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QUEENSLAND AGRICULTURAL JOURNAL

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VALEDICTORY.

With this issue of the "Queensland Agricultural Journal" our connection with it as Editor from its first issue, twenty-three years ago, now ceases. We wish our readers farewell, and especially recognise our indebtedness to all of them who have liberally contributed to its pages valuable articles on numerous phases of the agricultural and allied industries of Queensland, and do not doubt that their interest in the Journal will receive a favourable impulse under the new conditions.

A. J. BOYD.

Agriculture.

COTTON-GROWING.

In view of the probability of the recrudescence of the cotton-growing industry in Queensland, it is advisable that intending growers should be carefully instructed in all that concerns the preparation of the land; the best varieties of cotton to grow in the various districts and varying climates of this extensive State; and the best system of planting, cultivating, picking, and marketing the crop.

In 1911 the Queensland Department of Agriculture published an exhaustive treatise on the industry by a former practical cotton-grower and ginnery-owner in the East Moreton district. This pamphlet has reached its sixth edition, and has undoubtedly proved of great service to growers since its first issue.

It is, however, advantageous to Queensland growers to study the methods adopted in the United States of America, whence comes the major portion of the world's production of the textile.

It should be noted that little, if any, disease of the cotton plant or boll has made its appearance in Queensland. At rare intervals a kind of boll worm attacked the green bolls; but no such devastation has taken place anywhere in the world probably as that caused by the Pink Boll Worm and the Weevil in the cotton-growing States of America—owing to whose ravages whole districts have been thrown out of cultivation, and others are still being threatened by the boll worm—on all the plantations. That cotton is a good drought-resisting plant is undoubted, for we have seen in the Central Western district, 500 miles from the eastern coast, fine cotton plants which were growing luxuriantly throughout the protracted drought which terminated in 1902. For two or three years these plants had been unacquainted with visible water in any form; but it does not follow from this that cotton can always be successfully produced on a commercial scale in an arid wilderness, for long-continued dry weather has an injurious effect on the crop, in that it checks the

production and growth of the bolls, and is the cause of the fibre being too short to realise the best price in the world's markets.

Mr. D. Jones, cotton expert, in a communication to a Brisbane daily paper in May last, stated that at Boonah he saw a small cotton plot which had yielded £20 worth of cotton to the acre. On the other side of the fence the farmer was burning off a maize crop which had failed from lack of rain.

Now turn to the State of Arizona, U.S.A., where two varieties of cotton are grown—the Pima or American Egyptian, and the short-staple varieties, of which Mebane's Triumph is the most important at present.

We have received from the University of Arizona College of Agriculture an excellent pamphlet on cotton-growing in that State by G. E. Thompson and C. J. Wood, in which the seed and the land and its preparation are first considered as follows:—

The discussions of this bulletin refer primarily to American Egyptian cotton. At the end of the bulletin those particulars in which short-staple cotton differs from long-staple are given special mention.

SEED.

Great pains to secure the best possible seed should be exercised by all who grow cotton. Seed of an inferior strain will result in a decreased yield and a poor quality of fibre. It is advisable for farmers to buy seed for planting purposes from responsible cotton-growers' associations. At least one of these associations at the present time (and others are preparing to do the same) make it a business through their cotton experts to produce and sell high-quality seed to members of the association. One of the associations now maintains, and the other associations should maintain, a separate gin for handling this cotton. Cotton seed that goes through the regular commercial gins is certain to be mixed more or less with inferior seed, and its use will in time result in decreased yields.

Those who have the time and who are especially interested in cotton-breeding may find it worth while to grow a separate small field of cotton from which seed is selected for the following year's planting. On this special field great care should be taken to rogue out and destroy all plants of undesirable or inferior type and all plants that fail to produce a reasonable number of matured bolls. In addition to this general precaution, the fibre itself should be examined; and if any of the plants have produced fibre that is short and weak, they should be discarded. The seed that is to be used for planting purposes should be fully matured before the first freeze of consequence in the fall. Because early setting and maturing of bolls is very desirable in American Egyptian cotton, it is advisable to select seed from plants that show this character.

The average farmer in Arizona uses 25 lb. to 35 lb. of seed per acre when planting cotton. Although one-half of this amount will give a sufficient stand if seed is good and soil and weather conditions are ideal, still it is advisable to use the amount indicated and later thin to the proper stand.

LAND ADAPTED TO GROWING COTTON.

A rich sandy loam soil, well supplied with humus, is ideal for the growing of cotton. Very light sandy soils, as a rule, do not produce heavy crops of cotton. Heavy clay soils are unsatisfactory because of the trouble experienced in securing a good stand, and because of the difficulty of irrigating properly. However, with good care, cotton can be produced upon practically any soil that is suitable for general farming.

PREPARATION OF LAND FOR PLANTING.

Thorough preparation of the land for cotton pays, and pays well. Cotton is a cash crop. A good quality of clean, strong fibre brings a better price than fibre that is weak, dirty, or inferior for any other reason. Well-prepared land will produce more fibre, longer fibre, and stronger fibre than poorly prepared land. Cotton from a field that produces a heavy crop is easier to pick and keep clean and free from dirt and trash than cotton with small, poorly opened bolls. If land is to be properly prepared for cotton, the preparation should begin several months before the planting season. Coarse trash or other material on the ground must be chopped fine and ploughed under or otherwise put in such shape that it will not interfere with the cultivation of the cotton plants. The ground should be ploughed rather deep (7 in. to 8 in.) as early as possible, and allowed to weather till planting time. From five to ten days before planting, the ground should be thoroughly irrigated. This time should be just sufficient to allow the ground to dry out properly and be worked to a good seed-bed. Many farmers make a mistake in the preparation of their cotton land by not having sufficient moisture in the ground before planting. Water should be held on the land long enough to ensure its being wet to a depth of 4 ft. to 5 ft. Land left rough after ploughing takes water better than land that has been disked and harrowed to a smooth surface. Land that has been irrigated when rough, particularly if it is of a heavy clay type, should be harrowed with a spike-tooth

harrow as soon as dry enough to permit of this treatment. This harrowing will save considerable moisture, knock off the tops of large clods, and fill the small depressions. The disk, followed by the spike-tooth harrow when necessary, can be used to work up a satisfactory seed-bed. An ideal seed-bed consists of about 2½ in. of finely mulched surface soil with a firm and moist soil beneath. It is not advisable to plant cotton and "irrigate it up" because of the difficulty often encountered with the baking of the ground over the sprouting cotton seeds.

PLANTING.

The time of planting cotton will vary somewhat with the kind of soil and with the locality of the State in which the planting is made. Recommendations differ greatly in this regard, but the consensus of opinion of the practical cotton-growers is that the best time for planting in an average season is during the last ten days of March and the first ten days of April [early spring]. Farmers handling sandy types of soil can plant one to two weeks earlier than those handling heavy or clay types of soil. It pays to plant as soon as the ground is sufficiently warm to ensure good germination and thrifty plants. Early plantings when the ground is cold often result in a thin stand and weakened plants; likewise early planting in cold ground, particularly if the days are warm and the nights cold, favours the development of the disease called "sore shin." Late plantings do not allow sufficient time for the plants to set and mature a large crop. The sooner the cotton can be planted after the ground is well warmed and danger of frost is past, the better the average results that will be secured. Cotton should be planted as shallow as possible and still get the seed deep enough into moist ground to ensure good germination.

THINNING.

The thinning of cotton is a question on which the best cotton-growers hold widely differing opinions. We believe that the distance to which cotton plants are to be thinned should be governed largely by the soil. Heavy, rich land will stand thick plantings of cotton. Thin, light land should have cotton spaced relatively far apart. This thin planting, however, should not be carried to such an extreme that the land will not be utilised to its full capacity to produce. With heavy rich ground some cotton-growers prefer that the plants be from 6 in. to 10 in. apart. A few growers will prefer even less space than this. The average cotton-grower with typical cotton land of the Salt River Valley will space his cotton from 12 in. to 18 in. apart in the row, with rows 3½ ft. apart. On thin poor land it may be advisable to increase the spacing to 24 in. or 30 in. The purpose of thinning cotton is so to space the plants that they may have light, air, moisture, and plant food in such proportions that they will produce the maximum number of matured bolls per acre. Cotton given too much space is very likely to produce a large, coarse plant, from which the branches may be broken in the fall by heavy winds. Cotton given a reasonable spacing can stand more drying or more severe conditions and still recover than cotton closely spaced. American Egyptian long-staple cotton should be thinned on the sandy light soils when the plants are from 4 in. to 8 in. high, and on the heavy rich soils when the plants are from 8 in. to 12 in. high. On the extremely rich soils thinning can be delayed till the plants are 14 in. to 16 in. high.

Time of thinning has a great deal to do with the control of vegetative branches. The development of vegetative branches is undesirable in American Egyptian cotton. Early thinning encourages their development; while late thinning discourages their development.

CULTIVATION.

The cultivation of cotton should begin as soon as the plants are through the ground well enough to mark the row, and be continued every ten to fifteen days till the plants are too large to permit the use of a regular cultivator. Sometimes the cultivation can be continued by the use of a one-horse cultivator, especially in the wider spaced rows and on heavy soils that tend to bake. Early cultivation checks evaporation, warms the soil, and will kill weeds and grass at the stage at which they are most easily destroyed. It will also eliminate much hand work or hoeing. For the most part the early cultivations may be comparatively deep and reasonably close to the plant. Late cultivations must be shallow, in order to avoid cutting and breaking numerous cotton roots.

IRRIGATION OF COTTON.

The proper irrigation of cotton is the most important single item in the profitable growing of the crop. Even though all other conditions are right, if the irrigation is wrong the yields will not be satisfactory. Over-irrigation stimulates plant growth, and to a certain extent prevents the forming of cotton squares and the setting of bolls; while light irrigation encourages the setting of fruit and the dwarfing of the plant, which are highly desirable especially in the earlier stages of growth of American Egyptian cotton. However, this dwarfing of the plant is neither necessary nor desirable on light desert soils deficient in both nitrogen and humus. When a plentiful supply of water is suddenly applied, following a period when the plant has been

suffering for water, it will cause a quick stimulation of growth, and the plant will shed or drop much of the young fruit already set. It is best to withhold irrigation after planting as long as possible and still keep the plants in a growing condition. Cotton will not be injured by wilting slightly in the middle of the day, provided it fully recovers its fresh appearance by late afternoon or early evening, and provided there is enough moisture deep in the soil to encourage deep root penetration. As long as there is sufficient moisture in the ground to permit transpiration to maintain the leaves in a cool condition during the heat of the day, the plant is not suffering, but when the leaf feels warm to the hand irrigation must be immediately supplied. After cotton begins to bloom, the moisture supply should be kept as uniform as possible. Cotton should be kept growing steadily, but excessive growth should be prevented. If examination during the blooming stages shows that the vegetative growth has practically stopped and the cotton is blooming to the top of the plant, water has been withheld too long. In other words, the terminal bud should be kept growing slightly in the lead of the flowers on the fruiting branches.

Prior to fruiting, the desirable method is to give as little water as possible, forcing roots to penetrate deeply for soil moisture stored prior to planting. The system changes after the fruiting begins, and the purpose then is to maintain a thrifty and uniform though not rank growth.

PICKING.

In Arizona, cotton-picking is usually begun during the last half of September [autumn]. It does not pay to begin picking until sufficient cotton is open to allow the gathering of 500 lb. to 700 lb. of seed cotton per acre at the first picking. In nearly all cases it will be advisable to pick the fields two or three times before the gathering of the crop is complete. Care should be taken in picking to see that no dirt, leaves, sticks, or other trash get mixed with the fibre. It is extremely difficult to separate the dirt from the fibre in a roller gin, and dirty cotton always brings a low price. With short-staple cotton, leaves and other trash can be separated to a considerable extent. Saw gins are used with short-staple cotton.

VOLUNTEERING OR RATOONING.

The volunteering or ratooning of cotton for two or three years in succession from the same planting was practised in Egypt a good many years ago, but has been abandoned there. It has been tried in this State with varying results. The practice is to be condemned for several reasons. In many seasons the volunteer stand of cotton is insufficient to produce a maximum yield. Usually the fibre produced from volunteer cotton is shorter and weaker than the fibre produced from cotton planted each year. In addition to these difficulties, the practice of volunteering cotton favours the increase of injurious insect pests and the development of troublesome cotton diseases. The practice has much to condemn it and very little to favour it. It is only under the most extreme or unusual conditions that the volunteering of cotton will pay.

TOPPING.

The topping of cotton, or the pinching or cutting off the terminal buds, has been advocated and practised by many as a means of preventing excessive plant growth and as a means of stimulating the formation of bolls. The results secured from this practice have been conflicting. In some cases, particularly on heavy rich ground, reports state that the practice has been profitable. Up to the present time no reports have been received showing that the practice is profitable on medium or thin lands. Properly grown cotton plants should not require topping. Uncontrollable conditions, such as a high water table or excessive rains, may make topping desirable. If topping is to be practised at all, it is recommended that it be delayed until about the middle of August. Early topping, instead of checking plant growth, may stimulate the production of vegetative branches if growing conditions are favourable, while late topping ought to further the development of bolls already set [summer].

FERTILISING COTTON.

Considerable interest has developed in the last two years in the fertilising of cotton. For the most part the desert soils in Arizona are deficient in nitrogen, and it is possible that on such soils nitrogen fertilisers may prove beneficial. Experience indicates that desert land that has been ploughed and irrigated a number of times, and brought into a condition of good tilth, will produce better cotton than similar land that has received but little cultivation. This is shown by the fact that the second crop of cotton on desert soil is often better than the first crop. On old lands that have grown legumes for a number of years, if any fertiliser proves profitable, it will be one containing phosphorus. Nitrogen fertilisers probably will not pay on such lands. It is not advised that farmers buy phosphorus fertilisers or any other fertilisers on an extensive scale until they have first tried them on small plots in their own fields. Applications of 200 lb. to 500 lb. of acid phosphate per acre, at the time the cotton is planted, promise to give beneficial results; yet several farmers

who have made small tests failed to note appreciable benefits, and tests on the Salt River Valley Experiment Station have so far failed to give increases in yield.

During the last year many questions have been asked regarding the advisability of planting cowpeas in the growing cotton for the purpose of increasing the available nitrogen. This recommendation has usually been to the effect that the cowpeas should be planted about thirty days after the cotton is planted, and then destroyed about the time the cowpeas are coming into full bloom. A more practical method is to plant the cowpeas at the time the cotton is planted, as this avoids the necessity of special irrigation to bring up the cowpeas. It is claimed that the planting of cowpeas in this way has a beneficial effect upon the growing cotton. In handling the cowpeas in this manner, it has been customary to plant two rows of cotton and the third row of cowpeas. We do not have accurate or conclusive information regarding the benefit of planting cowpeas with cotton. There is considerable evidence to prove that a legume crop may have beneficial effects upon a companion crop, but whether it will pay in the case of cotton remains to be proven. If cotton is planted in this manner, it should be considered an experiment, and an accurate comparison should be made with the common methods of planting.

ANGULAR LEAF SPOT.

Fortunately there are not many cotton diseases of serious consequence in Arizona at the present time. Probably the disease that has caused heaviest losses is one that farmers have observed but little, even though it may be present to a considerable degree. This is a disease called Angular Leaf Spot or Black Arm Disease of cotton. This disease attacks the plant in all stages of its growth, appearing on the younger plants as small dark angular spots on the leaves. Later the disease attacks the stems and fruit, showing as darkened, shrunken spots. Control measures are still in the experimental stage; but there is evidence that control, at least in the seedling stage, can be effected by careful treatment of the seed before planting. If treatment of seed to control this disease is attempted, the following is recommended:—

Bichloride of Mercury Treatment for Angular Leaf Spot.

Dissolve 1 oz. of bichloride of mercury in a small quantity of hot water; then mix into 7½ gallons of water. Dip the seed into this solution, stirring to make sure that it is thoroughly wet and allow to soak for one hour. Spread the seed out and dry thoroughly before putting into sacks.

Do not dip more than three lots of seed into the same solution, as each lot of seed weakens the solution.

Bichloride of mercury is a poison, and the solution should be destroyed, in order that people or animals may not drink it by mistake.

Bichloride of mercury corrodes metal, and solutions of it must not be placed in metal utensils. Wooden or earthenware vessels should be used.

COTTON ANTHRACNOSE.

Cotton Anthracnose is a disease that has caused great loss in the south, but little if any in Arizona. Importation of cotton seed should be avoided, as this disease is carried on or within the seeds. No satisfactory methods of controlling this disease are known.

ROOT ROT.

Root rot of cotton is a disease, and lives over in the ground from year to year. The only practical known method of control on infected soil is to grow for at least two years in succession some crop not affected by root rot. Such crops are corn, the various varieties of sorghum, and the small grains, such as wheat, barley, &c. Alfalfa [lucerne] and certain other tap-rooted plants are subject to root rot, and must not be grown when attempting to rid the ground of this disease. Since certain weeds may be affected by root rot, deep ploughing and clean cultivation are recommended as control measures.

INSECT PESTS.

Due largely to the strict quarantine that has been maintained, cotton boll weevil, pink boll worms, and many other troublesome insect pests of cotton have been kept out of Arizona.

COTTON IN ARIZONA AGRICULTURE.

At the present time [1919] cotton is the most important cash crop in Arizona. It is unlikely that the present high price of cotton will be maintained indefinitely; and farmers should bear in mind that any system of agriculture that is to be permanently successful must be well balanced. Cotton should not be grown to such an extent that other crops or live stock are reduced below a safe amount or number. It should be the aim of every good farmer to maintain the soil at all times in a high state of fertility, and to this end an intelligently planned crop rotation must be followed.

SHORT-STAPLE COTTON.

Short-staple cotton will mature in a shorter growing season than American Egyptian cotton, and therefore can be grown further north and at higher elevations. The soil requirements and the preparation of the seed-bed should be the same for the two classes of cotton.

Because of its shorter growing season, short-staple cotton can be planted one to three weeks later than American Egyptian. A smaller amount of seed is required per acre—15 lb. to 25 lb. being sufficient.

The thinning of short-staple cotton should be done when the plants are 4 in. to 6 in. high, and the plants are usually spaced from 16 in. to 24 in. in the row, with rows 3½ ft. apart. With very rich soils, both the spacing between the plants in the row and the distance between rows are increased.

The general principles applying to the irrigation and cultivation of American Egyptian cotton apply to short-staple cotton.

SUMMARY.

In growing cotton, good seed is extremely important.

A rich sandy loam soil, well supplied with humus, is ideal.

Early deep ploughing and thorough preparation of the land are necessary.

The seed-bed should be wet to a depth of 4 ft. to 5 ft.

Plant early, but not until the ground is sufficiently warm to ensure good germination and thrifty plants.

The character of the land should govern the rate of thinning.

Cultivation should begin as soon as the plants are through the ground well enough to mark the row.

Proper irrigation is the most important single item in the growing of cotton.

After planting, withhold irrigation as long as possible.

Prevent excessive growth.

The terminal bud should be kept growing slightly in the lead of the flowers on the fruiting branches.

In picking, keep the cotton clean.

Volunteering cotton does not pay.

Report trouble with disease or insect pests to the Agricultural Experiment Station, or the State Entomologist.

Do not allow the soil to become depleted; practise crop rotation; maintain a balanced agriculture.

THE COTTON INDUSTRY IN AMERICA.

THE PINK BOLL WORM.

The cotton-growers in America are, according to an article published in "The Weekly News Letter," issued by the United State Department of Agriculture in March last, threatened with wide-spread losses, through the medium of the Pink Boll Worm, owing primarily to the distribution of seed from newly-found, hitherto unsuspected, areas in Louisana; and it is stated that, unless radical steps are taken promptly to destroy it, the worst known pest of cotton will get out of hand. Following is the article in the "News Letter":—

"The Pink Boll Worm of cotton, previously supposed to exist in this country only in Texas, has been discovered at a number of places in Cameron Parish, La., where it is believed to have been for at least two years. It has been found also in Calcasieu Parish, but so recently that definite information as to distribution is not available. The old infested area around Trinity Bay has also been somewhat extended. Lots of cotton seed, ranging from 1 to 20 ears, have been shipped from Cameron Parish to Alexandria, Broussard, Shreveport, Bunkie, and Monroe, La.; and San Antonio, Fort Worth, Houston, San Marcos, and New Braunfels, Tex. Several of these points have no oil mills, and the seed was probably used for planting. Thus there is the possibility that the Pink Boll Worm has been scattered to all of these sections and possibly to others not yet determined.

"This brings about a serious situation for the cotton industry of the United States (says the United States Department of Agriculture). Unless the radical but necessary steps are promptly taken by the States concerned in co-operation with

the Federal Department of Agriculture, the Pink Boll Worm will certainly get out of hand and the work of extermination already carried out in Texas will be lost. Congress has been asked to provide additional funds and to make them immediately available.

"CONFERENCE TO PLAN WORK.

"A conference was held in New Orleans on 5th March, which was attended by representatives of all the cotton States and of the Department of Agriculture. The conference was called by Governor Pleasant, of Louisiana, in co-operation with Governor-elect Parker, who is president of the American Cotton Association. The purpose was to consider the whole situation as it has now developed, and to secure the taking of necessary steps by Texas and Louisiana and any other States concerned to meet the emergency.

"The newly discovered infestations in Cameron and Calcasieu Parishes, La., and Orange County, Tex., are along the lower course of the Sabine River, near the Gulf of Mexico. In addition, there is some reinfestation of the old Trinity Bay area in Texas, but the work of recleaning that area has almost been completed. The work, however, has consumed practically all the money that the United States Department of Agriculture had available for Pink Boll Worm eradication. Reinfestation around Trinity Bay was due to a modification of the policy originally agreed upon by the Department and State authorities of allowing no cotton to be grown in infested areas for a period of two or three years. A revision of the State Pink Boll Worm Act permitted cotton to be grown, under restrictions, in the Trinity Bay area during 1919. The reinfestation which has resulted from such growth of cotton is scattered pretty well over the old district, but the actual points of infestation are very few as compared with 1917, and the amount of infestation in the fields where the insect has been found is insignificant as to numbers. The results clearly indicate (say the specialists of the Department) the possibility of extermination by the method of establishing non-cotton zones and the cleaning up of all volunteer cotton if continued for a sufficient period. It was deviation from this method that brought the reinfestation in Texas, and the Department will insist that it be strictly followed in the tremendously greater task that now confronts the country. ' This is the only means of control,' says the Department, ' that gives any hope of ultimately eradicating this most destructive pest of cotton, and the success of the work must necessarily depend on the absolute co-operation of the States concerned.'

"LOUISIANA TAKES ACTION.

"Louisiana, immediately upon the discovery of the infestation in Cameron Parish, declared a drastic quarantine prohibiting the growth of cotton and providing for the destruction of existing cotton and cotton seed within a radius of 15 miles of any infested point in that State. No provision has been made, however, for compensating planters for cotton destroyed. It is absolutely necessary (the Department says) that some provision be made to reimburse the planters for losses which they must accept in the interest of the cotton industry as a whole. The payment of these losses, it is pointed out, will be very small as compared with the risk to the cotton crop should the Pink Boll Worm get beyond control.

"The possibilities of further spread, due to the shipment of presumably infested cotton and cotton seed from Cameron Parish makes it necessary that all such shipments be traced to destination, and that steps be taken to safeguard any local infestations that may have resulted."

A NEW IMMUNE POTATO: ARRAN VICTORY.

A correspondent of the "Agriculture Gazette" (26th March), London, expressed a wish for a potato having fine shape and cropping power, resistancy to blight, and immunity to the Black Scab or Wart diseases. He mentioned instances of certain varieties having one or other of these advantages, but not any possessing the three to a marked extent. In response a correspondent of that Journal (26th March) says:—

"In the Arran Victory we have, perhaps, the nearest approach to the desired potato. The eyeholes are not deep, and the potato is easy to peel. It is an excellent cropper, and favourable reports have geen given from various parts of England, Scotland, and Ireland. I I have tried this variety with excellent results.

"With regard to disease, it has proved to be a strong resister of *Phytophthora infestans*, besides being certified immune to Wart disease (Black Scab). The tubers keep well, and as a late cropper for winter use this variety is eminently reliable.

"Arran Victory can be distinguished readily from other varieties, when growing, by the strength and erectness of the haulm, which has dark green leaves, and the stem inclined to be reddish in places.

"There is one factor, however, which might prejudice growers:—The skin of the tubers is dark purple. But it is becoming more generally realised that dark-coloured potatoes almost invariably possess excellent table qualities; and Arran Victory is no exception. The flesh is almost snow-white, and is floury and dry when boiled."

This brings to our recollection that in the year 1903 there was a potato boom in England, when £500 was paid for a single ton of the then new Northern Star. Then came the Evergreen, the Up-to-Date, the Sir John Llewellyn, and the Eldorado. The area usually devoted to potato culture in the United Kingdom, prior to the war, was 1,500,000 acres. It may, therefore, be easily understood that the industry is of immense importance to the country. It is perhaps not generally known to Queensland potato-growers that no variety of potatoes will flourish for longer than eight or nine years. After that time, it begins to deteriorate, and new blood is demanded. In the old country Messrs. Sutton brought out the Magnum Bonum, which was a general favourite with farmer and consumer. Then came the Red American varieties—Early Rose, &c. These all had their day, and in due course retired into oblivion, although the Early Rose is still grown in Queensland. As a matter of fact, the Northern Star first appeared in 1892, but became all the rage in 1903. So precious was this variety that, at Ham, near London, 14 cwt. of seed of this potato was planted, the crop being raised from single eyes. It was then necessary to be economical with this variety, as single tubers sold from 7s. 6d. to 10s. One Lincolnshire potato-grower paid £500 for a ton bought from the introducer (Mr. Findlay); 15 cwt. fetched £400. This lot was grown on 14 rows, with 35 plants to a row. In 1904 the London "Daily Mail" stated that at a sale of seed potatoes at Spilsby, in Lincolnshire, all existing records for extraordinary prices were eclipsed. Six tubers of the Eldorado variety, the lot weighing only 5 oz., were disposed of by auction. This little lot realised £56 3s. 6d.; and as this works out at £402,658 13s. 4d. per ton, it constitutes a world's record. One potato sold for £11; another for £10 10s.; and £9 9s. was paid for a tuber which weighed only ½ oz. A Stone potato, named "The Sir John Franklin," after it had only been on the market a fortnight, sold at the rate of £3,000 per ton. The higest price ever obtained for potatoes in Queensland was paid in 1919, when £50 per ton was paid in the Brisbane market.

THE ALGAROBA OR MESQUIT BEAN.

For the past twenty years, owing to the value of the Algaroba (*Prosopis juliflora*), the planting of this tree has from time been advocated by those who have had a practical acquaintance with its various uses, more especially as a food for stock. Not only is it a tree which will flourish during the driest seasons, but it gives large crops of beans of a highly fattening value, and, moreover, it remains in bearing for some considerable time. Another point in its favour is—that it supplies the food to the stock, so to speak, automatically—that is, it drops its pods as soon as ripe, thus doing away with any labour or expense in picking and feeding by hand. Some of the species only attain the shrub form; others, such as the *P. juliflora*, grow into a tree from 30 ft. to 40 ft. high. When ripe, the pods are of a buff colour, somewhat flat in shape, and from 5 in. to 8 in. long, and in appearance is not unlike a large French bean. The value of these pods lies in their being filled, between the seeds, with a sweet mealy substance which is very nutritious, and of which horses, cattle, and pigs are very fond.*

Mention of it is made by the late Mr. Lewis A. Bernays in his valuable work on "Cultural Industries," in which he pointed out the great value of this tree in times of long-continued drought. The late Baron F. v. Mueller, in his work on "Select Extra-tropical Plants," says:—"The Prosopis is vernacularly known as the Cashaw, Mesquit, or Algaroba Tree, a thorny shrub growing finally to a tree of 60 ft. in height, with a stem 2½ ft. in diameter which may send its roots to a great depth, occasionally to 60 ft., to reach underground water [Professor Sergeant]." The wood is durable and of extraordinary strength and hardness, fit for select furniture particularly, assuring when polished, the appearance of mahogany. The pods are said to be adapted only to animals chewing the cud; but, as above stated, both horses and pigs thrive on them. It is on record, however, that over-feeding

* See an article on the Algaroba trees at the Kamerunga State Nursery, by G. B. Brookes Manager of the Nursery, published in this Journal in April, 1900.

on the pods has caused the death of several horses in Jamaica. The following hints regarding germination of seed and propagation of seedlings are given by Mr. Brookes:—

"In sowing the seed, a loose open soil, made up of equal parts of rich loam or vegetable matter and sand, is the best. The seeds should be only just covered, for if planted deep, especially in cold weather, they will frequently lie dormant for some considerable time. In such cases, when the soil is stirred up, the seed will readily germinate in the spring or on the approach of warm weather. This is a point which should be noted, as seeds so planted, especially in the cooler portions of the State, are frequently looked upon as unfertile if they do not speedily show signs of vitality.

"After germination, the principal thing to guard against is over-watering. Some cases have come to notice where the young seedlings have damped off, but this was in the Northern coastal districts and in hot, moist weather. In the cooler portion of the State, this need not be feared, unless obviously over-watered. There is no mistaking young seedlings, for, like many other plants of this family, they raise the seed itself aboveground, which seed remains there for some short time until the seed lobes open, the typical Algaroba leaf not making its appearance for some days subsequent to this. The young seedlings grow very long tap-roots; plants of 4 in. in height have been found to have tap-roots of fully 18 in. in length. This necessitates careful handling if transplanting is contemplated. If the seeds are not sown where the tree is to remain permanently, shallow boxes or tins, say, 6 in. in depth, filled with the compost already referred to, are preferable to ordinary garden beds. This method prevents the tap-root from going too deep, and encourages a fibrous growth of root without detriment to the plant. On transplanting seedlings in this way, care must be taken in separating the roots when entwined, which will occur if the seed has been at all thickly sown. Otherwise, the transplanting of seedlings thus propagated is much safer than that of those grown in garden beds, and, if carefully done, very few failures will result."

SUCCESSFUL EXPERIMENTS IN FERTILISING SEEDS BEFORE SOWING.

We are indebted to "A Reader of the 'Q.A.J.'" for the following interesting cutting from a home paper, giving an account of successful experiments, made at the scientific farms of Rothampstead (in Hertfordshire, England) and in Italy, with a new idea in treating seeds, before sowing, with the object of imparting a fertiliser to them, which they absorb, as hereafter explained. Following is the article referred to:—

The Board of Agriculture and the scientific farms at Rothampstead, in Hertfordshire, have been experimenting with a new idea of treating seeds.

One of the gravest lessons impressed on us by the war is that we must grow much more food. We can do that either by cultivating more land or by making the same land produce heavier crops. In either case more fertilising substance must be used.

Scientists in Italy, where farmers have been specially handicapped by the difficulty of getting fertilisers, have been closely studying the whole question, and have come to the conclusion that our present system of manuring is astonishingly wasteful. They have now carried out experiments which may create a revolution in agriculture.

FEEDING THE SEEDS.

Consider what happens after the farmer spreads a fertiliser on his land. Part is carried away by rain, and lost; a large part simply serves to stimulate weeds. When the crop is young, and at the critical period of its life, it is least able to absorb the fertiliser; as the crop grows and ripens its appetite for fertiliser increases, but just at that time the power of the fertiliser in the soil is nearly gone.

The remedy proposed by the Italian investigators is that, instead of manuring the soil, we should manure the seeds. They contend that instead of scattering fertiliser on the ground, better results can be obtained by allowing the seeds to absorb the fertiliser *before they are sown.*

SPEEDING UP THE FOOD SUPPLY.

It sounds most captivating, and the process, carried out in Italy with nitrate of ammonia, consists of soaking a certain weight of seeds in a weak solution of

nitrate and water for a period of from twelve to fourteen hours. After they have been thoroughly soaked, the seeds are dried in the air and sown in the ordinary way.

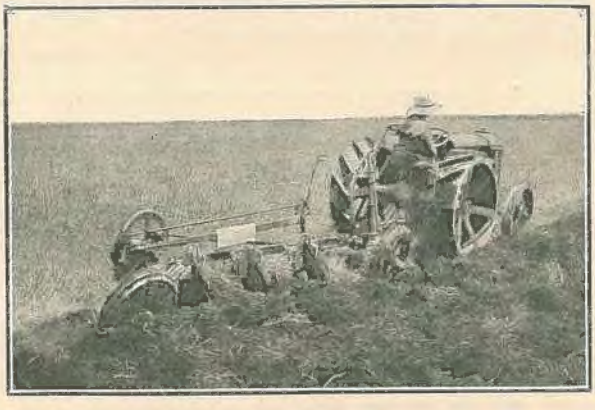
By this treatment it is claimed that the seed not only absorbs from the nitrate more of the nitrogen, which is essential to a sturdy growth, but gets it as it first starts to grow, just when the action of nitrogen is most beneficial.

Experiments carried out near Rome show that grain treated in this way shoots up earlier and grows better than untreated seeds. It is better able to withstand high winds, and, although ripening a little later, on account of its superior size, it gives 25 per cent. more grain and straw than seeds manured in the ordinary way. Moreover, it is said that only one-tenth of the nitrate that would be spread on the land is required.

THE FORDSON TRACTOR.

Amongst the many types of tractors for agricultural and allied purposes is the "Fordson," which has, like others, been put to severe tests, as shown by the following figures supplied by "Fordson" owners:—

Twenty-two Fordson owners each ploughed 1 acre in less than 1 hour; one hundred and four Fordson owners ploughed 1 acre in from 1 hour to 1½ hours; sixty-three Fordson owners each ploughed 1 acre in from 1½ to 2 hours; therefore the average maximum time required to plough 1 acre is 90 minutes, but this is on the assumption of each of the one hundred and four took the full 1½ hours to plough an acre, whereas they took between 1 hour and 1½ hours to do it. Likewise it is assumed the sixty-three took the full 2 hours.



Assumed that each of the one hundred and four averaged 1 hour 15 minutes, and the sixty-three averaged 1 hour 45 minutes, we find the real average time per acre to be 80 minutes, and maximum average time 70 minutes per acre.

This is under all varying conditions of soil, and taking into consideration that some used two ploughs and some three ploughs and 10-inch, 12-inch, and 14-inch buttons on each.

FUEL CONSUMPTION PER ACRE.

Kerosene—

Twenty-three Fordson owners state that they used 1½ gallons and less.
Seventy Fordson owners state that they used between 1½ to 2 gallons.
Thirty-five Fordson owners state that they used between 2 and 2½ gallons.
Fifty-one Fordson owners state that they used between 2½ and 2¾ gallons.

Average fuel consumption on over 179 farms under varying conditions of soil and load is 2 1.32 gallons.

Oil Consumption—

Thirty-six Fordson owners state that they used 1 pint and less per acre.
Forty-one Fordson owners state that they used 1 to 2 pints per acre.
Eleven Fordson owners state that they used 2 pints per acre.

Average oil consumed was 1.5 pints per acre.

COTTON SHORTAGE.

The "Daily Mail" (12th June) publishes the following "London Times" cable:—

"SERIOUS OUTBREAK.

"London, Friday.—The international congress on cotton, sitting at Zurich, discussed the increasing seriousness of the world shortage of cotton. British delegates urged the vital importance of developing new Empire supplies, and said that, if Governments would assist in every instance, plenty of cotton would be obtainable.

"Sir Herbert Dixon said he believed that production in America would not increase, but decline possibly, as the pink boll worm was affecting the crops, and great damage was feared if the pest spread. It was also worthy of note that a large portion of the Egyptian fields were reverting to agricultural production owing to food requirements."

We have constantly advocated the growing of cotton by Queensland farmers—not on large areas, but on the small scale of from 5 to 10 acres, the crop of which can be easily handled without much extra expense in the way of labour. The Department of Agriculture has done, and continues to do, all in its power to deal with all cotton grown in the State at a very small charge for actual cost of ginning, baling, and marketing, at the same time making growers an advance of 3d. per lb. and giving them a share *pro rata* in all profits on sales. Last season the growers received 5½d. per lb. clear on their crops—equal to £20 16s. 8d. for an average crop of 1,000 lb. of seed cotton per acre. In the old days of cotton-growing in Queensland, during the American Civil War, the farms from Brisbane to Ipswich where white with cotton crops. The farmers sold their cotton to the ginneries established at Ipswich, Harrisville, Oxley, and Brisbane for 3d. per lb., and were well satisfied with this. Certainly, expenses in those days were lighter in many respects—such as labour, cost of provisions, implements, fodder, &c. They may possibly, when the returns for 1920 are available, find that the price of cotton is already almost double what it used to be; and everything points, as above shown, to an increased demand and a serious short supply of this valuable product.

THE COTTON-GROWING INDUSTRY.

As time goes on, the growing of cotton in Queensland is attracting increased attention, due mainly to the assistance given to growers by the Department of Agriculture and Stock in the shape of annual increases in the cash advances made to them and to the supply of seed gratis. The urgent demand, both in England and the United States of America, for increased supplies of cotton cannot, apparently, be satisfied under existing conditions, especially in the latter country, where, owing to the ravages of the boll-worm, the boll-weevil, and other pests, there is a present and prospective shortage of supplies for the numerous local cotton mills, leading to a decreased export business. This is Queensland's second opportunity for establishing the industry on a firm basis, and the Minister for Agriculture has fully recognised the fact by recommending to the Government a guarantee of 5½d. per lb. for all cotton of good quality grown prior to June, 1922, and delivered at the nearest railway station or port consigned to the department, on receipt of which consignment the supplier will receive an advance of 3d. per lb., with a guarantee of a further 2½d. per lb. Having delivered his cotton, the supplier has no further trouble with it. It is ginned, lintered, baled, and sold by the department on account of the owner, the charges for which work are small. Early in June last, the Minister said that this guarantee is an advance upon that offered by the Federal Government for the 1920 crop, and should be an incentive towards substantial increase in the area for picking in 1921, at a time when the prospects for the grower, in a country admirably adapted for cotton growing, are particularly bright. The Government does not by any means intend to limit the price paid for seed cotton to the figure mentioned; if the price obtained for the lint will warrant a higher return the grower will receive a higher return, but he can be assured that it will not be less than 5½d. a pound. There is a demand for cotton throughout the world that cannot be over-supplied, so that there need be no fear whatever of the want of a good market; indeed, it may be stated that Australia alone can absorb all the cotton lint that Queensland can grow for many years to come, and the demand will be an increasing instead of a diminishing one. Seed can be obtained from the department free of charge, and consequently it now rests with the farmers to do their share, by each of them planting a few acres of cotton.

We have before pointed out that a crop of seed-cotton of good Uplands variety ranges from 1,000 to 1,500, and as much as 2,000 lb. The latter quantity was obtained by Mr. W. Goos, a farmer at Tallegalla, in 1907, when seed-cotton was selling at 2d. per lb. Under the conditions above named, that crop would to-day be worth £45 16s. 8d.

COTTON GROWING.

MORE AREAS WANTED.

A cable from London on 16th May on the annual report of the British Cotton Growing Association says that the report contains encouraging details of the Association's activities, but emphasises the urgency of extending the cotton-growing areas of the Empire, especially in view of the decline in production and the increase in consumption of cotton in the United States. The Association dealt with 30,881 bales in 1919, compared with 29,190 in 1918, and 48,087 in 1915, after which the results of the war began to be felt. The value in 1919 was a record, namely, £1,500,000.

NEGLECTED INDUSTRIES.

TOBACCO.

Amongst the agricultural products of Queensland, that of tobacco—once so payable a crop in the Texas and Inglewood districts as regards pipe tobacco, and Bowen and Cardwell for cigar leaf—may be said to rank amongst our neglected industries, as indicated in Norman Cobbs' article in the "Producer's Review," republished in the May issue of this Journal. In 1912, when the Department of Agriculture availed itself of the invaluable services of Mr. R. S. Nevill, tobacco-growing in the Texas districts was raised from a Chinaman's industry to one engaging the attention of white farmers; and Mr. Nevill expressed his surprise that people did not go in for the growing of it more extensively, for after the crop is once in the field the work, though constant, is light, such as children, both boys and girls of twelve to fifteen years of age, can do just as well as men, with the exception, of course, of the plough work.

The yield of the pipe tobacco in the Texas and Inglewood districts is not far from half a ton per acre, and sometimes, with exceptionally good seasons, more, and the price something near £80 per ton; and an industrious man can take care of from 4 to 5 acres. Thus it will be seen that, to the man who is not afraid of farm work, it offers special inducements, especially at the present prices for leaf. Other crops—such as corn, potatoes, &c.—can be grown at the same time, and thus add to the farmer's income. The Inglewood and Texas districts, at this time, have, so far, grown the best of these tobaccos; and to-day there is still plenty of suitable land available. The railway reaches the country about Inglewood, and there are large re-handling houses at Texas, where the farmer can sell and deliver his tobacco. Many people are under the impression that tobacco is a winter crop, but this is not so, as Mr. Nevill pointed out. "The time for seed-sowing," he said, "depends upon locality."

In Southern Queensland, from 10th August to 10th December is about the usual time; but he considered that seed sown as late as September is in plenty of time for transplanting, for the reason that you cannot transplant till all danger of frost is over.

In the North, for cigar tobacco, from 1st August to 1st January is the usual time, as the danger from frost there is very small, and plants can also be transplanted late—say to 20th February, whereas in Southern Queensland we cannot set out later than 1st February; and that is very late.

In the South, it takes from 90 to 110 days ordinarily for tobacco to mature from the time it takes root in the field. In the North, it takes from 80 to 90 days.

The time for transplanting is any time when the weather is suitable—from 1st October until it is too late for the tobacco to mature; but it is best to have the crop growing, if possible, during the rainy season, as a humid atmosphere is necessary to obtain the best results.

Regarding tobacco soils:—Heavy forcing soils are not suitable for tobacco, as such soils produce a rank, coarse tobacco of little commercial value. The soil should be a very friable one, and for cigar tobacco a high percentage of sand is desirable; but for heavy, dark pipe tobacco a clayey soil is desirable; and for yellow, aromatic tobacco the poorest sandy soil that will produce a crop is considered the best.

SOWING TOBACCO SEED.

Mr. Nevill advised the farmers at Maryborough that tobacco seed might be sown there and further north up to 25th December, in order to ensure a good crop. North of Mackay the seed could be sown at any time. At this time of year in the South it is necessary to be very careful with the beds, as the hot sun will kill the seeds as soon as they sprout if they are not well protected, and, in fact, they will not germinate at all if great care is not taken. It is always best to put a lot of rubbish on the ground intended to be sown and burn it. This kills the weed seeds, and so save the trouble of weeding later on; and the ashes are the very best fertilisers that can be had for the young plants. The soil should be broken up to a depth of 6 in., and made as fine as it is possible to make it, and then mix the seed with ashes and sow thinly. Do not cover or rake in the seed, but take a watering pot and sprinkle the bed well, going over the bed two or three times until it is thoroughly wetted; then take old corn bags, or hessian corn bags are best. Wet them, and lay them over the beds. Remove the bags, and again sprinkle the beds. Then wet the bags and replace them on the beds about three times a week if it does not rain. In about ten days or two weeks begin to watch for the young plants, and four or five days after they make their appearance arrange sticks around the bed, and raise the bags about 2 in. off it, continuing to raise them as the plants grow. When these are about 2½ in. high, remove the covering in the cool of the day, but replace them when the sun gets hot. Do this every day, letting them stay off a little longer each day until they are nearly large enough to transplant. Then leave them off altogether. This is what is called "hardening," and the process is absolutely necessary to enable them to stand transplanting. Do not wait for rain to sow seed. When it rains, you want plants ready for setting out in the field. In order to get strong and vigorous plants, only the best and strongest should be chosen, and in order to get these put the seed you intend sowing into a tumbler of water three or four hours before they are wanted. The strong, vigorous seed will sink to the bottom, and the light ones will remain floating on top. Pour these off, and sow only those that are left in the bottom of the glass.

The following letter on tobacco seeds was addressed to the Department of Agriculture in May last by Mr. E. J. L. Claes:—

Delta,
Bowen, 19th May, 1920.

SIR,—

In a contribution to the *Producers' Review*, quoted in the *Queensland Agricultural Journal* at the present month, Mr. Norman Cobb, after pointing out that in the Lancaster County (Penn.) 1 ton per acre of fine cigar leaf is obtained as against our average of only 1,000 lb., states that "unfortunately the Queensland growers are ignorant of those improved American methods, and generally the cultivation and curing are very backward," &c.

In connection with the above, I beg to assure you that we, the growers, are only too anxious to improve our methods, which are those (now apparently obsolete) taught us by Mr. Neville, the late Government tobacco expert, and I am sure I am voicing the wish of all the Bowen tobacco men when I appeal for your department's assistance to obtain the means of doubling their harvest.

Mr. Cobb further asserts that the Spanish variety, which is almost exclusively grown in this district, is out of date, and he recommends the trial of several other varieties which he names. None of them, however, happen to be included in the list of seeds offered for sale by your department. This is rather unfortunate, because, while several growers are prepared to admit the comparative mediocrity of the Zimmer Spanish leaf in the market, they find it difficult to introduce reliable seeds of varieties that may prove more acceptable to the manufacturers.

To give my own experience in this respect, I have only to state that I purchased from the leading seeds merchants in New York several ounces of their cigar leaf seeds for this year's crop. Several beds were sown, but not a single plant came up, and a fire test for germination plainly showed that the seeds were dead. So I was compelled to fall back on my local Spanish seed, and it will be admitted that I am justified in looking with distrust on imported seed that has not been tested by responsible experts. Perhaps in this matter also your department may help the growers by importing, for distribution, reliable seeds through the American Agricultural Department.

As Mr. Cobb truly remarks, the tobacco industry in this region is capable of great development, and I am confident that a strong impetus would follow your assistance and instruction.

Yours, &c.,

ERNEST J. L. CLAES.

The Under Secretary for Agriculture, Brisbane.

The Department of Agriculture obtained seeds of different tobaccos on several occasions, and these were always tested as to their germinative powers before they were supplied to intending growers and if any failed to germinate it could only be attributed to the careless treatment in the seed beds, and to their being sown broadcast, like wheat or lucerne, without any protection from the hot sun. Let tobacco-growers try the method here described, and failure would not be recorded.

TRANSPLANTING.

The young plants having been carefully raised according to the foregoing directions, the next important business is their transplanting. The land for this purpose should be deeply and well ploughed during the winter, in order to destroy the insect larvæ as much as possible and to well rot the rubbish which is turned under. After this, the land should be kept clean by a spring-tooth harrow or a cultivator until the time for planting arrives. Before planting, however, the ground should be again deeply ploughed, not cutting too wide a furrow. By cutting only about two-thirds of the capacity of the plough, the soil is better pulverised. This ploughing should be fully 8 in. or 10 in. deep, and then double harrowed.

New ground does not require such deep ploughing as old; it also gives a lighter yield and better colour. The land should be checked off 3 ft. 6 in. each way, so that it can be cultivated both ways and kept clean.

It is best to transplant in showery cloudy weather if possible, as then the plants will not need to be watered or covered; if such weather cannot he had, then the transplanting should be done late in the afternoon, beginning when the sun is about an hour high, watering the plants as you set them, and covering early next morning. This covering will not be needed after five or six days; but a piece of bark or a shingle may be stuck in the ground in such a position as to shade the plant during the heat of the day. The plants should not be washed before setting, as they are now free of disease and insects. In transplanting use a peg made of a piece of broom handle. This should be thrust into the ground deep enough to take the whole root of the plant. Press the ground well round the root, but put the soil loosely about the stem. If properly set, the plants will take root in about ten days; and as soon as this has taken place, and the plant begins growing, go over the field with a hoe, clearing off any weeds and loosening the earth above the plant; but, after this, do all cultivating with the plough. When the plants begin to grow *thickly*, run a one-horse teasing plough with the land side as close as possible to the plants without disturbing them, thus throwing the soil away from the plants, and then across the field the same way, leaving the plant standing on a small hill. Let them remain so for three or four days, if the weather be cloudy and rainy; but, if it be hot and dry, the earth should be thrown back into the furrow from which it was taken in thirty-six hours. This ploughing in old land should be deep, so as to give a deep and well-pulverised soil for the roots to penetrate. After this, the ground should never be allowed to pack and become hard or get foul, but should be occasionally well and deeply stirred—first one way, and then across with a double shovel one-horse plough, care being taken not to disturb the roots or break the leaves, ploughing a little further away from the plant each time. This ploughing tends to keep the soil moist, enables the roots to grow and spread, and you get a healthy vigorous plant, the top leaves spreading and growing and ripening with the lower ones. If the weather is seasonable, the last ploughing may be done, throwing the soil to the plant, thus forming a hill; but, if the weather be dry, the level cultivation is better.

Tobacco should be topped and primed as soon as the proper number of leaves can be secured; do not wait for the bloom; otherwise you retard the development of the top leaves, and the plant ripens at the bottom before the top has done growing.

"Priming"—that is, taking off the bottom leaves—makes less work for you, and gives the remaining leaves the full benefit of plant life. All the leaves that are damaged should be taken off, and, if none or only a few are damaged, take four to six leaves, that the remaining ones may be well off the ground. Then pinch off the top, leaving not more than fourteen leaves, though most good growers prefer only twelve. All the plants will not be ready for topping at once, and a second topping will be necessary, when every remaining plant should be topped, if it should

even have six or eight leaves left. Suckers must not be allowed to grow, and should be taken off as soon as they appear, for, if allowed to grow, they seriously injure the tobacco. The above is necessary in order to have the field ripen evenly, and the even ripening is necessary to get a good cure.

CUTTING.

Following on this subject is a useful extract from a Bulletin issued by the United States Department of Agriculture:—

"The passage of the various constituents of a plant from one part of it to another, as the plant advances to maturity, is a capital fact common to all plants, and we see in fact that the oldest leaves gradually wither and die as they give up to the newer parts of the plant many of the matters that were contained in their cells. There comes a time when the plant ceases to draw food from the air and from the soil, and devotes itself to the purpose of concentrating the nourishment that was previously scattered through all its parts. At this period the leaves begin to change colour, light yellow spots appear upon them and the leaf or plant is said to be ripe and ready to be cut. As the leaves ripen from the bottom upward, the rational system is to pick or prime the tobacco as the leaves ripen. This is done in the Bright tobacco district, and to some extent in the cigar districts of Florida. In the other districts, including the cigar districts of the North and manufacturing and export tobacco districts, the plant is cut when the middle leaves are about ripe. If the plant is not fully matured at the time of cutting, it is liable to cure dark, or if the weather happens to be dry or cold, so that it dries out quickly, it will cure green, and be worthless.

"The time when a plant is ripe and ready to be cut is a matter of judgment and experience. There is a slight change in the colour of the leaf, perceptible in looking over a field of tobacco, which shows the experienced grower that it is ready to be cut. When the leaf is observed to change colour from a rank green to a lighter shade of green, and yellow spots appear, it is a certain indication that the constituents of the leaf have performed their duty and are going back to the stalk to be carried to the upper leaves or to be used for other purposes in the economy of the plant.

"Another test of this is to fold the leaf between the fingers, and if the leaf snaps or retains a crease where it was folded it is said to be ripe.

"A plant that is topped low, with only 8 or 10 leaves, will mature more uniformly, of course, than one that is topped high, like the Sumatra, where 18 or 20 leaves are left on the plant.

"Cutting or priming should not be done when dew or rain is on the plant, as it is liable to leave black spots on the cured leaf. In the South, cutting is not done until late afternoon in midsummer, as the midday sun is liable to sunburn the tobacco in a few moments.

"Where priming is done, the leaves are placed in baskets or shallow boxes to be carried to the drying sheds, where they are strung on twine or on wires. The leaves are put face to face and back to back, 30 to 50 to a string, according to the size of the leaf. The twine or wire is then stretched on a 4-ft. lath with a slit about 2 in. long sawn in each end, and hung in its place in the barn. In harvesting plants they will not all be ready to be cut at the same time, and it is necessary to go over the field a number of times, and cut them only as they ripen.

"Where the whole plant is cut it is allowed to wilt for several hours before being carried to the barn to prevent breaking the turgid leaves. Plants are cut and laid in rows on the ground to wilt, several rows being laid in one for convenience in handling. With the finer grades of cigar wrapper the plant is not allowed to lie on the ground directly, and in many localities the wilting is done after the plant is put on laths, upon which it is to be hung in the barn, and the laths supported on small trestles in the field or in racks arranged for the purpose. When sufficiently wilted, the tobacco is hauled to the barn, either on racks made for the purpose or carefully piled on the wagon bed. In hanging the tobacco the butts are either pierced with an iron-pointed lath, or the stalk is split all the way up, and the plants strung on the laths in this way. Before being hung up, care should be taken to remove all eggs and worms from the leaves, as the eggs are liable to hatch, and the worms do great injury to the leaves while hanging in the barn. All the suckers should also be removed, or they will continue to grow and absorb the nourishment of the full-grown leaves.

"In Cuba and Southern Florida the plant is cut in sections in the field. The three top leaves, usually the finest wrappers, are cut in one section; the rest of

the stalk is cut in sections of two each. Two rows are taken at a time, and the sections are assorted according to their grade and position on the plant. The field is gone over several times, until all the ripe plants have been cut. Boys accompany the experts, and receive the sections on their arms, the stems being turned alternately to prevent the loads from falling. When a turn has been received, the boys slide the sections on to poles placed on forked stakes at convenient places in the field. These poles, when full, are carried to the barn. The Cubans use long poles, usually 13 ft. in length. This system has the advantage of sorting the tobacco as it goes into the barn. As the curing progresses in the barn, the leaves are separated more and more for a better circulation of air.

"Cut tobacco must not be left exposed to the sun and wind, especially when lying on the ground in small piles. It must be hauled to the wilting sheds or barns as soon as the leaves are sufficiently wilted to avoid being broken in handling.

"Where priming is practised, the leaves should be left to mature further than where the entire stalk is cut, for while the stalk is hanging in the barn a translocation of the matters from the stalk to the leaves takes place, and from the leaf to the stalk; and the leaf ages and matures, therefore, while hanging in the barn. When the leaf is once severed from the stalk, however, in the process of priming or cutting in sections, there is no opportunity for this transfer, except to the very small portion of stalk which is left on the section.

"SAVING SEED.

"The grower should maintain and even improve the quality of his crop by a judicious selection of seed plants. To this end, the field is gone over several times during the growing season, and typical plants picked out possessing the greatest possible number of good points. After finally deciding upon the plants which should be saved for seed, these are allowed to grow to full maturity without removing the seed head when the rest of the field is topped. As the seeds of a plant are produced from the food material prepared in the leaves, the leaves should be left upon the seed plant until the seed is ripe. It is advisable also to have plants close together, in order that they may fertilise each other by the exchange of their pollen. Only the central spike of the plant should be left for seed, the suckers being removed as they develop, in order that all the nourishment taken up by the plant should go into the central spike to make heavy seed.

"The largest pods will contain the heaviest seed, and these should be selected for planting. 'Hellriegel found that the weight of the seed sown had, under some circumstances, considerable influence on the yield of the crop, and that the young plants from the overripe seed were decidedly the strongest and most vigorous, the others being smaller and feebler, very much in proportion as the seed from which they grew had been gathered earlier.' The heavier seeds can be separated from the light by winnowing in a light wind or by screening. Seed plants of different varieties should be separated as far as possible to prevent crossing through the intervention of insects, air currents, &c. Exchanging and mixing seed of the same variety grown some miles distant is good practice, as it tends to make the seed and plants more vigorous.

"A great deal of the trouble arises in attempting to maintain a fair strain of tobacco seed on account of the facility with which cross-fertilisation occurs in the field. For this reason the recent experiments of Dr. Doroxie, editor of the 'Hungarian Tobacco Gazette,' of Budapest, mentioned by Killebrew and Myrick in 'Tobacco Leaf,' are of great interest. This gentleman 'has propagated tobacco from slips, and claims that the leaves harvested from such propagated plants are finer and of higher quality than those of the mother plant.'

"The suckers from the plants are easily propagated in a suitable seed bed, just as slips of any of the ordinary flower plants, such as geranium or coleus. They can be readily grown to maturity in the field or in the hot house, and the seeds so obtained will actually represent the parent without change from cross-fertilisation from other plants if care is taken.

"It seems probable that, by continuously raising seed from suckers instead of from seed, Havana or other superior kinds of tobacco can be acclimated in the Northern States, and retain the qualities of the first year's crop, just as original qualities are retained by layering and grafting fruit.

"Tobacco seed will retain its vitality for ten or twenty years, but it must be remembered that as a general rule all seeds begin to lose their vitality from the moment of ripeness. The process of deterioration with tobacco seed goes on, and on each succeeding year a less number of seeds will sprout, until finally all lose their germinating power. In planting old seed they should be first tested, and the quality sown should be proportional to the vitality of the seed."

Dairying.

CHARACTERISTICS OF DAIRY COWS.

Everyone is familiar with the more usual qualities which dairy cows should possess as a rule, and which have often been described. But there are a number of less well known and less often remarked characteristics which are thought by practical writers on the subject to be of some significance, the fact being that dairy and maternal qualities are of so subtle and far-reaching a character that they influence the conformation of the body in a great variety of ways.

To quote the words of a noted American dairyman when striving to produce a profitable dairy cow: "We must breed and develop an enlarged function of maternity; the dairy cow is an animal with an enlarged talent for the exercise of maternity, and the dairy form and outline are essential to the work of a dairy cow." That these functions are largely connected with the nervous system explains probably to what a large extent dairy characteristics attach themselves to external features, and the "nervous theory" which was brought out some while ago by the above-mentioned authority helps to make this clear. It was to the effect that maternal qualities are closely connected with the nervous system; and that if we develop a race of cows which shows an increased tendency towards milk and butter-making, so in proportion do we increase both the nervous form or build and the maternal qualities, at the same time diminishing the heavy-going qualities of the fleshy type beast.

According to this theory, it will be seen that there is ample room for the opinions regarding the fairly pronounced distinctions which exist between the two types of animal, and the ideal dual-purpose cow will perhaps never be fully evolved.

Among the points referred to at the beginning of this article are such characteristics as are indicated by the conformation of the head and face, tail and thighs. The head is naturally of peculiar interest in this connection, and in a general way a long one is usually advocated, but there are differences of opinion on the point. Youatt commended length, but was no lover of *big* heads, which, he said, were seldom a good indication either of milk or beef, and a "small but long shape" which some have given as their ideal seems to be what he meant. One exponent of this subject, while admitting that it frequently means a good milker, goes so far as to say that a long head often implies a dull, apathetic, colourless animal, always the last of the herd to look out for herself, and this is hardly in keeping with the high development of brain power which has been advocated by a noted expert, and which it may be supposed is derived from a highly-developed nervous system. But a long head in moderation seems to be generally approved by farmers—in the heavy breeds, at any rate.

The mouth is among the points to which reference is seldom made, but its importance is not perhaps appreciated, though it is not maintained that points such as these have necessarily anything to do with maternal qualities. Mr. Grisdale, the dairy expert at the Central Experimental Farm, Ottawa, referring to this point a few years ago before the Dairymen's Association, remarked that a strong jaw and a large mouth are probably the best indications you can get of a good dairy cow, provided that the other parts are right. This type of mouth, together with thick and strong lips, have been commended as indications of a good digestion, and if this is so they are, of course, valuable features, and are in keeping with a good clean face and bright forehead, which, together with an eye of the right sort, are, according to the same authority, indicative of the abundant brain power above alluded to. Even the nostrils are held to be of some significance, but perhaps only in so far as a good shape here would imply good breeding and lung power, the latter being a point apt to be underrated.

The tail is certainly a feature of interest, because it seems to indicate either flesh or milking proclivities, according to its setting on. While it is inadvisable, perhaps, for it to stand well above the rump, as some people like to see it, a sunk-in tail implies meat rather than milk, because of the general compact levelness which this formation carries with it. A very shrewd breeder is said to have remarked that he would always avoid a dairy bull with a tail sunk in flesh, and doubtless he was right.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MAY, 1920.

The results for the month have been, on the whole, fairly satisfactory. No outstanding scores have been made in the light section, but there has been some creditable laying amongst the heavy breeds, viz.:—E. F. Dennis's total for the month of 134 eggs, 37 of which were laid during the last seven days; Gaydon's A bird finished the month with a continuous run of 18 eggs; and D. Fulton's F bird with a run of 23 eggs, the lastnamed owner's six birds laying 138 eggs for the month. One death occurred during May, E. Oakes losing his D bird through ovarian disorder. Some fourteen birds have been in the broody coop during the month. A very noticeable feature is the almost complete absence of false moults. The weather has been showery, and abundance of green feed has been available. The following are the individual records:—

Competitors.	Breed.	May.	Total.
LIGHT BREEDS.			
*G. Trapp	White Leghorns	114	220
*O. W. J. Whitman	Do.	120	213
*Haden Poultry Farm	Do.	112	210
*J. H. Jones	Do.	103	204
*J. D. Newton	Do.	109	201
*W. Becker	Do.	106	197
*J. J. Davies	Do.	124	195
Geo. Lawson	Do.	103	192
*G. Williams	Do.	110	191
*S. McPherson	Do.	129	189
*T. Fanning	Do.	104	186
*W. and G. W. Hindes	Do.	107	185
*Quinn's Post Poultry Farm	Do.	87	174
*Harold Fraser	Do.	106	173
Thos. Eyre	Do.	88	165
*J. M. Manson	Do.	119	164
*E. A. Smith	Do.	86	162
A. J. Anderson	Do.	81	153
*S. W. Rooney	Do.	100	157
*Range Poultry Farm	Do.	107	156
*Dr. E. C. Jennings	Do.	90	154
S. L. Grenier	Do.	101	149
*Mrs. L. Henderson	Do.	66	148
*N. A. Singer	Do.	75	147
*Thos. Taylor	Do.	79	144
*B. Chester	Do.	91	142
C. M. Pickering	Do.	67	139
Avondale Poultry Farm	Do.	78	132
W. Morrissey	Do.	78	128
*Mrs. L. F. Anderson	Do.	66	124
Mrs. R. Hodge	Do.	79	121
H. P. Clarke	Do.	63	120
E. Chester	Do.	75	119
C. H. Towers	Do.	83	119

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	May.	Total.
LIGHT BREEDS—*continued.*			
*L. G. Innes	White Leghorns ...	69	118
W. D. Evans	Do.	38	107
C. Langsbecker	Do.	60	105
R. C. J. Turner	Do.	73	98
Nurse E. M. Ellis	Do.	65	94
H. A. Mason	Do.	44	84
S. Chapman	Do.	43	83
C. A. Goos	Do.	35	82
HEAVY BREEDS.			
*R. Holmes	Black Orpingtons ...	132	246
*D. Fulton	Do.	138	222
*A. E. Walters	Do.	102	205
*R. Burns	Do.	123	204
H. M. Chaille	Do.	124	197
*R. Shanks	Do.	109	181
*E. Morris	Do.	113	180
*E. F. Dennis	Do.	134	174
*T. Hindley	Do.	92	173
*W. Smith	Do.	82	165
G. Muir	Do.	107	165
*Nobby Poultry Farm	Do.	82	162
*R. B. Sparrow	Do.	86	148
*A. Gaydon	Do.	106	143
*J. E. Ferguson	Chinese Langshans ...	80	134
*E. Oakes	Black Orpingtons ...	74	121
*E. Stephenson	Do.	87	108
J. E. Smith	Do.	94	108
R. C. Cole	Do.	63	102
Parisian Poultry Farm	Do.	62	100
*J. A. Cornwell	Do.	50	88
Mrs. G. H. Kettle...	Do.	77	88
G. Flugge	Do.	18	48
Total	...	5,769	9,811

* Indicates that the pen is being single tested.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	41	32	40	35	39	33	220
O. W. J. Whitman	35	30	41	31	37	39	213
Haden Poultry Farm	41	24	44	39	30	32	210
J. H. Jones	37	30	37	37	38	25	204
J. Newton	44	28	35	21	33	40	201
W. Becker	34	39	38	26	24	36	197
J. J Davies	34	34	29	41	25	32	195
G. Williams	26	34	34	32	37	28	191
S. McPherson	35	29	33	32	39	21	189
T. Fanning	15	33	28	33	37	40	186
W. and G. W. Hindes	31	26	37	31	27	33	185
Quinn's Post Poultry Farm ..	38	33	37	25	16	25	174

RESULTS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS—*continued.*							
Harold Fraser	29	13	35	32	35	29	173
J. M. Manson	30	26	40	20	21	27	164
E. A. Smith	34	21	33	26	27	21	162
S. W. Rooney	12	14	38	34	30	29	157
Range Poultry Farm	26	22	23	39	22	24	156
Dr. Jennings	19	33	27	22	30	23	154
Mrs. Henderson	14	26	26	20	42	20	148
N. A. Singer	33	21	23	35	9	26	147
Thos. Taylor	35	26	18	20	24	21	144
B. Chester	25	19	25	27	27	19	142
Mrs. L. Anderson	36	23	32	13	7	13	124
L. G. Innes	0	25	33	10	35	15	118
HEAVY BREEDS.							
R. Holmes	43	38	39	36	44	46	246
D. Fulton	42	41	27	20	42	50	222
A. E. Walters	36	34	7	50	34	44	205
R. Burns	40	21	44	23	41	35	204
A. Shanks	24	10	34	43	22	48	181
E. Morris	30	36	42	8	24	40	180
E. F. Dennis	28	15	48	24	16	43	174
T. Hindley	31	39	34	42	14	13	173
W. Smith	30	44	43	86	10	2	165
Nobby Poultry Farm	21	47	18	46	24	6	162
R. B. Sparrow	35	0	39	39	4	31	148
A. Gaydon	24	44	19	0	20	36	143
J. Ferguson	23	29	24	29	28	1	134
E. Oakes	15	24	37	0	27	18	121
E. Stephenson	36	20	23	22	0	0	108
J. Cornwell	26	39	5	0	0	18	88

CUTHBERT POTTS,
Principal.

CHICKEN-POX OR WARTS.

By D. WALLACE, Rocklea.

(*Continued from May Issue.*)

The first and most important preventive measure against this disease is early hatching. There is no limit to the evils resulting from hatching late. The time when the last chicks of the season should be out of the shell varies to the extent of about ten days in Queensland according to latitude. For heavy breeds hatching should cease by the end of the first week in September, and for light breeds by the end of September. This applies to the neighbourhood of Brisbane, and the warmer the climate the earlier, relatively, should hatching terminate.

Early hatching supplies two things—vigour or stamina, and maturity or a ripened constitution; and these will be found to be valuable assets when chicken-pox is prevalent.

If the birds cannot be given range, they must be regularly supplied with green feed. In the absence of anything better, grass and weeds may be fed; but green feed they must have.

A weakling should never be tolerated in the flock, no matter how fine it may be in feather or other qualities. Out with the culls. Retaining them is only courting disaster.

Another important consideration is dry and well-drained yards. If not naturally so, they should be made so as much as possible. Fowls have a peculiar predilection for damp shaded spots in the day time, such as in a hollow with overhanging foliage. They should be kept away from these. They are largely creatures of habit, and after resorting to such a place for some weeks they make it offensive and dangerous from a hygienic standpoint. Fresh sulphuretted calcium, in daily doses of 6 grains per bird for the heavy breeds and a grain less for the light breeds, has proved to be a reliable remedy. It should be dissolved as well as possible in the water to be mixed with the mash, and the whole very thoroughly worked so as to ensure a uniform distribution of the drug in the feed. The dosage should be accurate; and, when the correct quantity for the number of birds to be treated has been ascertained, it should be measured and the measure used as a guide for ready use. Animal food—unless fresh cooked meat is fed—should be cut out except when the disease is present only in a mild form; and it is as well also to substitute a mash feed in the evening in lieu of grain, giving 3 grains of the drug in the morning and 3 grains in the evening. In addition, a teaspoonful of Epsom salts should be used to each quart of drinking water, no other water being allowed.

In flocks of any size it is impracticable to employ any external treatment save in the case of very badly affected birds. A mixture of tannic acid and glycerine should be applied to the sores of such birds.

Sulphuretted calcium may be used also as a preventive in somewhat smaller doses without doing away with the grain feed. The well-known "Douglas Mixture" is a capital thing to use in February and March. Judiciously used, Epsom salts is very beneficial at any time, but it should not be continued for too long a period.

On no account should birds suffering from infectious diseases of any sort be sent to market. Such a course only tends to spread the disease and does the sender harm in that it is damaging to the industry, apart from the cruel loss inflicted on other poultrymen, as the following instance will show:—

A farmer close to Brisbane had 700 head of fowls, and, deciding to obtain some turkeys for incubating eggs, he purchased ten of these birds at a market in town for £2 12s. 6d. When he penned them on his farm it was soon apparent to him that something ailed them, and the bowel trouble they suffered from rapidly developed. Some fowls that had access to the turkey pen soon showed similar symptoms, and in a short time the disease went through the entire flock. The trouble appears to have been septic enteritis, which closely resembles fowl cholera. To cut the story short, the whole flock, except thirteen birds, succumbed. All the turkeys also died, save one, and she died soon after on a setting of eggs, after having apparently recovered. Fortunately this man was not unscrupulous enough to send his birds to market from time to time as soon as they began to show signs of the trouble, or there is no telling where the evil may have ended.

The lifelong immunity acquired by birds that have had warts, however mild, indicates that therapeutic, and also more especially prophylactic, vaccine treatment would be very effective; and it is quite within the bounds of possibility, considering how rapidly the industry is developing, that this will be available in the not too distant future. The main consideration is a reasonably cheap application of the principle. The flocks of the future will be worth it; indeed, not a few of them are at present. Single birds have changed hands in Australia for as much as fifty guineas, and others have been imported at much higher figures.

MORE ABOUT CHICKEN-POX.

This subject has been dealt with at some length, at various times, in this journal. It is one of great importance to poultry-breeders, and we gladly publish what is written on the disease by experienced poultry men. We have now another very useful communication from Mr. D. Wallace, dealing with the means for combating and overcoming this trouble. We mentioned to him that, some years ago, when we ourselves bred prize poultry, a number of Brahma chickens were badly affected, and a remedy was suggested to us, which proved successful, all the birds having recovered. Mr. Wallace deals with this remedy in the following paper:—

"The treatment you refer to is known among poultry men as 'dipping.' No doubt the ammonia in urine has a more or less antiseptic effect on the sores themselves, and much would depend on the condition of the birds, the stage of the disease, and the severity of the attack. Two seasons ago, at Woodridge, I had an opportunity of noting the effect of dipping on an affected flock there. The owner, in the belief that mosquitoes were responsible (we never saw any save the *Culex vigilax* mosquito there), had for weeks before been laboriously spraying his birds on their perches each evening with kerosene oil. Some of the chickens he had protected in gauze-fronted coops. In spite of all his trouble, his flock became infected in common with other flocks in the place. He practised dipping for a while; then he was persuaded into buying in town, for *16s. per lb.*, some stuff, which I found to be alum with a sprinkling of pot. permang., for use in the drinking water. But the disease ran its course, and he had one or two birds returned from Gatton, where he had sent a team, for the reason that they were found to have warts. He was one of those people who would never be advised. My own birds, treated with *calx sulphurata*, got the trouble so very mildly that it was only noticeable here and there. In that year I hatched some chicks in March, which were wholly immunised for the time. I have them still, and they are the parents of my two birds competing at the Zillmere single-pen test.

"Chicken-pox is a disease of the blood. *Calx sulphurata* is recognised as having the property of remedying a suppurative condition of the blood. It supplies the element or elements necessary to enable the bird's system to overcome the effects of the toxic products of the chicken-pox microbe, and also, by way of prophylaxis, to partly or completely resist it when infection is about. Magnesium sulphate (Epsom salts) does the same thing in a lesser degree. Both combined confer the maximum benefit.

"Though milder and less dangerous by far than human syphilis, it is analogous to it in that when the *Spirochaeta pallida*, or, as it is now more correctly termed, the treponema pallidum, is destroyed in the system the flesh recovers. It would be of little use to attempt to heal the skin while the organism responsible remained unmolested throughout the system.

"Of course, treating the eruptions themselves with an antiseptic tends to subdue suppurative staphylococci and streptococci which add their quota to the toxins already produced by the chicken-pox organism; but once this latter is overcome, the blood may be relied on to use its own antibodies against the organisms mentioned that find a haven in the abraded surfaces.

"I have been experimenting in a small way with the birds at my disposal, in order to ascertain whether, when a male has been removed from his hens and a second male substituted, any eggs laid by the hens after those fecundated by the second male could be fecundated by the first male, seeing that chicks have been hatched from eggs from hens after removal of the male for three weeks. In other words, when Male No. 1 has been permanently removed and Male No. 2 at once put in his place, after you start getting chicks sired by Male No. 2, is it possible to get an occasional one sired by the removed male within three weeks or so of his removal?

"A single experiment, conducted on Mendelian lines for the purpose of identifying the chicks, without which nothing definite could be accomplished, has shown me that the question must be answered in the affirmative. If of any use for publication, I shall send it along."

The Orchard.

FRUIT-GROWING AND IRRIGATION METHODS IN CALIFORNIA.

By THE HON. J. M. HUNTER, Agent-General for Queensland.
409 and 410, Strand, London, W.C.2, 1st March, 1920.

California, as the result of a splendid campaign of publicity and advertisement, is world-famous for its fruits and orchards. In many respects it deserves to rank high, for it supplies an extraordinarily large market with first-grade fruit, for which there is always a big demand. But, compared with many fruit-producing centres in Queensland, of which the outside world has never heard, Californian orchards are over-boomed.

Nature has not been so bounteous, even in California, as in Queensland, and during the investigations I made of the fruit-growing industry, with special reference to irrigation, I was repeatedly shown trees producing, after six or seven years, fruit that is grown in Australia in three. Summed up, my conclusions are that Queensland is pre-eminently suitable for fruit-growing, and that with an equal expenditure of capital and labour our State is undoubtedly a much more bountiful and profitable field for the orchardist than any part of America.

The Californian orchardist has neglected nothing that will assist him in making a success of his industry. The Californian irrigation schemes are well developed, and are a practical guarantee to the fruit-grower against drought. Some of these schemes supply a large number of farms, whilst some of the more prosperous orchardists prefer an individual scheme of their own, by means of which they can irrigate at their own convenience, and not at the discretion of the irrigation authorities. Individual irrigation is, however, rather an expensive project, as it means the installation of a large and expensive reservoir on the farm from which to draw supplies.

NO FENCES.

The most striking feature of the fruit-growing industry in California is the almost complete absence of fences around the orchards. This even applies in the thickly populated centres and near townships, and, in addition to proving a big saving in initial outlay and upkeep, is a decided convenience for the marketing of the farmer's products. It would appear, however, to invite theft from passers-by, but the trees on the borders of the roads are as thickly covered with fruit as those in the centre of the orchard, and I was assured that fruit-stealing is practically unknown. This is not on account of any extraordinary moral qualities on the part of the Americans, but simply because the Government has passed such stringent laws for the protection of the industry that fruit-stealing in California is regarded as a criminal offence. A fine used to be the punishment, but it proved futile. Now gaol is the penalty without the option.

The fruit is produced in very large quantities, but, despite this fact, it is not uncommon to have to pay 3d. or even 6d. for a good orange, especially on trains. That the industry is a profitable one is indicated by the comfortable homes and well-ordered orchards. It is the exception for the orchardist not to run his own motor car, and with the marvellous roads of California motor traction is very largely availed of for the conveyance of goods to market or to the train. On five good acres a man "can raise a family." In other words, he can earn £800 a year, though it must be remembered that the cost and standard of living in America are much higher than in Australia.

IRRIGATION.

One of the most successful citrus orchards in California is that of Mr. E. B. Griffith, of Azusa, near Los Angeles, which I was given an opportunity of inspecting. From this farm, I was informed, the owner is netting 12,000 dollars a year, after paying for cost of water, cultivation, fertiliser, and labour. This is one of the orchards that has its own irrigation project. The storage supply is situated on the farm. Pipe lines are laid at an interval of every fifteen trees, which latter are 20 ft. apart, in a row, a similar distance of 20 ft. separating one row from another. The pipes are of cement and 8 in. in diameter.

At the head of each row is a tap or "stand-pipe," arranged with four jets and regulators to direct the flow of water into the four furrows which separate the rows of trees. The orchard is irrigated once every five weeks, and the object in only watering fifteen trees at a time is to get more even distribution. Half as many trees should be irrigated per hour as the miner's inch flow, the contents of a miner's inch being approximately 13½ Imperial gallons. For instance, a 50-inch flow should irrigate twenty-five trees hourly.

STAFF EMPLOYED.

The orchard covers 180 acres, on which a staff of eight men is employed to attend to pruning, irrigation, and cultivation. One is engaged solely as a pruner, and, when necessary, extra men are hired to assist him.

There is a co-operative organisation which renders invaluable help in the picking of the crop, the association sending men to assist in the picking, the cost being deducted from the proceeds of the crop.

The method of picking is interesting. After removal from the trees, the fruit is put into a sack hung over the man's shoulder. It is then placed into a larger case and hauled to the co-operative packing-house, where the fruit is graded into "fancy," "choice," and other grades.

PESTS.

The orchardist has to combat a variety of pests, and his experience in fighting them may be of value to the Queensland grower. The worst pests with which the Californian fruitgrower has to deal are the Red Spider, the San José Scale, Scaly Bark, and Gummosis, the lastnamed being due to allowing damp soil at the budded joint.

Experience has proved that Red Spider can be most effectively treated with sulphur and lime, applied either dry or by wet spray. The solution for the latter can be bought in concentrated form in drums ("Orchard Brand" or "Rex Brand"), and before use is diluted in water. A special spraying machine is used, and is drawn through the orchard between the rows by two horses. A tank containing the solution is attached to the machine, and the liquid is pumped at a pressure of 250 lb. It takes two men to work the plant, and sometimes a third is required to drive the horses.

The treatment for Scaly Bark is still in the experimental stage, but the trouble is certainly diminished by the application of a preparation known as "Bordeaux Mixture," the principal ingredient of which is copper sulphate.

For San José Scale fumigation is employed, the operations being carried out by a co-operative company, the gas used being extremely volatile and very dangerous. Prior to treatment a large heavy calico or light canvas tent is thrown over each tree, and if the tent is not large enough to be air-tight earth is shovelled round the edges. An accurately trained man, whose work is of extreme importance, then judges the exact amount of gas that should be pumped under each tent, and on his judgment largely depends the success or ruination of the farmer. After fumigation, the tents are allowed to remain on the trees for forty minutes, but are then removed. The solution used is liquid hydro-cyanic acid gas, made by treating potassium cyanide with sulphuric acid. It has been invented locally during the last two or three years, and is really a very good remedy, the life of the tents themselves being trebled by this as compared with the old treatment. As the tents cost £50 each, this means a considerable saving.

GENERAL.

Though the best crop is oranges, lemons are also extensively grown. Of these the best fruit is picked green. They are picked by size, after measurement by a ring. After picking, they are taken to the packing-house and sweated by steam in an air-tight room belonging to the co-operative producers. They are then laid on trays in the packing-room and kept there for some weeks, after which they will keep for a remarkably long time.

It may be noted that the rubbish from the pruning is cut up and used for manure, and that peas are used as a cover plant.

Should you desire a further elucidation of any of the points raised, Mr. E. B. Griffith, the gentleman whose address is given above, would be pleased to furnish you with any information if you write to him direct.

ERADICATING FRUIT PESTS.

In the May issue of the journal we republished from the "Brisbane Courier" a paragraph on the discovery of a new method of dealing with fruit pests. We have since had an interview with Mr. W. H. Parker, chairman of the Q.F.I.T. Society, who is one of the earliest and most successful orchardists in this State. He described the method of dealing with citrus pests as published, and explained how the inspiration came to him—by considering how medical men deal with many diseases in human beings by treatment through the blood. That being so, he thought, "Why should not diseases of plants be treated through the 'sap,' which is the life blood of the tree?" He then experimented, and the result is as described in the following article in the "Moreton Mail" of 2nd April, 1920:—

"The idea is not by any means new. The specific used may be, but the method of application was proved to be a success upwards of a quarter of a century ago. The honour of the discovery is claimed by Mr. W. H. Parker, the chairman of the Q.F.I.T. Society. He, as is generally known by Queensland fruitgrowers, is a very old hand at the game. He was born on an orchard, and has been interested in fruitgrowing for about three score years. About a quarter of a century ago some of the trees in his famous 'Glen Retreat' orchard were in a very bad way. He had ordered their removal when a thought struck him, and he experimented. He bored holes in them with an auger, cleaned them out, and filled them with flowers of sulphur. He trusted to the sap to do the rest. And the sap did not fail him. The trees flourished exceedingly and bore such good fruit that samples of Paper Rind, St. Michel's, and Queen oranges, sent by him to Mr. F. Coffey, of Sydney, then the leading nurseryman of New South Wales, were very highly praised. Coffey pronounced the fruit to be excellent and some of the finest that he had ever seen. It is a great pity that Mr. Parker did not follow up his experiments. As is well known, he is the 'discoverer,' or, to be more correct, the propagator of the now world famous 'Beauty of Glen Retreat' mandarin. Had he wished, he could have made a fortune out of that beautiful fruit. But he did not do so. On the other hand, he distributed it free amongst the people of Australia. Had he followed up his sulphur hole-in-the-tree cure, and changed the name of the specific, it is quite on the cards that another fortune could have been won. But Parker is one of the curiosities of these days. He works for the public good—without fee, and without reward.

PINEAPPLE-GROWING.

A correspondent, some time ago, propounded the following question on this subject to the editor of this Journal, to which the replies are appended:—

1. How long a time elapses between the planting of the suckers and the first production of marketable fruit?

Answer.—From twelve to twenty months (except where suckers throw fruit as soon as planted), according to the type of suckers, and the time of year when planted.

2. How long between the first appearance of fruit on the sucker and its readiness for market—summer and winter?

Answer.—Rough Leaf, about four months in summer—five months in winter. Ripley Queen, about four and a-half months; seedlings, about four and a-half months.

3. How long between first fruit and subsequent fruit from the same stock?

Answer.—The stock which has borne a fruit will bear no more. The subsequent fruits follow from the suckers.

4. Should the buttons that grow on the stalk beneath the fruit be removed when the fruit is gathered? If so, why?

Answer.—Some plant the buttons from the Common or Rough Leaf; but these are of no value for planting for a marketable product. Buttons from Smooth and Ripley Queen pines are better for planting than strong plants, as the first fruit from the button is marketable, whilst that from the sucker is not.

5. If buttons are allowed to remain on the stalks, will they bear fruit; and if so, at what period?

Answer.—Remove them, plant them out, and they will bear in two years.

6. Which are best for planting purposes—suckers, tops, or buttons; and how long between planting and bearing of each?

Answer.—Suckers are the best in the case of Rough Leaf pines. Tops will, it is said, produce better fruit; but it takes two years and more before they fruit. Buttons, except those above mentioned, are not worth planting.

7. Is the mealy bug really detrimental to the fruit? What means should be taken to combat it?

Answer.—The mealy bug does no harm to the fruit; but it should be brushed off before marketing the latter.

8. What is the best manure for pines; how should it be applied; what season of the year is best; and how often?

Answer.—The best manure for pineapples is stable manure. If this is not obtainable, the best results will be obtained from a complete manure containing at the rate of 150 lb. of pure potash, 75 lb. of nitrogen, and 75 lb. of phosphoric acid to the acre. Bone dust by itself, applied at the rate of 1,000 lb. per acre, shows no results at first, as it is a slow-acting manure. Nitrogen is of vital importance. Green manure (cow-peas) may be ploughed in, and suckers planted during the next season. Shirley's, Graziers', and Redbank manures may be applied about August, and again, after the summer crop is off, to give good growth during the autumn and winter. Plough in. Plant Smooth-leaved pines in rows 4½ ft. apart every three years. They do not spread like the Rough-leaved.

LISBON LEMONS GROWN AT MOOROOKA.

BY F. E. FRIEND.

Moorooka is a suburb 5 miles from Brisbane. The tree was set in July, 1916.

The several branches had to be staked, in order to assist them to bear the weight of fruit.

The ground is a clay subsoil, and the top soil has been judiciously manured. These lemons are selling at 2s. and 3s. per dozen.

It can be easily seen from the above that a good lemon orchard would be a paying proposition.

This tree was purchased from John Williams's nursery at Sunnybank.

The first crop of lemons totalled twenty-six dozen, in March, 1919.

[The two photos. supplied were not sufficiently clear for reproduction.—Ed.]

THE HOME GARDEN.

FLOWERS AND FRUITS.

Care in treatment is more necessary than heavy manuring for fruits and flowers. But they like attention from the compost heap now and again. It brightens them up wonderfully. The main requirement, however, is to keep insects and other pests in check. This is done very effectively by close pruning of the trees, so that they may not overbear and exhaust themselves, and by destroying insects, fungus growths, &c. These things require attention here, as they do in all other lands. Most of the pests of the garden are in a dormant state during winter, and they can be destroyed most effectively at that time. A wash or paint made of lime (4 lb.), flour of sulphur (2 lb.), water (2 gallons), and as much clay as will make a thick paint, acts as a manure for the trees, and it kills insects, fungus, &c. It should be put on the trees thickly all round the limbs and as far up the branches as possible; and, then, to aid us still further, we can use potash and other substances as washes, or by showering them upon trees and crops, and so kill insects, &c., and manure the land at one and the same time. Men have to attend to such matters in all parts of the world where successful agriculture is carried on; and we are neither better nor worse off than others in that respect.

Tropical Industries.

THE MAROOCHY SUGAR DISTRICT.

One of the most picturesque sugar districts in Queensland is that known as "the Maroochy." On each side of the river good cane farms are to be found, and, as the rainfall this year has been much more favourable than in other Southern sugar districts, the crops are looking particularly well, upwards of 50 in. of rain having fallen there since the beginning of the year. The General Superintendent of the Bureau of Sugar Experiment Stations, who has been visiting that area, reports that the cane is looking excellent and making fine growth. A highly successful meeting of canegrowers was held at the School of Arts, on the Maroochy River, on Tuesday evening, 1st June. The importance of growing more sugar for Australian requirements was strongly urged, and Mr. Easterby dwelt upon improved cultivation and fertilising methods as great aids to increased production. Insect and cane pests were also touched on. A large number of questions bearing on the industry were put at the end of the meeting, and a conversational discussion followed. As an example of what can be achieved in connection with increased production, it may be mentioned that the following day Yandina was visited, and a new area of land opened up by Mr. Bowder (a well-known resident of the Yandina district) was inspected. At the beginning of November last year this land, which is situated on the railway line between Nambour and Yandina, and is partly forest and scrub, was under heavy timber. The land was rapidly cleared, and to-day there is a highly promising cane crop in sight upon 70 acres. It is Mr. Bowder's intention to put in 200 acres of cane in all for the Nambour mill. The ground has been as well cultivated as possible with the hoe, and the cane is well grown, excellent in colour, and thriving splendidly. Mr. Bowder deserves the greatest credit for his enterprise, which should, it is hoped, have a good effect in the district, and eventually lead to the Nambour mill being fully supplied. Already other adjacent pieces of new land have been also put under cane.

RATS IN SUGAR-CANE.

The following paper on the rat trouble in sugar-cane will doubtless be read with interest by Queensland planters. From our own experience, we can vouch for the loss sustained by rats on plantations where these were numerous. Some years ago we were greatly troubled by the rodents on a plantation at Pimpama (Ormeau); but there was no remedy tried which was successful. The paper alluded to is by S. H. Skaife, M.A., Entomologist, School of Agriculture, Cedara, Natal, who writes, in the "Journal of the Department of Agriculture" of the Union of South Africa, as follows:—

On the whole the sugar planters in South Africa are singularly fortunate in having very few pests of importance to contend with. Compared with the conditions found in other sugar-growing countries, the plantations here are remarkably free from such troubles as fungous diseases, borers, mealy-bug, froghoppers, &c. Recently, however, the sugar farms on the Umfolozi Flats have suffered severe losses from the depredations of rats.

The rats in question are not the cane rats proper (*Thryonomys swinderenianus*), but four or five different species of ordinary field rats. They are present in enormous numbers in fields of cane ten months old and older. Cane younger than ten months is not troubled much by these rats, as it does not seem to afford them enough shelter against owls and hawks. The rats are found on all the farms along the banks of the Umfolozi River, but in most cases the damage is moderate compared with what is found on two or three farms along the north bank. On these farms the rats teem and cause great damage by gnawing through the base of the cane, causing it to fall and dry out. Mr. Jack Martens, of River View, whose farm is perhaps the worst infested of all, was cutting during November last (on the occasion of the writer's visit there) only 7 tons of cane to the acre instead of an average of 35 tons.

The rats causing the trouble are nearly allied to the common house rats, and resemble them closely in general appearance. They are apparently widely spread in South Africa, yet it is seldom we hear of them causing such serious damage as related above. They are reported to be giving trouble at Empangeni, not as a pest of sugar-cane, but as a nuisance in a cotton field where they robbed the bolls

as soon as they were open, removed the seed, and lined their nests with the fibre. An experimental plot of cotton on Mr. Duncan's farm, at Umfolozi, was treated in exactly the same manner, and, although the plants did well, there was no cotton to be gathered, as the rats took it all.

The trouble at Umfolozi seems to be entirely due to an upset in the balance of Nature. The farms in this district suffered severely from floods in February, 1918; and the planters state that hundreds of snakes were killed by these floods. Formerly snakes were very common in the plantations, but now they are seldom seen. Thus the rats were rid of one of their chief enemies, and consequently have been able to breed enormously under the ideal conditions of an abundant food supply, ample shelter, and freedom from persecution. Hawks and owls abound, but as the rats make their homes amid the dense growth and thick trash of the older fields they are practically immune from attacks by these enemies. The theory that the present outbreak is indirectly due to the floods is borne out by the fact that the worst-infested farms are those which suffered most from the floods.

In all probability the balance of Nature will be restored sooner or later. The natural enemies of the rats will be attracted by the abundance of their prey, and in the presence of an ample food supply they in turn will breed up and eventually restore the rodents to their original numbers. But in the meantime something has to be done to check the damage.

The chief object of the writer's visit to Umfolozi early in November last was to try out a virus kindly supplied by the Union Commerciale, Smith street, Durban. This virus is manufactured by the Pasteur Institute, Paris; it is sent out in tubes and known as "Pâte Verte." It is said to have been highly effective against rats in the trenches during the late war. The application of the virus is very simple; it has to be spread on bait and placed where the rats can get at it and devour it.

Two dozen field rats were captured and placed in a large roomy cage. Every day for a week these rats were fed on short lengths of sugar-cane smeared liberally with the virus. They ate the cane quite freely, yet at the end of the week all were as healthy and happy as some others which were not fed on the virus. Either these particular species are immune from the organisms which are pathogenic to ordinary rats, or else the virus had lost its virility owing to its age. One of the first essentials in using a virus is to obtain it as fresh as possible, otherwise the disease-producing organisms may die out or lose their virulence. The virus used at Umfolozi was at least two months old, and this may have been the cause of its failure to act.

SEVERAL POISON BAITS

were tried on other caged rats to see if a bait could be found which was more attractive than sugar-cane. The poison used in every case was a sweetened 2 per cent. solution of strychnia hydrochloride. Extensive experiments in America have proved that strychnine is about the best poison to use in the destruction of rodents. The soluble hydrochloride was used, as it is more easily applied to the baits in the form of a solution than the insoluble strychnine crystals. Raisins, slices of potato, sweet potato, carrot, and short lengths of fresh cane were soaked in the 2 per cent. solution for an hour or so and then placed in the cages with the rats. Next morning twelve out of the twenty rats were dead, and during the day seven more died, leaving only one alive. The raisins, potato, sweet potato, and carrot had been left severely alone, but the cane had been freely eaten. Thus it was found easy enough to destroy cage specimens, but the application of the bait under field conditions was a different matter. The poisoned cane could not be scattered broadcast owing to the danger of oxen finding it and eating it. It was also found impracticable to search for the holes and place the bait down each hole, owing to the dense growth of the older plantations and the thick covering of dead foliage.

A third method that was tried seemed more hopeful. It is the practice of the planters to burn the trash and dead vegetation before cutting their cane. By surrounding a field as it was being burnt, it was found that very few rats were driven out by the fire and still less were found dead after the fire. Thus it was concluded that they were all driven into their burrows by the fire and an attempt was made to dig them out. The majority of the holes were found to be lodged

among the roots of the cane, consequently it was impossible to dig out the rats without injuring the roots to a certain extent. The burrows were by no means deep and were easily opened up. In nearly every case one or more rats were found at the bottom of each burrow, and in some cases as many as ten were found in one hole. The rats were dazed and stupefied by the fire, and were easily caught and destroyed.

Thus we have here a comparatively simple means of getting this pest under control under the present conditions. The planters could burn off just enough cane early in the morning to suffice for the day's cutting. After the cane has been cut, the natives could be set on to dig out and destroy the rats on the piece of land just cut. It would be inadvisable to leave the destruction of the rats till next day, for from observations made it would seem that the great majority of the rats, if not all, trek overnight from the field that has been cut into the neighbouring standing cane.

From the planters' point of view there are two objections to this measure. First, the roots of the cane are somewhat injured by the digging; and, secondly, labour is scarce and difficult to obtain. But the need for some such remedy is desperate, and the present writer is convinced that the loss entailed by the damage to the roots and cost of labour will fully be set off by the increased crops obtained.

The expense and trouble of the suggested remedies are surely justified in the case of a pest which causes such heavy losses as the present one, amounting to 75 per cent. of the crop or more on at least two of the farms visited.

The planters are very keen on the idea of a virus which will start an epidemic among the rats and eventually wipe them out. Nothing could be better, provided such a virus could be found. In the first place, although several viruses have been put on the market at various times, seldom have any of these proved satisfactory. The rats in the trenches in Flanders were congregated in large numbers over small areas, were mostly ravenously hungry, and were easily induced to take the baits offered. Under these conditions the use of a virus proved very effective, but it is extremely doubtful whether the same effects would be obtained by the use of a virus in the cane fields. In the second place, it is very difficult to obtain fresh virus in South Africa. The writer made inquiries of most of the big dealers in agricultural supplies in Pietermaritzburg and Durban, and only from the Union Commerciale was he able to obtain any at all. The latter firm had only two tubes in stock, and these were generously placed at the writer's disposal for experimental purposes. This meagre supply was all used up at Umfolozi with the results detailed above. Thus it would seem that the planters' hope of the pest being overcome by the use of a virus is doomed to disappointment, and that some such measures as those discussed in this article will have to be adopted, troublesome and expensive though they seem.

ARMSTRONG-WHITWORTH AND CIVIL ENGINEERING.

To those who have watched the recent operations of the great Armstrong-Whitworth concern in the share markets, it will occasion no surprise to hear that they are preparing to add civil engineering and public works contracting on a large scale to their extensive enterprises.

We understand that this civil engineering department has now been formed, under the control of Mr. Robert H. Mackenzie, and will commence operations immediately.

The firm's recent amalgamations place them in the strongest position for undertaking big contracts of this nature in any part of the world. In addition to the great resources of their works at Elswick and Openshaw, they also have the assistance of Messrs. Armstrong and Main for constructional work and of Messrs. Crompton for electrical undertakings. Their recent purchase of Pearson and Knowles shares now places them in control of important supplies of raw materials and completes a combine, the organisation of which will enable them to undertake throughout civil engineering contracts of any magnitude. This may be said to be a departure in regard to civil engineering practice which will materially assist in the development and future prosperity of the Armstrong-Whitworth interests.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No. 17.

NEEDLE BURR (*Amarantus spinosus*, LINN.)

Description.—An erect, much-branched, glabrous annual of 2 to 3 ft., spiny at the leaf axils; spines straight, ¼ to ½ in. long. Leaves long-stalked, broadly lanceolate, 1 to 4 in. long, ¾ to 2 in. broad. Flowers in clusters in the leaf axils and also in long terminal spikes; both clusters and spikes spiny. Seeds small, lens-shaped, black or reddish black, smooth and shining.

Distribution.—It is a common weed over the tropics and subtropics of the world; it has been naturalised and is an abundant and aggressive weed in Northern Queensland for many years, and has recently made its appearance in more southern parts, specimens having recently been sent in to the Weed Pest Committee of the Commonwealth Bureau of Science and Industry from the Rosewood Shire Council, and I have also seen it about Brisbane. Whenever seen in new localities it should be immediately destroyed, and the above description and accompanying illustration should enable persons to easily identify it should it make its appearance in their district.

Common Name.—In Queensland it is usually known as "Needle Burr." In the Southern United States of America it is known as Spiny Amaranth, Soldier Weed, and Prickly Careless Weed.

Uses.—In tropical Asia the young plants and tender shoots, as with others of the genus, are used as food by the natives, being cooked in the same way as spinach.

Eradication.—As the seeds have considerable vitality in the soil, efforts should be made to prevent seed production, and the plants should be hand-pulled or closely hoe-cut before the flowering heads and spikes develop, or, at any rate, before the seeds ripen.

ALGAROBA SEED.

With reference to the advertisement to the effect that Dr. Hastings Reed, Cairns, would be pleased to supply imported seeds, we have since been informed by him that he has exhausted his supply of seed, and applicants are hereby notified to that effect.

PLATE 1.—"NEEDLE BURR" (*Amarantus spinosus*).
A, Seed (natural size). B, Seed (× 10).

Science.

WATER-FINDING.

At one time it was customary to look upon a person claiming to have the power of locating underground water as a visionary fanatic. Yet to-day not only is it accepted as a fact, but that not only water but oil can be located, as has lately been demonstrated by Mr. Arthur Morry, surveyor and engineer in the Department of Agriculture and Stock, who has located a large oilfield near Brisbane, has formed a strong company to work the field, and the necessary machinery has been provided. In all cases of finding water Mr. Morry has been able to indicate the depth at which the water would be found; but, singular to say, he unerringly has stated whether the water would prove to be fresh or salt, giving also the width of the stream.

So far back as 1908, we published the following notes on the subject:—

Such a gift (we said) is one not to be despised in a country like Australia, some parts of which are devoid of surface water. We believe that there are some very successful water-finders in Queensland, but their modesty is so great that we seldom hear of their doings and of their methods from themselves. In New Zealand a clergyman has a wonderful gift in this direction—the more wonderful since he uses no rod whatever. He has been very successful in locating water in that country, and has given some account of his methods to a representative of "The New Zealand Farmer," from which journal we take the following account of the Rev. Mr. Mason's operations:—

Considering that the fact of water-finding is as well established as the demise of the late Queen Anne, it is astonishing how many people know absolutely nothing about it, and how many look upon it in the same light as telling fortunes by cards or tea-cup reading, and dismiss it all as "fudge." The divining rod has probably at times been used as a means of deception, but so have other things which, in the hands of the proper persons, are instruments for good; and the broad fact of being able to locate the position of underground streams of water, or the pools from which artesian wells are tapped, is as unassailable as the statement that the needle of the compass points north. The power is such a remarkable one that no wonder it was in by-gone days classed with the black art by the ignorant, and even in the light of present-day knowledge one cannot see it manifested without a feeling of astonishment and something approaching awe. The fact that the power is possessed by so comparatively few, and that thousands could walk over the same ground till they dropped from sheer exhaustion without experiencing any of the sensations which tell the water-finder that he is over living water, is in itself sufficiently remarkable and is quite enough to prove to the "what I don't understand I don't believe" class of persons that the whole thing is fudge.

It is usual for water-finders to carry a forked stick, but Mr. Mason dispenses with this, and simply stretches his hands out. As soon as he comes over living water, he is affected with a trembling which seems to be in proportion to the size of the body of water over which he is standing. The pipe at his feet marks the spot at Richmond Hills where water was found in abundance at 50 ft. after an unsuccessful attempt had been made at twice that depth only a few yards away.

Round about Auckland there are a good many settlers whose opinions on the subject are very different from those they held not so very long ago. At Otahuhu lives the Rev. Harry Mason, vicar of Holy Trinity Church, and he is one of the few in New Zealand who have the gift of locating water that is hidden from the ken of ordinary mortals. There are hundreds of well-authenticated instances in which he has found water for people who were badly in need of it, and, as the late Mr. Samuel Luke once said to the writer, "I don't know what the people out our way would have done this summer if it had not been for Mr. Mason." The numerous cases cited in support of his success, and also the somewhat unusual circumstances—that he was a clergyman, and did not make a profession of finding water—led a "New Zealand Farmer" representative out to the village one day recently to investigate first hand. After some difficulty—for he has a cordial hatred of publicity—Mr. Mason was induced to talk about this gift, or power, or whatever we decide to call it, and, as he had had the advantage of a scientific education, his remarks on the matter are full of interest to the student of the question, and those who know nothing of it will see that water-finding is simply a manifestation of some force of which we have as yet only a very elementary knowledge.

DISCOVERING THE POWER.

"It is a rather peculiar story," said Mr. Mason, in answer to a question as to when he first became aware that he had the power. "About ten years ago, when I was in the Taranaki district, I met a Dr. ——, who was travelling leisurely round

the world, and he possessed the gift of finding water with the divining rod, or at least he said he did, though I did not give any credence to his claim, as I was a sceptic in those days. One day, while on a farm in the neighbourhood, the owner of the place was complaining about the scarcity of water for his stock, and I said, laughingly, 'Oh, you should have Dr. —— here. He would soon find you water.' They wanted to know what the doctor did, and I cut a rod from one of the trees near by, and, holding it like Dr. —— used to, I walked a few yards to show the farmer how it was done. Suddenly, to my surprise, I found that I was affected just as the doctor had been, and the stick snapped under the influence that was exerted. This was the first indication I had of possessing the power, and, as I tell you, I had previously laughed at the idea of there being anything in it.''

''But I understood that you did not use the rod?''

''Not now. And that is another peculiar story. One day, while working in the orchard, I discovered quite accidentally that I was affected without anything at all in my hands. I had just thrown down a grubber I had been using, and, after the manner of tired people, had yawned with my hands stretched out slightly behind me, when I felt a sudden trembling, and it seemed as if somebody had gripped me by the biceps and was trying to pull me backwards. Nonplussed for the moment, I pondered over the incident, and at last came to the conclusion that it must be the water. Subsequent events proved that it was so. With regard to the rod, my experience has been that it is not always reliable, as it will act in the hands of a hysterical or highly-nervous nature when there is really no water there. Nowadays I never use any rod or stick, but simply walk along with my arms stretched straight down by my side, pointing somewhat to the back. When over water, I feel the sensations that I have just mentioned, and it seems that the greater the body of water the more intense are the sensations set up.''

SUGGESTED EXPLANATION.

''Have you formed any idea or theory about this much-discussed power?''

''Yes; and, though I have not previously seen it suggested, I feel convinced that it is the scientific solution of the great disadvantage, that none have been made by men of scientific attainments, but they have all laboured under this great disadvantage, that none of them have been possessed of this peculiar gift or power, or whatever you like to call it, of being sensitive to the influence of underground water. It is known that there is a certain amount of friction in flowing water. Professor Tait, of Edinburgh, has carried out experiments which prove this, and reliable figures can be quoted from his book, but, except to those acquainted with mathematical physics, those figures would convey little information. However, to give the results of his experiments in a popular form, I may say that I gather that the force generated by this friction decreases proportionately with a rise in temperature of the water. A certain volume of water of the temperature of 40 degrees Fahr. would generate a force half as much again as a similar volume of water at 80 degrees Fahr., the velocities of the two currents being the same. Some people say that this force is magnetic, but I think I have proved that it is not. I have insulated myself by standing on a piece of glass and also on rubber, and still have felt it. I have also experienced it while on horseback. Another experiment tried was with a magnetic needle, which I placed close to me in many different positions while feeling the influence of the water, but the needle was not affected in the slightest. No; I think it is not magnetic It is some force that is at present unknown. We are always discovering something new in the scientific world, some new forces—the Rontgen Rays, for example—and I am convinced that this power of finding water is explainable on a scientific basis, and upon that alone. You are aware that all currents, magnetic or electrical, must complete a circuit. As illustrations, the return circuits in connection with the tramways and the telephone may be mentioned. Now, my theory is that the friction of the running water, or, rather, living water, under the ground, sets up an energy which is not all used up in raising the temperature of the water, but comes up through the ground, and, finding me a good 'conductor,' flows through my body, and seeks to re-enter the earth by way of my arms, and so complete the circuit. I think that this is proved by the fact that when I stand over stagnant water—a well, for instance, in some cases—there is not the slightest effect on me.''

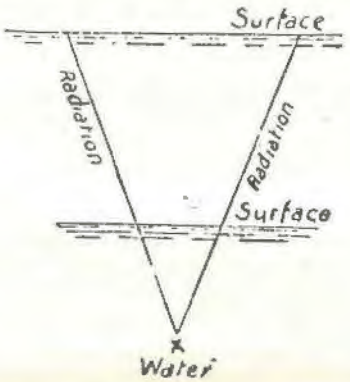
Mr. Mason was asked if he had any means of arriving at the probable depth the water would be found after he had located it.

''No,'' was his reply, ''I must confess that I cannot tell, except in country where I have located a lot of different spots, as at Papatoetoe, and there it is only by analogy, of course. However, I think it probable that there is some way of arriving at a solution, and am now working on the matter in conjunction with a mathematical friend of mine. It seems to me that there may be some relation between the width of surface of ground over which the force is felt and the depth from which the force comes. Let me explain. If it is not at a great depth from the surface, it will not radiate over much ground; but if it is situated at a considerable depth

it will have time to radiate fan-like over a proportionately greater area of ground. This is only a supposition, but it seems to me there is something in it."

Mr. Mason then gave demonstrations of the work, and indicated several spots on his own property where water existed, and also went over the ground across the road where the city council was boring for a supply for the abattoirs—a matter which is again referred to later on. He simply walks along with his arms by his side, his hands pointing somewhat behind, and when he comes on to ground over water he is seized with a trembling in the hands and arms, and the body bends as though he were being forced down by pressure on his two shoulders, till he stands on tiptoe. In some places the effect on him is more marked than in others—presumably owing to a greater or less body of water. If one holds Mr. Mason's wrist while his body is undergoing this contortion, one can feel a sensation not unlike that received from one of those penny-in-the-slot electrical contrivances which are so popular at fairs. Asked if he felt any after effects, Mr. Mason said there was a strained feeling in the muscles of the legs after a big day—He has located over thirty spots on some days—and he could not sleep the night after, but experienced nothing unusual beyond that; and, if he found one or two places only, he felt no inconvenience whatever. It is only when he stretches his arms down in the manner referred to that he can tell when he is over water; and, taking this in conjunction with the fact that those who use the rod must naturally exert a certain amount of force to hold it, one comes to the conclusion that there must be a certain rigidity in the muscles of the upper part of the body before the finder answers to the force generated by the running water.

Mr. Mason believes that there is some connection between the width of the ground over which he feels the sensations set up by the water and the depth at which one may get the water. Take, for instance, the lower line marked "surface" in the diagram. If he can be affected over an area of, say, 3 yards, and the water is tapped at 50 ft., then if he be affected over a greater area, as in the second line marked "surface," the depth at which this water will be found will be so much deeper in proportion. Of course, these figures are purely supposititious.



Some very interesting phenomena are met with now and again in the course of the work. While a bore was being put down at Mangere, the men, after going through scoria for a considerable distance, came across a buried tree (which was afterwards proved to be kauri), and struck a grand flow of water. Many, many centuries ago there must have been a forest there which was buried by some eruption, all the country round about being volcanic. At Mount Wellington, while looking for water for the road board, Mr. Mason found an enormous body of water right in the middle of the scoria pit which is now being worked, and that hundreds of small streams radiated from this centre all round the mountain. His investigations also proved to him that Lake St. John—about whose source there have been frequent discussions—was fed from Mount Wellington, as he traced the course of the underground streams from one to the other. On one occasion Mr. Mason located water for a man in the Waikato, and heard no more about it till one day a messenger came asking advice, as they were in difficulties with the bore. Water had come in intermittently when they had reached a depth of 184 ft., but they had gone down 350 ft. without success; and, as it was getting beyond their means, would Mr. Mason tell them what to do? He replied that there was evidently some obstruction at the 184 ft., and advised putting in a charge and blasting at that spot. The man was canny, and did not like to blow away all the work of weeks, so he put in a charge at the bottom of the bore. No result. He put in another higher up. Still no result. Finally, he exploded a charge at 184 ft., and the water at once came in with a splendid flow.

Entomology.

CANE GRUB INVESTIGATIONS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigations from Dr. Illingworth, entomologist of the bureau:—

The seasons are being turned upside down in North Queensland. The rains, delaying in starting, have certainly made up for lost time by the continued downpour of the past month. Unfortunately, the ground was so saturated that the cane has made little advance; and it is still several months behind its usual size. As is usually the case, the activities of the grubs were not so noticeable while the soil was wet, but the effect at Greenhills was startling, once the rains ceased. Within four days the whole infested area yellowed, and, in places, the leaves turned brown, giving the appearance that fire had scorched them. Furthermore, the end is not yet; the large third-stage grubs are not nearly through feeding. Usually they go deep into the soil to hibernate before the cold nights of May begin; but they were so late in hatching this season, due to the delayed rains, that they must feed for several weeks yet in order to store up sufficient fat to last them during the long hibernating period. It is approximately six months before they change to beetles and emerge to begin feeding again.

A recent visit to the Babinda area, which is one of the most humid in the North, was very satisfactory. I have not seen finer cane this season. Situated in the heart of the scrub, this newly-cleared district is virgin land; and with the copious rainfall, which began last season three months earlier than in the vicinity of our station, the cane has made steady advance. White grubs have not gotten a foothold there yet, though the Beetle Borer (*Rhabdocnemis obscura*, Boisd.) is a serious pest, and is spreading very rapidly. With the heavy crops of rapidly growing and often fallen cane, the conditions there are most excellent for the quick multiplication and spread of this pest.

Fortunately, the Tachinid parasites are still available at Mossman, where these flies are doing much to hold the pest in check. As I have indicated in former reports, I have made several minor attempts to introduce the flies into other districts; and several colonies of the parasites have been liberated at Babinda. Nevertheless, I have not yet been able to find these friendly insects established in the fields where they were liberated. With the assistance of the Cairns Canegrowers' Association, I am now making a more extensive effort to establish these parasites here. A large breeding cage has been constructed at the station, along the lines of those which I used successfully in Fiji, and a fresh supply of the flies has been brought from Mossman. The difficulty just now, however, is to secure sufficient borer grubs for the flies to work upon. Several hundred per week are required for successful breeding operations, and these are difficult to secure while the cane is standing. As soon as cutting begins—next month—it will be an easy matter to get all the grubs I need, and I hope then to be able to distribute larger colonies to our principal infested areas. From this new supply I have already liberated another colony at Blackwell's farm, near the river, where the crop is heavy and the borers again plentiful.

Possibly when the cane is cut we will be able to find that the parasites are essential in some of the fields where colonies were liberated last season.

Lepidiota albohirta at Greenhills.—As I intimated in last report, it was the end of April before all the grubs changed to the third or final stage; and even now (15th May) most of them are far from maturity. Nevertheless, the fields in the infested area are already a wreck, and the limits of this area are considerably extended—fully a quarter of a mile more than usual.

In a former report I called attention to the value of poultry, which was apparently responsible for the control of the pest in the vicinity of the quarters. All the fowls, however, were disposed of before the flight of the beetles this season; so I have looked forward with interest to note the result upon the crop. The area, several chains in length, which was formerly immune, is now thoroughly infested; all the cane is yellow and drying up. It would appear that the fowls are able to do this valuable service because of the great numbers of egg-laden beetles which they destroy when the females fly to the cane in the early morning to oviposit.

Several hundred acres of the most fertile and beautiful soil have been thrown out of cultivation on this estate this season because of the devastation of this terrible pest. It is interesting to remark that during the past five years the present owners of the lease have sunk £29,000 in a continued attempt to produce a paying crop on this infested estate of approximately 1,000 acres of cultivated land. It is enough to make one heart-sick to view the wreck of the crop, when one considers all the work and expense that have been put into it.

As has been suggested, there may be some value in having fields thrown out of cultivation for a time. In some cases such fields have produced well when planted again, for the grubs do not always reappear at once. Recently, when I noticed an abundance of the parasitic wasps (*Campsomeris* and *Scolia* species) feeding in the pink flowers of the burr which now covers the uncultivated fields, it occurred to me that this might be an explanation. These wasps normally must go far from the cane areas to find nectar-bearing flowers, and probably few of them ever get back to perform their friendly services. With nectar abundant near the fields, the wasps congregate in such numbers that they should have a very beneficial effect in reducing the grubs. It will be recalled that I have suggested, in earlier reports, the planting of the nectar-bearing shrubs, &c., along the headlands or in the hedgerows—anywhere that there is waste land—to serve this purpose.

ARSENIC FOR GRUB CONTROL.

As I suspected last month, the placing of arsenic in furrows on either side of the stools has proved absolutely worthless, as far as controlling the grubs is concerned. I have already explained that this is probably due to the habit of the beetles. When flying to the cane to ovipost, the females alight on the canestalks and rest for a considerable period, before proceeding downward directly into the heart of the stool; the cluster of eggs being deposited in a well-formed chamber, where, in the case of ratoons, it is not possible to reach them by cultivation. Then, too, under the drought conditions which we experienced early in the season, the young grubs do not migrate sufficiently to come into the poisoned area of soil at the edges of the stools.

I have extensive experiments started to determine a satisfactory method of applying the arsenic, and, also, to find just what quantity of the poison is necessary. I am confident that with another successful growing season some definite results may be accomplished.

DESTRUCTION OF FEEDING TREES.

The experiment, which I have under way at Greenhills, is not yet extensive enough for very conclusive results. Nevertheless, we are apparently going to get considerable profit on the cost of clearing. I will be able to say more definitely within a few weeks, when the devastation by the grubs is finished for the season.

DOTICUS SP. (D. PESTILENS?) ATTACKING GRANADILLAS IN QUEENSLAND.

By EDMUND JARVIS, Assistant State Entomologist.

PAST HISTORY.

The first record of an Anthribid beetle of the above genus proving injurious to cultivated fruits in Australia was, I believe, in 1889, when several specimens of this little weevil, together with a quantity of shrunken apples, were sent to Mr. C. French, senr., F.L.S., who at that time had been recently appointed Government Entomologist of Victoria.* Mr. Oliff, to whom he submitted this apple-beetle for identification, finding it to be new to science, gave it the name of *Doticus pestilens*.

"The fruit," says Mr. French, "when attacked by the grub of this beetle, will remain for about a month before it shows any decided signs of shrivelling, when the apples wither and dry up."

* "Handbook of the Destructive Insects of Victoria": French. Part I., p. 83.

The grub is said to perforate such fruit until reaching the centre, where it undergoes the closing stages of its metamorphosis, finally emerging as a beetle in time to damage the early crop.

It may interest Stanthorpe apple-growers to learn that the varieties found to be attacked first in Victoria were "Reinette du Canada," "Emperor Alexandria," and "Winter Majetin."

More recently (1910 to 11) the occurrence of *Doticus* was noticed, in various orchards close to Brisbane, on the stems and fruit of papaws; but, although regarded with suspicion, the beetles were not found directly associated with plant injury of any kind.

In 1914, however, the writer† bred a species of *Doticus* from green bananas, the pupæ of which were situated in the ends of fingers that had been bored in the first instance by larvæ of *Heteromicta latro*—a Paralid moth which breeds normally in flower-stalks of grass trees; so in this case the former was probably a secondary insect and perhaps attracted by the injured semi-dry condition of the fruit pulp.

OCCURRENCE IN UNRIPE GRANADILLAS.

Whilst studying some minor pests of the granadilla at Meringa, near Cairns, in 1919, a coleopterous larva was found by the writer inhabiting a hole made in the stem-end of a green fruit, under the dried corolla, and filled in with pellets of dejecta.

In order to make sure that it was a primary pest, this grub was transferred (22nd June) to a green perfectly sound granadilla fruit, enclosed in a suitable cage, and when examined three days later had again tunnelled under the rind and covered itself with a mat formed of excretory matter. Upon removing this covering, it was found lying in a cavity with smooth vertical sides about a quarter of an inch deep; and when looked at a week later (2nd July), it had once more sealed the top of this cell with a roofing of similar material, but hardened by the application of some special fluid to a firm consistency, under cover of which transformation to the pupal stage had taken place.

The pupa was of the usual coleopterous form, and at first milky-white; but by the end of a fortnight the outer portions of the elytra had turned light blue, darker at apex, and the eyes and mandibles deep-brown. The beetle emerged four days later (20th July), when it was then seen to be a species of *Doticus*.

DESCRIPTION OF BEETLE.

About a quarter of an inch long, of humped-up weevil-like form, and a uniform dark reddish-brown colour. Legs long, particularly the front pair, which have unusually large thickened tarsi. From the basal portion of wing-cases arise two dorsal, tuft-like protruberances; and the whole insect is covered with light reddish down.

This beetle, which generally drops quickly from a plant when alarmed, flies with great agility during the heat of the day, and has a curious habit of jumping.

It will sometimes enter houses, attracted by the aroma arising from papaws, granadillas, &c., that have been picked for consumption; and on such occasions may be found resting on the fruit or crawling over it.

Froggatt states that *D. pestilens* has a habit of laying its eggs in dried apples "that are left over the season upon the trees"; and that in its native state it breeds in the large vegetable galls found on our wattle trees.

Its occurrence in juicy green fruit of the granadilla, in the much firmer tissue of galls containing very little moisture, and finally in comparatively dry, dead fruit appears rather remarkable, and is, I think, worth recording.

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† "A New Fruit-boring Caterpillar of Bananas, occurring at Tweed Heads (*Heteromicta latro*)." "Queensland Agricultural Journal," Brisbane, Ap. 1914, pp. 280-284, 1 plate.

General Notes.

TRAPPING OF OPOSSUMS.

Many representations having been made to the Minister for Agriculture and Stock concerning the interference, through drought and other causes, with the opportunities of the open opossum trapping season, it has been decided by the Governor in Council that the season will be extended until the 31st July next. This extension does not in any way effect native bears, which are wholly protected during this year.

TANNING HOG SKINS.

AMERICAN METHOD.

Of late, we have had several inquiries as to the proper method of tanning pig skins.

Hog skins make very nice leather when they are properly tanned. They are usually very greasy, and have numerous holes in them. It is very important that the tanner handles the skins carefully, so as not to increase the number of holes; and the skins must be degreased right at the start, as they will cause trouble all the way through.

The skins should be worked before they are soaked, and as much of the grease as possible must be scraped out. After the skins have been scraped out dry, they should be washed in warm sal soda water, and then worked and scraped to get the dissolved grease out. The soda solution is made by dissolving 5 lb. of sal soda in a barrel of water of about 95 degrees. The skins are put into this water, and left there about one minute; they are then put on the beam, and scraped and worked, and the dissolved grease will flow out. After this has been done at least twice, the skins should be washed in soda solution to free them from adhering grease, and then soaked for twelve to twenty-four hours in cold water. The unhairing is accomplished most readily in a solution of sulphide of sodium or patented depilatory. Fleshing should be done before the skins are unhaired.

DEPILATORIES.

A suitable depilatory is made by dissolving 10 lb. of depilatory in each 7 gallons of water in the vat; the skins are then put into the solution and stirred about for thirty-six hours, more or less, or until the hair is dissolved and the skins are ready for the lime. Wash the hair off, and then lime the skins in weak, white lime for one day; and then transfer them to stronger lime, or make the first lime stronger. From two to four days are usually required by the liming process, according to the thickness of the skins and the strength of the lime. The lime dissolves the remaining grease, and the bathing and washing remove it. A bran bath is good for drenching the skins: 50 lb. of bran soaked in warm water until it is sour and then stirred into 700 gallons of water makes a good drench for the skins; 10 lb. of sulphuric acid should be added to the drench, and the skins stirred about in the liquor for several hours until they are soft and clean.

The next work is fine hairing, and the skins should be worked out over a beam; and all the lime, dirt, and oil should be removed on the flesh side, and the skins are then ready to be scudded upon the grain. This work must be carefully done so as not to damage the grain. All the dirt and fine hairs should be removed from the grain; the skins then rinsed in warm water, and they are then ready to be tanned. On account of their porous nature, the skins absorb the tan very rapidly. Hemlock extract is the cheapest tanning material that can be used; quebracho extract tans the skins with a fine, natural grain; and a combination of the two also makes good leather.

THE TANNING PROCESS.

A paddle vat is the best to do the tanning in, as a drum is apt to tear the skins. When hemlock is used, the skins are kept in the liquor until they are struck through, the liquor being strengthened twice a day. About eight days are required to do the tanning. After they are tanned, the skins should be bleached and drummed in sumac, then washed, struck out, oiled lightly, and dried. Dampen the dry skins, and shave those that need it. Have the skins moist and soft and give them fat liquor made of oil, soap, and degras; give considerably less fat liquor than calf skins, and then dry the skins again. If the skins are to be coloured, moisten them with warm water, and clear the grain with borax and sulphuric acid or any other good bleaching process, and then mill in sumac again; rinse the leather, and colour it in a drum the desired shade; rinse the skins again; oil the grain with cod oil, and dry the skins again. Staking and finishing complete the work, and the skins are ready for use.

TANNING BATHS.

To tan with quebracho, make up the first tanning bath by adding dissolved quebracho extract to water in the paddle vat to make a 4-degrees liquor. To each 100 gallons of liquor add 1½ lb. of alum and 4 lb. of salt, and plunge the liquor well. Process the skins in this liquor for thirty-six hours, or until they have assumed a light oak colour; then place them in the second bath. This is simply a clear quebracho liquor of 6 degrees. Paddle the skins in this liquor thirty-six hours; then strengthen the liquor to 10 degrees; and in about two days the skins will be completely tanned. Drum the skins in sumac; oil the grain with neatsfoot oil, and hang the skins up to dry or tack them on frames. The dry skins can then be moistened, coloured, and finished. They can also be bleached and finished without being coloured. Hemlock combined with quebracho makes a good tannage. For inner-soiling, the skins are oiled with a combination of fish and mineral oil, and are finished on the rolling machine, which makes them smooth and firm. It is of benefit to the leather to mill the skins in a lactic acid solution before tanning them; it clears the grain.—"Indian Trade Journal."

SOCIETIES, SHOW DATES, ETC.

CABOOLTURE.—Caboolture Pastoral, Agricultural, and Industrial Society, Secretary D. J. Collins. Show dates: 15th and 16th July next.

CHARTERS TOWERS.—Towers Annual Show will take place on the 17th and 18th July, 1920. Secretary, G. Urquhart.

INGHAM.—Herbert River Pastoral and Agricultural Association. Secretary, J. W. Cartwright. Show dates, 20th and 21st August.

NORTH PINE.—Pine River Agricultural, Horticultural, and Industrial Association, Secretary Geo. Armstrong. Show dates: 3rd and 4th September.

POMONA.—Noosa Agricultural, Horticultural, and Industrial Society. Secretary, N. J. Mackinnon. Show dates, 25th and 26th November, 1920.

PROSERPINE.—The Bowen-Proserpine Tobacco Growers' Association, Secretary W. F. Jochheim.

RAVENSHOE.—Ravenshoe Show Association. Secretary, R. Anderson. Show dates, 13th and 14th October.

LONDON QUOTATIONS.

COTTON.—25d. to 44d. per lb.; Rubber, Para, 2s. 4½d.; Plantation, 2s. 0½d. per lb.; Linseed Oil, £91.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JUNE, 1920.

Article.		JUNE. Prices.
Bacon	lb.	1s. 5d.
Bran	ton	£19
Broom Millet	"	£45 to £55
Broom Millet (Sydney)	"	£40 to £50
Butter (First Grade)	cwt.	228s. 8d.
Chaff, Lucerne	ton	£17 5s.
Chaff, Mixed	"	£14 to £15
Chaff, Oaten	"	£15 10s.
Chaff, Wheaten	"	£15 to £16
Chaff, Panicum	"	£12 10s. to £13 10s.
Cheese	lb.	1s. 4d. to 1s. 7d.
Flour	ton	£19 10s.
Hams	lb.	1s. 8d. to 1s. 10½d.
Hay, Lucerne	ton	£13 10s. to £14
Hay, Oaten	"	£18
Honey	lb.	6½d.
Maize	bush.	9s. 10d. to 11s.
Oats	"	...
Onions	ton	£13 to £16.
Peanuts	lb.	6d. to 10½d.
Pollard	ton	£10
Potatoes	"	£16 to £17
Potatoes (Sweet)	"	£6 to £7
Pumpkins (Cattle)	"	£6 to £8 10s.
Turnips (Swede)	"	...
Eggs	doz.	1s. 11d. to 2s. 6d.
Fowls	per pair	5s. to 7s. 6d.
Ducks, English	"	5s. 6d. to 6s.
Ducks, Muscovy	"	5s. to 7s.
Geese	"	10s. to 12s.
Turkeys (Hens)	"	10s. to 14s.
Turkeys (Gobblers)	"	£1 1s. to £2.
Wheat	bush.	11s. 1d.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar bag	6s. 6d. to 20s.
Beetroot, per dozen bunches	9d. to 1s. 6d.
Cabbages, per dozen	17s. 6d. to 30s.
Cauliflowers, per dozen	15s. to 28s.
Carrots, per dozen bunches	1s. 9d. to 3s.
Cucumbers, per dozen	6d. to 2s.
Lettuce, per dozen	9d. to 1s.
Marrows, per dozen	3s. 6d. to 10s.
Peas, per sugar bag	11s. to 19s.
Potatoes (Sweet), per sugar bag	3s. 6d to 8s.
Pumpkins (table), per sack	9s. to 12s.
Tomatoes, per quarter case	2s. to 5s.
Turnips (Swede), per sugar bag	1s. 6d. to 2s.

SOUTHERN FRUIT MARKETS.

Article.	JUNE. Prices.
Bananas (Queensland), per double case	25s. to 30s.
Bananas (Tweed River), per double case	15s.
Bananas (Fiji) per double case	...
Lemons, per bushel case	6s. to 9s.
Mandarins, per bushel case	6s. to 13s.
Oranges (Navel), per bushel case	7s. to 12s.
Pineapples (Queens), per double case	10s. to 22s.
Pineapples (Ripley), per double case	15s. to 18s.
Pineapples (common), per dozen	5d. to 9d.
Tomatoes, per quarter case	2s. to 5s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel case	9s. to 15s.
Apples, Cooking, per bushel case	9s. to 12s. 6d.
Bananas (Cavendish), per dozen	5d. to 1s.
Bananas (Sugar), per dozen	5d. to 10d.
Citrons, per cwt.	15s. to 16s.
Cocoanuts, per sack	£1 5s.
Custard Apples, per half bushel case	5s. to 8s.
Grapes, per lb.	...
Lemons (Lisbon), per half bushel case	4s. 6d. to 11s.
Mandarins, per case	12s. to 19s. 6d.
Oranges (Navel), per case	12s. to 13s. 6d.
Oranges, per half bushel case	10s. to 19s.
Papaw Apples, per case	6s. to 10s.
Passion Fruit, per half bushel case	3s. to 8s.
Peaches, per quarter case	...
Pears, per quarter case	...
Pineapples (rough), per case	12s. to 15s.
Pineapples (smooth), per case	10s. to 15s. 6d.
Pineapples (Ripley), per case	12s. to 15s.
Rosellas, per sugar-bag	6s. to 9s.
Tomatoes (prime), per quarter case	1s. to 8s.

TOP PRICES, ENOGGERA YARDS, MAY, 1920.

Animal.	MAY. Prices.
Bullocks	£18 5s. to £22 15s.
Bullocks (Single)	...
Cows	£13 10s. to £16 7s. 6d.
Cows (Single)	...
Merino Wethers	35s. 9d.
Crossbred Wethers	36s. 9d.
Merino Ewes	30s.
Crossbred Ewes	40s.
Lambs	31s. 3d.
Pigs (Backfatters)	...
Pigs (Light Bacon)	...
Pigs (Porkers)	73s.

A Field of Giant Kangaroo Rape

Farm and Garden Notes for August.

This and the following two months are about the busiest periods of the year so far as work in the field is concerned; and the more activity now displayed in getting in the summer crops, the richer will be the reward at harvest time. Potatoes should be planted, taking care to select only good sound seed that has sprouted. This will ensure an even crop. Yams, arrowroot, ginger, sisal hemp, cotton, and sugar-cane may now be planted. Sow maize for an early crop. If the seed of prolific varieties is regularly saved, in the end it will not be surprising to find from four to six cobs on each stalk. This has been the experience in America, where the selecting of seeds has been reduced to a fine art.

In choosing maize for seed, select the large, well-filled, flat grains. It has been shown that, by constantly selecting seed from prolific plants, as many as five and six cobs of maize can be produced on each stalk all over a field. A change of seed from another district is also beneficial. Sow pumpkins, either amongst the maize or separately, if you have the ground to spare. Swede turnips, clover, and lucerne may be sown, but they will have to contend with weeds which will begin to vigorously assert themselves as the weather gets warmer; therefore keep the hoe and cultivator constantly going in fine weather. Tobacco may be sown during this month. If vines are available, sweet potatoes may be planted towards the end of the month. In this case also it is advisable to avoid too frequent planting of cuttings from the old vines, and to obtain cuttings from other districts. If grasses have not yet been sown, there is still time to do so, if the work be taken in hand at once. Sugar-cane crushing will now be in full swing, and all frosted cane in the Southern district should be put through the rollers first. Plough out old canes, and get the land in order for replanting. Worn out sugar lands in the Central and Northern districts if not intended to be manured and replanted will bear excellent crops of sisal hemp. Rice and coffee should already have been harvested in the North. The picking of Liberian coffee, however, only begins this month. Collect divi-divi pods. Orange-trees will be in blossom, and coffee-trees in bloom for the second time. As this is generally a dry month in the North, little can be done in the way of planting.

Kitchen Garden.—Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnip, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

Flower Garden.—All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragon), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmas, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07 in., increasing gradually to a rainfall of 7.69 in. in February.

Orchard Notes for August.

THE SOUTHERN COAST DISTRICTS.

The remarks that have appeared in these notes during the last few months respecting the handling and marketing of Citrus Fruits apply equally to the present month. The bulk of the fruit, with the exception of the latest ripening varieties in the latest districts, is now fully ripe, and should be marketed as soon as possible, so that the orchards can be got into thorough order for the Spring growth. All heavy pruning should be completed previous to the rise in the sap; and where Winter spraying is required, and has not yet been carried out, no time should be lost in giving the trunks, main branches, and inside of the trees generally a thorough dressing with the lime and sulphur wash.

Where there are inferior sorts of seedling citrus trees growing, it is advisable to head same hard back, leaving only the main trunk and four or five well balanced main branches cut off at about 2 ft. from the trunk. When cut back give a good dressing with the lime and sulphur wash. Trees so treated may either be grafted with good varieties towards the end of the month or early in September; or, if wished, they may be allowed to throw out a number of shoots, which should be thinned out to form a well balanced head, and when large enough should be budded with the desired variety.

Grafting of young stock in nursery, not only citrus but most kinds of deciduous fruits, can be done this month. It comes in useful in the case of stocks that have missed in budding, but for good clean grown stocks I prefer budding.

In the case of working our Seville orange stocks to sweet oranges, grafting is, however, preferable to budding, as the latter method of propagation is frequently a failure. The Seville stock should be cut off at or a little below the surface of the ground. If of small size, a single tongue graft will be sufficient, but if of large size, then the best method is the side graft—two or more grafts being placed in each stock, so as to be certain of one taking. In either case the grafts are tied firmly in place, and the soil should be brought round the graft as high as the top bud. If this is done, there will be few missed, and undesirable Seville stocks can be converted into sweet oranges.

In selecting wood for grafting, take that of the last season's growth that has good full buds and that is well-matured—avoid extra strong, or any poor growths.

Seville oranges make good stocks for lemons. In case it is desirable to work them on to lemons, it is not necessary to graft below ground, as in the case of the sweet orange, but the stock can be treated in the same manner as that recommended in the case of inferior oranges—viz., to head hard back, and bud on the young shoots.

Where orchards have not already been so treated, they should now be ploughed so as to break up the crust that has been formed on the surface during the gathering of the crop, and to bury all weeds and trash. When ploughed, do not let the soil remain in a rough, lumpy condition, but get it into a fine tilth, so that it is in a good condition to retain moisture for the tree's use during Spring. This is a very important matter, as Spring is our most trying time, and the failure to conserve moisture then means a failure in the fruit crop, to a greater or lesser extent.

Where necessary, quickly-acting manures can be applied now. In the case of orchards, they should be distributed broadcast over the land, and be harrowed or cultivated in; but, in the case of pines, they should be placed on each side of the row, and be worked well into the soil.

The marketing of pines, especially smooths, will occupy growers' attention, and where it is proposed to extend the plantations the ground should be got ready, so as to have it in the best possible condition for planting, as I am satisfied that the thorough preparation of the land prior to planting pines is money very well spent.

The pruning of all grape vines should be completed, and new plantings can be made towards the end of the month. Obtain well-matured, healthy cuttings, and plant them in well and deeply worked land, leaving the top bud level with the surface of the ground, instead of leaving 6 or 7 in. of the cutting out of the ground to dry out, as is often done. You only want one strong shoot from your cutting, and from this one shoot you can make any shaped vine you want. Just as the buds of the vines begin to swell, but before they burst, all varieties that are subject to black spot should be dressed with the sulphuric acid solution—viz., three-quarters of a pint of commercial sulphuric acid to one gallon of water; or, if preferred, this mixture can be used instead—viz., dissolve 5 lb. of sulphate of iron (pure copperas) in one gallon of water, and when dissolved add to it half a pint of sulphuric acid.

THE TROPICAL COAST DISTRICTS.

Bananas should be increasing in quality and quantity during the month, and though, as a rule, the fruit fly is not very bad at this time of the year, still it is advisable to take every care to keep it in check. No over-ripe fruit should be allowed to lie about in the gardens, and every care should be taken to keep the pest in check when there are only a few to deal with, as, if this is done, it will reduce the numbers of the pest materially later on in the season. The Spring crop of oranges and mandarins will be now ready for marketing in the Cardwell, Tully, Cairns, and Port Douglas districts. For shipping South see that the fruit is thoroughly sweated, as unless the moisture is got rid of out of the skins the fruit will not carry. Should the skins be very full of moisture, then it will be advisable to lay the fruit on boards or slabs in the sun to dry; or if this is not possible, then the skin of the fruit should be artificially dried by placing same in a hot chamber, as the moisture that is in the skin of our Northern-grown citrus fruits must be got rid of before they will carry properly.

Papaws and granadillas should be shipped South, and the markets tested. If carefully packed in cases holding only one layer of fruit, and sent by cold storage, these fruits should reach their destination in good order. Cucumber and tomato shipments will be in full swing from Bowen. Take care to send nothing but the best fruit, and don't pack the tomatoes in too big cases, as tomatoes always sell on their appearance and quality.

THE SOUTHERN AND CENTRAL TABLELANDS.

All fruit-tree pruning should be finished during the month, and all trees should receive their winter spraying of the lime and sulphur wash.

All new planting should be completed, orchards should be ploughed and worked down fine, and everything got ready for Spring.

In the warmer parts, grape-pruning should be completed, and the vines should receive the Winter dressing for black spot. In the Stanthorpe district grape-pruning should be delayed as late as possible, so as to keep the vines back, as it is not early but late grapes that are wanted, and the later you can keep your vines back the better chance they have of escaping Spring frosts.

Towards the end of the month inferior varieties of apples, pears, plums, &c., should be worked out with more desirable kinds; side, tongue, or cleft grafting being used. In the case of peaches, almonds, or nectarines, I prefer to head back and work out by budding on the young growth.

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1920.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5 0	6 39	5·3	6·30	5·18
2	6·14	5·15	6·32	5·0	6·40	5·4	6·29	5·19
3	6·15	5·15	6·33	4·59	6·40	5·4	6·29	5·19
4	6·15	5·14	6·33	4·59	6·40	5·4	6·28	5·20
5	6·16	5·14	6·33	4·59	6·40	5·5	6·27	5·20
6	6·17	5·13	6·34	4·59	6·40	5·5	6 27	5·21
7	6·17	5·12	6·34	4·59	6 40	5·5	6·26	5·21
8	6·18	5·12	6·34	4·59	6 40	5·6	6·25	5·22
9	6·18	5 11	6·35	4·59	6·40	5·6	6 24	5·22
10	6·19	5·10	6 35	4·59	6·40	5·6	6 23	5·23
11	6·19	5 9	6·35	4·59	6·39	5·7	6·23	5·23
12	6 20	5·8	6·36	5·0	6·39	5·7	6 22	5·24
13	6·21	5·8	6·36	5·0	6·39	5 8	6 21	5·24
14	6·21	5·7	6·36	5·0	6·39	5·8	6·20	5·25
15	6·22	5·6	6·36	5·0	6·38	5 9	6·19	5·26
16	6·22	5·6	6 37	5·0	6·38	5·9	6·18	5·26
17	6·23	5·5	6·37	5·0	6 38	5·10	6 17	5·27
18	6·23	5·5	6·38	5·0	6 37	5 10	6·16	5·27
19	6 24	5·4	6·38	5·0	6 37	5·11	6·16	5·28
20	6·25	5·4	6·38	5 0	6 36	5·12	6·15	5·28
21	6 25	5·4	6·39	5·0	6·36	5·12	6 14	5 28
22	6·26	5·3	6·39	5 0	6·35	5·13	6·13	5 29
23	6 26	5·3	6·39	5·1	6 35	5 13	6·12	5 29
24	2·27	5·3	6·39	5·1	6·34	5·14	6 11	5·30
25	6 28	5·2	6·39	5·2	6 34	5·14	6·10	5 30
26	6·28	5·2	6·39	5·2	6 33	5·15	6·9	5 30
27	6·29	5·2	6·39	5·2	6 33	5·15	6 8	5·31
28	6·29	5·1	6 39	5·3	6 32	5·16	6·7	5 31
29	6·30	5 1	6 39	5·3	6 32	5·16	6 6	5·32
30	6·30	5·1	6·39	5·3	6·31	5·17	6·5	5·32
31	6·31	5·1	...	...	6·31	5·17	6·4	5.33

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria).

			H.	M.	
3 May	○	Full Moon	11	47	a.m.
11 „	☽	Last Quarter	3	51	p.m.
18 „	●	New Moon	4	24	p.m.
25 „	☾	First Quarter	7	7	a.m.

Apogee on 7th at 6 a.m. Perigee on 19th at 4 p.m. The Moon will be totally eclipsed on the 3rd at midday, but will not be visible in Australia. It will cause a partial eclipse of the Sun on the 18th, visible in parts of Queensland about sunset.

2 June	○	Full Moon	3	18	a.m.
10 „	☽	Last Quarter	4	58	a.m.
16 „	●	New Moon	11	41	p.m.
23 „	☾	First Quarter	4	49	p.m.

Apogee on 3rd at 2·30 p.m. and on 30th at 5 p.m. Perigee on 17th at 1·12 a.m. The Moon will occult Mars and Spica on the 25th, not visible in Australia unfortunately, but on the 28th the occulation of a small star in the Scorpion about 6 p.m will be an interesting sight in small telescopes and binoculars.

1 July	○	Full Moon	6	41	p.m.
9 „	☽	Last Quarter	3	5	p.m.
16 „	●	New Moon	6	25	a.m.
23 „	☾	First Quarter	5	20	a.m.
31 „	○	Full Moon	9	19	a.m.

Perigee on 15th at 10·24 a.m. Apogee 28th, 12·24 a.m.

7 Aug.	☽	Last Quarter	10	50	p.m.
14 „	●	New Moon	1	44	p.m.
21 „	☾	First Quarter	8	52	p.m.
29 „	○	Full Moon	11	3	p.m.

Perigee on 12th at 3·48 p.m. Apogee on 24th at 2·36 p.m. On the 8th and 9th of August the planets Venus and Jupiter will appear to be in juxtaposition, but will be too near to the Sun to be seen to much advantage without a telescope or binoculars. They will be about ten degrees south-east of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S. —add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

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 somewhere 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.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MAY, 1920 AND 1919, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1920.	May, 1919.
North Coast.	In.		In.	In.
Atherton	2·19	19	2·84	4·04
Cairns	4·52	38	11·78	6·19
Cardwell	3·62	48	11·36	5·95
Cooktown	2·99	44	12·68	6·06
Herberton	1·68	33	4·62	2·99
Ingham	3·45	28	12·07	3·95
Innisfail	11·64	39	29·58	21·74
Mossman	2·52	12	15·56	4 24
Townsville	1·34	49	5·27	0·28
Central Coast.				
Ayr	1·14	33	5·57	0·42
Bowen	1·35	49	4·48	0·31
Charters Towers ...	0·79	38	3·34	0·52
Mackay	3·98	49	7·47	9·99
Proserpine	5·30	17	7·89	4·89
St. Lawrence ...	1·89	19	4·19	3·00
South Coast.				
Biggenden	1·95	21	1·39	2·66
Bundaberg	2·83	37	3·01	6·53
Brisbane	2·93	69	2·02	5·47
Childers	2·40	25	2·89	2·71
Crohamhurst ...	5·00	25	5·18	11·41
Esk	2·19	33	2·41	5·42
Gayndah	1·61	49	1·86	1·56
Gympie	3·13	50	1·79	5·85
Glasshouse M'tains	3·91	12	3·26	10·37
Kilkivan	2·01	41	2·41	2·99
Maryborough ...	3·16	49	3·61	6·35

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1920	May, 1919.
South Coast—continued:	In.		In.	In.
Nambour	5·25	24	2·69	11·41
Nanango	1·67	38	1·82	2 91
Rockhampton ...	1·63	33	1·94	4·88
Woodford	3·05	33	3·80	7·69
Darling Downs.				
Dalby	1·36	50	1·95	2·99
Emu Vale	1·23	24	2·32	2·59
Jimbour	1·25	32	1·57	1·54
Miles	1·65	35	0 52	1·45
Stanthorpe ...	1·98	47	2·20	3·46
Toowoomba ...	2·35	48	3·48	4·27
Warwick	1·67	33	2·19	2·98
Maranoa.				
Roma	1·55	46	0 35	2·24
State Farms, &c.				
Bungeworgorai ...	0·75	6	0 95	1·88
Gatton College ...	1·88	21	3·26	2 97
Gindie	1·15	21	0·57	1·49
Hermitage ...	1·37	14	2·44	3·40
Kairi	2·11	6	Nil	4·27
Sugar Experiment Station, Mackay	3 63	23	7·87	5·94
Warren	0·93	6	4·61	3·56

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for May this year, and for the same period of 1919, having been compiled from telegraphic reports are subject to revision.

GEORGE G. BOND, State Meteorologist.