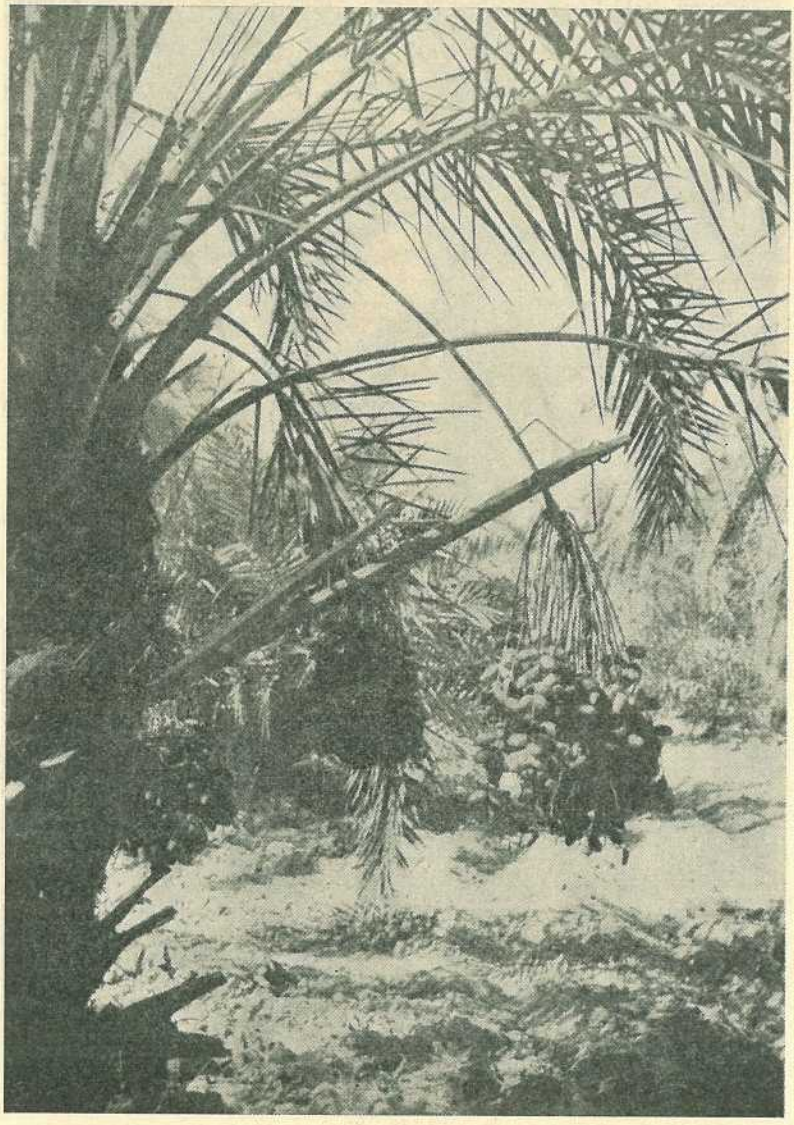


PLATE 195.

Before the fruit reaches full size the bunches should be supported to prevent breaking of the fruiting arm and to minimise wind damage.

There are several methods of thinning now used in commercial areas. The same method is not satisfactory for all varieties nor for all soil and climatic conditions encountered throughout dategrowing districts. For varieties which are subject to damage by rain, it is desirable to leave all strong flower stalks and thin by removing the strands from the centre of the clusters. This produces a relatively loose cluster which affords better air circulation, a desirable condition during damp, rainy seasons. Certain varieties, especially where grown in areas of low humidity and little rainfall, have a tendency to shrivel

PLATE 196.

The use of permanently anchored platforms on tall palms minimises the handling of long cumbersome ladders and greatly reduces picking costs.

or become puffy as they ripen. In such cases, it is advisable to keep the clusters as compact as possible to prevent excessive loss of moisture from the fruit. This is accomplished by removing entire clusters or by removing the lower portion of all strands on individual clusters.

Thinning is usually done at the time the blossoms are pollinated, but it may be done at any time before the fruit reaches approximately one-fourth of its maximum size.

Supporting the Clusters.

After the fruiting stem has reached its full length, the weight of the rapidly developing fruit will force the cluster down through the leaves. It is important to direct the clusters so that they will hang freely and be equally distributed around the palm. When the berries have reached approximately three-fourths maximum size, the clusters should be supported to prevent the kinking or breaking of the fruiting arm, and to minimize the wind damage.

Light clusters may be tied to adjacent leaves for support, but large heavy clusters require a special brace. A commonly used brace consists of a 1 inch by 3 inches stake 3 to 6 feet long, bevelled at one end, with a heavy specially designed hook fitted to the bevelled end. This hook is made of heavy wire, 24 inches long, twisted to give a 2-inch eye in the centre parallel to the arms with the ends bent in a 3-inch semi-circle at right angles to the arm. The fruiting stem rests in the half circles of the hook, one half circle being fastened in front of the first whorl of strands on the cluster to prevent slipping on the fruiting stem. The bevelled end of the stake is fitted into the eye of the hook and the other end is wedged behind a leaf base. A more simple and less expensive method is to tie one end of the stake securely to the base of the fruit cluster with a light rope in place of using the hook described above.

Harvesting the Fruit.

As all dates on the fruiting clusters do not ripen at one time, it is necessary to make several pickings during the season. The rate of fruit ripening appears to be influenced by the same factors as those influencing the rate of palm growth. Those varieties ripening early in the season when the minimum temperatures are quite high, have a shorter ripening period than do those ripening later. Likewise, cold weather during the autumn retards ripening and warm weather accelerates it.

It is essential that the fruits have a high percentage of their sugar accumulated before they are picked from the palm, if a high quality product is to result from artificial ripening. The fruits of nearly all varieties ripen from the distal end toward the calyx. During ripening, the flesh becomes pliable and the colour changes to a light translucent amber in the light coloured, soft and semi-soft varieties. The influx of sugar differs in the early and late maturing varieties and data obtained indicates that the sugar content of the early maturing varieties continues to increase until the fruit reaches the fully translucent stage. If such fruits are picked when they show the first signs of ripening, an inferior product characterised by a tasteless, watery flesh will result. If dehydrated or held in storage, the flesh separates from the skin and dries to a leathery consistency unfit for commercial purposes. Fruits ripening late in the season accumulate the greater part of their sugars before the flesh begins to soften. Therefore, they can be picked and ripened into a high quality product at a much earlier stage of maturity.

Fruits which remain on the palm until fully ripe become darkened in colour, wrinkled or puffy, and considerable loss may occur during periods of unfavourable weather due to souring. Also, the loss from birds, insects, and handling will be greatly increased.

Two methods of picking are now used in commercial groves. In one, the date is detached from the calyx by means of a twisting motion of the fingers. The other method is to clip the date from the strands leaving the calyx attached to the fruit. The latter method increases the cost of picking but adds to the attractiveness of the fruit. Fruits of the soft type must be handled with care to prevent crushing or injury to the skin. This is best accomplished by using a shallow picking container holding not more than two layers of dates. The firm varieties may be picked less carefully, using deeper containers, without damage to the fruit.

The dry or bread dates are easily picked as all the fruit is allowed to become fully ripe and dry on the cluster. The cluster is then cut late in the season and the dates removed.

Ladders are used for picking the fruit when the palms are small, but as they grow in height, the long ladders used become more and more unwieldy. This has necessitated the use of picking platforms for the taller palms from which all the fruit clusters can easily be reached. The cost of these platforms is more than offset by the saving of labour involved in the pruning, pollinating, thinning, bracing, protecting clusters, and picking. A very satisfactory type of permanent platform is shown herein.

Effect of Rain during the Ripening Season.

Rain, followed by periods of high atmospheric humidity during the ripening season, may cause serious injury to dates. This injury is of two types—first, the cracking or bursting of the skin, and second, loss due to souring (bacteria and moulds).

The flesh of the date fruit contains relatively large amounts of sugar. This high sugar concentration within the fruit causes it to absorb water readily in atmospheres of high relative humidities of 80 per cent., or higher or when placed in direct contact with water. Tests made to determine the amount of water absorbed by certain varieties of dates after heavy rain gave the following results: The moisture content of green and 20 to 30 per cent. ripe fruit, which was determined before and after the rain, showed that the dates absorbed 3.6 and 6.95 per cent. moisture, respectively. The higher sugar content of the partially ripened fruit apparently caused it to absorb more moisture than the greener fruit. Fully matured fruits have a high percentage of dry matter and moderate quantities of water may be absorbed without injury. Undue absorption of the water causes a rupture of the skin, the extent of injury depending upon the amount and duration of the rain, the subsequent weather conditions, the variety and the stage of maturity of the fruit.

Damage to fruit periods subsequent to rain is frequently more severe than that resulting directly from the excessive absorption of water. After the skin of the date is ruptured, bacteria, moulds, and yeasts find a favourable medium for growth in the syrupy flesh of the date, causing it to sour and rot. Fruits injured in the green stage apparently do not offer so favourable a medium for organisms as do the

more ripened fruits, and the cracks are readily healed by the drying out of adjacent tissues and become very conspicuous as the fruit approaches maturity. Fruits scarred in this manner may mature with no loss except that the grade is lowered. However, certain varieties are seriously damaged by a condition following severe marking, known in America as "Blacknose," and characterised by the darkened and desiccated condition of the distal end of the fruit.

Protecting Fruit Clusters.

Whilst in America, I noticed various types of covers devised to protect the fruit from rain, but none appeared absolutely efficient. The ideal protector would be one possessing the following attributes:—(1) Waterproof, (2) allowing free circulation of air throughout the fruit cluster, (3) designed for ease in handling whilst the fruit is being picked, (4) fashioned to exclude insects and birds, and (5) economical.

To devise such a protector is still an aim to be achieved for all the above qualifications must be incorporated. Otherwise, covers have to be put on to protect the fruit from the rain and later removed to allow for air circulation. If this is not done, it is likely that the fruit will become syrupy and some of it will sour and mould.

Whatever form of protection is used, it does not seem advisable to cover the clusters until just before the fruits begin to ripen. If covered earlier in the season, considerable loss by sunburn is likely to occur by fruit touching the covers where exposed to full sunlight. The covers may be attached and folded back, exposing the fruit until rain is imminent when they should be pulled down.

Grove sanitation is a very important factor in decreasing the loss of fruit from bacteria, fungi, and insects, especially during unfavourable ripening conditions. Injured, over-ripe and diseased fruit should be picked from the clusters and removed from the ground beneath the palms and either buried or otherwise destroyed. This is particularly helpful in controlling both insect and fungi diseases.

[TO BE CONTINUED.]

PRODUCTION AND CONSUMPTION—THE URGENT TASK.

The hard lesson of adversity had taught them that the prosperity of all nations depended on the prosperity of each. In these days of swift transport and communication, and interlocked commerce and finance, it was true to an increasing extent that nations could not live to themselves alone. The world-wide trade depression and economic disturbance had been largely caused by maladjustment of distribution.

The potential output is far greater than ever before. If all employable labour were employed for a reasonable number of hours per week, the world would have at its disposal a volume of commodities and services that would enable the entire population to live on a higher level of comfort and well-being than has ever been contemplated in the rosiest dreams of the social reformer.

The urgent task is to bring consumption and production into a proper relationship—not a simple, but quite a possible task.—*From a report of an address by His Majesty the King, when Prince of Wales, to an international congress of commercial educationists.*

PURCHASE OF MERINO RAMS.

THE Minister for Agriculture and Stock, Mr. F. W. Bulcock, made the following announcement recently:—

As the Government is aware of the serious losses suffered by many sheep farmers throughout the State following on recent droughts and owing to the recent improvement in the seasons, the initiation of the scheme referred to herein for the purchase of flock rams is considered most opportune. Such scheme, however, has only been in force a few months and an effort is now being made to further broadcast its advantages.

Obviously, the assistance must be limited to those farmers who may have reached the limit of their overdrafts or, in other words, exhausted their present borrowing limit, and consequently are unable to acquire without financial help the required rams so necessary for the re-building of their flocks.

This method of assisting necessitous small farmers is already in vogue in the sister State and, it is understood, with very beneficial results. Generally, the scheme is to enable merino sheep breeders, who own not more than 1,500 breeding ewes, to buy flock rams to the extent of two per cent. (2 %) of their flocks and/or to replace impotent ones; therefore, the maximum number that could be purchased by one individual would be thirty (30) and the Government, through the Rural Assistance Board, is prepared to advance up to eighty per cent. (80 %) of the landed cost of the rams purchased. The security required would mostly be limited to an order on the proceeds of the wool sales; the interest rate would be only four per cent. (4 %) and the repayment terms would be fixed so that no embarrassment would be caused to the borrower.

In all cases officers of the Department of Agriculture and Stock will, on application, furnish any intending applicant with the names of merino stud breeders, districts, &c., and any other relevant information which may be required. Again, any stock and station agent, who has clients interested herein, may apply to the Board before mentioned, Box 111B., G.P.O., Brisbane, for a supply of the necessary application

forms and any further details relating to the scheme. Intending applicants, of course, may also apply direct to the Board or the local Agricultural Bank Inspector, if so desired.

In certain cases where applicants are in a position to offer security, loans may be advanced to sheep farmers in excess of the limits referred to in this announcement. It is hoped as the result of the policy outlined herein that those interested will take advantage of it with the ultimate objective of building up their flocks in a manner calculated to not only considerably benefit themselves but the State of Queensland generally.

QUEENSLAND SHOW DATES.

May.

Taroom, 4 to 6.
Longreach, 4 to 7.
Goondiwindi, 1 and 2.
Biloela, 7, 8, and 9.
Beaudesert 6 to 9—Show 6 and 7, Camp Draft 8 and 9.
Charleville, 5 to 7.
Wowan, 14 and 15; Rodeo, 16.
Murgon, 7 to 9.
Mundubbera, 6 and 7.
Goomeri, 13 and 14.
Mitchell, 13 and 14.
Gayndah, 13 and 14.
Ipswich, 19 to 22.
Roma, 19 to 21.
Biggenden, 21 and 22.
Gympie, 22 and 23.
Dirranbandi, 22 and 23.
Warrill View, 23.
Maryborough, 26 to 28.
Toogoolawah, 29 and 30.
Kalbar, 30.
Kilkivan, 25 and 26.
Emerald, 27 and 28.
Gin Gin, 29 and 30.

June.

Childers, 1 and 2.
Bundaberg, 4 to 6.
Lowood, 5 and 6.
Boonah, 10 and 11.
Gladstone, 10 and 11.
Esk, 12 and 13.
Rockhampton, 23 to 27.
Laidley, 24 and 25.
Marburg, 27 to 29.
Mackay, 30 June and 1 and 2 July.

July.

Proserpine, 3 and 4.
Kilcoy, 2 and 3.
Bowen, 8 and 9.
Townsville, 14 to 16.
Cleveland, 10 and 11.
Ayr, 10 and 11.
Rosewood, 10 and 11.
Nambour, 16 to 18.
Charters Towers, 21 and 23.
Cairns, 21 to 23.
Maleny, 23 and 24.
Atherton, 28 and 29.
Gatton, 29 and 30.
Caboolture 31 July and 1 August.

August.

Barcaldine, 4 and 5.
Pine Rivers, 7 and 8.
Royal National, 17 to 22.
Home Hill, 28 and 29.

September.

Tully, 11 and 12.
Innisfail, 18 and 19.
Malanda, 30 September and 1 October.
Southport, 26.
Imbil, 4 and 5.
Pomona, 11 and 12.
Beenleigh, 18 and 19.

ANUARY and March rainfall registrations were generally over average throughout the agricultural areas, less fortunate districts being Gayndah and the Darling Downs. During April, although heavy rains were received throughout the far-northern coastal lands, only light, scattered showers fell elsewhere, so that at the time of writing pastures are drying off and all growing crops are in need of good soaking rains. The Townsville, Rockhampton, and Maranoa districts have experienced an excellent season as far as grass and water supplies are concerned, although, with the approach of winter, the pastures are losing their succulence, resulting in the normal decline in dairy production. On the Darling Downs, particularly the southern and south-western districts, droughty conditions prevail, many properties being eaten out, and seasonal crops are showing the effects of the dry period. A fair body of grass was in evidence during January, but the following heat wave and drying winds had a detrimental effect on all pastures. Summer crops have therefore produced only light yields, that of the late-sown maize being insufficient to meet local requirements.

Kapok.

"Ageratum," South Bundaberg, in a recent letter requests information in regard to the growing of kapok (*Eriodendron anfractuosum*). This is a large, quick-growing, thornless tree which thrives in tropical lands from sea-level to an elevation of 2,500 feet. It is deciduous in the dry season, the greenish-white flowers being produced in clusters shortly after the leaves have dropped. The pods ripen about 2½-3 months after flowering, but should be collected before they are quite ripe and dried in the sun. The floss or kapok fibre is utilised chiefly for stuffing pillows, &c., and for mixing with other fine fibres for textile purposes.

Java and the Philippines provide the bulk of the world's requirements of kapok fibre, the export from Java alone approximating 12,000 tons annually. Cleaned kapok is valued in London at about 8d. per lb. The tree is propagated from seed, or from cuttings spaced 15 feet by 15 feet apart, and commences to yield in the fourth year. A mature tree at fifteen years old would produce 6 to 9 lb. of clean floss. In view of the labour involved in picking and shelling, kapok-growing does not appear to offer great inducement for large-scale production under

PLATE 197.
FIRST LESSONS IN FARMING.
Harvesting fodder for dairy stock, St. Lucia Farm School.

Australian conditions, although a market could doubtless be secured for good-quality fibre.

Wheat.

The census of wheat varieties for the 1935-36 season discloses that Florence has maintained its lead with an acreage of over 47,000, or 15·62 per cent. of the total area placed under crop. This popular variety is followed by Three Seas, Flora, Pusa, Gluyas, Cedric, and Clarendon, the seven leading varieties being responsible for 62·92 per cent. of the State's acreage under wheat. Numerous other varieties are grown, many in areas too small to record as a percentage of the crop, and it is considered that many such varieties could be eliminated with benefit to the growers concerned, besides simplifying the task of the Wheat Board's classification staff.

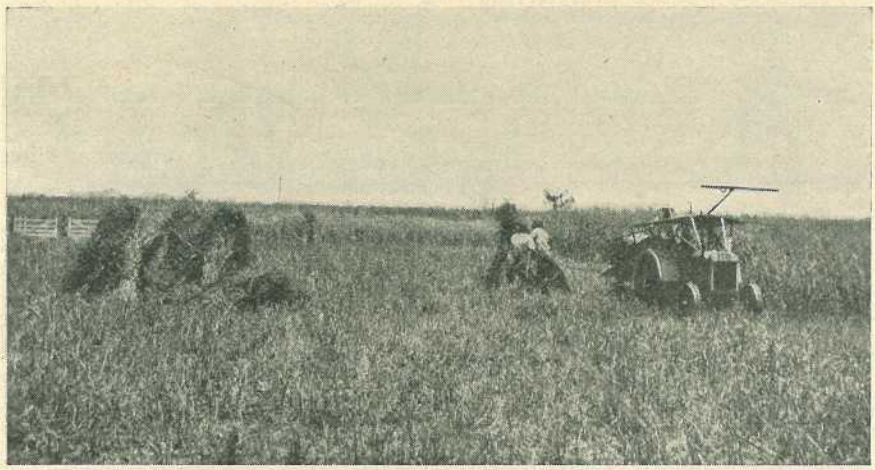


PLATE 198.
Harvesting a heavy crop of Sudan grass, Coreena Station (Central Queensland).

Tobacco.

In spite of the excessive rains which fell in the northern tobacco areas, reports now evince the fact that the amount of damage occasioned is not by any means as severe as was at first estimated. Indications are that the yield will be heavier than expected, as the leaf has developed in both body and size, and although the colour will not be as bright as previously, good quality leaf will result. The late-planted crops, however, have made disappointing growth and only light yields will be recorded. Except in odd instances, curing has been completed in the Texas and Miriam Vale areas.

With the object of further minimising the risk of carrying over disease and pests from one season to another, a move is on foot to establish a closed period of two to three months when no tobacco will be grown. This will, of course, vary in the different districts.

Sugar.

The cane crops in all sugar areas made good progress during early April, but the advent of cooler conditions has caused a cessation of growth in the southern districts. It would now appear certain that the 1936 crop yield will exceed that of the previous season. Preliminary estimates will be gathered during May.

FRUITGROWING IN NORTH QUEENSLAND.

By S. E. STEPHENS, Instructor in Fruit Culture.

WEATHER conditions have been wet throughout the quarter. The rainfall at Cairns amounted to 58.95 inches, of which 16.76 inches fell in January, 29.57 inches in February, and 12.62 inches in March, the number of wet days being respectively seventeen, eighteen, and twenty.

The weather throughout the northern area has been particularly suitable for the growth of all crops and they are responding remarkably well.

Citrus.

Local lemons have been on the market throughout the quarter. Although largely green in colour and in an uncured state the quality has been very good.

Local common oranges came on the market towards the end of February, whilst marketing of mandarins was commenced late in March.

In the Cardwell area, which is the largest citrus-producing district in the northern area, the size of crop in the orchards is variable. Orchards which have received reasonable care and attention are, this year, carrying heavy crops whilst others which have been neglected are showing the results of the neglect in the lightness of the crop and general unhealthy condition of the trees.

In the Cairns district the crop generally is heavy. Unfortunately, fruit fly has already commenced its attack on the fruit.

Bananas.

The quality of fruit produced this quarter has been of fair standard. Thrips have, however, become very prevalent and practically all fruit marketed in Cairns has been more or less affected with rust discolouration of the skin.

Pineapples.

The summer crop was not completed on the Tablelands until well into February. The acreage there being small, no difficulty was experienced in disposing of the crop on the local markets.

The autumn crop commenced to ripen in Cairns early in March, and fruit of good quality has been available here since that time.

Mangoes.

The crop in the coastal districts was finished by the end of January. In many of the Tableland areas, notably around Irvingbank and Watsonville, the early part of the crop was only commencing to ripen at that time, consequently harvesting extended into March.

Granadillas.

Vines made excellent growth during the quarter under review. The early autumn crop commenced to ripen about mid-March, and towards the end of the month fruit of good quality were plentiful.

Papaws.

The new plantings made during last quarter have shown good progress since, when conditions for growth have been exceptionally suitable. Fruit has been plentiful and of fair quality. The flavour was slightly deficient on account of wet conditions, but should return to normal during the coming quarter.

Miscellaneous Tropical Fruits.

The majority of purely tropical fruits matured crops during this quarter and included Bread Fruit, Jack Fruit, Five Corners, Malay Apples, Mangosteens, Mabolos, Vi-apples, Longans, Cashews, Sugar apples, and Star apples. The quality of these various fruits was chiefly good and amply demonstrates the suitability of North Queensland for the production of the strictly tropical fruits.

Avocados.

Early fruits of this tree ripened at the end of February. Although a number of trees have been planted throughout the North, the plantings have been only in ones and twos, no commercial areas being yet laid down.

Temperate Fruits.

The grape crop was this year a good one, but the hopes of growers for a good harvest were not fulfilled owing to extensive damage by birds. All measures taken by the growers to cope with the invasion proved fruitless and nearly all crops were heavily reduced.

The plum crop was good and escaped fruit fly depredations until late in the season, thus allowing the growers to harvest the majority of their crop without loss.

The persimmon crop was again a heavy one and commenced ripening in early February.

Seeds and plants of various kinds have been supplied to the South Johnstone Experiment Station, notably some 400 odd tea seed, pepper seed, and plants of Jack fruit, coffee, vanilla, &c. Many distributions of tropical seeds and plants have also been made to interested persons.

CITRUS NOTES.

R. L. PREST, Instructor in Fruit Culture.

THE harvesting of early varieties of oranges, mandarins, and grape fruit has commenced. The onus is on the growers to ensure that these fruits have reached full maturity, as the maturity standards are being rigidly enforced.

The maturity standards for citrus fruits are—In the case of oranges, grape fruit, and mandarins, the weight of hand-pressed juice must be not less than 30 per centum of the total weight of the fruit. With regard to the juice, the acidity test for navel oranges and mandarins requires that 10 cubic centimetres of juice shall be neutralised by not more than 26 cubic centimetres of deci-normal (N/10) alkali; while, with regard to the juice of oranges, other than navel oranges and mandarins, 10 cubic centimetres of juice must be neutralised by not more than 3 Ocubic centimetres of deci-normal (N/10) alkali.

Graduated pipettes and supplies of deci-normal (N/10) soda solution may be purchased through the Committee of Direction of Fruit Marketing.

Colouring Mature Citrus Fruits.

Certain varieties of oranges and mandarins are satisfactory and desirable as food although they are still green in colour. Such varieties, when left on the trees to become fully coloured, deteriorate as regards their eating quality, while in some districts the adverse weather conditions experienced late in the season frequently result in skin-blemished and scalded fruits, which, if not a total loss, are at least greatly reduced in market value.

It has been found during recent years that the introduction of certain gases during the sweating process, such as carbon monoxide acetylene and ethylene, accelerates the colouring of mature citrus fruits. Greenness in citrus fruits suggests immaturity, and militates against the satisfactory marketing of such fruits. In order to colour such fruits satisfactorily they must reach a certain stage of maturity, as if too green and immature they will not develop a normal colour.

All fruits to be coloured require to be treated with special care in handling. Bruises will show up as greenish areas; oil liberated from the rind may cause spotting; while if the residues of oil or Bordeaux sprays remain on the fruit, it will be found to come from the colouring room spotted and unsightly.

Any ordinary room lined with timber, provided it is air-tight, can be used for colouring citrus fruits. A convenient and economical size is one to hold from 40 to 50 bushel cases; allowing 5 cubic feet of air space to each bushel case, the chamber would require to be of from 200 to 250 cubic feet in capacity. Even where large numbers of cases are to be treated it will be found more satisfactory to build two medium-sized chambers than one large chamber.

For oranges, lemons, and mandarins an average temperature in the chamber of between 65 and 75 deg. Fahr. will prove satisfactory. If the temperature falls below 65 deg. Fahr. the colouring process will be retarded. On the other hand, high normal temperatures are not likely to affect the fruit, no ill effects having been shown by temperatures up to 89 deg. However, the humidity will require to be adjusted; in the case of a very dry atmosphere an open container of water may be introduced to moisten the air and prevent withering of the fruit; while,

when the humidity is high and likely to cause softening of the friut, it may be reduced by placing sand, caustic soda, or quicklime on the floor of the chamber.

The fruit should be graded for colour and placed loosely in open cases having plenty of ventilation. Dunnage should be used in stacking in order to permit a free circulation of air around each case.

The required quantity of carbide should be placed in a suitable container, and a second vessel containing water arranged in such a manner as to permit the water to drip slowly on to the carbide, thus generating the acetylene gas. This apparatus may be fitted either inside or outside the chamber; if the latter, of course, the gas will have to be led inside the chamber by means of suitable piping.

After closing the chamber and making sure that it is airtight, it should be charged and allowed to remain closed for four hours. It should then be opened up and thoroughly aired for at least two hours, after which it may be charged again, and the performance repeated as often as is necessary. Between nine and fifteen charges should be sufficient to give mature citrus fruits their normal colour.

It has been found that a very small quantity of acetylene gas (1 part in 2,500 to 1 part in 1,875) satisfactorily colours mature citrus fruits. In order to determine the dosage required, the air space remaining after the chamber has been loaded must be known. One ounce of carbide generates sufficient gas for every 75 cubic feet of air space. For all practical purposes it is sufficient to allow 1¼ cubic feet displacement for each bushel case of fruit. For example, the following table illustrates the dosages required for a chamber of 200 cubic feet capacity with a varying number of cases:—

No. of Bushel Cases.	Air Space.	Dosage.
40	150 cubic feet	2 oz. carbide
20	175 cubic feet	2⅛ oz. carbide
10	187½ cubic feet	2½ oz. carbide

FRUIT MARKETING NOTES.

By JAS. H. GREGORY, Instructor in Fruit Packing.

WITH the arrival of the month of May it is realised that winter is close at hand. We have seen the last of many fresh fruits for this year, grapes, apples, pears, and stone fruits having had their season. From now on attention must be given to the raising of next year's crop. However, pruning has not yet been started, and it is at this period that growers on the Tablelands have some respite from the long days of toil required during harvesting operations. Frosts have commenced to make their presence felt, to the detriment of late tomatoes, beans, and other kitchen supplies. At this period of the year growers should take the opportunity of doing odd jobs connected with packing-house hygiene, the manufacture of home-made equipment, and repairs to plant; pest eradication also should receive attention. Stored fruit should be examined, and specky specimens carefully removed and destroyed.

Packing-house Hygiene.

For many reasons codling moth has been bad this year, and efforts should be made to minimise the trouble for next season. Apple-picking boxes, packing sheds and plant should have all cracks and crevices inspected for the presence of the larvæ of this pest, and all specimens found should be carefully destroyed. The dipping of boxes in boiling water is of benefit, and will amply repay the trouble. Old stone fruit cases containing rotted specimens should be either carefully sprayed with a lime-sulphur solution or dipped in boiling water. These precautions, if taken, will greatly assist in the elimination of disease in next season's crop.

Shed Equipment.

Home-made sizers, case-making benches, paper needles and holders, packing stands and spring boards, can all be put together cheaply at home, and should be spare-time jobs.

Prospects for the year appear brighter than for a long time past. Good fruit has sold more easily and at higher levels than for some years. Growers would do well to try to market their fruit regularly rather than haphazardly in an effort to obtain the best of the market prices.

The following conditions and prices have prevailed during the past few weeks:—

Stone Fruits.

Stone fruits have now finished for the season, which has been a fairly satisfactory one for most growers with the exception of those who experienced hail damage. Spraying the packing shed with a 5 per cent. solution of formalin should assist greatly in checking the incidence of brown rot next season.

Grapes.—Prices for grapes were maintained during last month, and the finish of the season saw from 9s. to 11s. per half-bushel being obtained for choice Waltham Cross and Purple Cornichon. Future supplies will be obtained from cold storage. Growers holding fruit in cold store should have it inspected frequently from now on.

Pears.—Local pears are now finished, supplies of this fruit coming from the Southern States. Prices have been—Packhams, from 7s. to 9s.; Winter Cole, from 11s. to 13s.; Beurre de Capiaumont, 6s. to 8s.

Apples.—Dunns, from 5s. to 7s.; Democrat, from 8s. to 9s.; Granny Smith, from 8s. to 12s., for local supplies, which are now practically finished; Southern Jonathans (2½ and 2¾ inches), from 11s. to 12s. (2¼ inches), 9s.

Growers harvesting late fruit are now reaping the benefits of good prices. Those who have Jonathans in cold store should now commence to watch them very closely for any sign of deterioration. Granny Smiths, Dunns, and Delicious should not start to deteriorate for some weeks yet and should cause no anxiety. Export consignments are now practically completed.

Exporters should now put their affairs in order by checking over stamps, stencils, and other implements, and repairing and replacing same where necessary. The stencils or stamps "Extra Fancy" and "Fancy" are necessary, also the packing counts for both the Dump and Standard cases.

The following is a list of counts for export and home markets:—Dump Case—68, 75, 83, 90, 96, 98, 108, 120, 132, 144, 156, 168, 175, 182, 193, 210, 228, 245, 263, and 270. Standard Case—48, 56, 64, 72, 80, 88, 96, 100, 113, 125, 138, 150, 163, 175, 180, 198, 216, 234, 252, and 270.

The practice of using pencil or crayon for marking the count on cases is too prevalent at the present time, and does not do justice to the quality of fruit that is grown in Queensland. Stencils can easily be cut by growers from thin sheet zinc, whilst rubber stamps are cheaply procurable.

Tropical Fruits.

Papaws have eased in price, locals bringing from 2s. to 6s. per bushel, and Yarwuns from 7s. to 9s. per bushel and a-half. We again draw attention to the increased necessity for paying strict attention to colour and maturity. The Sydney prices of from 12s. to 14s. per tropical case should show a satisfactory return. When sending to the South it is necessary to pay careful attention to packing.

Custard Apples.—With the advent of heavier supplies prices have eased to from 4s. to 5s. per case. It is well to remember that only matured fruit is wanted, as nothing ruins the custard apple market more quickly than green fruit colouring to a black colour, when it is so-called ripened.

Pineapples.—Complaints have been received from Southern markets that green fruit has been sent. Fruit of this type very quickly has a detrimental effect on Southern markets at this period of the year, particularly as new season's oranges and mandarins are now coming on the market.

Brisbane prices for Smooths have been from 3s. to 8s. per case and from 2s. to 6s. per dozen, and for Ripleys from 8s. to 11s. per case and up to 7s. per dozen; Sydney prices from 6s. to 12s. per case; Melbourne from 8s. to 14s.; and Adelaide from 14s. to 15s.

Bananas.—Prices have improved during the past few weeks on the Brisbane market, and strike a more hopeful note for the industry. Brisbane prices have been—Sixes, from 6s. to 12s., sevens, from 10s. to 13s. 3d., eights, from 11s. to 13s. 6d., and nines, from 12s. to 13s. 9d.; Sydney prices—Sixes and sevens, from 10s. to 14s., eights and nines, from 14s. to 16s.; Melbourne—Sixes, from 10s. to 12s., sevens, from 12s. to 13s., eights and nines, from 14s. to 15s.; Adelaide—from 18s. to 22s. It is the time now for the best packing methods to be used. Be sure that the fruit is properly filled before cutting.

Citrus Fruits.

All varieties of citrus fruits are now on the market, and growers must take care that all fruit conforms to the required maturity standards. To pass the test it is necessary that 10 cubic centimetres of juice shall be neutralised by not more than 26 cubic centimetres of deci-normal alkali (N/10 soda) in the case of navel oranges and mandarins, and by not more than 30 cubic centimetres in the case of other varieties of oranges. A good market for prime mandarins and grapefruit exists in the Southern States. Prices are as follows:—

Oranges.—Commons, 5s. to 8s., Navels, 8s. to 14s. in Brisbane; Melbourne prices—Navels to 15s., Commons, 9s. to 10s., Local Valencies, 5s. to 13s.

Mandarins.—Melbourne prices for Fewtrells from 12s. to 14s., Brisbane prices, 7s. to 12s.

Lemons.—Market in Brisbane quieter; prices for Gayndah district 12s. to 17s., Esk district, from 12s. to 14s., local coastal, from 6s. to 9s.; in order to command high prices it is necessary that lemons marketed be cured and free from blemishes.

Grapefruit.—A good demand on all markets is indicated for choice fruit of the Marsh type, Brisbane prices being from 7s. to 9s., whilst for other varieties they were only from 4s. to 6s.; Melbourne prices for Marsh Seedless were from 10s. to 15s., while other types brought only 7s. to 9s. per case and were hard to move.

Miscellaneous Fruits.

Tomatoes still remain dull property on all markets. Brisbane prices ranged from 1s. up to 3s. 6d. for coloured lines; Melbourne and Sydney prices were from 7s. to 10s. Frosts have seriously curtailed the remainder of the crop in the Granite Belt, which may have the effect of raising values.

Passion Fruit.—Melbourne provided only a fair demand with prices from 6s. to 7s. per case, while Brisbane prices were from 3s. to 9s. per case. Close attention to packing in all instances should do much to overcome the big discrepancy in prices. Sydney prices were from 4s. to 10s.

In summing up the marketing situation one cannot but feel disappointed at the continued use of bags for sending apples all over the country for private orders. Secondhand cases would be just as cheap and much more effective for the safe carriage of the fruit.

Observations serve to show that well-packed fruit is much easier to sell than inferior packs.

It is again repeated that assistance in acquiring knowledge of the latest packing methods can be obtained free upon application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

WHAT THE YELLOW WRAPPER MEANS.

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MURARRIE'S MILLIONTH PIG—TRIUMPH OF CO-OPERATIVE EFFORT.

ALTHOUGH it is not as yet possible to forecast when the second millionth pig will be slaughtered and treated at the Murarrie Bacon Factory, the Queensland Co-operative Bacon Association Limited has every reason to be proud of its achievement in disposing of the products of 1,000,000 pigs. The putting of the millionth pig through the usual process was the occasion early in April for the gathering together of 800 people representative of all sections of the producing interests and of the wholesale and retail trade.

His Excellency the Governor, Sir Leslie Wilson, in speaking at the luncheon, remarked that the auspicious treatment of such an honoured animal as the millionth pig was indeed an occasion for congratulation, especially as at that date the Association had been able to successfully dispose of all its products to advantage in this and other States and on overseas markets.

As an indication of the importance of the factory it may be remarked that for the year ended 30th June, 1935, no fewer than 86,590 pigs were treated at Murarrie, an average weekly handling of 1,665 pigs drawn from almost every district in Southern and portions of Central Queensland. During that period the average price paid for baconers was 4·72d. per lb., which compared more than favourably with prices paid in any part of Australia. Sales for that year amounted to £242,565. There are 5,041 shareholders, the total number of shares being 64,815.

The chairman of directors, Mr. J. A. Heading, presided at the gathering, and in the course of an interesting address said that the guiding principle of his Association was to give shareholders and the purchasing public a fair deal, and every effort had been made to bring the factory and depots up to date. They all took pride in the knowledge that the "Atlas" brand of pork products was well and favourably known throughout Australia, having won prizes at all the principal Royal and Royal National Shows in competition with the products of older established factories.

There had been, he said, a marked development in recent years, one instance being that for the year 1935, 33,240 more pigs were treated than in the preceding year and more than double the number received in

1933. A greater number of shareholders supplied the factory last year than ever before in the history of the Association, these results being achieved in the face of keener competition than during any previous period. Every one of the seventy trucking agents increased his truckings to the factory. The Sydney branch, which was opened in 1929, had a satisfactory year and sales made constitute a record. The export trade in frozen pork to the United Kingdom had also been developed, and from January, 1935, regular shipments of frozen pork had been made to the United Kingdom. Reports received from buyers are gratifying as to the way in which the pork had been placed on those markets. Eastern trade continued to expand steadily throughout the year, and their relations with agents throughout the East had been good, and they had expressed their satisfaction with the quality of the hams and bacon going forward.

For the twelve months ended June, 1935, more pigs were treated at Murarrie than had even been treated at any single bacon factory in Australia. Mr. Heading remarked that shareholders had every reason to be proud of their fine plant and the efficiency of the staff. "There is certainly no better anywhere," he added. "As a co-operative enterprise Murarrie has a splendid record, and in spite of all the changing conditions in recent years has come out year after year in a stronger and better position. To have increased the pig supply to 86,590 pigs, paid for them, treated and sold them, established a branch in Melbourne, and bought their Sydney premises was undoubtedly a good year's work."

The gathering of 800 people to witness the treatment of the millionth pig was another red letter day in the Association's history, and he believed it was the largest gathering of wholesale and retail traders that had ever assembled in Queensland.

Other speakers included the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, who congratulated the Association and gave a most interesting review of the development of the pig-raising industry; Hon. Digby Denham, who had officiated at the opening of the factory twenty-three years before; and Mr. R. G. Watson, Chairman of the Australian Pig Industry Council, and representative of pig producers of Australia on the Australian Meat Board.

After the luncheon, the visitors proceeded to watch the treatment of the millionth pig, a Large White grade of choicest quality. This honoured (!) pig passed successfully through the hands of the various butchers and was finally adjudged as entirely wholesome by the Government Slaughtering Inspector who had pleasure in affixing the approved health stamp on to the carcass.

NOTICE TO SUBSCRIBERS.

If your Journal is enclosed in a yellow wrapper, it is an indication that your subscription has expired.

Kindly renew your subscription at once. Write your full name plainly, preferably in block letters.

Address your renewal of subscription to the Under Secretary, Department of Agriculture and Stock, Brisbane.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advance Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of February, 1936 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Penrhos Pansy	A. Sandilands, Wildash	17,603·31	844·13	Strathdu Admiration 2nd
Highfield Pink	J. A. Heading, Cloyna	10,744·5	425·243	Gloaming of Hill Top
Hillvale Jean 2nd	J. Weber, Peak Crossing	9,126·15	390·738	Drafter of Greyleigh
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Sunnyside Honey 8th (365 days)	P. Moore, Wooroolin	13,085·6	504·054	Bruce of Avonel
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 370 LB.				
Home Hill Gertie II.	A. E. Althouse, Cloyna	8,528·18	291·223	Headlands Gordon
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Homelea Duchess 8th	J. C. Savage, Humphrey	9,036·48	324·118	
Rosemount Jewel 10th	A. J. Bryce, Maleny	8,020·45	289·649	Rosemount Radiance
Plum of Alfa Vale (189 days)	W. H. Thompson, Nanango	6,880·65	263·635	General of Alfa Vale
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Trevor Hill Bracelet	Geo. Gwynne, Umbiram	5,769·88	237·549	Viceroy of Wilga Vale
JERSEY.				
MATURE COW (OVER 4½ YEARS), STANDARD 350 LB.				
Midlands Melrose	Wallace Bishop, Kenmore	7,184·13	384·045	Oaklands Favourite Mascot

SENIOR, 3 YEARS (OVER 3½ YEARS) STANDARD 290 LB.				
Glenview Sultanes Majesty	F. P. Fowler and Sons, Biggenden	9,355·61	516·909	Trinity Officer
Linwood Violet	D. Young, Kingaroy	6,314	373·064	Aerofoil of Banyule
Langside Thelma	G. W. Young, Inverlaw	5,524·7	305·422	Masterpiece Yeribee of Bruce Vale
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Wingate Bonnie	L. Pierce, Graceville	9,802·95	451·19	Meteor of Brooklands
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Pineview Margaret	T. Maurer, Darra	7,678·8	434·87	Oxford Buttercups Noble
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Brooklands Royal Lily	W. S. Conochie, Sherwood	7,403·4	407·353	Retford Earl Victor
Trinity Harmonys Dream	W. S. Kirby, Byrnestown	5,303·25	272·028	Trinity Dreaming Pioneer
College Duty	Queensland Agricultural High School and College, Gatton	5,397·09	271·009	College Chiefton
Langside Primel	G. W. Young, Inverlaw	5,218·45	260·666	Primrose of Langside
Bellgarth Rosalie II.	D. R. Hutton, Cunningham	5,012·5	249·116	Bellefaire Blondes Bellringer
Kenilworth Glory	H. T. Rowe, Kenilworth	4,560·8	248·129	Kenilworth Prince
Bellgarth Bonzanette	D. R. Hutton, Cunningham	4,840·93	238·076	Trecarne Renown 2nd

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week a ten minutes' talk, commencing at 7.5 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for May, June, July, and August, 1936:—

SCHEDULE OF LECTURES

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 5th May, 1936.—"The Rural Assistance Board and its Functions," Mr. A. Gray, Agricultural Bank.

Thursday, 7th May, 1936.—"Pasture Mixtures," Mr. C. W. Winders, B.Sc.Agr., Assistant in Agronomy.

Tuesday, 12th May, 1936.—"The Rural Assistance Board and its Functions," Mr. A. Gray, Agricultural Bank.

Thursday, 14th May, 1936.—"The Economic Use of Licks in the Sheep-grazing Industry," Mr. J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 19th May, 1936.—"Pests of Seed Beds," Mr. J. A. Weddell, Entomologist.

Thursday, 21st May, 1936.—"The Prospects of the Fruitgrowing Industry in Queensland," Mr. H. Barnes, Director of Fruit Culture.

Tuesday, 26th May, 1936.—"The Suitability of Sheep-farming Areas," Mr. J. Carew, Senior Instructor in Sheep and Wool.

Thursday, 28th May, 1936.—"The Value of New Cultivation for Cotton-growing," Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 2nd June, 1936.—"Fiji Disease in Southern Queensland," Mr. A. F. Bell, M.Sc., Assistant Director, Bureau of Sugar Experiment Stations.

Thursday, 4th June, 1936.—"Pigs for Pork and Pigs for Bacon," Mr. L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 9th June, 1936.—"Some Peculiar Feeding Habits of Stock and what they Indicate," Mr. W. R. Winks, B.Sc., A.A.C.I., Analyst.

Thursday, 11th June, 1936.—"Cotton Varieties for Alluvial Soils," Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 16th June, 1936.—"Cotton Varieties for Hill Slopes," Mr. W. G. Wells, Director of Cotton Culture.

Thursday, 18th June, 1936.—"Artificial Incubation," Mr. J. J. McLachlan, F.B.S.A., Poultry Inspector.

Tuesday, 23rd June, 1936.—"Cane Irrigation," Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Thursday, 25th June, 1936.—"Citrus Pruning in Queensland," Mr. R. L. Prest, Instructor in Fruit Culture.

Tuesday, 30th June, 1936.—"Transferring Bees," Mr. H. Hacker, F.R.E.S., Entomologist.

Thursday, 2nd July, 1936.—"Dategrowing in Queensland," Mr. H. J. Freeman, Senior Instructor in Fruit Culture.

Tuesday, 7th July, 1936.—"Interpretation of Labels attached to Stock Foods," Mr. R. A. Taylor, Inspector and Examiner, Fertilizers Branch.

Thursday, 9th July, 1936.—"The Giant Toad," Mr. A. F. Bell, M.Sc., Assistant Director, Bureau of Sugar Experiment Stations.

Tuesday, 14th July, 1936.—"Amended Regulations of the Dairy Produce Acts," Mr. G. B. Gallwey, Inspector of Accounts, Dairy Branch.

Thursday, 16th July, 1936.—"The Breeding of New Cane Varieties," Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Tuesday, 21st July, 1936.—"The Use of Drugs in the Treatment of Parasitic Worms," Dr. F. H. S. Roberts, Entomologist and Parasitologist.

Thursday, 23rd July, 1936.—"The Production of Choice Quality Cream," Mr. O. St. J. Kent, Dairy Research Laboratory.

Tuesday, 28th July, 1936.—"Fungi which Assist the Growth of Plants," Mr. H. E. Young, B.Sc.Agr., Assistant Plant Pathologist.

Thursday, 30th July, 1936.—"Herd Recording," Mr. L. Anderson, Dairy Instructor.

Tuesday, 4th August, 1936.—"A Plea for the Tree," Mr. J. F. F. Reid, Editor of Publications.

Thursday, 6th August, 1936.—"Timber Trees on the Farm," Mr. W. D. Francis, Assistant Botanist.

Tuesday, 11th August, 1936.—"Rotation of Crops." Mr. H. W. Ball, Assistant Experimentalist.

Thursday, 13th August, 1936.—"The Problem of Prices," Mr. J. F. F. Reid, Editor of Publications.

Tuesday, 18th August, 1936.—"Some Ways of the Soil," Mr. J. L. Foran, Analyst.

Thursday, 20th August, 1936.—"Some Plants Poisonous to Poultry and Pigs," Mr. C. T. White, Government Botanist.

Tuesday, 25th August, 1936.—"Our Debt to Denmark," Mr. J. F. F. Reid, Editor of Publications.

Thursday, 27th August, 1936.—"The Tick Fever of Cattle in Queensland," Mr. C. R. Mulhearn, B.V.Sc., Government Veterinary Surgeon.

Answers to Correspondents

BOTANY.

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

Lotus or Birds' Foot Treefoil. English Oak.

W.A. (Maleny)—

The specimen represents a species of lotus or bird's foot trefoil. In the absence of flowers it is hard to be sure which actual species, but it looks like a form of the native *Lotus australis*, sometimes called bird's foot trefoil or Barwon River lucerne. It is very common in parts of the State, but like all species of lotus it contains a prussic-acid-yielding glucoside. In spite of this it is very readily eaten by stock, and losses occur principally among travelling animals or animals that gorge themselves on it on an empty stomach. It is an annual plant and will grow on land other than swamps.

The English oak should grow quite well at Maleny. The trees would reach a height of about 20 feet in your district in about ten years or perhaps a little less. There is only one variety, that is *Quercus robur*. It is not raised much by Brisbane nurserymen, but they would procure a plant for you, or failing that, you could write to Messrs. Hazelwood Bros., Epping, N.S.W.

General Notes

Staff Changes and Appointments.

Mr. A. J. Peberdy, Greenslopes, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. J. P. H. Clark, Inspector of Stock, Gladstone, has been appointed also an Inspector under the Diseases in Plants Acts.

Messrs. A. Kempnick and A. Wilson, Petches Creek, have been appointed honorary inspectors under the Diseases in Plants Acts.

Constable W. A. C. Zunker, Blackall, has been appointed also an Inspector under the Slaughtering Act.

Messrs. R. Evans and J. S. Pollard, Farleigh Sugar Mill, via Mackay, have been appointed millowners' representatives on the Farleigh Local Sugar Cane Prices Board, vice Messrs. W. B. Fordyce and John Smith, who have resigned on account of ill-health.

The Officer in Charge of Police, Wandoan, has been appointed also Acting Inspector of Stock.

Mr. W. G. Hancock, Banana Agent, Department of Agriculture and Stock, has been transferred from Gympie to Brisbane.

Mr. J. F. Whitby, Loader for the Committee of Direction of Fruit Marketing at Howard, has been appointed also an Honorary Inspector under the Diseases in Plants Acts.

Mr. J. M. Gibson, care of Racecourse Sugar Mill, Mackay, has been appointed Millowners' Representative on the Racecourse Local Sugar Cane Prices Board, in lieu of Mr. A. S. Hamilton, who has resigned.

Stallion Boards.

Under "*The Stallions Registration Acts, 1923 to 1932*," arrangements are now in progress for stallion parades in the various districts of the State to which the above Acts apply. The following have been appointed members of the stallion boards which will operate during those parades:—

Darling Downs North Stallion District.—Messrs. J. C. J. Maunder, B.V.Sc. (Chairman), W. C. Jeffrey (Miriam Vale), and J. H. Wall (Rockhampton).

Darling Downs South.—Messrs. A. F. S. Ohman, M.V.Sc. (Chairman), G. Elliot (Laidley South), and W. O. Scott (Taroom).

East Moreton.—Messrs. J. C. J. Maunder, B.V.Sc. (Chairman), W. Frood (Toowoomba), and R. J. F. O'Bryen (Toowoomba).

West Moreton.—Messrs. A. F. S. Ohman, M.V.Sc. (Chairman), W. Frood (Toowoomba), and R. J. F. O'Bryen (Toowoomba).

Wide Bay.—Messrs. P. F. A. Hardman, B.V.Sc. (Chairman), M. F. Yore (Logan Village), and H. S. Handley (Pampas).

Burnett.—Messrs. P. F. A. Hardman, B.V.Sc. (Chairman), M. F. Yore (Logan Village), and H. S. Handley (Pampas).

Central Coast.—Messrs. M. R. Irving, B.V.Sc. (Chairman), T. J. Turkington (Pilton), and G. H. Stokes (Toowoomba).

Northern Coast.—Messrs. M. R. Irving, B.V.Sc. (Chairman), R. G. Talbot (Ripplebrook, St. Lawrence), and W. A. Coady (Toowoomba).

Northern.—Messrs. A. L. Clay, B.V.Sc. (Chairman), G. Elliot (Laidley South), and A. V. Ralston (Clayfield, Brisbane).

The Dairy Products Stabilisation Board.

An Order in Council has been issued in pursuance of the provisions of "*The Dairy Products Stabilisation Act of 1933*," constituting the third Dairy Products Stabilisation Board, and appointing the members of the Butter and Cheese Boards and the Director of Marketing to be members of such Board, from the 1st May, 1936, to the 31st December, 1938.

Rural Topics

The Kicking Cow.

Kicking on the part of a milking cow may be a vice or it may be an excuse, and it is the business of all intelligent stock-handlers to find the true cause and, where possible, correct it. The fault may have some definite reason or it may be disposition. It is sufficient to have only a small skin crack on one's own hand or finger to realise the sensitiveness of the cow whose sore teat is being manipulated during the milking process. Where a cow in such a condition kicks out the action is instinctive and in self-defence. As soon as the careful herd manager sees to it that such cracks are healed up the kicking will cease. There is the type of cow whose make-up results in her kicking simply to relieve her own feelings. The animal showing signs of such a disposition must be treated at all costs with unruffled patience if she is to be turned into a contented milker. Such herd members are of the nervous, irritable sort, and if wrongly handled will become habitual kickers and a loss, so far as dairying profit is concerned. With a kicker of this type it is as often as not an effective plan to give at milking time a picking of some feed to which she is particularly partial to divert her attention from the pail-filling operation. Should this stratagem be ineffective and leg-roping be resorted to, all temptation to retributive violence on the part of the handler must be resisted, for harsh treatment in any form will increase the kicking propensity and lessen the chance of improving the kicker into a settled milking type. The cow that, despite all firm but kindly treatment, persists in the habit to an extent that suggests permanent viciousness should be disposed of in the same way as that decided on in the case of any other unsatisfactory milker—by being fattened up for sale to the butcher.—"The Australasian."

Husk-free Oats.

After nearly twenty years of research work on the part of English agriculturalists, the announcement was made a year ago that on a Norfolk farm the determination to breed an oat free from husk had at last met with success. During the past season the huskless oat has been cropped on a commercial scale so considerable as to make possible the sale offer of 3,000 cwt. of seed to farmers in other parts of the country. The new oat type is attracting widespread inquiry, and so extensive has been the application for trial lots that the originators, Messrs. Parker and Proctor, of Bakingley, King's Lynn, have stipulated that of the 3,000 cwt. they are willing to supply only 1½ cwt. (a sackful) is to be supplied to each applicant. The sowing recommendation is 45 lb. of seed to the acre, so that an area of 3½ acres can be sown by each farmer obtaining his supply. The cost of such added field experimentation is not low, for £12 a sack is the price of securing supply. Yields up to 40½ cwt. to the acre have been cropped by the new oats breeders on medium quality land, and the heavy crops are said to be exceptionally well supported on stiff straw of excellent quality. An important consequence of the development of the huskless oat that is anticipated is the making available as feed for poultry and pigs a cereal which, despite the rich food value of the oat kernel, has so far been little used on account of the preponderating quantity of husk coating present. The value of Sussex ground oats is well recognised, but the trouble and cost of grinding the husk has made the feed prohibitive except in small quantities. The fine oatmeal used to build up pig weaners had had similarly to be used sparingly. Should the huskless oat prove in general cropping to be all that is claimed for it the outcome in popularised farm and domestic use may be little short of revolutionary so far as farm practice is concerned.—"The Australasian."

Value of Native Birds.

At Wondai Shire Council meeting held recently, Councillor Outridge, speaking with regard to the campaign for preservation of native birds as endorsed at the preceding meeting, stated that at Brigooda the native birds were so plentiful that they effectively dealt with the recent caterpillar plague in that area without the farmers being put to trouble and expense. Councillor Porter stated that at Mondure the flocks of ibis had dealt with the grubs.—"The South Burnett Times."

Pedigree and Performance.

The real value of a pedigree is in its worth as a guide in the breeder's selection and mating problem, and therein it is indispensable. A "good" pedigree is not merely an imposing list of illustrious names, but is the record of sires and dams of proved individual quality and reproductive ability.—F.W.L. in "The Australasian."

Orchard Notes

JUNE.

THE COASTAL DISTRICTS.

THE remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly punctures, as there is always a percentage of damaged fruit which is liable to blue mould infection, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year; consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an

adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit-fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn-out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now where the land is ready and the trees are to hand, as early-planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyards ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress; otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

GIVE THE COW FAIR TREATMENT.

Sir Merrik Burrell, President of the Royal Agricultural Society (England), addressing a meeting of the Leicestershire and Rutland Milk Recording Society, issued a warning against imposing too great a strain on dairy cows. "The cow had to do much more than give milk if she were to be an economical animal," he said. "She had to retain her stamina and produce a calf each year." He went on to say that it would be madness to allow dairy cows to get into the condition so common in the poultry industry which aimed at getting the maximum egg yield at the expense of stamina, vitality, and lack of resistance to disease. Pedigree breeders should never lose sight of the utility points of dairy cattle. The problem of the proven bull bristled with difficulties. If a bull were not used until it were known whether he produced the right progeny six bulls would have to be kept, four of which would be idle. "My own experience," said Sir Merrik, "is that if a breeder had a really good bull and wanted to sell him when he was eight years or nine years old, he could not give him away." As many Australians are aware, Sir Merrik Burrell is a noted breeder of Red Polls.

Farm Notes

JUNE.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrow-root will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

OUR BABIES.

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

WHAT BECOMES OF THE BEAUTIFUL BABIES?

IT is many years since Patrick Geddes, the biologist, asked this question. He could not refrain from expressing his disappointment at the failure of so many human beings to reach the splendid possibilities with which they nearly all seemed to start. As he walked along city streets or wandered over the open country, he found everywhere boys and girls, men and women, young and old, who had fallen short of what they might have been.

In more recent years Sir Truby King, a name well known to most, repeated the same question. He asked, "As the crowd passes up and down the street before us, how many youths or adults of either sex could we pick out who would compare favourably as examples of human perfection with the beautiful babies, who are comparatively common?" He presses the question: How many would be entitled to 75 per cent. of marks, if judged by the following standard?—

1. Well-developed jaws and sound, good teeth.
2. Fully developed nose and throat, free from all restrictions or obstructions.
3. Fully developed chest with ample breathing capacity.
4. Sound digestive organs and freedom from indigestion.
5. Shapely, well-developed calves and feet, free from distortions and deformities.

In Truby King's opinion, our shortcomings are obvious even to the casual observer, yet for the most part people regard the present state of matters as normal. There is no general protest against human unfitness. So long as people can manage to struggle through their daily work with the help of occasional patchings-up by the doctor and the dentist, it does not occur to them that any higher standard than this is expected. Yet it is quite safe to say that, with few exceptions, the great majority of those who drag along with indifferent health, and who seldom feel perfectly well, strong, and fit, could have grown up excellent specimens of humanity had they been properly and sensibly reared. For the most part, men and women do not suffer from inevitable ill-health or unfitness, but from the results of a few easily avoidable daily transgressions of the laws of life. The main cause of modern bodily unfitness and inefficiency lies with our women, and is due, not to indifference on their part, but to lack of necessary knowledge and consequent failure to put into practice the laws of healthy living as regards themselves and their children.

And now to-day in this favoured land of Queensland we may usefully ask ourselves the same question: What becomes of our beautiful babies?

SUGGESTIONS FOR HOME STUDY.

Typewritten notes on various subjects will be available again this year from the Department of Tutorial Classes within the University of Queensland in Brisbane. On a variety of subjects there are sets of twenty-one papers. A fee of 8s. 6d. will enrol you for any one of these courses. The papers are posted two per fortnight over a period of twenty-one weeks. These fortnightly papers provide simple and helpful introductions to the subjects with which they deal. Books on the subject chosen can also be borrowed without extra charge.

Some of the subjects are of particular interest to farmers. One set of notes is concerned with horticulture and agriculture, and has been prepared by D. A. Herbert, D.Sc., of the University of Queensland. Another course on food and diet, and the scientific principles involved in correct feeding would be of interest to many of the women folk.

Many farmers are, nowadays, taking an increasing interest in economic and social affairs, and on these subjects they would find, among the courses provided, some of which would be very helpful in giving a basis of fact on which economic and social thinking can be built. There are special courses for the younger members of the family, such as elocution, composition, and essay writing.

Of very great utility to many who are not concerned with studying any particular subject, but who do like a good book in the evenings, would be the general library which is associated with the Department of Tutorial Classes. This library is available for use by post. A catalogue of all the books contained in it can be had from the Director, and books may then be borrowed three at a time for periods of three weeks. The library includes books of the better class fiction as well as books on most subjects about which people want to know something. Anyone interested should write to the Director of Tutorial Classes, corner of Edward and Ann streets, Brisbane, for information.

IN THE FARM GARDEN.

GREEN MANURE IN THE VEGETABLE GARDEN.

Where it is intended to commence the cultivation of vegetables during the spring this is the most important time of the year to make the preliminary preparations. As advised in earlier issues the laying out of the ground, digging and trenching are important operations which may be undertaken now. Green manuring is a most important and useful practice for bringing soil into good condition for sowing and planting in the spring, when almost any variety of vegetable may be grown. Green manuring offers a ready means of increasing the organic matter in the soil, and also of adding to the soil fertility. It is also the most useful means of suppressing weed growth and cleaning land for future cropping. It is generally recognised that legume-bearing plants are the most useful for green manuring. Field peas are very largely used. When plants belonging to the legume-bearing family are grown under suitable conditions, and the roots are attacked by bacteria in the soil which produce nodules upon the roots of the peas, the plants are capable of absorbing a considerable amount of nitrogen from the air, and thus the soil is enriched by this valuable plant food which is expensive to purchase in manures. But unless the nodule-forming bacteria are present in the soil the legume-bearing plants will draw from the soil the nitrogen they require for their growth, and the soil will be no richer in this element for their use.

If the land has not grown peas successfully before, it will pay to take a bushel or two of soil from a garden patch or field where peas have thrived, and sprinkle a small quantity of this soil along the drills where the peas are being sown. Another very useful legume for green manuring is the tick or horse bean. This plant resembles the broad bean, but the seeds are much smaller and are not used as a vegetable. The main object of a green manure crop is to obtain as much organic matter as possible for digging into the soil in the early spring. In this regard the horse bean is more valuable than the field pea. If it is necessary to inoculate land with nodule-forming bacteria for this crop, soil should be taken from a garden patch where broad beans have been grown successfully. There are different species of organism which produce nodules upon the roots of legume plants, and the bacteria which produce the nodules on the roots of peas will not similarly act upon the roots of beans. For general purposes a crop of Algerian oats or Cape barley is very satisfactory as a green manure crop. These cereals may be depended upon to give a good strong growth, providing ample bulk for digging into the soil. They also have the advantage that, not being related to any of the plants commonly grown in the garden, they are not subject to diseases which may be transferred to the vegetable crops to be grown later on. When sowing green-manure crops superphosphate should be used with the crop at the rate of 1½ to 2 oz. to the square yard. The use of the fertilizers will produce a greater bulk of green manure, and where the crop is dug into the ground the phosphates which have been absorbed by the crop will be liberated in the soil as the plants decay, and be made available in time for other plants to use.

DRAINAGE.

Drainage should be considered in relation to all types of soil, but especially heavy soils. Neglect to make the necessary provision on such soils explains many failures to get good results from them during the winter months.

Briefly, the objects of drainage are (1) to enable as much water as possible to percolate through the soil; and (2) to prevent the lodgment and stagnation of water on the soil surface by enabling excess water to run off with ease. It is especially necessary, of course, to drain clay soils. If water is allowed to remain on these for long they tend to "puddle," but if the water is drained away the soil does not become so compacted, retaining, instead, a more friable (crumbly) and porous condition.

Drainage may be of two kinds—surface or underground; the latter is the more effective, but it entails more labour and expense. A simple surface drainage scheme consists of shallow trenches running between plot and pathway, and connected up to an outlet at a suitable point. A modified form of surface drainage is expressed in a system of raised beds. Where some form of drainage is necessary, and the installation of the underground system is impossible, either of these methods is to be commended.

Underground drainage necessitates a considerable amount of trench digging. On what plan it is advisable to set out the drains will depend upon the size and contour of the area. In some cases a herring-bone design may be applicable, the main trench forming the backbone, so to speak, and running through the lowest portion of the land and the smaller contributory trenches spreading upwards from this. In other cases it may only be necessary to feed the main trench from one

side, while in others again main trenches may best be laid at the edges of the area and fed from the centre. These trenches may then be partially filled with broken stones, and the surface of the filling protected with a layer of tin or brushwood, so that the earth with which it is subsequently overlaid may not drop through and destroy the porous character of the filling.

A drain provided with this rubble filling is usually the most convenient to make, and is quite effective; but a roughly-built conduit or channel may take the place of the broken stones, if desired. This may be made of flat stones or bricks, or (failing either of these) of boards. Only the sides and top need be formed of these materials, the trench floor serving for the bottom. The stones or bricks, or whatever is used, should only be loosely laid together, so that water may fall into the trench through them and be carried off. In country gardens, where saplings are easily available, these may be used effectively in the bottom of the trench (say a foot deep), covered by a 6-inch layer of brushwood.

The depth of the drain depends on the class of soil, but it should be sufficiently deep to allow of cultivation above it. If there is difficulty in arranging this the scheme should be so adjusted that the drain runs underneath the garden pathways, and not under the beds proper; 2 feet 6 inches to 3 feet is usually a satisfactory depth at which to lay a drain in the ordinary household plot.

There is little necessity for drainage on sandy soils, but gardeners working on heavier land should set to work now to repair any deficiency in this direction. If the contour of the plot is regular it is not necessary to do the work all at once. As a section of the plot becomes vacant opportunity may be taken to carry out drainage work on it prior to preparing it for another planting. Then, when each section of the garden has been dealt with, the scheme can be connected up.

NITROGEN FOR THE GARDEN.

The most important and at the same time the most expensive element of plant food in garden soils is nitrogen. It is obtained in various forms, and the pea and clover family have the power of absorbing and assimilating to their own use the nitrogen of the atmosphere. It is for this reason that nitrogenous manures should not be applied, except in extreme cases, to beans or culinary or sweet peas. The four principal nitrogenous manures are sulphate of ammonia, nitrate of soda, nitrate of lime, and calcium cyanide of nitrolim. All are highly concentrated, and need to be used with the utmost care.

Nitrogen always stimulates the development of stem and foliage at the expense of flower and fruit or seed. If after excessive wet, or from some other cause, a plant appears to stand still, a small dose of nitrogenous manure will often stimulate it, and have a wonderful effect. On the other hand, a dose of a nitrogenous manure given when the plants are in flower or seed will often cause them to shed their flowers and fruit or seeds by causing an exuberance of growth of a soft, sappy nature.

KITCHEN GARDEN.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

A REMINDER TO ONION GROWERS.

Onion seed growers should, by now, have gone through their selected onions with the object of picking out the best keepers for the production of seed. The bulk of these onions should have been selected, previous to storing, for early maturity and variety characteristics. At the final selection bulbs that are soft or prematurely shooting, or those showing any indication of being bad keepers, or that are diseased, should be discarded.

The bulbs should be planted in rows at least 3 feet apart and spaced 2 feet apart in the rows. A handy position well protected from the boisterous winter winds should be selected for the growing of onion seed.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1936 AND 1935, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1936.	Mar., 1935.		Mar.	No. of Years' Records.	Mar., 1936.	Mar., 1935.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	8·71	35	10·36	16·56	Clermont	2·97	65	8·52	1·15
Cairns	18·20	54	12·76	34·36	Gindie	2·42	37	..	0·05
Cardwell	15·53	64	21·16	16·97	Springsure	2·83	67	5·55	0·48
Cooktown	15·27	60	14·48	34·57					
Herberton	7·69	50	11·16	11·24					
Ingham	15·39	44	28·51	17·79					
Innisfail	26·36	55	24·96	46·46					
Mossman Mill ..	18·02	23	19·39	28·74	*Darling Downs.*				
Townsville	7·12	65	9·44	2·78					
Central Coast.					Dalby	2·59	66	4·04	0·16
					Emu Vale	2·24	40	1·70	0·55
Ayr	6·30	49	12·33	3·10	Hermitage	1·97	30	..	0·40
Bowen	5·45	65	26·16	2·62	Jimbour	2·43	48	2·63	0·62
Charters Towers ..	3·64	54	7·33	1·35	Miles	2·55	51	5·15	0·16
Mackay	11·63	65	31·53	5·20	Stanthorpe	2·56	63	4·47	0·19
Proserpine	11·44	33	35·56	2·60	Toowoomba ..	3·62	64	3·68	0·80
St. Lawrence ..	5·11	65	4·47	2·62	Warwick	2·42	71	1·92	0·49
South Coast.									
					Maranoa.				
Biggenden	3·64	37	4·06	1·66					
Bundaberg	4·90	53	8·45	1·11	Roma	2·49	62	7·05	..
Brisbane	5·60	85	5·96	1·05					
Caboolture	7·37	49	10·93	2·21					
Childers	4·28	41	6·43	1·14					
Crohamhurst	10·75	43	18·80	4·42					
Esk	4·58	49	4·28	1·88					
Gayndah	2·96	65	2·49	1·41					
Gympie	6·00	66	7·83	2·57	*State Farms, &c.*				
Kilkivan	3·73	57	5·17	0·60					
Maryborough ..	5·76	65	5·32	1·52	Bungeworgorai ..	1·39	22	6·98	..
Nambour	8·86	40	14·34	4·65	Gatton College ..	3·03	37	2·84	4·09
Nanango	3·27	54	3·76	..	Kairi	8·39	22	11·63	19·03
Rockhampton ..	4·30	65	5·10	1·49	Mackay Sugar Experiment Station	10·26	39	36·97	3·78
Woodford	7·59	49	12·25	1·96					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MARCH, 1936.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Means Atmospheric Pressure at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·76	87	71	92	20	69	26, 27	1,448	18
Herberton	..	80	65	87	1	58	28	1,116	23
Rockhampton	29·88	83	70	96	2	64	30	510	19
Brisbane	30·01	79	66	88	2	61	27	596	15
Darling Downs.									
Dalby	29·96	82	62	92	1	53	5	404	8
Stanthorpe	..	74	57	84	29	45	28	447	15
Toowoomba	..	76	59	87	1	49	25	368	15
Mid-Interior.									
Georgetown	29·79	88	71	93	21, 22, 23, 24, 30	60	28, 29	1,319	17
Longreach	29·86	88	69	96	1	63	29, 30, 31	1,274	9
Mitchell	29·95	81	63	93	1	52	29	494	13
Western									
Burketown	29·78	89	75	93	2, 22, 23, 24	69	28	557	11
Boulia	29·84	88	70	94	1	64	27	322	8
Thargomindah	29·92	86	68	93	6	62	2, 25	222	4

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May, 1936.		June 1936.		MOONRISE. May, 1936.	June, 1936.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·18	5·20	6·37	5·2	2·4	2·7
2	6·18	5·19	6·37	5·2	2·34	2·45
3	6·19	5·18	6·38	5·2	3·5	3·23
4	6·20	5·17	6·38	5·2	3·35	4·8
5	6·20	5·17	6·39	5·2	4·9	4·58
6	6·21	5·16	6·39	5·2	4·47	5·52
7	6·21	5·15	6·39	5·2	5·25	6·49
8	6·22	5·14	6·40	5·2	6·13	7·51
9	6·23	5·14	6·40	5·3	7·4	8·51
10	6·23	5·13	6·40	5·3	7·58	9·54
11	6·24	5·12	6·41	5·3	8·57	10·55
12	6·24	5·11	6·41	5·3	9·57	11·57
13	6·25	5·11	6·41	5·3	10·59	..
					a.m.	a.m.
14	6·26	5·10	6·42	5·3	12·0	12·57
15	6·26	5·10	6·42	5·3	..	2·4
					a.m.	
16	6·27	5·9	6·42	5·3	1·2	3·12
17	6·27	5·9	6·43	5·4	2·6	4·10
18	6·28	5·8	6·43	5·4	3·12	5·27
19	6·29	5·8	6·43	5·4	4·19	6·25
20	6·29	5·7	6·43	5·4	5·28	7·22
21	6·30	5·7	6·44	5·4	6·37	8·11
22	6·31	5·6	6·44	5·4	7·42	8·54
23	6·31	5·6	6·44	5·4	8·44	9·31
24	6·32	5·5	6·44	5·4	9·37	10·5
25	6·32	5·5	6·44	5·5	10·20	10·35
26	6·33	5·4	6·45	5·5	10·59	11·6
27	6·34	5·4	6·45	5·5	11·35	11·36
					p.m.	p.m.
28	6·34	5·3	6·45	5·5	12·5	12·7
29	6·35	5·3	6·45	5·5	12·35	12·42
30	6·35	5·2	6·45	5·5	1·5	1·19
31	6·36	5·2			1·35	

Phases of the Moon, Occultations, &c.

6 May,	○	Full Moon	1 1	a.m.
14 ,,	☽	Last Quarter	4 12	p.m.
21 ,,	●	New Moon	6 34	a.m.
28 ,,	☾	First Quarter	12 46	p.m.

Apogee, 3rd May, at 10.24 p.m.
Perigee, 19th May, at 12.36 p.m.
Apogee, 31st May, at 12.54 p.m.

On the 20th Mercury, in Taurus, will become apparently stationary, after which it will appear to move westward until the 14th of June.

On the 25th Neptune, in Leo, will also become stationary, changing its direction once more eastward.

On the 29th Mercury and Mars will be apparently in conjunction, Mercury being 2·2 degrees south of Mars, long after they have set in Queensland.

On the 31st Mercury will reach that part of its orbit which brings it between the Earth and the Sun and almost in a line with it—avoiding a transit by being 2 degrees north of the Sun.

Mercury sets at 6.21 p.m., 1 hour 1 minute after the Sun on the 1st, and at 6.18 p.m., 1 hour 8 minutes after it on the 15th.

Venus rises at 5.15 a.m., 1 hour 3 minutes before the Sun on the 1st, and at 5.29 a.m., 57 minutes before the Sun on the 15th.

Mars sets at 5.57 p.m., 37 minutes after the Sun on the 1st, and at 5.54 p.m., 34 minutes after it on the 15th.

Jupiter rises at 7.55 a.m. and sets at 9.45 p.m. on the 1st; on the 15th it rises at 6.56 a.m. and sets at 8.44 p.m.

Saturn rises at 2.23 a.m. and sets at 2.59 p.m. on the 1st; on the 15th it rises at 1.34 a.m. and sets at 2.6 p.m.

The path of the Moon, beginning at 8 p.m. on 1st May, will be as follows:—In Leo till the 2nd, in Virgo till the 5th, passing Spica on the 4th; in Libra till the 7th, passing Alpha Libri on the 6th; in Scorpio and Orphincus till the 10th, passing Jupiter. It will be in Sagittarius till the 12th, in Capricornus till the 14th, in Aquarius till the 16th, passing Saturn in Pisces till the 18th, in Aries till the 20th, passing Uranus near its western and Venus near its eastern border. It will pass through the great constellation Taurus from the 20th to 23rd, passing Mars on the west and Mercury on the east of the Hyades; through Gemini till the 25th, through Cancer till the 26th, through Leo till the 29th, passing Regulus on the 27th, and be again in Virgo till the 31st.

In May the Southern Cross will be visible soon after sunset and remain on the upper half of its circle round the south celestial pole until daylight.

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5 June,	○	Full Moon	3 22	p.m.
12 ,,	☽	Last Quarter	10 5	p.m.
7 ,,	●	New Moon	3 14	p.m.
19 ,,	☾	First Quarter	5 22	a.m.

Perigee, 16th June, at 7 a.m.
Apogee, 28th June, at 6.36 a.m.

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

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

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