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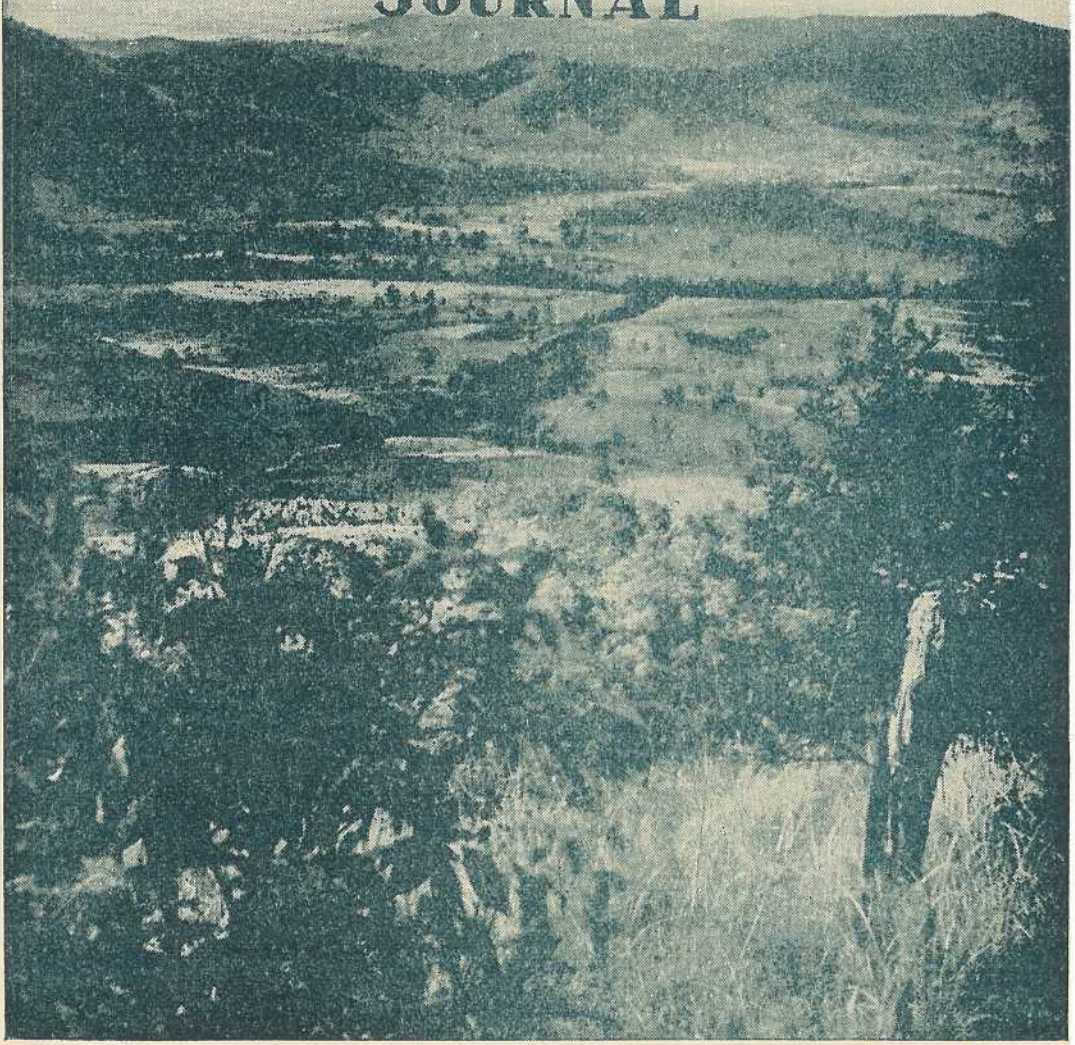
DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL



Samsonvale District, South-eastern Queensland.

LEADING FEATURES

Soil Conservation
Hormone Weedkillers
Wool and its Uses
Banana Plantation Management
Mechanised Cheese Making
Diseases of Ducks

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Contents

Soil Conservation in Queensland.

J. E. LADEWIG, Senior Soil Conservationist, and A. F. SKINNER, Soil Conservationist.

4. Water Disposal Systems.

THE adoption of soil conservation practices will usually reduce the wasteful loss of soil and water, but Queensland's heavy summer storms frequently yield more rain than can be absorbed by the soil, or otherwise stored or used. In order to dispose of the surplus run-off a carefully planned and protected drainage system becomes a necessity, but, since the efficient utilisation of rainfall is essential for maximum production from crops and pastures, water should be conserved to the greatest possible extent—firstly, by ensuring the maximum absorption of rain where it falls; secondly, by temporarily trapping it on the surface so that it can soak in later; and thirdly, by bulk storage in ponds or dams.

In the planning of works for the pondage or diversion of run-off it is necessary to ensure that a *stable well-grassed waterway* is available for the disposal of surplus water; it is equally important to design the works from the top of the immediate catchment, planning each work in succession, down the slope, so that control of run-off from the upper catchment is assured, before control on the lower catchment area is attempted.

Waterways.

Prior to settlement the surplus run-off water flowed into natural depressions, and since these were usually well covered with grass or trees, with the additional protection of ground litter, the water was safely transported to the main watercourses without serious drainage line erosion (Plate 121) occurring.

Following settlement, many of these drainage lines were ploughed or heavily grazed, the natural protection of vegetation disappeared, and huge gullies frequently developed. This is understandable when it

Plate 121.

Drainage Line Erosion.—This depression was once well grassed and quite stable; overstocking has contributed towards the development of the gully.

is realised that, whereas bare soil erodes under water velocities of 1 to 2 feet per second, good turf forming grasses so effectively protect the soil that velocities of up to 12 feet per second can be carried without erosion occurring, and even moderate natural pasture can withstand velocities of 4 feet per second.

In addition to the destruction of the protective plant cover on natural drainage lines, the volume and velocity of water carried by them has been greatly increased since settlement, by the clearing, burning, ploughing, and grazing of land in catchment areas.

Where gullying has developed, the flow of run-off into that section of the catchment should be reduced to a minimum; on no account should additional run-off water be turned into an unstable gully unless special precautions have been taken. There is often a tendency to regard existing deep gullies as a satisfactory site for water disposal, but the waterfall created during rain, where the diversion structure enters the gully, inevitably induces the development of deep gullies along the channels of the water diversion structures (Plate 122).

Water Disposal on Natural Pasture.

Natural pasture may be utilised for the disposal of water from banks if the grass cover is good, and provided the velocity of flow does not exceed 4 feet per second; this method of disposal is therefore only utilised where small areas are being drained and only minor flows are anticipated. Water disposal on pasture has the effect of an irrigation

and the quality of limited areas of pasture can often be improved by this means. Where pasture is used as a disposal area, it must be carefully grazed and precautions taken to ensure that the water is spread widely.

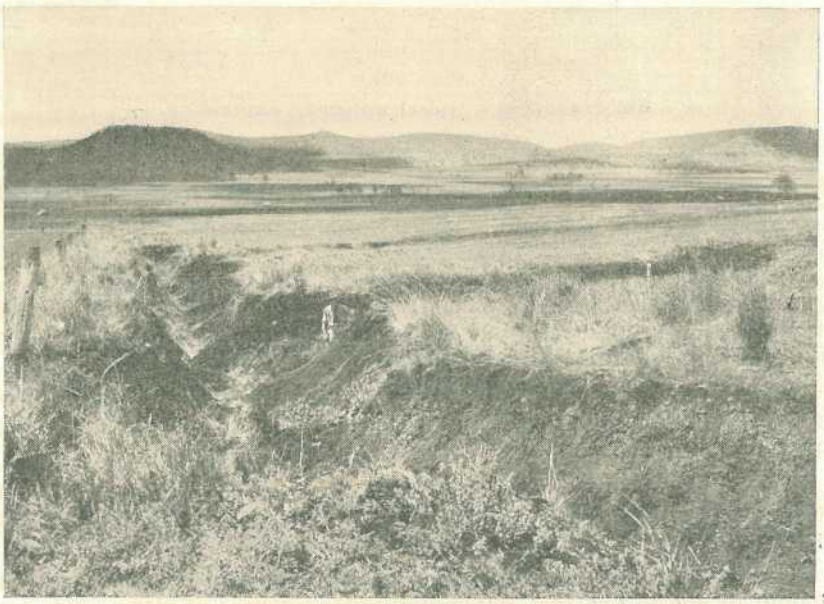


Plate 122.

Water Disposal into Unstable Gullies.—The secondary gully, almost 4 ft. deep, developed in a few years where a contour bank discharged water into the main gully.

Well grassed depressions are occasionally available on farms for the disposal of water, but it is important to appreciate that the "ground cover" of grass is the essential feature of a good waterway; grasses which grow in tufts are not suitable because the run-off water is channelled into the bare areas surrounding the grass crowns, and erosion rapidly occurs.

Artificial Waterways.

Since natural well-grassed depressions are now a rarity in the agricultural areas of the State, it is usually necessary to provide a waterway, and establish a good grass cover on it, well in advance of projected bank construction operations. The construction and stabilisation of these waterways is one of the most important points in a soil conservation programme, and without the prior provision of this type of structure the subsequent programmes have little, if any, chance of being successful.

Since the velocity of flow is dependent largely on the depth of water, it is important that the water depth should be kept as shallow as possible by the construction of wide strips, which are level from side to side and slightly concave in the centre to the extent of 3 inches (Plate 123).

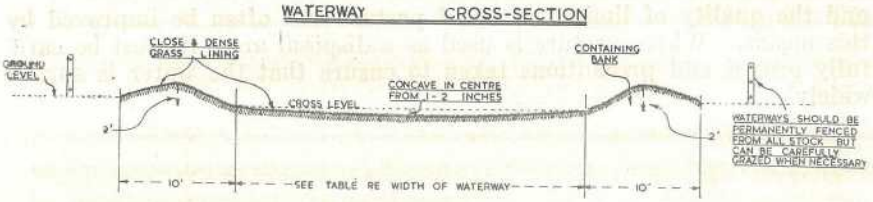


Plate 123.

Sketch showing a typical waterway cross section.

The width of the waterway to be constructed will vary according to the area of land to be drained, and, since water velocity increases with degree of slope, greater widths of waterway per acre drained will be required on steep slopes.

Pending further research the following general rules apply:—

Where the land slope exceeds 8 per cent. (8 feet vertical rise or fall per 100 feet horizontal), but does not exceed 12 per cent., one foot of waterway width is allowed per half acre of arable land.

Where the land slope is between 4 feet per 100 feet and 8 feet per 100 feet, one foot of waterway width is allowed per acre of arable land.

Where the land slope is between 2 per cent. and 4 per cent., one foot is allowed per 2 acres of land; and where the slope is less than 2 per cent., one foot is allowed per 4 acres of arable land.

Containing banks are constructed on both sides of the waterway, to a height of one to two feet, depending on the degree of slope, each with a bank base width of approximately 10 feet.

Since artificial waterways must be level in cross-section, much expensive grading work can be avoided by the careful selection of sites, ensuring where possible that the waterway follows the natural fall of the land; in this case the only requirement is the construction of the containing banks.

Where, in the interests of farm layout, it is desirable to construct a waterway adjacent to a fence line, additional grading work may be necessary to provide a level cross-section, and in this case may be justified. However, since waterways become a more permanent feature of the farm than fences, it is often preferable to ignore existing fence lines in order to provide the best waterway site; the task of re-fencing can be reduced by the use of a power driven post-hole auger.

The construction of waterways is a simple operation, but usually requires the use of a grader to move soil to build the containing banks, and to level out the centre section (Plate 124).

When construction work is completed the waterway area is cultivated to produce a fine seed-bed, and, since the establishment of vegetation is a most important consideration, the grasses to be used must be carefully selected to suit the soil type and local climatic conditions, preference being given to those that form a continuous turf. Kikuyu, couch, buffalo, paspalum and Rhodes grasses are the most satisfactory, though molasses and Wimmera rye grasses, and the legumes black medic and burr medic, have been used successfully where soil type and climate are favourable.

Plate 124.

An Artificial Waterway.—This waterway has been constructed with a grader, grasses sown, covered with a sorghum stubble mulch, and a temporary fence erected to exclude stock.

Plate 125.

Kikuyu Spreader Strip.—The line of straw, pegged down with netting, assists in controlling the water flow and facilitates the establishment of the kikuyu spreader strip.

It is preferable to sow a grass-legume mixture, and difficulties are occasionally encountered, particularly with light seeds such as Rhodes grass; a technique developed in the United States, utilising rice hulls as a regulator for planting grass mixtures through the grain drill, has given encouraging results.

Following the sowing of the seed mixture it is sound practice to establish "spreader strips" of kikuyu (Plate 125) or other suitable grass in level lines across the waterway at intervals of 50 feet. These strips assist in maintaining an even spread of water, and help to protect the waterway from scouring in the early stages before the other grasses provide the maximum protection.

As soon as possible after sowing operations have been completed it is usual to spread a layer of stubble or hay over the entire surface to a depth of one to two inches; this mulch layer protects the waterway against damage from heavy storms in the early stages, and by reducing evaporation assists the establishment of vegetation.

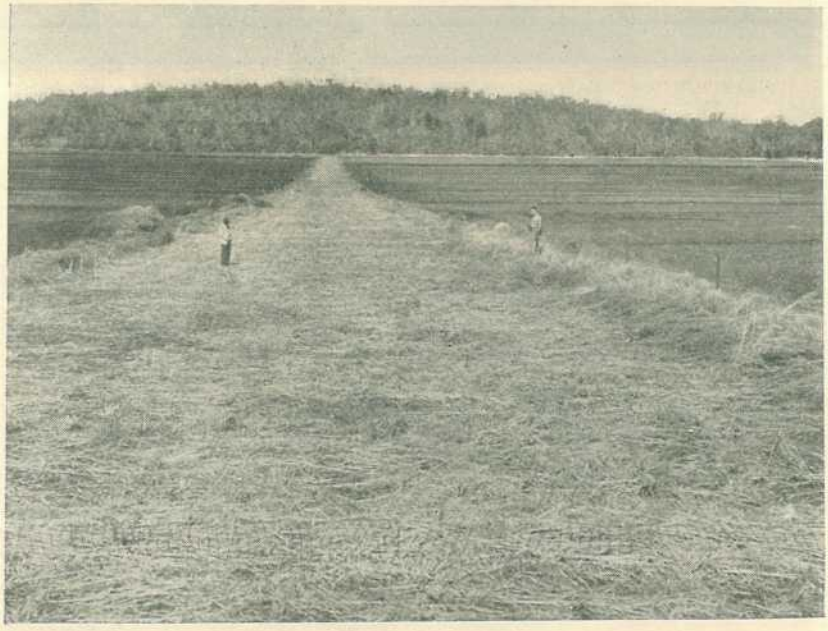


Plate 126.

A Completed Waterway.—Vegetation is well established and contour banks have been constructed. Photo. taken 12 months after construction.

All outside run-off must be excluded from the waterway until it is completely vegetated (Plate 126); under favourable conditions a waterway may be ready for use six months after construction, but where conditions for establishment of vegetation are unsatisfactory the period may extend to 12 months or more. It is essential that waterways be fenced to prevent access of stock during the period of establishment of vegetation, though at a later stage light grazing may be permitted, and in some circumstances it may be necessary to mow to remove surplus "top" vegetation.

Banana Plantation Management, with Particular Reference to the One Bunch—One Sucker—Straight Follow Through System.

J. H. MITCHELL, Assistant Adviser in Horticulture.

Bunches thrown between January and March are usually cut when prices are good, and banana growers, therefore, try to confine bunching to this period. Within the limits imposed by climatic factors, control of bunching and maximum production can be achieved under the "one bunch—one sucker—straight follow through" system of management. The keynote of success is control of the plantation from the time of its establishment. This calls for careful selection of planting material, accurate timing of planting, and strict adherence to some principles of de-suckering and follower selection which are peculiar to this system.

Apart from the special features of the system, the plantation must be properly laid out and handled, so that conditions are uniformly favourable for plant growth. Windbreaks should be established to reduce leaf splitting and root injury; adequate fertilizer should be applied at the appropriate times; weed growth must be continuously controlled; and where bananas are grown on steep slopes steps should be taken to prevent soil erosion.

PLANTING MATERIAL.

There are three forms of planting material used in establishing bananas—namely, corms, "bits" and suckers (Plate 127).

Corms.

The corm is the whole of the underground portion of the plant. The growing point and all but one of the eyes or buds are gouged out and the corm is then buried so that its junction with the pseudostem is approximately six inches below the surface of the ground.

Plate 127.

Banana Planting Material.—Left to right, bit, sucker, corm.

"Bits."

A "bit" is a portion of a corm with an eye or bud. Well-grown healthy plants at least six months old, but which have not yet bunched, provide a good source of "bits." The roots are trimmed from the plant after it is dug, a thin layer of the outer tissue removed as a precaution against beetle borer infestation, and the pseudostem cut off about four inches above the corm. On removing the outer ring of leaves the pink edges of the next pair will be seen to meet on the corm, and it is in this position that a small bud will be found (Plate 128);

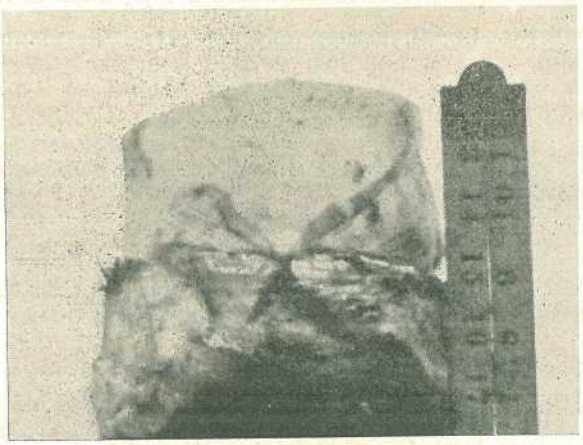


Plate 128.

Bit Prepared for Planting (Weight 3½ lb.).—Note the effective bud.

a similar bud will be seen at the base of the next two leaves on the opposite side. These are the buds from which the new plant will arise. After they have been located the corm and attached pseudostem are split in half, so that each part possesses an eye, and placed in a shaded position for at least 24 hours to allow the cut surfaces to heal before planting. Prepared "bits" may vary from one to four pounds in weight.

The "bit" should be planted in an almost vertical position, generally with the eye facing in a south-easterly direction, and at a depth of about six inches. In heavy soils shallower planting is permissible. "Bits" are given first priority as planting material.

Suckers.

Suckers are the most widely used planting material, chiefly because they are easily obtained. Although a very good plantation can be established from suckers, this type of planting material has some disadvantages. When growth begins, a new corm is formed directly above the original and this habit brings the plant nearer to the surface (Plate 129). When the plantation is subjected to cyclonic winds, such plants have a tendency to collapse.

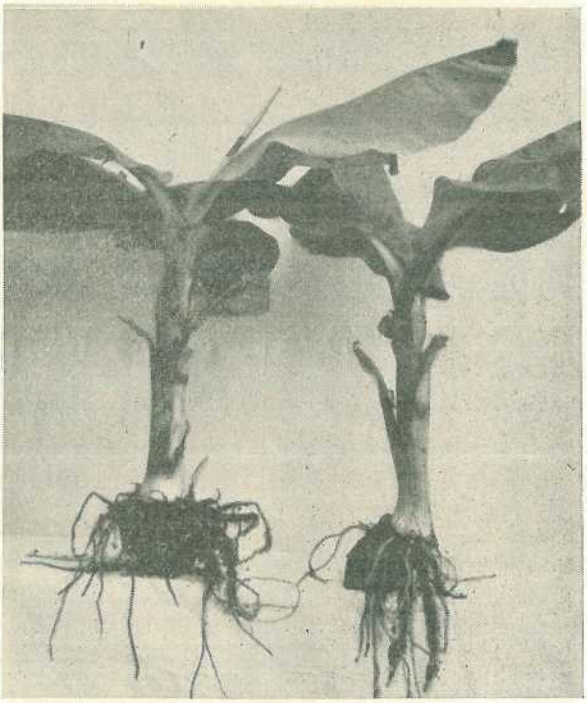


Plate 129.

Left, Sucker Two Months Old.—Note formation of new corm above original sucker.

Right, A Bit Two Months Old.—Note unrestricted root development.

Suckers are planted with the junction of the corm and pseudostem approximately six inches below ground level. They should be placed

so that the part originally furthest from the parent plant faces in the direction desired in the first follower sucker, which in most cases is the south-east.

TIME OF PLANTING.

In a hot, moist, even climate the banana will bunch in about 12 months. On the near north coast, where cooler conditions prevail, the rate of growth is slow from April to September, and in a dry spring rapid growth may not occur until late in November. Under these conditions bananas will usually bunch 15 to 18 months after planting.

Seasonal conditions vary somewhat, but, in order to ensure bunching between January and March, Cavendish and Mons Marie varieties may be planted from mid-October to mid-December. Lady Fingers should be planted early in this period.

In order that control of bunching may be maintained, it is important that plant growth should not be checked. If for any reason the plants are backward, each stool may be given an additional application of two ounces of sulphate of ammonia each month, with a maximum of four applications. Satisfactory growth must be maintained by good cultural methods, particularly during the first six months, for it is in this period that the size of the future bunch is determined.

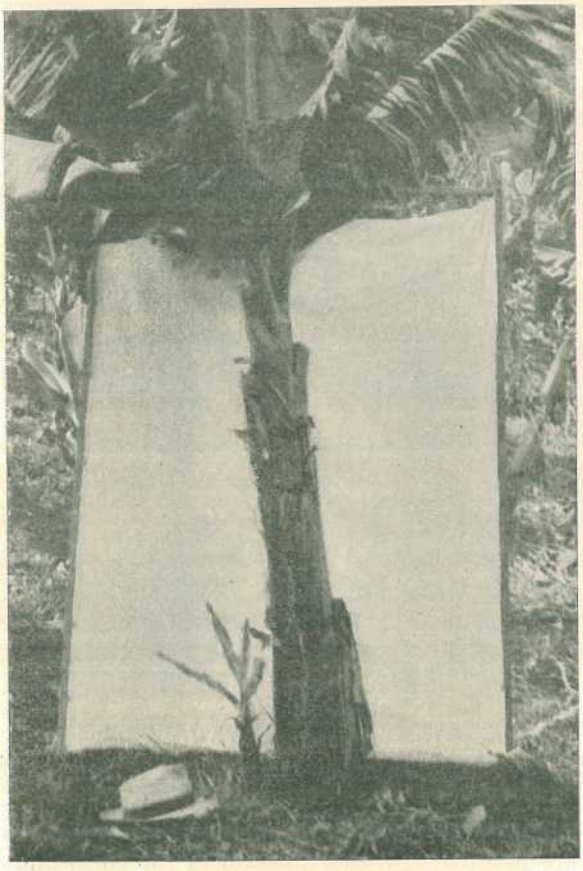


Plate 130.

Setting the Follower.—Maiden Plant Twelve Months Old with First Follower Set in November.

DE-SUCKERING.

As its name implies, this system demands the destruction of all suckers except a single follower, which is itself selected at the time and in the manner to be described later. Unwanted suckers develop at the expense of the parent plant. Up till the time when the first follower is set, all suckers must be destroyed soon after they appear above soil level. De-suckering each month is therefore essential, the approved practice being to cut off the sucker a few inches above the surface of the ground, gouge out a small central portion of the butt, and pour in about one-third of a teaspoonful of kerosene, or a little more in the case of larger suckers.

THE STRAIGHT FOLLOW THROUGH SUCKER.

The straight follow through sucker is that which arises more or less directly in line with the previous season's sucker and the parent plant. This sucker invariably originates from the base of the parent corm (Plate 131), and the new plant is thus firmly established in the soil and therefore less liable to damage by heavy winds.

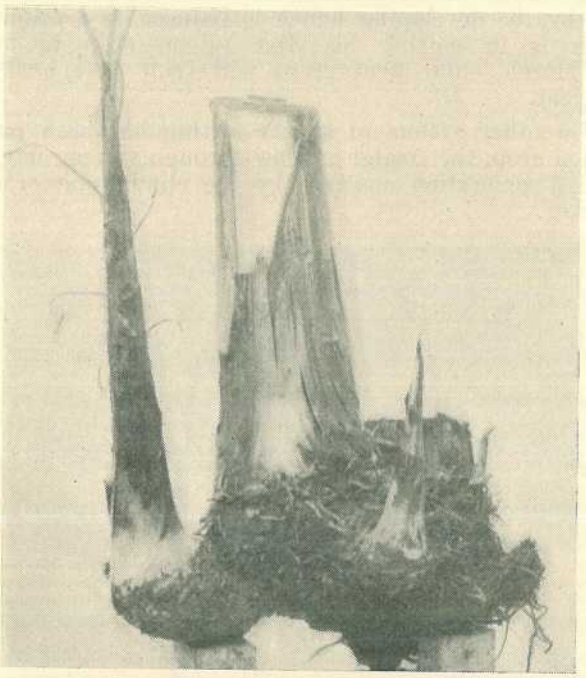


Plate 131.

The Straight Follow Through Sucker.—Maiden Plant at extreme right; first follower not yet bunched (cut for photographing) at centre; top sucker, referred to as a "sitter," at right centre. Note depth of straight follow through.

The straight follow through sucker usually appears when the parent plant is about three-quarters grown, and at a time when it is most desirable to set suckers for the next crop. Under normal conditions, selection of suckers for the second and subsequent ratoon crops is to a very large extent automatic if the first follower has been set at the right time.

SELECTING AND SETTING THE FIRST FOLLOWER.

The correct time at which to set the first follower will vary slightly from one plantation to another, but in all cases the first follower must be set before the parent plant bunches (Plate 130). Location, soil type, aspect and altitude will all influence the time taken for a plant to bunch, and will therefore govern the time for setting the first follower. Generally speaking, the best month for planting will be the best month to set the followers. The size of the parent plant is not taken into account; all followers are set at or about the same period so as to secure uniform bunching in the next ratoon crop. The system breaks down if this rule is ignored. The time at which the first follower is set to a large extent determines the success or otherwise of the plantation, for the behaviour of the crop in the third and subsequent years is governed by the management of the first ratoon crop.

Particular attention should be paid to the position of the first follower in relation to the parent plant. It should not be set directly up-hill, but rather across the slope, as nearly as possible in a south-easterly direction. As there is a tendency for the plant to throw its bunch on the sunny or northern side of the plant, interference with the follower by the developing bunch is reduced to a minimum. If a grower succeeds in getting his first ratoon crop to bunch from January to March, subsequent crops will fruit over much the same period each year.

Even if another system of sucker setting has been practised for the first ratoon crop, the straight follow through system may be applied from the third generation onwards by the elimination of all but the required sucker.

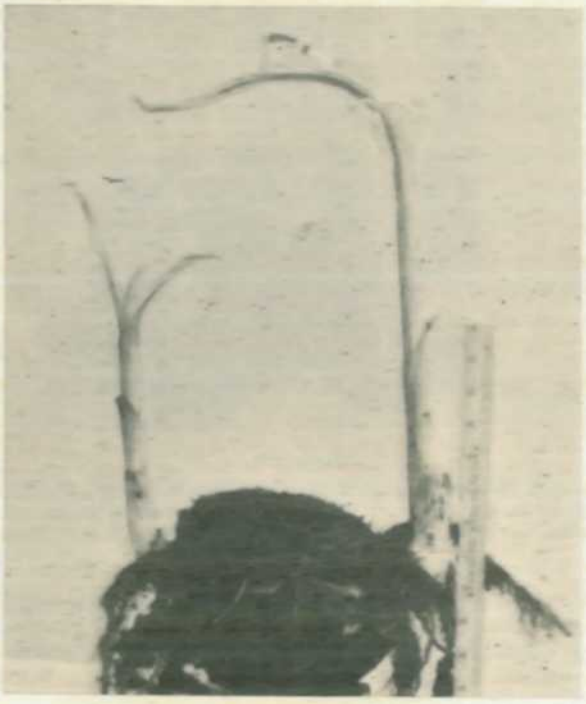


Plate 132.

Lady Finger Corm 29 Days from Planting with Two Suckers Growing from a Corm with the Centre Removed.

LADY FINGER.

The one bunch—one sucker—straight follow through system, though better known in Cavendish and Mons Marie varieties, is also applicable to the tall Lady Finger.

Normally suckers or whole corms, three to six months old, are used as planting material; the plant crop bunches are small, full production beginning with the first ratoon crop. A different practice used to initiate the one bunch—one sucker method of management has given better results on the near north coast. The corm is trimmed to two eyes on opposite sides and the centre of the corm gouged out at the time of planting. These two eyes develop into healthy plants in the one stool position and provide the plant crop (Plate 132).

Suckers from the plant crop are suppressed as in the dwarf and semi-dwarf varieties until the required sucker in the follow through position appears. Control is then imposed in the way already outlined.

ADVANTAGES OF THE SYSTEM.

The one bunch—one sucker—straight follow through system of banana plantation management was pioneered on the near north coast and has stood the test of long experience. It is the standard practice of good growers and appears to be a contributory factor to long productive life in the plantation, high yields and maximum financial returns. It is essentially a system of management for the man who values his land and aims to get the most out of it by efficient farming.

1950 SHOW DATES.

May.

Eidsvold	1 and 2
Roma	2, 3 and 4
Kingaroy	4, 5 and 6
Beaudesert	5 and 6
Inglewood	5 and 6
Wondai	11, 12 and 13
Marburg	12 and 13
Ipswich	16, 17 and 18
Blackall	16 and 17
Charleville	17 and 18
Biggenden	18 and 19
Murgon	18, 19 and 20
Thangool	19 and 20
Warrill View	20
Biloela	25 and 26
Gympie	25, 26 and 27
Crow's Nest	26 and 27
Kalbar	27

June.

Maryborough	1, 2 and 3
Wowan	1, 2 and 3
Boonah	2 and 3
Childers	5 and 6
Bundaberg	8, 9 and 10
Mt. Morgan	8, 9 and 10
Lowood	9, 10 and 12
Gin Gin	12 and 13
Gladstone	15, 16 and 17
Toogoolawah	16 and 17
Rockhampton	21, 22, 23 and 24
Kilcoy	23 and 24
Mackay	27, 28 and 29
Esk	30 and 1st July
Proserpine	30 and 1st July
Home Hill	30 and 1st July

July.

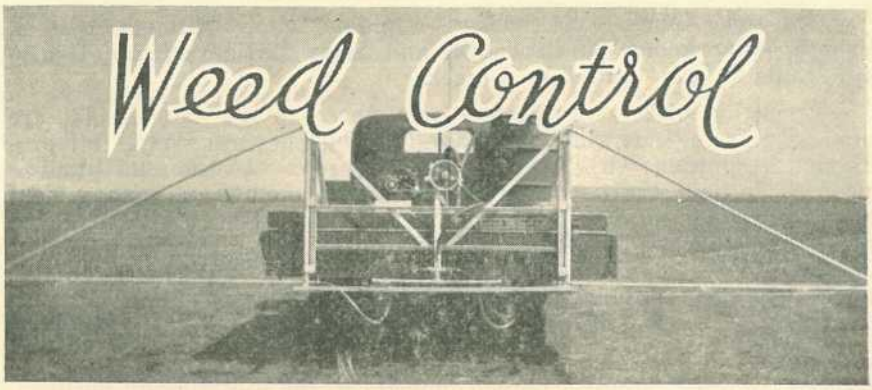
Bowen	5 and 6
Nambour	6, 7 and 8
Ayr	7 and 8
Laidley	7 and 8
Townsville	11, 12, and 13
Maleny	13 and 14
Ingham	14 and 15
Rosewood	14 and 15
Cairns	18, 19 and 20
Gatton	20, 21 and 22
Redlands	21 and 22
Tully	21 and 22
Woodford	21 and 22
Atherton	25 and 26
Innisfail	28 and 29
Lawnton	28 and 29

August.

Brisbane	5 to 12
Redcliffe	18 and 19

September.

Canungra	2
Beenleigh	15 and 16



Hormone Weedkillers and Their Use.

B. EASTERBROOK, Assistant to Weeds Officer, Science Branch.

THE discovery of the selective weedkilling properties of some growth-promoting substances used at relatively high concentrations compared with those occurring naturally was made during the early part of the war independently in England and in America. Since then these substances, generally known as "hormone" weedkillers, have become the most widely used of all selective weedkillers and are much to be preferred to other weedkillers for use in crops not affected by them. They are non-poisonous, non-corrosive, can be used successfully for high volume or low volume application and in most cases are much cheaper than other types of weedkillers.

It appears that in the soil hormones are oxidised and disappear after a period varying from about 30 to 90 days, depending upon the amount applied, the type of soil and its moisture and organic matter content, and the temperatures. Up to the present there is nothing to suggest that hormones will accumulate in the soil until they reach toxic proportions.

Hormones are not poisonous to man or animals even if taken in fairly large doses. Some people are allergic to them, although such cases are rare. Excessive contact with the skin has been known to cause slight blistering on a few occasions.

Mode of Entry and of Action.

It appears that hormones are absorbed by living surface cells on most parts of the plant. The breathing pores or stomata in the leaves are comparatively unimportant as a means of entry. Thick layers of dead cells, such as occur in old bark, greatly impede entry, but young, green stems readily absorb hormones. Ester formulations such as "Weedone" appear to be soluble in the cuticle, or waxy layer on the outside of the leaves, and hence penetrate tissues more rapidly.

Many plants absorb hormones readily through the roots, and it appears that when hormones are root-absorbed they are transported upwards to other parts of the plant in the transpiration stream, which is a stream of water passing from the roots to the leaves. If applied

to the leaves, hormones are transported downwards in the phloem, which is the tissue concerned with transporting the sugars and other carbohydrates manufactured in the leaves downwards to other parts of the plant.

Hormones are moved downwards from the leaves most readily when the translocation of sugar is most active and this usually occurs about the time the leaves have fully expanded. Very young, rapidly growing leaves have not made much carbohydrate and are still drawing upon the reserves stored in the roots, so that at this stage hormones are not usually rapidly transported down from the leaves. Similarly at the end of the growing season the mature leaves are ceasing to manufacture carbohydrates, so that downward translocation at this stage is not rapid.

Hormones appear to affect plants by interfering with one or other of the enzymes or inhibitors concerned with certain chemical reactions which are part of the growth process. Thus plants which are not growing are little, if at all, affected by ordinary concentrations; higher concentrations appears to have some action as contact poisons.

Characteristic effects of hormones are distorted growth, production of galls or roots on the stems and depletion of carbohydrate reserves; greatly increased rates of respiration have been observed. These effects are frequently followed by the death of the cells.

General Remarks on Use of Hormone Weedkillers.

From the above it is clear that the best time to spray plants with hormones is when there is active growth and maximum downward translocation of carbohydrates. These conditions can be best satisfied by spraying just before the plants are in full leaf, as growth is still active and the leaves are vigorously manufacturing carbohydrates. However, in practice this applies only to perennials which have a reserve of carbohydrates from the last season stored in underground organs. Annuals, or any seedling plants, have no such reserve and as soon as the food in the seed is exhausted the young leaves make food to send down to the growing roots. Consequently, seedlings in general are readily affected by hormones.

Hormones should be applied when the weather is calm and sunny and the temperature between 70 deg. F and 80 deg. F. Frosts and drought tend to check the growth of plants and make weeds more resistant to the action of hormones. Dust or water on the leaves tends to prevent adequate penetration and may seriously lessen the effect of the spray. Rain falling within a few hours of application is likely to wash off most of the spray if a water soluble type is used, and even oil-based sprays are likely to be affected to some extent. Hence, choosing a period of fine weather for spraying is important.

Generally speaking, water-soluble types are less effective against perennials than the oil-soluble esters but are very effective against a wide range of annuals and their selective action is more marked. The esters are not sufficiently selective to be used in any crops unless in very low concentrations and even then uneven coverage, where there has been overlapping of areas sprayed, may in places result in injury to the crop.

Spraying Weeds in Crops and Pastures.

In the following paragraphs are given recommendations for use of hormones in specific crops and in pastures. As little experimental work on spraying crops has been done in Queensland, most of these recommendations are taken from overseas reports. The effect of hormones on the particular varieties of crop plants grown and under particular local conditions may vary; therefore, in applying overseas results to Queensland conditions a conservative attitude has been adopted. Later work may cause the recommendation to be changed, but until such work has been done it is not advisable to depart widely from these recommendations when spraying on a large scale. The use of esters in growing crops is not recommended at present. Hormones are used for weedkilling in concentrations varying from about 0.025 per cent. for extremely susceptible species (such as weeds of the turnip family) up to 0·3 per cent. or 0·4 per cent. for more resistant species such as nut grass. For killing suckers and undergrowth strengths up to 2·0 per cent. are used.

Cereal Crops may be sprayed at rates of up to 1 lb. of active ingredient per acre after the crop plants are five or six inches high and before head formation has begun. In maize or sorghum no more than ½ lb. per acre should be applied, and the maize is less likely to be injured if sprayed when suffering from lack of moisture, though at such times the weeds also are more resistant. An application of 20 gallons per acre of a 0·1 per cent. solution is sufficient to kill bell vine and some other weeds of corn with little chance of crop damage. In many cases it is possible to apply as little as 15-16 gallons per acre in cereal crops by using boom sprays and at this rate of application 1 lb. of active constituent can be dissolved in 100 gallons of water, which will cover roughly six acres. This treatment has been found to give excellent results against turnip weed and other closely related species which are common in grain crops, and there is no danger of crop damage. However, black bindweed and European bindweed are not satisfactorily killed by so light an application.

Linseed.—If grown for seed only, linseed may be sprayed after it is four inches high and before flowering. Rates of application recommended by overseas workers as harmless to the crop vary from 1 lb. to 2 lb. per acre. The crop tolerance probably varies with the soil and climate and the varieties grown, so that until experiments are done in Queensland not more than 1 lb. per acre should be applied.

Potatoes.—It appears that hormones can be used for killing weeds in potatoes under certain conditions, but in the absence of any experimental work under Queensland conditions and with the varieties grown here, their use cannot be advised.

Sugar Cane.—The Bureau of Sugar Experiment Stations is conducting experiments with 2,4-D in cane crops and growers requiring information should contact officers of the Bureau direct.

Pastures.—These can be sprayed at rates up to 2 lb. per acre with salts or esters; esters may burn the leaves of grasses, particularly kikuyu, but are not likely to kill them, although bent grasses (*Agrostis* spp.) and buffalo grass have occasionally been killed. Most legumes are highly susceptible, so that the use of hormones in mixed pastures should be confined to the weed-infested patches. White clover is usually not killed completely unless several sprayings are carried out, but annual clovers are likely to be killed readily.

Susceptible Crops.—The following is a list of susceptible crops which should not be sprayed with hormones and which may be damaged by spray drift or volatilization of esters from adjoining areas or by applying insecticides or fungicides in equipment contaminated with hormones:—bananas, citrus, peas, tomatoes, beans, cotton, pineapples, turnips, beetroot, cabbage, cauliflower, carrots, clover, grapes, lucerne, parnsips, pumpkins, radish, stone and pip fruits, tobacco.

All flowers should be regarded as being highly susceptible.

Pre-emergence Treatment.

This can be classified into two types. In contact pre-emergence, the application of a light dose of spray is made shortly before the crop emerges, to control all weeds that emerge before the crop. Timing of application is very important, as the crop may be damaged if it emerges while there is still any spray residue in the soil.

In residual pre-emergence, the material is applied usually soon after planting and the chemical remains in the soil for some time, often long after the crop has appeared, so that selective action by the weed-killer is necessary. Hormones and some phenolic compounds are used for this type of treatment. It is really a selective soil sterilization and, where practicable, is preferable to contact pre-emergence as it controls weeds over a longer period. More work on pre-emergence treatments will have to be done under Queensland conditions before they can be recommended here. In many cases post-emergence treatment is either more desirable or just as effective.

It has also been found that treating of compost and manure with 2,4-D in a 0·01 per cent. solution prevented weed seeds present from germinating; beans and peas four weeks later germinated normally when treated with this manure. Grass seeds were more difficult to kill.

Combination of Hormones with Other Sprays.

Sodium salts and esters can be combined with several fungicides and fertilizers. Amine salts should not be used with sprays containing lime or metals such as copper, magnesium or iron, as precipitates which may block the nozzles are likely to occur. Very hard water may also cause troublesome precipitates to form, particularly with amine salts.

Removal of Hormone Residues from Spraying Equipment.

Where possible, equipment and containers should be used for hormones alone. If this is not possible, all equipment including tanks, hoses, nozzles, &c., must be thoroughly washed and, before being used for spraying insecticides or fungicides on crops susceptible to hormones, should be tested for any toxic residue by spraying water on a few young tomato plants or some other highly susceptible species. If there is no injury in three days, the equipment is clean; if there is injury, the washing must be repeated.

Where water soluble sprays have been used, wash the equipment three times with soapy water then fill with clean water to which household ammonia has been added at the rate of one quart to 25 gallons of water; allow the equipment to stand overnight and then wash out the ammonia. When esters are used, the equipment should first be rinsed out with kerosene and then washed as before; several washings may be necessary.

Sometimes instead of washing out with soapy water and then soaking overnight with ammonia, equipment is given two or three washings with washing soda followed by rinsing out with clean water.

Equipment.

For small areas knapsack sprays are suitable; the chief disadvantage with these is the large amount of refilling that is necessary, as most knapsacks have a capacity of about 3½ gallons. The use of low-volume nozzles will help to overcome this difficulty.

For spraying extensive, even areas boom sprays are used. The commonest type at present being used, particularly for spraying crops, consists of a 20 foot or 40 foot boom fitted with nozzles with an aperture of $\frac{3}{64}$ inch, delivering a fan shaped spray; the nozzles are spaced about 22 inches apart. The pump develops an effective pressure of about 15 lb. per sq. in. with a 40 foot boom and about 20 lb. per sq. in. with a 20 foot boom.

It is very important to adjust the position of the boom to the correct height above the weeds to give an even cover. Two heights are used, the lower height giving what is termed uniform single coverage, the greater height giving uniform double coverage; the latter does not involve the use of any more spray but gives the most even cover it is possible to get. However, it has the disadvantage of requiring the boom to be placed exactly twice as high as for uniform single coverage. With nozzles 22 inches apart and an aperture of $\frac{3}{64}$ inch, the correct height for uniform single cover at 15 lb. per sq. in. is approximately 19 inches and at 20 lb. per sq. in. is approximately 17 inches. To give an application of 15 gallons per acre the speed of the vehicle needs to be roughly 4½ m.p.h. at 20 lb. pressure and 4 m.p.h. at 15 lb. pressure.

For rough country sometimes short booms are mounted on a tractor and hoses fitted to the booms, the nozzles being fitted to the free ends of the hoses. Men walking behind the tractor then manipulate the hoses. This method is of no use for spraying crops but should be of value in spraying weeds such as lantana in uneven country. A pump capable of developing high pressure is necessary, as there is often a considerable loss of pressure along the hose, particularly if long hoses are used. A suitable outfit needs a pump developing pressures up to 250 or 300 lb. per sq. in. The hoses should be fairly long and be fitted preferably with twin nozzles, as a greater area can then be covered by each hose. For this type of work, nozzles delivering a cone-shaped spray are better than those delivering a fan-shaped spray.

The application of hormones by aeroplane and by fogging machines is still in the experimental stage in Australia.

Classification of Hormone Weedkillers.

All the brands at present on the market are derivatives of phenoxyacetic acid; it has been found that the effectiveness of this acid is greatly increased by the substitution of chlorine atoms in certain positions on the benzene ring which forms the basis of the acid molecule, and the various brands may be classified according to the particular substituted acid from which they are formulated. The following list includes all the brands at present marketed in Queensland, together with some others shortly to become available. Prices may vary from time to time and those given are current at the time of writing.

2-Methyl, 4-Chlorophenoxyacetic Acid.

The sodium salt of this acid is marketed in Australia as Methoxone, a 10 per cent. water solution without wetting or spreading agents, and is used largely against annuals in cereal crops and other annuals such as Noogoora burr and mint weed. Methoxone is sold by the Lands Department for killing Noogoora and Bathurst burrs, mint weed and weir vine at 11s. 3d. per gallon, rail free to the nearest station. It is also obtainable from A.C.F. & Shirleys Fertilizers Ltd., Little Roma Street, Brisbane, at the following prices:—3s. 9d. per pint; 18s. 5d. per gallon; £3 7s. 4d. per 4-gallon drum; £33 per 44-gallon drum.

2,4-Dichlorophenoxyacetic Acid.

The various formulations of this acid are all known as 2,4-D. There are two main types: (*a*) sodium and amine salts, which are water-soluble, and (*b*) esters, which are insoluble in water but soluble in oils.

(*a*) Sodium and amine salts are sold as powders or in solution. All are readily water-soluble and most of the brands have wetting and spreading agents included. The sodium salts are similar to Methoxone but with a slightly greater range of susceptible weeds. The amine salts are rather more effective against perennials, being intermediate in properties between the sodium salts and the more powerful esters, but are quite suitable for use in the specified crops. The following are the brands of sodium and amine salts at present available. For most of these the price works out at roughly £1 per lb. of active constituent. Actual brands differ widely in price per pound and per gallon because they differ widely in the amount of active constituent present.

United Selective Hormone Weedkiller.—50 per cent. solution; obtainable from Lands Department for Noogoora and Bathurst burrs, mint weed and weir vine at 58s. per gallon rail free. Also sold by United Chemicals Pty. Ltd., Montague Road, South Brisbane.

2,4-Diweed:—70 per cent. powder; H. Blaiklock & Co., 1078 Ann Street, Valley, Brisbane:—

	s.	d.	
½ lb.	12	0	
1 lb.	20	5	
14 lb.	19	6	a lb.
28 lb.	19	0	a lb.

Hardy's 2,4-D: 77 per cent. powder. Brett & Co., Grey Street, South Brisbane:—

	s.	d.	
16 oz.	12	6	
35 lb.	10	6	a lb.

Vallo 2,4-D: 82 per cent. powder; A. Victor Leggo & Co., Mary Street, Brisbane:—

	s.	d.	
4 oz.	6	0	
8 oz.	10	9	
1 lb.	19	6	
5 lb.	17	3	a lb.
25 lb.	16	6	a lb.

Dartormone: 80 per cent. powder; International Traders, 228 Roma Street, Brisbane:—

	s.	d.	
4 oz.	6	0	
1 lb.	18	6	
5 lb.	17	3	a lb.
1 cwt.	15	9	a lb.

Chloroxone: 80 per cent. powder; A.C.F. & Shirleys Fertilizers Ltd.:—

56 lb. drums only at 11s. per lb.

Taubman's No. 6 Weedkiller: 81 per cent. powder. Taubman's (Qld.) Pty. Ltd., 95 Edward Street, Brisbane:—

	s.	d.	
1 lb.	20	0	
7 lb.	16	6	a lb.
28 lb.	12	8	a lb.

Hormex: 50 per cent. liquid (amine salt); Lands Department for Noogoora and Bathurst burrs, mint weed and weir vine at £3 a gallon, rail free.

Also from Wilcox Mofflin Ltd., Barry Parade, Brisbane:—

	£	s.	d.	
8 oz.	0	6	10	
½ gallon	3	2	8	
1 gallon	5	14	0	
4 gallons	4	13	9	a gallon

Weed-all: 50 per cent. liquid (amine salt). Pope, Mayne, and Southerden Pty. Ltd., 300 Adelaide Street, Brisbane:—

	£	s.	d.
1 gallon	4	15	0
4 gallons	18	0	0

Weedar: 41 per cent. liquid (amine salt); A. G. Bignold & Co., 169 Elizabeth Street, Brisbane:—

Approximately £5 5s. per gallon.

(*b*) Esters: These are insoluble in water but are sold in an oil solution which can be readily emulsified with water; they are volatile compounds and sufficient may evaporate in warm weather to cause damage to susceptible plants growing alongside areas sprayed with them. They are not recommended at present for spraying crops but are useful for killing perennial and shrubby weeds in pastures, waste areas, roadsides, and other places where marked selective action is not desired. They may burn leaves of grasses, but do not kill the runners. The ethyl ester is at present sold in two forms:—Weedust, a powder mainly for use in lawns; and Weedone 57, a 35·2 per cent. oil solution with emulsifiers added. Both are sold by A. G. Bignold & Co., 169 Elizabeth Street, Brisbane. The price of Weedone 57 is £5 15s. a gallon.

2,4,5-Trichlorophenoxyacetic Acid.

Several formulations of this acid will soon be available. In general, 2,4,5-T is less effective than 2,4-D on annuals and some perennials such as water hyacinth and nut grass, but is markedly more effective on

woody shrubs. It has been found very effective against members of the rose family, such as blackberry, briar and wild raspberry, and in experimental work shows great promise against eucalypt suckers, tea-tree suckers and others.

Weedone Special 2,4,5-T:—35·2 per cent. ester in emulsifiable oil solution. A. G. Bignold & Co., 169 Elizabeth Street, Brisbane. The price is approximately £7 18s. 6d. a gallon.

A combination of 2,4-D and 2,4,5-T esters in an emulsifiable oil will soon be available. This has been found to be effective against a large number of shrubs and trees in America. Both this and 2,4,5-T appear to be promising as non-toxic alternatives to arsenic for killing many trees and suckers in dairying and pastoral country. Results so far indicate that oil or kerosene solutions are more effective than water emulsions for swabbing and frill poisoning, but any greater effectiveness must be measured against increased costs.

The following brands of this combination will soon be available:—

Weedone Brushkiller 32: 34 per cent. in an emulsifiable oil; A. G. Bignold & Co., 169 Elizabeth Street, Brisbane.

2,4,5-T plus: 40 per cent in emulsifiable oil. International Traders Ltd., 228 Roma Street, Brisbane:—

	£	s.	d.
3 oz.	0	5	9
1 pint	1	13	9
1 quart	2	6	3
½ gallon	3	19	6
1 gallon	6	4	6

Trimex: 40 per cent. in emulsifiable oil: Wilcox Moffin Ltd. Sold in 8 oz., 1 gallon and 5 gallon tins at roughly £6 8s. 3d. per gallon.

Diweed 5-T: 40 per cent. in emulsifiable oil; H. Blaiklock & Co.:—

	£	s.	d.
1 pint	1	1	0
1 quart	1	17	6
½ gallon	3	10	0
1 gallon	6	5	0

Taubman's No. 11 Weedkiller: 40 per cent. in emulsifiable oil; Taubman's (Qld.) Pty. Ltd., Edward Street, Brisbane:—

	£	s.	d.	
1 pint	1	1	0	
1 quart	1	17	6	
1 gallon	6	5	0	
4 gallons	6	0	0	per gallon

Carbamates.

It is of interest to note that certain other organic chemicals known as carbamates affect the growth of grasses but not of broad-leaved weeds. The most active of these, isopropyl-phenylcarbamate, stopped the growth of cereals at a concentration which did not affect marigold, sugar beet, flax, rape and charlock. However, no practical use of carbamates has been made yet.

Susceptible and Resistant Weeds.

The following lists are to a great extent provisional and further testing may alter the positions of various weeds as well as adding new weeds. If a weed has, up to the present, been killed satisfactorily with only one type of hormone, the name of that hormone is given after the name of the weed. Weeds marked with a star have been killed either in small scale tests only or in other States but not in Queensland and should therefore not be sprayed on a large scale unless a small patch is first sprayed to test the effectiveness of the hormone under the conditions existing in the particular area. Plants such as wild tobacco, with very hairy or velvety leaves, need a spray with a highly efficient wetting and spreading agent.

The minimum amount necessary to apply to get a satisfactory kill is expressed in pounds of active constituent per acre. Often when spraying small areas it is more convenient to think in terms of the concentration to be used rather than in terms of the number of pounds which must be applied per acre. In these lists it may be taken that 1 lb. per acre requires a 0·1 per cent. solution, 2 lb. per acre a 0·2 per cent. solution and so on, where the rate of application is sufficient to give a good cover of all leaves.

A 0·1 per cent. solution applied at the rate of 100 gallons per acre gives an application of 1 lb. per acre, at 200 gallons per acre 2 lb. per acre and so on. If it is necessary to apply 1 lb. per acre and the equipment being used applies the solution at the rate of 20 gallons per acre, a 0·5 per cent. solution must be used.

The concentration of all hormone weedkillers on the market is expressed as the percentage of active ingredient contained per gallon in the case of liquids and per lb. in the case of powders. For powders, a 0·1 per cent. solution is obtained by dissolving 1 lb. of the powder in 80 gallons of water if the powder contains 80 per cent. active constituent; if it contains 70 per cent. active ingredient 1 lb. should be dissolved in 70 gallons, and so on. If a 0·2 per cent. solution is required only half as much water as for a 0·1 per cent. solution should be used, for a 0·5 per cent. solution one-fifth as much. For liquids, a 0·1 per cent. solution is obtained by mixing 1 part with 100 parts of water if the liquid is 10 per cent., 1 part with 360 parts of water if it is 36 per cent., and so on. Again, for a 0·2 per cent. solution the amount of water added should be half that added for a 0·1 per cent. solution.

Annuals and Biennials.

Highly susceptible if sprayed under the right conditions.	lb. per acre.
Asthma plant (*Euphorbia hirta*)	1
Barbwire weed (*Nyssanthes diffusa*)	2
Bathurst burr (*Xanthium spinosum*)	1
Bell vine (*Ipomoea plebeia*)	¼
Blue top or billygoat weed (*Ageratum conyzoides*)	1
Bull-head or cat-head (*Tribulus terrestris*)	1
Burr medic (*Medicago denticulata*)	1
Charlock (*Sinapis arvensis*)*	¼
Chickweed (*Stellaria media*)*	2
Cobbler's pegs (*Bidens pilosa*)	1
Crowfoot (*Erodium cygnorum*)*	2
Dead nettle (*Lamium amplexicaule*)	1

	lb. per acre.
Devil's claw (*Martynia louisiana*)	1
Fennel (*Foeniculum vulgare*)	2
Hedge mustard (*Sisymbrium officinale*)*	¼
Hexham scent (*Melilotus indica*)	1
Horehound (*Marrubium vulgare*)	1
Jojo weed (*Soliva sessilis*)	2
Mallow (*Malva parviflora*)	2
Milk thistle (*Sonchus oleraceus*)	1
Milkweed (*Euphorbia drummondii*)	1
Mint weed (*Salvia reflexa*)	1
Noogoora burr (*Xanthium pungens*)	1
Oriental rocket (*Sisymbrium orientale*)	¾
Petty spurge (*Euphorbia peplus*)*	2
Pigweed (*Portulaca oleracea*)	1
Prickly lettuce (*Lactuca scariola*)	2
Ragweeds (*Erigeron canadensis and E. linifolius*)	2
Red caustic creeper (*Euphorbia prostrata*)	2
Scotch thistle (*Cirsium lanceolatum*)	2
Shepherd's purse (*Capsella bursa-pastoris*)	1
Slender thistle (*Carduus tenuiflorus*)*	2
Stagger weed (*Stachys arvensis*)	1
Star burr (*Acanthospermum hispidum*)	1
Stinking roger (*Tagetes minuta*)	1
Texas sage or wild Salvia (*Salvia coccinea*)	1
Turnip weed (*Rapistrum rugosum*)	¼
Wild hop (*Nicandra physaloides*)	2
Wild radish (*Raphanus raphanistrum*)	⅙
Wild turnip or mustard weed (*Brassica spp.*)*	¼
Yellow weed (*Galinsoga parviflora*)	1

Susceptible in young stages; older plants very variable.

Black nightshade (*Solanum nigrum*)*	2
Canada thistle (*Cirsium arvense*)*	2
Chicory (*Cichorium intybus*)	2
Cockspur thistle (*Centaurea melitensis*)*	2
Fat hen (*Chenopodium album*)	2
Fish weed (*Chenopodium triangulare*)	2
Fumitory (*Fumaria parviflora*)*	2
Panicled amaranth (*Amaranthus paniculatus*)*	2
Mexican or prickly poppy (*Argemone mexicana*)*	2
Saffron thistle (*Carthamus lanatus*)	2
Spiny emex or double gee (*Emex australis*)	2
Star thistle (*Centaurea calcitrapa*)	2
St. Barnaby's thistle (*Centaurea solstitialis*)*	2
Variegated thistle (*Silybum marianum*)	2
Wireweed (*Polygonum aviculare*)	2

Perennials.

A great many perennials require more than one spraying to eradicate them completely; later sprayings often have to deal with no more than isolated patches.

Highly susceptible under suitable conditions.	lb. per acre.
Bindweed (*Convolvulus arvensis*)	2
Black roly poly (*Bassia quinquecuspis*)*	2
Blackberry (*Rubus fruticosus*)* 2,4,5-T.	3½
Brigalow burr (*Bassia tetracuspis*).* Not Methoxone	2
Bryophyllum (*Bryophyllum calycinum*)	1
Carrot weed (*Daucus glochidiatus*)	1
Castor oil plant (*Ricinus communis*)	1
Common verbena (*Verbena officinalis*)	1
Common dock (*Rumex brownii*)	2
Curly dock (*Rumex crispus*)	2
Devil's apple (*Solanum sodomaeum*)	2
Dodder (*Cuscuta australis*)	2
Duckweed (*Lemna oligorrhiza*)	1
Flannel weed (*Sida cordifolia*)	2
Flat weed or dandelion (*Hypochaeris radicata*)	1
Fern-leafed verbena or Mayne's Pest (*Verbena tenera*). 2,4,5-T	2
Galvanised burr (*Bassia birchii*), 2,4,5-T	2
Gomphrena weed (*Gomphrena celosioides*)	2
Guava (*Psidium guajava*)*	2
Hemlock (*Conium maculatum*)	2
Hoary cress (*Lepidium draba*)	2
Indian weed (*Siegsbeckia orientalis*)	2
Inkweed (*Phytolacca octandra*)	2
Lantana (*Lantana camara and L. montevidensis*)	2
Mexican clover (*Richardia brasiliensis*)	1
Morning glory (*Ipomoea purpurea*)	1
Mullumbimby couch (*Kyllinga monocephala*)	2
Needle burr (*Amaranthus spinosus*)	2
Paterson's curse (*Echium platagineum*)	2
Pennyroyal (*Mentha satureioides*)	2
Pennywort (*Hydrocotyle asiatica* and *H. laxiflora*)	1
Pepperwort (*Lepidium hyssopifolium*)	2
Pink-flowered Chinese burr (*Urena lobata*)	2
Plantains (*Plantago* spp.)	1
Poinsettia (*Euphorbia heterophylla*)	2
Spear-leaved fishweed (*Rhagodia hastata*)*	2
Star of Bethlehem (*Ipomoea quamoclit*)	2
Streaked rattlepod (*Crotalaria striata*)	2
Swinecress (*Coronopus didymus*)	2
Tree of Heaven (*Ailanthus glandulosus*)*	2
Veined verbena (*Verbena rigida*), 2,4,5-T	2
Wandering Jew (*Commelina cyanea*)	2
Water hyacinth (*Eichhornia crassipes*), 2,4-D sprays only	2
Weir vine (*Ipomoea calobra*)	1
White clover (*Trifolium repens*)	2
Susceptible in early stages; older plants very variable.	
Creeping knapweed (*Centaurea repens*)*	2
Galvanised burr (*Bassia birchii*)*. Weedone	4
Khaki weed (*Alternanthera repens*)	2
Lesser joyweed (*Alternanthera denticulata*)*	2
Onion weed (*Asphodelus fistulosus*)*	2
Purple top (*Verbena bonariensis*)	2

Susceptible in seedling stages only.

	lb. per acre.
Sida retusa or Paddy's lucerne (*Sida rhombifolia*)	.. 2
False mallow (*Malvastrum coromandelinum*) ..	.. 2

Plants which are susceptible in early stages, older plants requiring brushing and the regrowth to be sprayed.

Devil's Fig (*Solanum torvum*)* ..	.. ..	.. 2
Groundsel bush (*Baccharis halimifolia*) ..	..	.. 2
Wild tobacco (*Solanum auriculatum*)* ..	..	.. 2
Wild verbena (*Heliotropium amplexicaule*)*.	2,4,5-T	2

Plants which require to be cut off and the butts swabbed.

It appears that suckers and young plants of numerous species of *Eucalyptus, Casuarina, Leptospermum* and others may be satisfactorily killed by cutting off near ground level and swabbing with a 1 per cent. solution of 2,4,5-T. However, this work is still in the experimental stage and large scale operations should not be carried out until results of the trials are definite.

Species very variable in susceptibility at all stages of growth.

Black pig weed (*Trianthema portulacastrum*).
Common thorn apple or stramonium (*Datura stramonium*).
Green amaranth (*Amaranthus viridis*).
Mist flower (*Eupatorium riparium*).
Sensitive plant (*Mimosa pudica*).
Tick trefoil (*Desmodium triflorum*).
Waterpepper (*Polygonum hydropiper*).

Species resistant for practical purposes.

Black bindweed (*Polygonum convolvulus*).
Bracken fern (*Pteridium aquilinum*).
Bullrush (*Typha* sp.).
Cape gooseberry (*Physalis peruviana*).
Green cestrum (*Cestrum parqui*).
Ground cherries (*Physalis* spp.).
Long-spined thorn apple (*Datura ferox*).
Lilac-flowered oxalis or shamrock (*Oxalis corymbosa*).
Milky cotton bush (*Asclepias fruticosa*).
Redheaded cotton bush (*Asclepias curassavica*).
Rushes (*Juncus* spp.).
Yellow oxalis (*Oxalis corniculata*).
All true grasses except bent grass (*Agrostis* sp.) and buffalo grass.

Special Weeds.

Nut grass (*Cyperus rotundus*): Shoots and the tubers from which they rise are killed by liberal application of 0·2 per cent. solution. Dormant tubers can be killed by later sprayings when they have germinated; very deep tubers are not killed but may be starved by repeatedly spraying shoots arising from them.

Crofton weed (*Eupatorium adenophorum*): If brushed and the regrowth sprayed it is killed by liberal application of 0·4 per cent. 2,4,5-T or 2,4-D plus 2,4,5-T.

Lantana (*Lantana camara*): Young bushes or regrowth are readily killed by 2,4-D sprays in a 0·2 per cent. solution provided that the plants are actively growing when sprayed and that all the leaves and young stems are covered thoroughly with spray. 2,4,5-T appears to give best results of all, particularly on larger bushes.

Mechanisation of the Cheese Industry.

W. A. G. HAYLETT, Senior Adviser in Dairying.

DURING a recent visit to Victoria, the opportunity was taken by the writer to observe some of the developments which have taken place in the mechanisation of the cheese industry of that State in recent years. By this means much progress has been made in meeting the changing situation in manufacture brought about by the dearth of skilled labour and the shorter working week. Prior to the advent of these improvements in cheese manufacture, there was a tendency to use "hurry up" methods with the ordinary type of equipment; this was detrimental to quality in a fermentation process such as cheese-making. The developments referred to herein have enabled a reduction in the amount of unskilled labour in the factory, have reduced manufacturing cost by avoiding overtime payments for employees, and at the same time have led to an improvement in the body and texture of the cheese.

Starter Control.

Modern methods of starter control were described in this Journal for April, 1949. In Victoria considerable headway has been made in adopting improved methods of starter control along the lines referred to in the abovementioned article by the use of water-sealed bulk starter-can lids and the technique of single-strain propagation. This has done much to overcome "slow" vats, reduce overtime and improve cheese quality.

Travelling Motor Agitator and Curd Stirrer.

The introduction of the mechanical curd stirrer to replace the wooden rake was a notable advance in the cheese industry of some years ago, and most Queensland factories now have these mechanical agitators. The electrically-driven motor travelling agitator and curd-stirring device now used in some factories in Victoria is a further development. As well as stirring the curd in the whey, it can be used for stirring the curd after the whey has been run off and after milling.

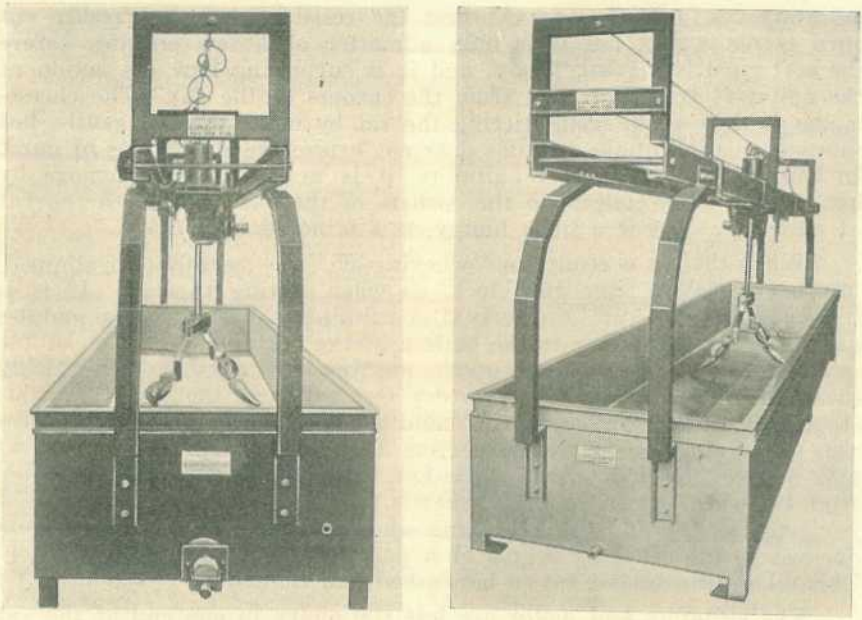


Plate 133.

Two Views of Travelling Agitator and Curd Stirrer.

The travelling agitator and curd stirrer consists of a pair of metal paddles driven by a 1 h.p. motor which travels backwards and forwards from end to end of the vat on overhead rails fitted to both ends (Plate 133). The motor can be controlled by an accessible push-button switch. The paddles, which are screwed to arms fitted to a block just above the level of the top of the vat, rotate in a clockwise direction and efficiently stir the milk or the curd. The machine, which has two speeds, takes approximately 40 seconds in top gear and 80 seconds in bottom gear, to travel the length of a 1,000 gallon vat. A trip-gear automatically changes the direction of movement by throwing the patent drive clutch from one winding drum to the other by means of tension on either of the $\frac{3}{4}$ inch flexible steel cables. The overhead gear is made from channel iron or from three galvanised iron pipes set apart like the three points of a triangle to enable the convex wheels to run on two pipes whilst the third supports a metal strap to avoid displacement.

The paddles are like plough shears, measuring 4 inches across at the widest part and tapering to the toe. The paddles can be geared into any of three speeds, varying from 6 to 14 revolutions per minute. By adjusting the hinges holding the paddles to the two arms, the paddles can be set at convenient heights for stirring (*a*) milk in the vat, (*b*) curd in the whey stage, and (*c*) the curd after wheying off and milling. To avoid wear of the vat or the paddles, when dry stirring the curd a plastic or rubber shoe is fixed to the paddles.

When milk is being added to the vat and "ripened" by the starter the agitators can be set in motion in high or low gear. When the vat is ready for setting, the paddles and arms attached to the block are removed. After the curd is cut, the paddles are refitted, and the

agitators set in low gear. At first the resistance of the freshly cut curd is noticeable, but it is only a matter of a few minutes before the soft curd is moving freely, and it is surprising how the action of the agitators frees the curd from the corners of the vat. The cheesemaker is thus saved from stirring the vat by hand and the gentle, but thorough, action of the paddles does not bruise the soft pieces of curd. In contrast with standard agitators, it is unnecessary to remove by hand curd which collects in the corners of the vat. Although the vat of curd may appear a little lumpy, this is not detrimental.

When the vat is ready for "wheying-off," the agitators are stopped, but not removed from the block, as when setting the vat. If it is necessary to "dry-stir" the curd after running off the whey, the paddles are set lower and closer to the bottom of the vat and the action of the paddles in top gear, breaking up the matting curd particles and quickly draining off the whey, assists to dry out and firm the curd. At this stage the agitators are capable of handling the curd from another cheese vat, and from then on the curd from two vats is combined in one vat and handled by mechanical agitation. In "doubled" vats the whey from two vats (set at the same time) is run down at approximately 0·15 per cent. acidity and the remaining whey and curd pumped over from one vat to the other by means of a portable 2-inch centrifugal pump. This allows the second vat to be washed and refilled in 1½-2 hours.

The agitators and motor are left stationary in one end of the vat when the curd is being cheddared. During milling, the agitators are again put into use, the manipulation of the trip gear enabling their return over the milled curd while the curd mill is still operating. This prevents the early matting of the curd pieces and allows for early aeration of the curd.

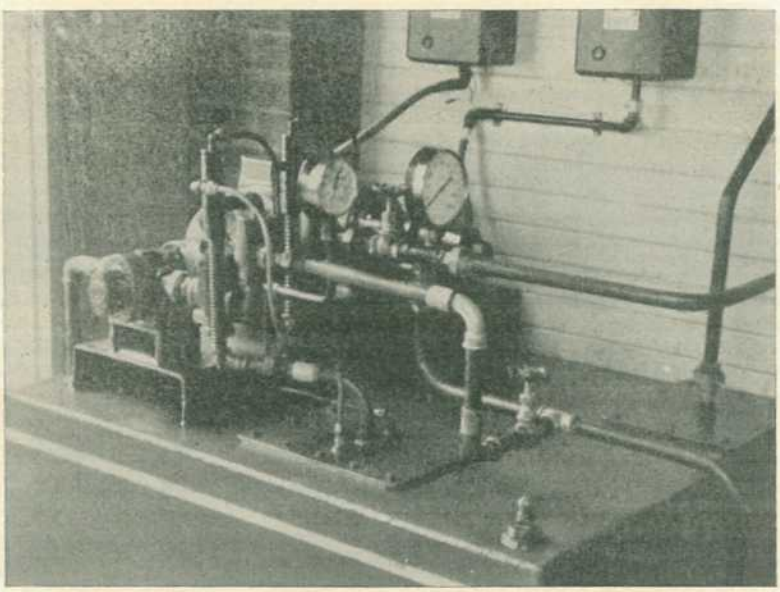
After milling, the machine-stirring enables the curd to be handled by one operator, or, if there are several vats, one cheesemaker can salt without any assistance. At this stage, machine-stirring is more effective than hand-stirring, which is one of the heaviest and most fatiguing jobs in a cheese factory. Another advantage is that salting can be done in several light applications, and the salt thoroughly and evenly incorporated. At the same time, the curd is sufficiently disturbed to prevent it from matting, and sufficient time is allowed for it to mellow. This is beneficial to the body and texture of the cheese. The mechanical stirring of the curd during salting is also more hygienic than manual stirring. The only disadvantage appears to be that excessive stirring of the curd has a tendency to dry it out too much, which causes a hard, corky body. If the speed is reduced and the curd handled carefully, this defect can be obviated.

The cost of the equipment is approximately £400 per unit. The weight of the unit is about 3 cwt.; and when channel iron is used for the overhead gear it weighs about 10 cwt. By the use of a triangular set of galvanised iron piping, strapped to prevent spreading, the overhead weight would be considerably reduced in comparison with the channel iron, which is difficult to procure. Moreover, the galvanised iron piping would increase the strength and rigidity for the travelling of the convex wheels. This overhead piping could be fitted to the usual vats in use in Queensland, by suspending it from the factory rafters or fitting it to the ends of the vat, so that the tipping of the vat would not affect its use (Plate 133.) The 1 h.p. electric motor could be driven by power generated by the diesel engine commonly found in Queensland cheese factories.

Taking into consideration the advantages mentioned and the saving of wages of one unskilled labourer, the cost of the equipment is economically justified.

Hydraulic Cheese Press.

The hydraulic cheese press overcomes the heavy manual work associated with the standard cheese press and saves time at the close of the day when the factory staff are tired. The higher and continuous pressure gives a close-textured cheese. It is also likely that export-size cheeses could be pressed for one instead of two days.



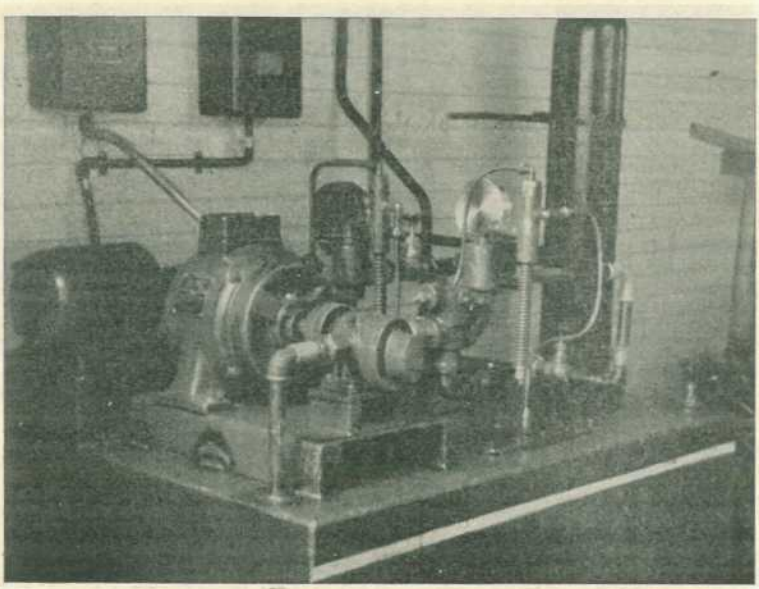


Plate 134.

Two Views of Pump Unit for Hydraulic Cheese Press.

Hydraulic equipment for operating cheese presses consists of an electrically driven pump unit (which is duplicated for emergency purposes) mounted on an oil sump of a capacity suitable for the number of presses (Plate 134). The oil under pressure is piped to the cylinder unit which is mounted on the end of each press. The movement of the ram in each cylinder unit is controlled by one lever for forward, neutral and reverse. When left in the forward position it automatically presses the tube to any pre-determined pressure up to 10 tons and maintains this pressure so long as the pump unit is running (Plate 135).

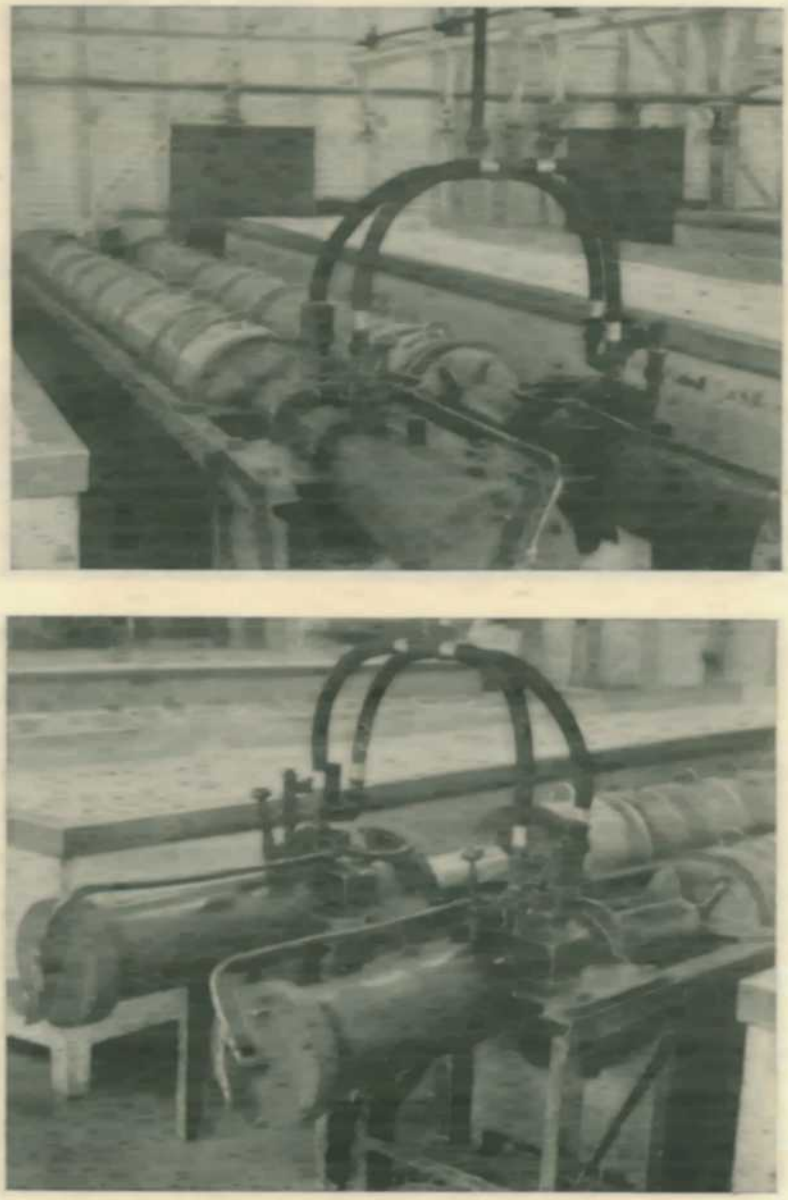


Plate 135.
Two Views of Hydraulic Cheese Press.

Should any trouble occur with the electric motor, switch gear, pump valve, &c., the stand-by unit can be instantly put into operation by the closing of a separate switch. The pump unit is equipped with an unloading valve, which increases the life of the motor, pumps and valve considerably and uses less electric power. All weights, levers and screws are dispensed with and more cheeses can be placed in the press at once. As many as 17 export-size cheeses (80 lb. each) have been placed in the press at once, compared with 13 in the ordinary gang press. To manage the extra number of cheeses to a press, it is necessary to take up pressure and, on reversing the gear, add additional hoops.

To enable the ordinary cheese press frames to withstand the higher pressure used for hydraulic pressing, it is necessary to increase the strength of the press frames. It has been found from experience that the addition of two extra sets of legs to a standard cheese press frame strengthens it quite appreciably and presses so reinforced have withstood pressure of up to 11 tons for quite long periods without adverse effect. This equipment could be installed by the average engineer. It entails the following work:—

(*a*) The placing of the pump unit in a suitable position relatively close to the cheese presses, but preferably in an adjoining room so as to protect the plant from moisture, steam and salt.

(*b*) The running of a pressure and return pipe line of ¾-inch steam piping from pump unit to cylinder unit, keeping the vertical head of hydraulic fluid as low as possible.

(*c*) The connecting of 415 volt three-phase electricity supply, including suitable fuses and switch gear; alternatively, a 2 h.p. generator driven by a diesel engine as found in most Queensland factories would suffice to drive this equipment.

(*d*) The bolting of the cylinder unit on the end of the press frame and the removal of the existing screws and ratchet assemblies and the pressure-retaining weight from the other end. A short press is made by adding a loose plate which can be pinned or bolted to any existing holes in the cheese press frames.

The hydraulic cylinders attached to the presses (Plate 135) each measure 42 inches in length and 8 inches in diameter and are coupled in pairs with ¾-inch hose piping. The 6-inch diameter ramrod piston drives a 15-inch diameter head and with a 2 ft. 6 in. drive exerts a constant pressure of 8 to 10 tons, which is almost double the pressure exerted by the 160 lb. ball and lever of the ordinary cheese press.

The telescopic type of drive is usually in three sections and gives a longer drive up to 3 ft. 5 in., thereby allowing two extra export cheeses to be added after the preliminary pressing, whereas the 2 ft. 6 in. drive only accommodates one extra export size cheese. Present fittings are only for a 2 ft. 6 in. drive, but this will be increased on later models.

The cost of the hydraulic cheese press units is dependent on the number of cheese presses to be accommodated. The pump unit, which costs from £400 to £500, operates a number of cylinder units fitted to each press. These cylinder units cost approximately £250. Thus it would cost approximately £1,000 to set up two presses, £1,500 for four presses and £2,000 for six presses. The cost may seem heavy, but as

hydraulic cheese pressing is much quicker and is operated by a finger-controlled lever, as compared with the heavy work required to raise the ball and lever, the less arduous labour and saving of overtime rates are strong factors in its favour. Moreover, it represents a capital asset. Seven large Victorian factories are now completely fitted with hydraulic presses.

Other Equipment.

The projected development of regional electricity supplies in Queensland may open up the possibilities of the use of other labour and time-saving equipment in the near future in Queensland cheese factories. In this regard interesting items of equipment seen in Victorian cheese factories were as follows:—

1. *Metal jacketed vats,* holding water which is steam heated, provide better control over temperatures of milk and the curd in the vat, particularly in winter. However, because of the high environmental temperatures in Queensland, tests would be required to determine the advantages or otherwise of water-heated vats in this State. It was also noticed that screw jacks are fitted to tip the metal jacketed vats in Victoria for running off the whey; this eases the work with large vats, and reduces the strain on the vats themselves. It is doubtful if they are any quicker acting than the levers or legs used on Queensland vats.

2. *A centrifugal pump* coupled to a 6-inch piping, or an open guttering, has been used successfully for "wheying off" a vat quickly. A sanitary foot valve is inserted into the vat and the pump and valve need priming. The open guttering or pipe takes the whey to a whey separator situated outside the cheese room. Some pumps are directly coupled and gravity fed at the end of the chute.

3. *A stainless steel sieve,* 6 inches high, 2 feet long and 15 inches wide, placed inside the vat near the tap, is used to replace the piece of cheese cloth so often attached to the tap and which drops on the floor. To provide a large area for free drainage of whey and to fit comfortably against the vat when lowered into it, the sieve is shaped at right angles at the bottom and slopes back.

4. *An electric curd milling machine* with an oil immersion worm cuts the curd more evenly and is smoother running than a belt-driven curd mill. It can be driven by a 1 h.p. electric motor on the curd mill frame and as there is no need to clamp it on to the vat damage to the edges of the vat is avoided.

5. *A curd fork* is used in some factories which have not installed the combined travelling agitator and curd stirrer. The fork, which measures about 12 inches in width, has 10 curved prongs, each being 18 inches long. It forks the curd after milling and salting, thus dispensing with hand stirring.

6. *A curd filler* like a shell of a milk strainer sits on top of the hoop and facilitates hooping the curd.

7. *A mobile electric loader,* driven by a 3 h.p. motor and costing about £200, is an asset in a large factory. Six export cheeses can be placed comfortably on the platform or tray which is 2 ft. 6 in. square, and it is common to see nine export cheeses being wheeled to the

curing room. It is capable of being raised to the higher shelves, thus facilitating the placing of the cheeses on the shelves in the holding room. A rubber tyred unit is advantageous.

8. *Cooling of cheese holding rooms.* Unsuitable temperatures cause much cheese to deteriorate in quality in cheese holding rooms. Air conditioning is the ideal, as it enables the control of both temperatures and humidity. Refrigeration itself permits control of temperature but not humidity and so suffers the disadvantage that moisture from dripping coils favours the growth of cheese mites and moulds. To give better control by a less expensive method than air conditioning, a fan blowing against a brine cooler is being used in some Victorian factories. A fan blows direct on to an area of coils about the size of a truck radiator, which is also a little larger in area than the fan itself. At least two fans are needed on opposite sides of the room, but they must not be placed directly facing each other, otherwise the circulation of air is not efficient. The cost of each fan is about £80 to £90.

Suitable insulation of the walls and ceiling of the cheese-holding room is essential. Several thicknesses of fibre board treated against rodents is suitable; insul wool and solomit have also been used with some success. That portion of the refrigerated coils in the cheese room which is not immediately in front of the fans needs to be insulated to prevent condensation of moisture.

9. *Roller conveyors* are used on cheese factory platforms to facilitate the handling of milk on receival.

10. *Starter can trolleys* are used for easier handling of heavy starter cans.

11. *Can washers* (both rotary and straight through types) which save time and labour were observed to be used extensively in Victoria. They are an aid to quality improvement by ensuring the return to the farmer of properly washed cans.

Conclusion.

It will be appreciated from the foregoing observations that in Victoria the use of modern equipment has made it possible to reduce the cheesemaking process from 6½ to 5 hours without detriment to the quality of the cheese. The main factors which have enabled this are:—

(*a*) 2 to 2½ hours are still allowed for the curd to remain in the whey.

(*b*) Time is saved by wheying off quickly.

(*c*) Salt is added immediately after milling but the salted curd is allowed to mellow before hooping.

(*d*) The curd is handled throughout the process with less manual effort.

(*e*) Hydraulic pressing enables a quicker finish to the day's manufacture and reduces the pressing time for large cheeses.

(*f*) The shorter time of manufacture permits more attention to be given to cleaning of factory equipment and factory maintenance, all within the normal working day of 6 hours 40 minutes.

Appreciation is expressed to Mr. W. J. Park, Cheese Expert of the Department of Agriculture, Victoria, manufacturers of dairy equipment, and factory managers for assistance given to the author during his visit to Victoria.

Wool and its Uses.

G. R. MOULE, Director of Sheep Husbandry.

WOOL is one of the most useful fibres in the world. Others are important in providing clothes and meeting industrial requirements, but few have its versatility.

The fibres in most common use may be classified as natural fibres and artificial fibres. The natural fibres can be divided into those of animal origin, those of vegetable origin and those derived from minerals. The fibres of animal origin include wool, silk and hair. Amongst those of vegetable origin are cotton, flax and hemp; while asbestos is the outstanding example of the mineral fibres.

The artificial fibres can be classified on their origin as those coming from cellulose, from protein, from resins and plastics, and from other sources. The fibres made from cellulose include rayon, with which most people are familiar, and algenata, which is made from seaweed. The sources of protein most commonly used for the manufacture of fibres are casein, soy bean and fish albumen. Nylon is the best known fibre in the group made from resins and plastics. Included in the miscellaneous class originating from other sources is fibre glass.

Woollen Articles.

Articles made from wool may be divided into five main groups:—

(i.) Woollens, which include blankets and flannels.
(ii.) Worsteds, which include closely woven suitings.
(iii.) Knitted garments, which range from jerseys to stockings.
(iv.) Felt, which may be fine and soft in hats or thick and coarse in Numnah pads under saddles.
(v.) Carpets.

Different types of manufacturing processes produce various finished woollen articles. The differences commence in the shearing sheds, where the wool is classed into lines uniform in such physical characters as staple length, tensile strength, character and colour. Before manufacture, the wool is blended, and variations in the amount of twist applied to the yarn during spinning carry this differentiation still further.

Wool is suitable for apparel manufacture because of its physical properties. These permit the making of woollen fabrics, which are warm, soft, durable and of satisfying appearance. Approximately four-fifths of the wool produced in the world each year is used for the

manufacture of wearing apparel. The remainder is used for carpet making. It is well known that woollen clothes are thermostatic—that is, they help the body maintain an even temperature. This is because wool itself is a bad conductor of heat and woollen fabrics entrap large amounts of air between their component fibres. This means that the body is surrounded by a layer of air at uniform temperature, which also acts as an insulating medium. It has been demonstrated that the warmth of rough fabrics, such as "Donegal" tweed and blankets, depends on their fluffy finish, as the comparatively loosely twisted yarn and the "nap" hold a large volume of insulating air. Woollen fabrics are twice as warm as rayon fabrics of the same dimensions, but rayon and silk are warmer than fabrics of the same density (that is, fabrics of the same weight per unit area). Woollen clothes have a remarkable capacity for absorbing sweat. The clothes worn by the average man weigh about 8 lb. and during usual spring weather in Brisbane would contain about one pound of moisture. During extremely dry weather this would decrease to about ½ lb. and in wet weather may increase to 1½ lb. This immediately raises questions as to where so much water can be secreted.

It has been found that the water forms a thin film around each fibre and it is interesting to know that the fibres in 1 lb. of 60's quality Merino wool present a total surface area of 800 square feet. The 3 lb. of wool in a suit of clothes would have a total area of 2,400 square feet, which accounts for the tremendous capacity of woollen garments to absorb moisture. This absorptive capacity makes an important contribution to the thermostatic properties of woollen garments. The rapid absorption of sweat decreases the rate of its evaporation and modifies its sudden cooling effects.

Wool is elastic and resilient, strong and durable, and these are important qualities in any fibres used for the manufacture of wearing apparel. Wool fibres are as strong as bronze and steel "fibres" of identical dimensions and they are from 2 to 4 times as strong as comparable 'fibres" of wood. However, dry silk is 2½-3 times as strong as wool and nylon is even stronger. Dry cotton is about twice as strong as wool, but these fibres are comparably weaker when wet. In addition they become quite "tender" when they are constantly wet with sweat. The ease with which the backs of cotton shirts and singlets tear after being worn for a full summer is evidence of this.

The durability of wool is apparent from the following table which compares the number of bends, each of 180 degrees, required to fracture single filaments.

Fibre.	Fibre Diameter in Microns.*	Number of Bends each of 180°.
Wool	24	20,000†
Nylon	14	20,000†
Cotton	17	3,200
Silk	15	1,800
Soy Bean	21	150
Cellulose (acetate) (Synthetic)	19	100

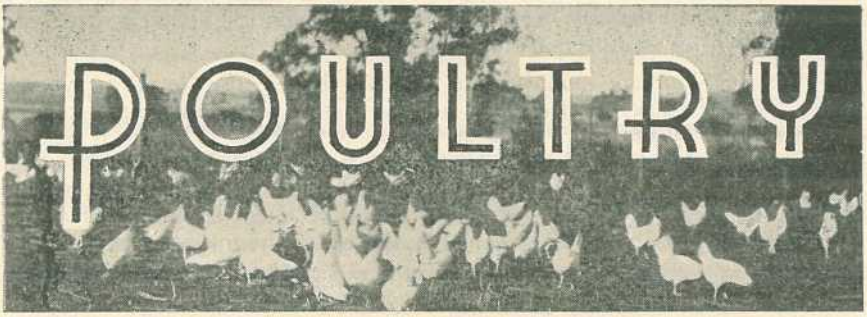
* 1 Micron = $\frac{1}{25400}$ inch.

† Some still unbroken.

All of these factors influence the uses to which wool might be put. Many producers refer to the "ideal" wool, apparently believing that there is one particular line of wool especially sought by the trade.

It is true that some lines of wool may command greater competition at auction than others, but it should be remembered that the wool trade is highly specialised and well organised. There is very little waste wool and uses can be found for most types. An appreciation of the uses to which various types of wools are put forms a useful background for any one interested in classing, and the following table presents this information in summarised form.

Wool.	Worsted.		Woollen.
	Woven.	Hosiery.	
Merino ..	Woven suits and dresses	Hosiery ; good underwear	Woollen luxury blankets ; rugs, coats and dresses ; billiard cloths
Fine crossbred	Cheap suits and dresses	Average knit wear ; beach wear	Better blankets ; tweeds ; coats ; rugs
Medium to strong crossbred	Bunting ; filler cloths ; uniforms	Cheap knit wear ..	Blankets ; tweeds ; low grade coats



Diseases of Ducks.

Prepared by Officers of the Animal Health Station, Yeerongpilly, and the Poultry Branch.

THE number of ducks raised in Queensland has increased greatly in the last few years. The weight of dressed ducks exported increased from 134,473 lb. in the year 1947-48 to 389,760 lb. (valued at £46,284) in 1948-49. This rapid expansion of the industry has brought about an increased demand for information on the prevention and treatment of diseases of ducks. It has resulted also in many farmers commencing duck raising when they lacked the experience and the accommodation and equipment necessary to handle large flocks.

Owing to the peculiar feeding and watering habits of ducks, serious outbreaks of infectious diseases such as salmonellosis and cholera often develop among them once infection is introduced into a flock.

When sickness occurs, correct diagnosis of the cause of the trouble is necessary so that effective methods of controlling the outbreak may be commenced quickly. Owners of flocks suffering from disease may consult their local veterinarian or officer of the Department of Agriculture and Stock or they may send affected birds by rail direct to the Animal Health Station at either Yeerongpilly or Oonoonba. Live sick birds are preferred, but in some diseases death occurs suddenly and in such cases recently dead birds may be sent provided they will reach the laboratory within 24 hours. Dead specimens must be wrapped in cloth, then packed in a sound tin or wooden box. As laboratory examinations may take several days to complete, birds should be submitted as soon as possible after signs of ill health appear in a flock.

Full particulars of the management and feeding of the flock, the number and age of the birds affected and the nature of the complaint should accompany all specimens sent to the laboratory.

Cholera.

This is one of the most important diseases of ducks. It is caused by a bacterium (*Pasteurella aviseptica*), which also infects fowls and turkeys.

Ducks of all ages are susceptible. The death rate varies, but it may be high. In a recent outbreak near Brisbane 60 out of a pen of 70 ducks almost ready for market died in five days. Affected birds

become weak, fevered and unable to stand and diarrhoea may be present. Death usually occurs after 24 to 48 hours' sickness, but birds may die before symptoms are noticed.

On post-mortem examination, haemorrhages are found in various parts of the body, particularly in the heart, liver and spleen. The pericardium (heart sac) may be filled with fluid. There is usually excessive fluid or a thick yellow exudate in the abdominal cavity. The intestines are often inflamed and haemorrhagic. The liver is enlarged and is frequently dotted with pale areas of dead tissue. Laboratory bacteriological tests are necessary for the exact diagnosis of this disease.

Spread of cholera is favoured by insanitary and wet conditions, so ducks must be kept in clean, well-drained yards large enough to prevent overcrowding.

When cases of cholera occur, the whole of the affected group should be treated at once by giving either sodium sulphamezathine or sodium sulphamerazine at the rate of 0·2 per cent. in the drinking water. Both these drugs are available from poultry supply houses as a 16 per cent. solution. Two ounces of this solution is added to each gallon of drinking water on the first day and 1 oz. per gallon on subsequent days to give concentrations of 0·2 per cent. and 0·1 per cent. respectively. No other water should be available to the birds. Treatment is continued for 4 or 5 days.

As some of the birds in a flock in which an outbreak has occurred continue to harbour cholera bacteria for many months, the whole of the affected group should be held in isolation and sold for slaughter as soon as possible.

Salmonellosis.

This is an infectious disease caused by bacteria of the Salmonella group. It has also been called paratyphoid, infectious enteritis and "keel disease" of ducks. Many cases of salmonellosis in ducks have been diagnosed in Queensland during the last few years. Salmonella bacteria also infect man and domestic animals and birds.

Ducks of all ages are affected but ducklings in the first few weeks of life are most susceptible. Birds contract salmonellosis by ingesting contaminated feed or water. The usual source of infectious material is the excreta from either sick ducks or carriers (that is, ducks which appear healthy but harbour Salmonella bacteria in their intestines or ovaries). Some of the eggs laid by carrier ducks are infected and the ducklings hatched from them may therefore be affected. Other sources of infection are the excreta from either sick individuals or carriers among other animals (pigs, calves, chickens, rats, mice) or human beings.

Outbreaks of salmonellosis occur more frequently and more severely in flocks kept under insanitary conditions but occasionally outbreaks occur in well managed flocks.

Affected birds appear listless, refuse food and may die within 48 hours. Fever and diarrhoea may also occur. In ducklings there is often an ocular discharge which wets the down around the eyelids.

Upon post-mortem examination the intestines may be inflamed, and the spleen and the liver may be swollen and spotted. For correct diagnosis it is essential that Salmonella bacteria be identified in the internal organs by laboratory tests.

When salmonellosis occurs, seriously affected birds should be destroyed, and treatment with sulphamerazine or sulphamezathine similar to that recommended for cholera should be given to the affected groups. Ducks surviving an outbreak of salmonellosis should be isolated and marketed as soon as possible, because they may be carriers of the Salmonella bacteria.

The pens or yards in which cases have occurred should be thoroughly cleaned and then either disinfected or exposed to sunlight for several weeks before being used again.

Botulism.

This is caused by eating food, usually decomposed vegetable or animal material, in which the growth of a particular germ (*Clostridium botulinum*) has resulted in the production of a remarkably potent poison.

When ducks or fowls eat such contaminated food, paralysis of the neck, wings and legs occurs. The bird is unable to lift the head and the feathers pull out very easily. Affected birds eventually become very sleepy and appear almost dead.

Botulism is prevented by feeding only food which has not been allowed to decompose. When this disease occurs, an immediate search should be made for decaying meat, carcases or bones, rotting vegetables, or waterholes contaminated by such materials.

Spirochaetosis (Tick Fever).

This disease is caused by a micro-organism, *Borrelia anserina* (also called *Treponema* and *Spirochaeta anserinum*), which is spread usually by the fowl tick. Occasionally it is spread among fowls by the red mite and perhaps mosquitoes.

The disease occurs in fowls as well as ducks. The affected birds are fevered, have diarrhoea and are listless. Death may occur in a few days, but some birds recover. The death loss from spirochaetosis is sometimes heavy.

There is no effective treatment for spirochaetosis. It is prevented by eradication of ticks and red mites.

Enteritis.

Enteritis (inflammation of the bowel) may be caused by faulty feeding or feeding on decomposed food or garbage. It may be present also in the specific infectious diseases, salmonellosis, described above.

Coccidiosis.

Coccidiosis occurs occasionally amongst young ducks. It is similar to coccidiosis of chickens, except that blood is rarely seen in the droppings. It is prevented by keeping young stock in clean sanitary yards. Treatment with either sodium sulphamezathine or sodium sulphamerazine in the drinking water, as used for coccidiosis in chickens, appears to be effective.

The coccidia that infect ducks do not infect chickens, and vice versa.

Sinusitis.

This disease affects adult and growing ducks. It is an infectious disease which causes inflammation of the nasal cavities and sinuses. Sometimes the lungs and abdominal air sacs are also involved.

Affected birds lose weight, are lethargic and have a discharge from the nostrils. Later there is swelling of the face due to accumulation of cheesy material in the sinuses. The breathing becomes difficult and the birds gasp for breath. Death occurs after days or weeks of sickness.

To minimise the effects of sinusitis ducks should be given plenty of fresh green feed, to provide vitamin A, and provided with deep water vessels so that they may clean the bill and nostrils.

Treatment recommended is to withdraw the pus from the swollen sinuses with a hypodermic syringe fitted with a short stout needle and then inject 2 c.c. of a 4 per cent. solution of silver nitrate. The solution must be freshly prepared in distilled water.

Any batch of ducks in which sinusitis has occurred should be isolated from the remainder of the flock and then sold for slaughter as soon as it is marketable.

Staggers.

Vitamin A deficiency, cholera, spirochaetosis and salmonellosis can cause ducks to stagger, but in addition ducklings fed without the provision of water or suffering excessive heat without ample shade may also show this symptom. If ducks, particularly young stock, are deprived of water for even a few hours and then allowed to drink excessively they are also likely to stagger and die rather quickly. Care should be taken, therefore, to provide large water vessels so that the birds have water before them at all times. This point is sometimes overlooked when ducklings are growing rapidly and their water requirements are increasing from week to week.

"White Eye."

This is one of the common diseases of ducklings. The cause is unknown. Some authorities suggest that it is an infectious disease caused by a micro-organism, probably a virus. Locally the disease has occurred very frequently in ducklings deficient in vitamin A. Ducklings hatched from breeders fed on a ration deficient in vitamin A are apt to show symptoms during the first week of life, while ducklings reared on a deficient diet are apt to suffer during the second or third week. Wet, cold or dirty conditions predispose birds to this disease.

Ducklings are susceptible to the disease from a few days up to eight weeks of age. Outbreaks seldom occur in birds older than this.

Affected birds may die within a few hours, or they may linger for days. The eyes discharge tears and later the eye is covered with a whitish film so that the cornea becomes opaque. The nasal cavity and the sinuses may be filled with mucus. The ducklings become weak, roll on their backs and struggle until death. Diarrhoea is often present, so the down around the vent may be soiled.

Post-mortem examination reveals inflammation of the mucous membrane of the nasal cavity, but usually no abnormalities in other organs.

This is often a difficult disease to control. The affected birds or the affected batch of ducklings should be isolated from all others in the flock and kept in clean dry quarters. Additional vitamin A should be fed by adding cod liver oil or a vitamin A emulsion to the mash. Additional leafy green feed should also be given.

The water vessels should be deep enough to allow the ducklings to immerse their heads completely. The water should be changed frequently to keep it clean.

Vitamin A Deficiency.

Deficiency of vitamin A produces a variety of symptoms in ducks. In most cases there is a mucoid discharge from the eye and nose which usually becomes thick. On post-mortem examination the lining of the gullet may be studded with pustules, and the bursa (a small pouch connecting with the upper aspect of the vent) is filled with cheesy material. Occasionally the birds stagger and become paralysed before these symptoms are apparent.

Vitamin A is especially important for breeding ducks. Deficiency results in reduced egg production and later hatchability is greatly reduced. Furthermore, ducklings hatched from breeders fed a ration deficient in vitamin A may be weak, show symptoms of "white eye" and suffer high mortality in the first week or so of life.

This disease is prevented by providing ample fresh green feed (preferably good quality leafy lucerne) at all times or alternatively by the addition of vitaminised oil to the mash.

Rickets.

This is a disease of young ducks in which there is a lack of phosphate of lime in the bones, so that the bones are soft. It causes "leg weakness" and the birds are unable to stand or walk properly. The beak is soft and the rib bones are bent and beaded.

Rickets is usually due to deficiency of vitamin D, but occasionally deficiency of calcium (lime) or phosphorous or an imbalance of these constituents in the ration may be responsible.

Exposure to sunlight or the addition to the mash of a fish oil containing vitamin D will meet the requirements for this vitamin.

Calcium and phosphorous requirements are met by feeding bone meal in the mash and by providing shell grit or limestone grit.

Breeds of Fowls.

P. RUMBALL, Officer in Charge, Poultry Branch.

(*Continued from page* 184 *of March issue.*)

WYANDOTTES (Plate 136).

General Characteristics.

THE COCK.

Head.—Skull short and broad. Beak stout and well curved. Eyes intelligent and prominent. Comb rose, firmly and evenly set, low, square-fronted, gradually tapering towards the back and terminating in a well-defined spike or leader, which should follow the curve of the neck without any upward tendency; the top of it oval and covered with small and rounded points, the side outline being convex to conform to the shape of the skull. Face smooth and fine. Ear-lobes oblong, well developed, and smooth. Wattles of medium length, fine, and well rounded.

Neck.—Of medium length, well covered with hackle.

Body.—Short and deep, with well-rounded sides; broad round breast with straight keel; short back with full and broad saddle rising with a concave sweep to the tail; wings of medium size, well folded; tail medium size, but full, spread at base, the main feathers carried rather upright, the sickles of medium length.

Legs.—Of medium length, Thighs well covered with soft and webless feathers, the fluff fairly close and silky. Shanks strong, fine, well rounded, and free of feather or fluff. Toes (four) straight and well spread.

Carriage.—Graceful and well balanced, alert and active, but docile.

Plumage.—Fairly close and silky, not too abundant or fluffy.

Weight.—8½ lb.; cockerel, 7 lb.

THE HEN.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—7 lb.; pullet, 5½ lb.

Colour.

Beak bright yellow, except Columbian, yellow, or horn. Eyes bright bay. Comb, face, wattles, and ear-lobes bright red. Legs and feet bright yellow.

THE COLUMBIAN.

Plumage.—Pearl-white with black markings; primaries (wing), black or black edged with white; secondaries, black inner web and white outer; the cock's neck-hackle broadly striped with black down the centre of each feather, such stripe to be entirely surrounded by a clearly-defined white margin with a decided white point (free from black outer edging or black tips) and his tail glossy green-black, the coverts either laced or not with white; the hens hackle bright intense black, each feather entirely surrounded by a white margin, and tail feathers black, except the top pair, which may or may not be laced with white. Remainder (in both sexes), white, entirely free of ticking, with slate, blue-white, or white under-colour.

THE WHITE.

Plumage.—Pure white, free from yellow or straw tinge.

Scale of Points.

THE COLUMBIAN.

Colour and markings (body 15, hackle 10, tail 5, flights 5, legs 5)	40
Type	25
Head (comb 10, eyes 5)	15
Size 8, condition 7	15
Texture	5
	100

THE WHITE.

Type	25
Colour	25
Size	15
Head	15
Legs	10
Condition	10
	100

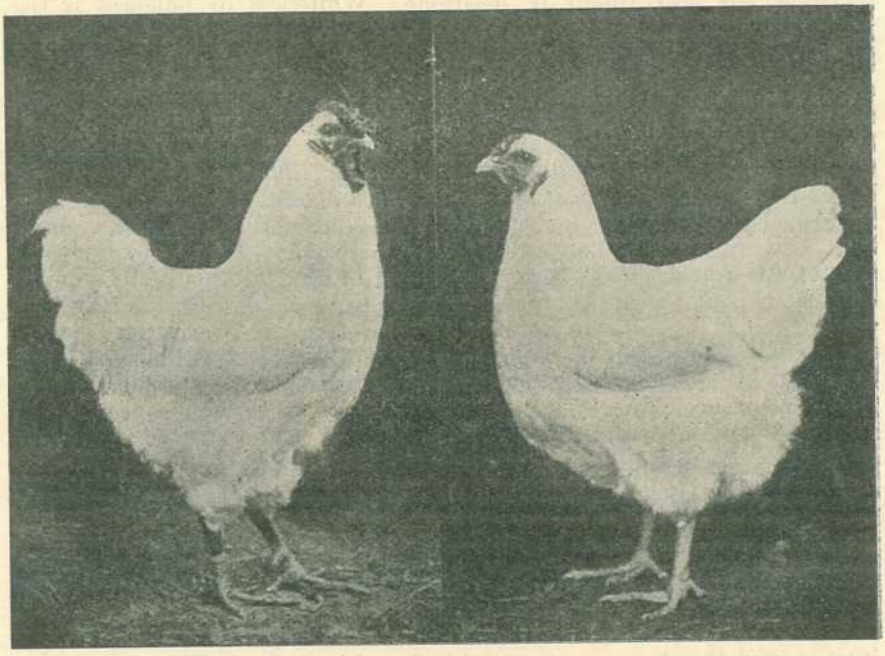


Plate 136.
White Wyandottes.

Serious Defects.—Any feathers on shanks or toes; permanent white or yellow in ear-lobe, covering more than one-third of its surface; comb other than rose, or falling over one side, or so large as to obstruct the sight; shanks other than yellow (except in adult cocks and hens, which may shade to light straw); any deformity. In Whites, other than white feathers; in Columbians, brown under-colour, green eyes, coarseness, inactivity, overhanging eyebrows.

The Wyandotte is an American breed, which is not bred extensively in this State. It is another breed made by a series of crosses. The first cross is believed to have been between the Sebright Bantam and Cochin Hen, and later Silver Spangled Hamburg, Buff Cochin, and Dark Brahma. The breed did not become popular commercially until the White was developed. This was a sport from the Silver breed.

The commercial possibilities of the breed were then visualised, as the birds were hardy, good foragers, and docile, and the chickens grew rapidly. The type of the Wyandotte ensures a carcase pleasing to the eye at any stage of development, and as its laying capacity was increased, it soon became popular; in fact, in Great Britain it is as popular as the White Leghorn.

This breed can be termed "the breed of curves." It is well-balanced, with legs set in the centre. From the top of its back to the bottom of its feet the distance should equal that from breast to end of tail. The body is carried horizontally, and depth of body is to be maintained. The maintenance of size is important, but coarseness has to be avoided. A good breadth of body and back is necessary to retain the meat-carrying characteristics of the carcase.

The principal eye defect is colour. Too many have light or almost green eyes. Age is responsible for some of this trouble, but greater selection for eye colour is desirable. Whiteness or paleness is the principal defect in the lobe.

The back has the appearance of being short, due to the curves and abundant hackle, saddle, and general set of the tail. The back shows a short space above the shoulders, which is level and then rises towards the tail, blending smoothly and evenly, making it difficult to see where the back terminates and the tail begins. This is what gives the Wyandotte its short appearance. The back should be broad with well-furnished saddle in the male, and a slight cushion or fullness of back held well up by a well-spread tail in the female. This gives the back line of the female from back to the end of the tail a slightly convex outline without the appearance of a Cochiny cushion. Breadth of back carried out in breadth of body, so that the side line of the fowl viewed from above shows smooth and even without hollow indentations, is to be aimed at. The breast must be full and prominent, not low enough to cover the hock line. The tendency to concave breasts, especially on side, and prominent gullet, is to be avoided.

The wings should not be too long; they should be folded snugly and carried level. Low-carried and slanting wings are more common in males than females. The top of the tail should be about level with the junction of the head and neck. Fairly full fluff is desired, but not so full as to hide the thighs. Do not go to the extreme and make the birds too fluffy.

The black of the Columbian is often inclined to be faded and not intense, and the strong contrast with the white is lost. This is offset by using breeding birds with dark slate under-colour. Select breeders with a clear white surface, with ½-inch to 1½-inch dark slate under-colour running to white next to the body. To attain the greatest success, keep away from breeders with pure white under-colour and save as breeders those showing no black on surface or white sections. It is also necessary to guard against brassiness, as this is a serious defect. It is more apparent in males and may appear on hackle, wing-bow, back, and saddle. In females it is more apparent in the white lacing of the hackle.

PLYMOUTH ROCK (Plate 137).

General Characteristics.

THE COCK.

Head.—Skull strong, but not thick. Beak short and stout. Eyes large and bright. Comb single, medium size, straight, and erect, with well-defined serrations, free from side sprigs. Face smooth. Ear-lobes fine texture, well-developed, and pendant. Wattles to correspond with size of comb, and moderately rounded.

Neck.—Of medium length and profusely covered with feathers flowing over the shoulders.

Body.—Large, deep, and compact; broad and well-rounded breast; broad back, of medium length, with saddle feathers of medium length and abundant; medium-sized wings carried well up, the bows and tips covered by the breast feathers and saddle-hackles.

Tail.—Rather small, rising slightly from the saddle, the sickles of medium length and nicely curved, the coverts being sufficiently abundant to cover the stiff feathers.

Legs.—Wide apart, stout, and strong, thighs 2 to 3 inches long (from hock to body), with shanks of medium length and free of feathers. Toes (four) strong, straight, and well spread.

Carriage.—Upright and smart.

Weight.—10 lb. to 12 lb.; cockerel, 8 lb. to 10 lb.

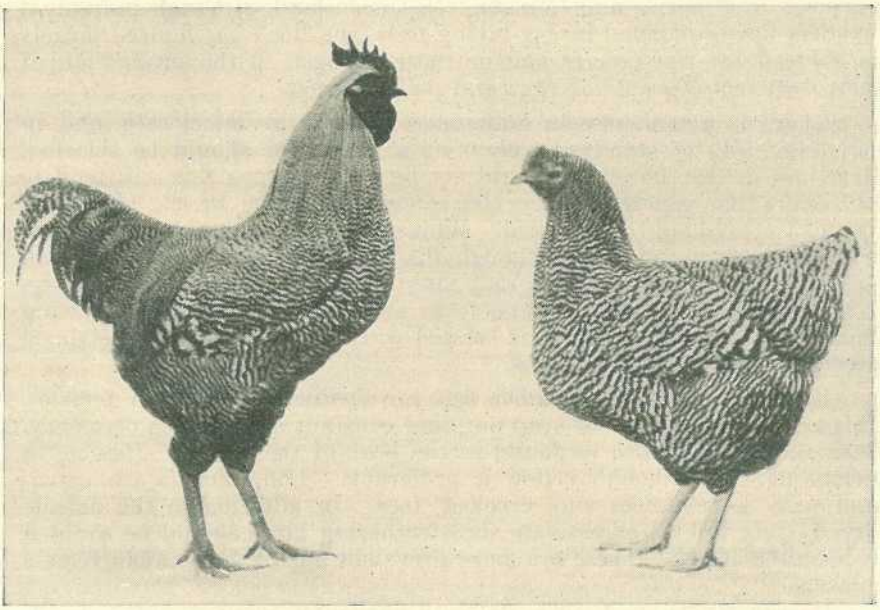


Plate 137.
Barred Plymouth Rock.—Pullet Line.

THE HEN.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—7 lb. to 8 lb.

Colour.

Beak bright yellow. Eyes clear, rich bay. Comb, face, ear-lobes, and wattles bright red. Legs and feet bright yellow.

THE BARRED.

Plumage.—White, of blue tinge, each feather barred across with black of a beetle-green sheen, the bands moderately narrow and of equal breadth, and the colours sharply defined and not shading into each other. The barring should continue through the shaft of the feather and into the fluff and under-colour, and each feather finish with a black tip. The plumage as a whole should present a blue appearance and be uniform—that is, the hackles, wing-bows, and tail corresponding in colour with the other part of the body.

Scale of Points.

THE BARRED.

Type	20
Colour	20
Barring	20
Legs and feet	10
Condition	10
Size	10
Head	5
Tail	5
	100

Serious Defects.—The slightest fluff or feather on the shanks or feet; shanks other than yellow; white ear-lobes; black, red, or white feathers in the Barred.

The Plymouth Rock originated in America. Several lines of barred Plymouth Rocks were developed and united in 1878 to produce the modern breed. In its make-up American Dominque, Black Cochin, White Brahma, and Minorca appear to have been employed.

The barred Rock was a larger-framed bird and a fair producer, with the result that it became very extensively used for commercial purposes in America and Canada. In Queensland, although individual breeders have competed in egg-laying tests, the Rock has figured largely as a breed for the fancier and/or those engaged in the production of their own requirements of eggs and poultry meat.

There is a tendency in both sexes for size to deteriorate, and in breeding birds of standard weight or a trifle over should be selected. Extremes in size, however, should not be aimed for, as this will tend to depreciate the general utility characteristics of the breed. Light or greenish eyes should be avoided. White in lobe is a trouble with which breeders have to contend, although the whiteness which develops with age is not as serious as that in young stock. Split or slipped wings is a trouble fairly prevalent and to be selected against. Another wing trouble that must be avoided is twisted wing flights, which it is claimed suggest constitutional weakness.

Dark spots or green-shaded legs are frequently noted in females. This trouble is difficult to keep out, and constant attention is necessary. Dark shading will also be found in the beak of the female. It is not a serious defect—although yellow is preferable. Long shanks are associated with knock-knees and crooked toes. In addition to the defects already referred to, excessively slow-feathering birds should be avoided in breeding Rocks. These are more prevalent among males than female chickens.

Barred Rocks are bred exclusively by double mating, and cockerel-bred lines and pullet-bred lines are now definitely fixed. The crossing of cockerel and pullet lines would be disastrous from a standard point of view, and it is necessary, therefore, to carry on with the system.

It is as well to point out that black feathers appear among the plumage of the barred Rock. This does not indicate impurity of breed, nor are black feathers a serious defect unless numerous.

Cockerel Mating.—The male to be used should be standard. In colour the female needs to be clean black and white, with no sign of smut. The black bar should be two or three times as wide as the white. Surface colour even in all sections, with under-barring well defined. Some females will have black feathers and even some black wing flights. This denotes plenty of pigment and will assure strong barring in progeny. The colour of the legs and beak is usually darker than in exhibition females.

Pullet Mating.—With this mating, we look for the female progeny to have a barring of equal width, the black as black as possible without sheen and the white as white as possible. In this mating use males with white barring two to three times as wide as the black, and females of standard colour.

SUSSEX (Plate 138).

General Characteristics.

THE COCK.

Head.—Skull of medium size. Beak short, strong, and well curved. Eyes full and bright. Comb single, of medium size, upright, evenly serrated, and fitting closely. Face smooth. Ear lobes and wattles of medium size.

Neck.—Of medium length, with fairly full hackle.

Body.—Broad, deep, and long; square breast and carried well forward with long and deep breast-bone; wide shoulders; broad and flat back; wings carried closely; tail of moderate size, carried at an angle of 45 degrees.

Legs.—Short and rather wide apart, the thighs stout and the shanks strong and free from feathers. Toes (four) straight and well spread.

Carriage.—Graceful, showing length of back, vigorous and well balanced.

Plumage.—Close and free from any unnecessary fluff.

Weight.—9 lb.

THE HEN.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—7 lb.

Colour.

Beak white or horn. Eyes, comb, face, wattles, and ear-lobes red. Legs and feet white. Flesh and skin white.

THE LIGHT.

Plumage.—Pure white, with black-striped neck-hackle, black in flights, and black tail, the black centre of each feather of the neck-hackle to be entirely surrounded by a white margin.

Scale of Points.

Type	25
Size	20
Colour	20
Legs and feet	15
Head	10
Condition	10
	100

Serious Defects.—Rose comb; feather on shanks; other than four toes; any deformity.

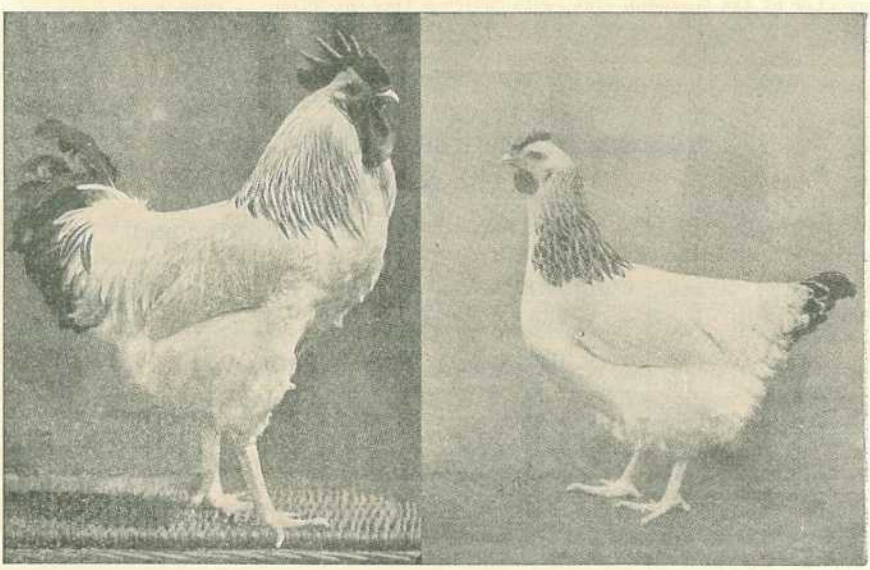


Plate 138.
Light Sussex.

The Sussex was developed in the south of England, but the breeds of fowls used are not definitely known, although it is generally believed that the Silver Grey Dorking entered extensively into its make-up.

The Sussex was developed primarily for its table qualities. Its white flesh, legs, and feet appeal to consumers. This fact, combined with the tenderness and juiciness of flesh and smallness of bone, enhances its table value. Although regarded as a table fowl, the Light Sussex is a fair layer, but the quality of flesh should not be sacrificed by efforts to increase the egg production.

A characteristic of the breed is that the rectangular body is reasonably long, deep, and wide. The breast-bone is reasonably long and well-fleshed. The head is somewhat coarse when compared with other utility breeds, but this can be overcome by selection.

The Light.—As indicated, the back is fairly long. This must not be overlooked, as there is a tendency for the back to be too short. Cut-away or flat breasts are very common, and this is a serious fault. Avoid any sloping or rounding of the back.

The Sussex, being descended from the Dorking, occasionally has five toes; this is definitely a disqualification on the show bench, and also as a breeder.

Plumage colour is clearly outlined in the standard. The principal faults are brassiness in males and dark or slaty under-colour. These are difficult to breed out.

JUNIOR FARMER CHAMPIONSHIP.

This year's State contest sponsored by the Australian Broadcasting Commission as a prelude to selecting the outstanding junior farmer in the Commonwealth was held in Brisbane during March and resulted in a win for Oliver Ulcoq, a prominent member of the Gayndah club, with Wilfred Day, of Tiaro, as runner-up.

TUBERCULOSIS-FREE CATTLE HERDS (AS AT 13th APRIL, 1950).

Breed.	Owner's Name and Address of Stud.
Aberdeen Angus	The Scottish Australian Company Ltd., Texas Station, Texas.
Jersey	W. E. O. Meier, "Kingsford" Stud, Rosevale, via Rosewood.
A.I.S.	F. B. Sullivan, "Fermagh," Pittsworth.
Ayrshire ..	L. Holmes, "Bencecula," Yarranlea.
A.I.S.	D. Sullivan, Rossvale, via Pittsworth.
A.I.S.	W. Henschell, Yarranlea.
A.I.S.	Con O'Sullivan, "Navillus Stud," Greenmount.
Jersey	J. S. McCarthy, "Glen Erin Jersey Stud," Greenmount.
Jersey	J. F. Lau, "Rosallen Jersey Stud," Goombungee.

Road Transporter Travel for Cattle.

Prepared in the Division of Animal Industry.

THE need for increased export of beef to the United Kingdom is well known and accepted. The beef producers of Queensland, individually and as a body, are anxious to increase production by any sound economic method and the United Kingdom people are certainly anxious to receive any additional supplies that may become available.

Whilst cattle killed in Queensland are produced in all parts of the State and the Northern Territory, the slaughter of cattle for export is confined to the seaboard. This necessitates very many cattle travelling hundreds of miles from the holdings to abattoirs.

Although wastage may not be great when cattle are transported by rail, it is very real when long journeys on the hoof have to be undertaken. This is, of course, accentuated when feed and water are not plentiful on stock routes, the more so if the "going" is rough and stony.

It is not uncommon for cattle to leave a property in prime condition and be only good stores by the time they arrive at their destination. The result of that is a very considerable loss of beef by reason of lowered dead weights, coupled with a decided reduction in the quality of the beef. The alternative is to hold the cattle on good pasture or crops for some weeks until they regain some or all of their former condition. This can sometimes prove a very expensive course to pursue.

It has happened on occasions that, because of the closure of a stock route due to a long adverse season, fat cattle in some areas have not been able to "get out" except perhaps after a long and arduous diversion to avoid the drought stricken area.

The improvement of stock routes by providing better and more numerous watering facilities and, where necessary, their diversion through better country, will help, but such a course is not always practicable, and during exceptionally dry spells may not be of much assistance.

In the final analysis, some form of mechanical transport becomes necessary if wastage is to be prevented in circumstances which are unfavourable to the movement of cattle on the hoof. The construction

of railways is a slow and costly procedure and at present is out of the question owing to shortages of materials. The possibility of motor transport might at first be dismissed as fantastic, but nevertheless it has been proved practical in the Northern Territory and is fast being adopted in Queensland. It does seem, however, that at least where fat cattle are concerned it may well be essential that the roads which the motor transporters traverse be first class and preferably, except perhaps for short stretches, of bitumen construction.

Queensland Observations.

During a period of some eight months in 1949, observations were made on a series of movements of fat cattle by road train from the Northern Territory to a rail-head in Queensland and thence by rail to a city on the coast where the cattle were slaughtered by a butcher for the local trade.

The cattle travelled in batches of 60 (which was the capacity of the road train used), a distance of 198 miles by road and then 603 miles by rail. The journey by road transporter was made at night and the cattle then rested in railway trucking yards until the late afternoon. Most, but not all, of the consignments were again spelled in daylight en route to the coast, the rail journey taking 2 to 2½ days according to whether the cattle spelled or not.

During the period March to November, 45 consignments, comprising 2,700 head, were sent forward. As might well be expected, there was considerable variation in the way the various consignments dressed out when slaughtered on the coast. Most of the consignments were made up of cattle in good to prime condition, but there was an occasional consignment of cattle which were in only fair condition.

A close check was kept on the percentage of carcases which showed bruising. Excluding the first two consignments, in respect of which special factors operated, the best result obtained was 80 per cent. free from bruising, 10 per cent. showing slight bruising, and 10 per cent. showing extensive bruising; the worst result was 50 per cent. free, 25 per cent slight and 25 per cent. extensive, and the average result was 67 per cent. free, 18 per cent. slight and 15 per cent. extensive.

Bruising did not appear to be more noticeable in cattle travelling in the prime mover of the road train than in the trailer wagons. This was established by paint branding cattle in the prime mover prior to the commencement of the journey and checking on them at slaughter.

Bruising was more noticeable during the hotter months and it is thought that this may have been due to the cattle tiring more quickly. There was in fact good reason for concluding that tired cattle generally were distinctly more subject to bruising than rested cattle. It would seem highly desirable that cattle be well rested both before loading into the road transporters and again before loading into railway wagons.

Only one animal of the 2,700 head forwarded had to be totally condemned because of extensive bruising. There was one death in transit and one shortly after arrival at destination.

Cattle travelled long distances by rail immediately prior to slaughter and without any previous travel in road transporters are generally accepted as being subject to grading down, as the result of bruising, to the extent of about 20 per cent. of their numbers. This, of

course, does not allow of a direct comparison with what has been stated here in respect of cattle travelling first by road transport and then by rail, but there is the indication that the fact of the former does not markedly worsen the final result.

Cost of Transport.

The cost of moving cattle by road transporters is naturally a matter of very great interest. No figures are available for the movements under discussion in this article, but in connection with another series of movements which included travel both in Northern Territory and Queensland the cost has been given out (by the Australian Meat Board) as 1·9 pence per head per mile. This is considerably more than the cost of moving cattle either by rail or on the hoof, but nevertheless allows the method to be adopted as an alternative to driving cattle along stock routes which are lacking in feed and water.

Time alone will tell, but it does seem as though the road transporter is here to stay as a means of conveying cattle to market in the absence of railways.

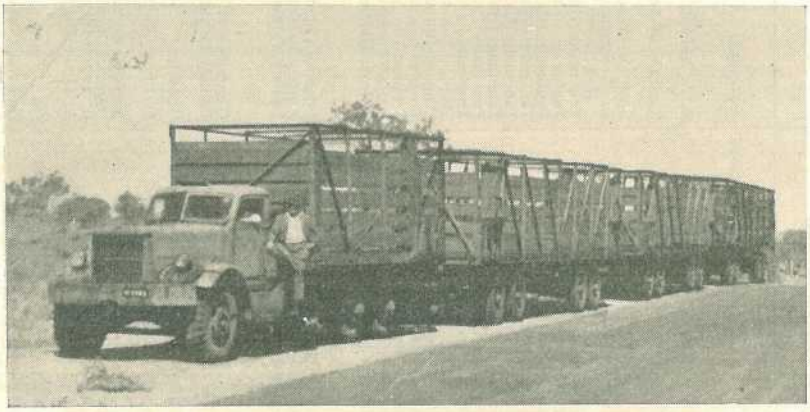


Plate 139.
An Empty Road Transporter.

LIST OF PEST DESTROYERS REGISTERED IN QUEENSLAND UNDER "THE PEST DESTROYERS ACT OF 1939."

For the Period Commencing January, 1949, as at 2nd December, 1949. *(Continued from April issue.)*

Name of Pest Destroyer.	Active Constituents as Declared by Seller.		Queensland Wholesale Dealer.
DDT PREPARATIONS—*continued.*			
MISCELLANEOUS—*continued.*	Per cent.		
Flytox DDT Insect Powder	3·0 0·65	para para dichlordiphenyltrichlorethane Total Pyrethrins	R. A. Riddell, Rome street, Yeronga, Brisbane
Shell Aphis Spray	4·0 78·0	para para dichlordiphenyltrichlorethane Refined Mineral Oil	Shell Co. of Aust. Ltd., 301–7 Ann street, Brisbane
Shell DDT Emulsion (25 per cent.)	25·0	para para dichlordiphenyltrichlorethane	Shell Co. of Aust. Ltd., 301–7 Ann street, Brisbane
Pestox No. 2 DDT Dust	2·0	para para dichlordiphenyltrichlorethane	L. L. Strange, Rep. Samuel Taylor Pty. Ltd., "Sunnyside," Miles street, Hawthorne, Brisbane
Rucide	50·0	para para dichlordiphenyltrichlorethane	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
Rudice DDT Dog Lotion	50·0	para para dichlordiphenyltrichlorethane	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
Rudust No. 4 General Agricultural Dust	2·0	para para dichlordiphenyltrichlorethane	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
Rudust No. 5 Field Crop Dust	5·0	para para dichlordiphenyltrichlorethane	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
Rulene DDT Field Crop Spray	25·0	para para dichlordiphenyltrichlorethane	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
Rulene DDT Garden and Orchard Spray	25·0	para para dichlordiphenyltrichlorethane	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
Runol DDT Emulsion Base	20·0	para para dichlordiphenyltrichlorethane	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
Buflidi	5·0	para para dichlordiphenyltrichlorethane	Tropical Dip & Chemical Co., Cambridge street, Rockhampton
Tropik DDT 2 per cent. Dust	2·0	para para dichlordiphenyltrichlorethane	Tropical Dip & Chemical Co., Cambridge street, Rockhampton
Tropik 15 per cent. DDT Dust	15·0	para para dichlordiphenyltrichlorethane	Tropical Dip & Chemical Co., Cambridge street, Rockhampton
Tropik DDT Emulsion	20·0	para para dichlordiphenyltrichlorethane	Tropical Dip & Chemical Co., Cambridge street, Rockhampton
Tropik 5 per cent. DDT Emulsion	5·0	para para dichlordiphenyltrichlorethane	Tropical Dip & Chemical Co., Cambridge street, Rockhampton
United 20 per cent. DDT Emulsion	20·0	para para dichlordiphenyltrichlorethane	United Chemicals Pty. Ltd., 91–7 Montague road, South Brisbane
Bovox Concentrated DDT Emulsion	8·4	para para dichlordiphenyltrichlorethane	Wilcox, Mofflin Ltd., Albert street, Brisbane
FLUORINE INSECTICIDES.			
Lurotox	2·34	Sodium Silico Fluoride	Imperial Chemical Industries of Aust. & N.Z. Ltd., 293 Queen street, Brisbane
Chemist Roush Lice Powder for Poultry	10·0	Fluorine (F) as Sodium Fluoride	Morden Laboratories, 66 Charlotte street, Brisbane
Red Comb Dusting Powder	4·0	Fluorine (F) as Sodium Fluoride	Poultry Farmers Co-op. Soc. Ltd., Roma street, Brisbane
FORMALIN.			
C.O.D. Formalin	40·0	Formaldehyde	Committee of Direction of Fruit Marketing, Turbot street, Brisbane
Red Comb Formalin	39·5	Formaldehyde (CH_2O)	Poultry Farmers Co-op. Soc. Ltd., Roma street, Brisbane
FUNGICIDES (NOT SPECIFIED ELSEWHERE).			
Blue-Ammon Spray	4·5 1·0	Copper (Cu) as Cuprammonium Sulphate Ammonia	Fertiliser Distributers Pty. Ltd., Little Roma street, Brisbane
Shirlan AG	25·0	Salicylanilide	Imperial Chemical Industries of Aust. & N.Z. Ltd., 293 Queen street, Brisbane
Shirlan WS	98·0	Sodium Salicylanilide	Imperial Chemical Industries of Aust. & N.Z. Ltd., 293 Queen street, Brisbane
"Folisan"	20·0	Nitrobenzene Compound	R. A. Riddell, Rome street, Yeronga, Brisbane
Vallo Sali-cide Banana Dip	80·0	Sodium Salicylanilide	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
HEXAETHYLTETRAPHOSPHATE.			
"Hexone"	100·0	Commercial Hexaethyltetraphosphate	Imperial Chemical Industries of Aust. & N.Z. Ltd., 293 Queen street, Brisban
"Vallo" H.E.T.P.	95·0	Hexaethyltetraphosphate	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
IRON SULPHATE.			
A.C.F. Sulphate of Iron	19·7	Iron (Fe) as Iron Sulphate	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane

LIME SULPHUR.

A.C.F. Lime Sulphur Solution	22·0	Sulphur (S) as Polysulphide Sulphur	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane
F.D.L. Lime Sulphur Solution	20·0	Sulphur (S) as Polysulphide Sulphur	Fertiliser Distributers Pty. Ltd., Little Roma Street, Brisbane
Neptune Lime Sulphur Solution	20·0	Sulphur (S) as Polysulphide Sulphur	Neptune Oil Co. Pty. Ltd., 301–7 Ann street, Brisbane

MERCURY FUNGICIDES.

Cerepest Cereal Fungus Deterrent	1·53	Mercury (Hg) as Benzyl Hydrag Acetate	Cerepest Laboratories, 200 Boundary street, Petrie Bight, Brisbane
Aretan	3·0	Organically Combined Mercury	R. A. Riddell, Rome street, Yeronga, Brisbane
Ceresan	1·5	Mercury (Hg) as Organic Mercury Compound	R. A. Riddell, Rome street, Yeronga, Brisbane

METALDEHYDE PREPARATIONS.

Lane's Killsem	1·25	Metaldehyde	A. G. Bignold & Co., 169 Elizabeth street, Brisbane
Lane's Snail–Slug	1·0	Metaldehyde	A. G. Bignold & Co., 169 Elizabeth street, Brisbane
Taylor's Metaldehyde No. 13 Snail and Slug Garden Pest Destroyer	1·4	Metaldehyde	F. C. Rowley, Rep. British Paints (Aust.) Pty. Ltd., 115 Queen street, Brisbane

NICOTINE AND NICOTINE COMPOUNDS.

A.C.F. Nico 3 Dust	3·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	A. C. F. & Shirleys Fertilizers Ltd.. Little Roma street, Brisbane
Aerofio Nico 3 Dust	3·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	Aerofio Dusts & Sprays Pty., Redland Bay road, Redland Bay
Waratah Brand Nico Dust No. 3	3·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	Committee of Direction of Fruit Marketing, Turbot street, Brisbane
Waratah Brand Nico Dust No. 5	5·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	Committee of Direction of Fruit Marketing, Turbot street, Brisbane
Pestoxol Liquid Insecticide	3·7	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	Faulding F. H. & Co. Ltd., 200 Charlotte street, Brisbane
F.D.L. Tobacco Dust	0·5	Nicotine ($C_{10}H_{14}N_2$) as Tobacco Powder	Fertiliser Distributers Pty. Ltd., Little Roma street. Brisbane

NICOTINE SULPHATE.

A.C.F. Nicotine Sulphate	40·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane
Lane's Nicotine Sulphate	40·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	A. G. Bignold & Co., 169 Elizabeth street. Brisbane
Waratah Nicotine Sulphate	40·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	Committee of Direction of Fruit Marketing, Turbot street, Brisbane
F.D.L. Nicotine Sulphate	40·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	Fertiliser Distributers Pty. Ltd., Little Roma street. Brisbane
"Vallo" Nicotine Sulphate	40·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
Hibiscus Nicotine Sulphate	40·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	Queensland Pastoral Supplies Pty. Ltd., 27 Bowen street, Brisbane
Felton Nicotine Sulphate	40·0	Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane

PARADICHLOROBENZENE.

A.C.F. Paradichlor	100·0	Commercial Paradichlorobenzene	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane

PARIS GREEN.

A.C.F. Paris Green	55·0	Arsenic Trioxide (As_2O_3)	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane
Paris Green	55·0	Arsenic Trioxide (As_2O_3)	A. M. Bickford & Sons Ltd., Tank street, Brisbane
Garden Brand Paris Green	55·0	Arsenic Trioxide (As_2O_3)	Cloudust Spray Manufacturers, Montague road, South Brisbane
Paris Green	55·0	Arsenic Trioxide (As_2O_3)	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane

PHENOLIC PREPARATIONS.

Acco 15/20 Disinfectant	15·0	Tar Acids	Australian Chemical Co. Pty. Ltd., 305 Montague road, South Brisbane
Cobra Disinfectant	15·0	Phenols and Cresols	Goldsborough, Mort & Co. Ltd., 63 Eagle street, Brisbane
Morrison's Soluble Phenol	16·0	Phenols	A. H. Langdon & Co. Ltd., 303 Queen street, Brisbane
"Vallo" Ovicidal Wash	45·0 25·0 9·0	Tar Oil Mineral Oil Phenols	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
Mactaggart's Cattle Lice Exterminator	80·0	Tar Acids	Mactaggart's P.P. Co-op. Assn. Ltd., 70 Eagle street, Brisbane
Cooper's Milk Oil Fluid	18·0	Phenols and Cresols	New Zealand Loan & Mercantile Agency Co. Ltd., Eagle street, Brisbane
Cooper's Ovicide Tar Oil Winter Wash	48·0 10·0 20·0	Tar Oils Phenols Mineral Oils	Queensland Fruitgrowers Co-op. Soc. Ltd., Makerston street, Brisbane
Osmond's Dermos	2·75	Tar Acids	Osmond & Sons (Aust.) Pty. Ltd., 500 Stanley street, South Brisbane
Mericine Disinfectant	3·0	Tar Acids	N. S. Pixley, Eagle street, Brisbane
Octopus Phenyle	3·0	Tar Acids	N. S. Pixley, Eagle street, Brisbane
Taycol Disinfectant	15·0	Carbolic and Cresylic Acids	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane

LIST OF PEST DESTROYERS REGISTERED IN QUEENSLAND UNDER "THE PEST DESTROYERS ACT OF 1939."—*continued.*

For the Period Commencing January, 1949, as at 2nd December, 1949.

Name of Pest Destroyer.	Per cent.	Active Constituents as Declared by Seller.	Queensland Wholesale Dealer.
PHOSPHORUS PASTES.			
Byrne's Electric Paste	0·6	Phosphorus (P)	Houghton & Byrne, Pty. Ltd., 161 Queen street, Brisbane
Chemist Roush Rat and Mice Paste	1·125	Phosphorus (P)	Morden Laboratories, 66 Charlotte street, Brisbane
S.A.P. Rabbit Poison	4·5	Phosphorus (P)	New Zealand Loan & Mercantile Agency Co. Ltd., Eagle street, Brisbane
Phosphorus Paste	1·3	Phosphorus (P)	Wm. Street & Son, 176 Ann street, Brisbane
Rat Death	1·9	Phosphorus (P)	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane
Rat Doom	1·3	Phosphorus (P)	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane
PYRETHRUM POWDER (EXTRACT AND/OR PREPARATIONS).			
Osmond's "Di-Pest" Fly Spray	0·1	Total Pyrethrins	Osmond & Sons (Aust.) Pty. Ltd., 500 Stanley street, South Brisbane
Rawleigh's Pyrethro Fly Killer	0·13	Total Pyrethrins	Robinson & Bott Pty. Ltd., 459 Adelaide street, Brisbane
Mustdie Powder	0·61	Total Pyrethrins	Taylors Elliotts Pty. Ltd. 150 Charlotte street, Brisbane
RAT BAITS OTHER THAN PHOSPHORUS.			
A.C.F. Zinc Phosphide Rat Baits	0·5	Commercial Zinc Phosphide	A. C. F. & Shirleys Fertilizers Ltd., Little Roma Street, Brisbane
Ra-Gas	32·0	Pot. Nitrate	Poultry Farmers Co-op. Soc. Ltd., Roma street, Brisbane
	32·0	Sulphur	
ARSENICAL—LIQUID.		**SHEEP DIPS.**	
Buzacott's Arsenical Liquid Dip	46·6	Arsenic Trioxide (As_2O_3)	Buzacotts (Qld.) Ltd., 443 Adelaide street, Brisbane
	15·0	Phenols and Cresols	
Harton Sheep Dip	64·0	Arsenic Trioxide (As_2O_3)	Goldsborough, Mort & Co. Ltd., Eagle street, Brisbane
	7·2	Cresols	
G.B.A. Sheep Dip	60·0	Arsenic Trioxide (As_2O_3)	Graziers' Benefit Assn. Pty. Ltd., 65 Montague road, South Brisbane
	3·5	Tar Acids	
Mactaggart's Arsenical Liquid Sheep Dip	30·0	Arsenic Trioxide (As_2O_3)	Mactaggarts P.P. Co-op. Assn. Ltd., 70 Eagle street, Brisbane
	16·0	Creslyic Acid	
Century Sheep Dip	35·0	Arsenic Trioxide (As_2O_3)	McGlew & Co., Ryan House, 239 Charlotte street, Brisbane
	3·5	Tar Acids	
Standard Sheep Dip Liquid Arsenical	30·0	Arsenic Trioxide (As_2O_3)	Qld. Chemical & Dist. Co., 107 Eagle street, Brisbane
Elliotts One Twenty-Eight Liquid Dip	64·0	Arsenic Trioxide (As_2O_3)	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane
United Liquid Arsenical-Cresol Sheep Dip	30·0	Arsenic Trioxide (As_2O_3)	United Chemicals Pty. Ltd., 91–7 Montague road, South Brisbane
	16·0	Cresols	
Vacdip Q	15·0	Arsenic Trioxide (As_2O_3)	Vacuum Oil Co. Pty. Ltd., 99 Creek street, Brisbane
	5·5	Tar Acids	
ARSENICAL—PASTE.			
Campbell's "Policeman Fly" Sheep Spraying Soap	30·0	Arsenic Trioxide (As_2O_3)	Campbell Bros. Pty. Ltd., Campbell street, Bowen Hills, Brisbane
ARSENICAL—POWDER.			
Quibell's "Special" Powder Sheep Dip (Prompt Action)	21·6	Arsenic Trioxide (As_2O_3)	Dalgety & Co., Elizabeth street, Brisbane
	0·7	Rotenone and Allied Substances	
Quibell's Powder Sheep Dip (Standard)	22·25	Arsenic Trioxide (As_2O_3)	Dalgety & Co., Elizabeth street, Brisbane
Vallo Dual Purpose Powder Sheep Dip	21·0	Arsenic Trioxide (As_2O_3)	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
	0·7	Rotenone and Allied Substances	
Vallo Powder Sheep Dip	21·0	Arsenic Trioxide (As_2O_3)	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
Cooper's Sheep Dipping Powder	22·5	Arsenic Trioxide (As_2O_3)	New Zealand Loan & Mercantile Agency Co. Ltd., Eagle street, Brisbane
Cooper's Sheep Dipping Powder (Quick Acting)	22·0	Arsenic Trioxide (As_2O_3)	New Zealand Loan & Mercantile Agency Co. Ltd., Eagle street, Brisbane
	0·7	Rotenone and Allied Substances	

"Viper" Powder Dip	20·0	Arsenic Trioxide (As_2O_3)	Osmond & Sons (Aust.) Pty. Ltd., 500 Stanley street, South Brisbane
Sickle Brand Arsenical Powder Sheep Dip	21·0	Arsenic Trioxide (As_2O_3)	Qld. Primary Producers Co-op. Assn. Ltd., Creek street, Brisbane
Sickle Brand Double Action Powder Sheep Dip	21·0	Arsenic Trioxide (As_2O_3)	Qld. Primary Producers' Co-op. Assn. Ltd., Creek street, Brisbane
	0·7	Total Ether Extractives (from Derris)	
	0·175	Rotenone (from Derris)	
Elliott's Udip	22·0	Arsenic Trioxide (As_2O_3) as Arsenious Oxide	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane
Elliott's Ninety-four Powder Dip	25·0	Arsenic Trioxide (As_2O_3)	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane
	0·24	Rotenone	
Little's Supreme Powder Sheep Dip (Rapid Acting)	19·5	Arsenic Trioxide (As_2O_3)	Wilcox, Mofflin Ltd., Albert street, Brisbane
	0·7	Rotenone and Allied Substances	
Little's Powder Sheep Dip (Standard)	21·0	Arsenic Trioxide (As_2O_3)	Wilcox, Mofflin Ltd., Albert street, Brisbane

BENZENE HEXACHLORIDE.

Quibell's Gamma Sheep Dip	6·0	gamma isomer of Benzene Hexachloride	Dalgety & Co. Ltd., Elizabeth street, Brisbane
Cooper's Gamatox Sheep Dip	6·0	gamma isomer of Benzene Hexachloride	New Zealand Loan & Mercantile Agency Co. Ltd., Eagle street, Brisbane
Sickle Brand Gamalene Liquid Sheep Dip	3·5	gamma isomer of Benzene Hexachloride	Qld. Primary Producers Co-op. Assn. Ltd., Creek street, Brisbane
Little's Numex Sheep Dip	6·0	gamma isomer of Benzene Hexachloride	Wilcox, Mofflin Ltd., Albert street, Brisbane

PHENOLIC.

Kreola Sheep Dip	20·0	Tar Acids	Australian Chemical Co. Pty. Ltd., 305 Montague road, South Brisbane
Quibell's Liquid Sheep Dip and Cattle Wash	18·0	Tar Acids	Dalgety & Co. Ltd., Elizabeth street, Brisbane
Harton Lact-Oil Fluid	18·0	Phenols and Cresols	Goldsborough, Mort & Co. Ltd., Eagle street, Brisbane
Morrison's Phenolic Sheep Dip	16·0	Phenols	A. H. Landon & Co. Ltd., 303 Queen street, Brisbane
Vallo Fluid Sheep Dip	18·0	Tar Acids	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
Mactaggart's Special Phenolic Sheep Dip	20·0	Tar Acids	Mactaggarts P.P. Co-op. Assn. Ltd., 70 Eagle street, Brisbane
Kymac Sheep Dip	57·0	Cresols	New Zealand Loan & Mercantile Agency Co. Ltd., Eagle street, Brisbane
	0·33	Rotenone and Allied Substances	
Osmond's "Ivory" Fluid Sheep Dip		18 to 20 Tar Acids	Osmond & Sons (Aust.) Pty. Ltd., 500 Stanley street, South Brisbane
"Standard" Sheep Dip	20·0	Tar Acids	Qld. Chemical & Dist. Co., 107 Eagle street, Brisbane
Two Twenty-One Liquid Dip	0·625	Rotenone (from Derris)	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane
	2·5	Total Ether Extractives (from Derris)	
	35·0	Cresylic Acid	
United Sheep Dip No. 2 (Liquid Phenolic)	20·0	Tar Acids	United Chemicals Pty. Ltd., 91–7 Montague road, South Brisbane
Little's Improved Fluid Dip	19·0	Tar Acids	Wilcox, Mofflin Ltd., Albert street, Brisbane

MISCELLANEOUS.

Hart's Immunol New Super Sheep Dip	1·0	Oleo Resin Derris	Queensland Pastoral Supplies Ltd., 27 Bowen street, Brisbane
	29·8	Arsenic Trioxide (As_2O_3)	
	40·7	Cresol	
	0·1	gamma isomer of Benzene Hexachloride	
Elliott's Sixty-Seven Liquid Dip	20·0	Polysulphide Sulphur	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane
Elliott's Thirty-Five Liquid p	25·0	Arsenic Trioxide (As_2O_3)	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane
	0·25	Rotenone (from Derris)	
	1·0	Total Ether Extractives (from Derris)	
	67·0	Cresylic Acid	

JETTING FLUIDS (*See also* SHEEP DIPS ARSENICAL).

Acco-Jet	34·4	Arsenic Trioxide (As_2O_3)	Australian Chemical Co. Ltd., 305 Montague road, South Brisbane
	5·4	Cresylic Acid	
Buzacott's "Spretter" Fluid	46·6	Arsenic Trioxide (As_2O_3)	Buzacotts (Qld.) Ltd., 443 Adelaide street, Brisbane
	15·0	Phenols and Cresols	
Harton Jetting Fluid	70·0	Arsenic Trioxide (As_2O_3)	Goldsborough, Mort & Co. Ltd., Eagle street, Brisbane
"Max-Jet"	29·5	Arsenic Trioxide (As_2O_3)	Mactaggarts P.P. Co-op. Assn. Ltd., Eagle street, Brsbane
Jet-O-Leen	46·6	Arsenic Trioxide (As_2O_3)	Walter Reid & Co. Ltd., Charlotte street, Brisbane
Elliott's Calarsenite	43·0	Arsenious Oxide (As_2O_3) as Calc. Arsenite	Taylors Elliotts Pty. Ltd., 150 Charlotte street, Brisbane
United Improved Jetting	46·6	Arsenic Trioxide (As_2O_3)	United Chemicals Pty. Ltd., 91–7 Montague road, South Brisbane
	15·0	Phenols and Cresols	

LIST OF PEST DESTROYERS REGISTERED IN QUEENSLAND UNDER "THE PEST DESTROYERS ACT OF 1939."—*continued.*

For the Period Commencing January, 1949, as at 2nd December, 1949.

Name of Pest Destroyer.	Active Constituents as Declared by Seller.		Queensland Wholesale Dealer.
		SHEEP PREPARATIONS.	
	Per cent.		
Kreeola Fly-Blow Dressing	78·0	Tar Oils	Australian Chemical Co. Pty. Ltd., 305 Montague road, South Brisbane
Acco Fly-Blow Dressing	80·0	Tar Oils	Australian Chemical Co. Pty. Ltd., 305 Montague road, South Brisbane
B.T.B. 15 Fly-Blow Dressing Concentrate "A"	12·9	Boron (B) as Boric Acid	Campbell Bros. Pty. Ltd., Campbell street, Bowen Hills
B.T.B. 15 Fly-Blow Dressing Concentrate "B"	50·0	Tar Oil	Campbell Bros. Pty. Ltd., Campbell street, Bowen Hills
Flynox	6·5	Tar Acids	Dalgety & Co. Ltd., 291–301 Elizabeth street, Brisbane
B.H.P. Blow Fly Oil	10·0	Phenols and Homologues	Elder, Smith & Co. Ltd., 334–8 Queen street, Brisbane
Benex Blow-Fly Dressing	0·52	gamma isomer of Benzene Hexachloride	Goldsborough, Mort & Co. Ltd., Eagle street, Brisbane
	4·0	para para dichlordiphenyltrichlorethane	
	20·0	Orthodichlorbenzene	
	8·0	Tar Acids	
	2·5	Boron (B) as Boric Acid	
Grazcos B.K.B. Fly Dressing	3·1	Tar Acids	Grazcos Co-op. Ltd., 356 Queen street, Brisbane
	5·2	Orthodichlorbenzene	
Flyxane	3·5	gamma isomer of Benzene Hexachloride	Grazcos Co-op. Ltd., 356 Queen street, Brisbane
G.B.A. Fly Oil	4·0	Cresylic Acid	Graziers' Benefit Assn. Pty. Ltd., 65 Montague road, South Brisbane
	4·0	Eucalyptus	
Improved Graziers' Friend	11·1	Arsenic Trioxide (As_2O_3)	Graziers' Friend Manufacturing Co., 19 Elfin street, East Brisbane
	0·9	Tar Acids	
	2·5	Boron (B) as Boric Acid	
I.C.I. B.K.B. Blowfly Dressing	3·1	Tar Acids	Imperial Chemical Industries of Aust. & N.Z. Ltd., 293 Queen street, Brisbane
	5·2	Orthodichlorbenzene	
Morrison's Fly Blown Sheep Oil	4·0	Tar Acid	A. H. Langdon & Co. Ltd., 303 Queen street, Brisbane
Mactaggart's Antiseptic Sheep Fly Oil	75·0	Tar Oils	Mactaggarts P.P. Co-op. Assn. Ltd., 70 Eagle street, Brisbane
Vetemac Fly Oil	8·0	Boracic Acid	A. H. McDonald & Co., 99–103 Mary street, Brisbane
	1·0	Zinc Sulphate	
	2·0	Phenols	
	0·6	para para dichlordiphenyltrichlorethane	
	1·0	Essential Oils	
Century Fly Oil	4·0	Cresylic Acid	McGlew & Co., 239 Charlotte street, Brisbane
	4·0	Eucalyptus	
Squatter Blowfly Oil	2·95	Cresylic Acid	Neptune Oil Co. Pty. Ltd., 301–7 Ann street, Brisbane
Elo-Fli-Di	7·5	Naphthalene	The Nightingale Supply Co. Ltd., 1078 Lower Ann street, Brisbane
	0·8	Sulphur	
	13·7	Benzol	
	8·4	Tar Acids	
Osmond's "Osblo"	2·5	Phenols	Osmond & Sons (Aust.) Ltd., 500 Stanley street, South Brisbane
	0·75	Eucalyptus	
Elephant Brand Jumbo Fly-Blow Dressing	15·0	Tar Acids	N. S. Pixley, Eagle street, Brisbane
"Fleeco"	75·0	Tar Oil	Qld. Chemical & Distributing Co., 107 Eagle street, Brisbane
	2·0	Cresols	
Blowfoil	2·0	Cresylic Acids	Qld. Pastoral Supplies Pty. Ltd., 27 Bowen street, Brisbane

Hart's Immunol B.K.B. Concentrated Blowfly Dressing	6·8	Boron (B) as Boracic Acid	Queensland Pastoral Supplies Pty. Ltd., 27 Bowen street, Brisbane
	6·7	Tar Acids	
	14·2	Orthodichlorbenzene	
	33·33	Eucalyptus (Terpenes, Aldehydes, Ketones)	
Way Blo	5·55	Chlorinated Benzene	Qld. Pastoral Supples Pty. Ltd., 27 Bowen street, Brisbane
	2·77	Phenol and Homologues	
	4·0	para para dichlordiphenyltrichlorethane	
Fly-O-Leen	0·52	gamma isomer of Benzene Hexachloride	Walter Reid & Co. Ltd., Charlotte street, Brisbane
	8·0	Tar Acids	
	20·0	Orthodichlor benzene	
	15·0	para para dichlordiphenyltrichlorethane	
Kleep Blowfly Dressing	44·0	Monochlor Benzene	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
	1·5	Synthetic Phenolic Bactericide	
	1·5	Sulphanilamide	
	61·0	Mineral Oil	
	8·0	Abietic Acid	
Kleenflox plus DDT	4·0	Eucalpyti Oleum	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
	3·0	Phenols	
	1·0	para para dichlordiphenyltrichlorethane	
Shell Defiance Blow-Fly Oil	2·95	Cresols	Shell Co. of Aust. Ltd., 301–7 Ann street, Brisbane
"Austral" Blow Fly Dressing Oil	2·5	Eucalyptus Oil	Taylors Elliotts Pty. Ltd., 150–160 Charlotte street, Brisbane
	2·5	Dichlorbenzene	
	2·5	Boron (B) as Boric Acid	
Elliott's B.K.B. Blowfly Dressing	3·1	Tar Acids	Taylors Elliotts Pty. Ltd., 150–160 Charlotte street, Brisbane
	5·2	Ortho lichlorbenzene	
	8·6	Kerosene	
Woollo Fly Blow Oil and Lamb Marking Dressing	80·0	Tar Oils	United Chemicals Pty. Ltd., 91–7 Montague road, South Brisbane
Wilmoff B.K.B. Blowfly and Lamb Marking Dressing	2·5	Boron (B) as Boracic Acid	Wilcox, Mofflin Ltd., 68 Albert street, Brisbane
	9·3	Mineral Oil	
	5·4	Orthodichlorbenzene	
	5·3	Lysol	
Wilmo Sheep Blowfly Dressing	55·0	Tar Oils	Wilcox, Mofflin Ltd., 68 Albert street, Brisbane
	5·0	Tetrachlorethylene	
	0·72	gamma isomer of Benzene Hexachloride	
G.M.X.	7·5	Tar Acids	Wilcox, Mofflin Ltd., 68 Albert street, Brisbane
	7·5	Tetrachlorethylene	

SPRAYING OILS AND EMULSIONS.

Volck	80·0	Refined Petroleum Oils	A.C.F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane
Albarol White Oil	80·0	Petroleum Oil	A. G. Bignold & Co., 169 Elizabeth street, Brisbane
Campbell's Citrus Orchard Spray	6·0	Fish Oils	Campbell Bros. Pty. Ltd., Campbell street, Bowen Hills, Brisbane
Campbell's Market Garden Spray	12·0	Fish Oils	Campbell Bros. Pty. Ltd., Campbell street, Bowen Hills, Brisbane
F.D.L. White Spraying Oil	82·0	Petroleum Oil (Heavy)	Fertiliser Distributers Pty. Ltd., Little Roma street, Brisbane
"Vallo" Red Spraying Oil	89·0	Red Mineral Oil	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
"Vallo" White Oil Emulsion	82·5	Mineral Oil	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
Neptune Clarifol Spraying Oil	85·0	Mineral Oil	Neptune Oil Co. Pty. Ltd., 301 Ann street, Brisbane
Neptune Palsol (Pale Spraying Oil)	82·0	Mineral Oil	Neptune Oil Co. Pty. Ltd., 301 Ann street, Brisbane
Neptune Prepared Red Spraying Oil C.	70·0	Mineral Oil	Neptune Oil Co. Pty. Ltd., 301 Ann street, Brisbane
Neptune Prepared White Spraying Oil	84·0	Refined Mineral Oil	Neptune Oil Co. Pty. Ltd., 301 Ann street, Brisbane
Neptune Red Spraying Oil A	85·0	Mineral Oil	Neptune Oil Co. Pty. Ltd., 301 Ann street, Brisbane
Cooper's Alboleum	80·0	Hydrocarbon Oil	Qld. Fruitgrowers Soc. Ltd., Makerston street, Brisbane
Shellicide D	77·0	Refined Mineral Oil	Shell Co. of Aust. Ltd., 301–7 Ann street, Brisbane
Shell Pale Spray	77·0	Refined Mineral Oil	Shell Co. of Aust. Ltd., 301–7 Ann street, Brisbane

LIST OF PEST DESTROYERS REGISTERED IN QUEENSLAND UNDER "THE PEST DESTROYERS ACT OF 1939."—*continued.*

For the Period Commencing January, 1949, as at 2nd December, 1949.

Name of Pest Destroyer.	Per cent.	Active Constituents as Declared by Seller.	Queensland Wholesale Dealer.
		SHEEP PREPARATIONS—*continued.*	
Shell Red Spray	76·0	Refined Mineral Oil	Shell Co. of Aust. Ltd., 301–7 Ann street, Brisbane
Shell Sprayol	76·0	Refined Mineral Oil	Shell Co. of Aust. Ltd., 301–7 Ann street, Brisbane
Shell Weevil Oil	85·0	Solution of Nitrated Phenols in Mineral Oil	Shell Co. of Aust. Ltd., 301–7 Ann street, Brisbane
Gargoyle Pale Spraying Oil	74·6	Petroleum Oil	Vacuum Oil Co. Pty. Ltd., 99 Creek street, Brisbane
Gargoyle Red Spraying Oil	78·2	Red Mineral Oil	Vacuum Oil Co. Pty. Ltd., 99 Creek street, Brisbane
Gargoyle White Spraying Oil	71·3	Petroleum Oil	Vacuum Oil Co. Pty. Ltd., 99 Creek street, Brisbane
		STERILISERS AND/OR CLEANSERS.	
Lavaloid	1·2	Phosphoric Acid (P_2O_5) as Trisodium Phosphate	Alfa-Laval Separator Co. (Q.) Pty. Ltd., 266 Roma street, Brisbane
	1·0	Silica (SiO_2) as Sodium Metasilicate	
Lakteel	47·0	Sodium Oxide (Na_2O) as Sodium Carbonate	H. Blaiklock & Co. Pty. Ltd., 150 Mary street, Brisbane
	5·5	Sodium Oxide (Na_2O) as Sodium Bicarbonate	
Ardesy	22·0	Soda (Na_2O) as Sodium Metasilicate	Campbell Bros. Pty. Ltd., Campbell street, Bowen Hills, Brisbane
Campbell's Liquid Dairy-Chlor	10·0	Available Chlorine	Campbell Bros. Pty. Ltd., Campbell street, Bowen Hills, Brisbane
C.B. Cleanser	50·0	Soda (Na_2O) as Sodium Carbonate	Campbell Bros. Pty. Ltd., Campbell street, Bowen Hills, Brisbane
	0·04	Silica (SiO_2) as Sodium Metasilicate	
"Snow Palm" Dairy Cleanser	42·0	Soda (Na_2O)	Campbell Bros. Pty. Ltd., Campbell street, Bowen Hills, Brisbane
Zanic Steriliser C	25·3	Available Chlorine	Imperial Chemical Industries of Aust. & N.Z. Ltd., 293 Queen street, Brisbane
"Calhypo"	30·0	Available Chlorine	Milking Machine Supplies Pty. Ltd., 330–2 Adelaide street, Brisbane
Clorize	5·0	Available Chlorine	Nightingale Supply Co. Ltd., 1078 Lower Ann street, Brisbane
Westolite	15·0	Phosphoric Acid (P_2O_5) as Trisodium Phosphate	Norris Agencies Pty. Ltd., 639 Ann street, Brisbane
Osmol Cleansing Powder	57·0	Soda (Na_2O) as Sodium Carbonate	Osmond & Sons (Aust.) Pty. Ltd., 500 Stanley street, South Brisbane
Chlorital	10·0	Available Chlorine	Qld. Chemical & Distributing Co., 107 Eagle street, Brisbane
Dairywhite No. 1	7·5	Phosphoric Acid (P_2O_5) as Trisodium Phosphate	Qld. Chemical & Distributing Co., 107 Eagle street, Brisbane
	18·5	Sodium Oxide (Na_2O) as Sodium Carbonate	
Rawleigh's Cleanser and Water Softener	18·0	Phosphoric Acid (P_2O_5) as Trisodium Phosphate	Robinson & Bott Pty. Ltd., 459 Adelaide street, Brisbane
Lamol AL Grade Detergent	27·5	Sodium Oxide (Na_2O) as Sodium Carbonate	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
	3·33	Sodium Oxide (Na_2O) as Sodium Silicate	
	0·36	Sodium Oxide (Na_2O) as Sodium Bicarbonate	
Lamol SF Grade Detergent	46·7	Sodium Oxide (Na_2O) as Sodium Carbonate	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
	6·2	Sodium Oxide (Na_2O) as Sodium Hydroxide	
	1·8	Phos. Pentoxide (P_2O_5) as Tri-Basic Phosphate	
	4·0	Silicate (SiO_2) as Sodium Metasilicate	
		STRYCHNINE.	
Alkaloid Strychnine	100·0	Strychnine Alkaloid ($C_{21}H_{22}O_2N_2$)	Qld. Pastoral Supplies Pty. Ltd., 27 Bowen street, Brisbane
Strychnine Brucine	43·0	Strychnine ($C_{21}H_{22}O_2N_2$)	Qld. Pastoral Supplies Pty. Ltd., 27 Bowen street, Brisbane
		SULPHUR.	
POWDERED.			
A.C.F Powdered Sulphur	99·0	Sulphur (S)	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane
Powdered Sulphur	99·5	Sulphur (S)	G. Horsburgh & Co. Pty. Ltd., 320 Kent street, Maryborough
Vallo Powdered Sulphur	99·5	Sulphur (S)	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
Pereoder			
DISPERSIBLE.			
Wetomic Sulphur	97·0	Sulphur (S) as Elemental Sulphur	Imperial Chemical Industries of Aust. & N.Z. Ltd., 293 Queen street, Brisbane
Cooper's Special Dispersible Sulphur	73·0	Sulphur (S)	Queensland Fruitgrowers' Co-op. Soc. Ltd., Makerston street, Brisbane

"Wetsul" Wettable Sulphur	97·0	Sulphur (S) as Elemental Sulphur	Queensland Fruitgrowers Soc. Ltd., Makerston street, Brisbane
Sulfaloid Dispersible Sulphur	75·0	Sulphur (S)	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
DUSTING.			
A.C.F. Sulphur Dust	90·0	Sulphur (S) as Powdered Sulphur	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane
Vallo Dusting Sulphur	90·0	Sulphur (S)	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
COLLOIDAL.			
Cosan Colloidal Sulphur	50·0	Sulphur (S)	A. G. Bignold & Co., 169 Elizabeth street, Brisbane

THALLIUM PREPARATIONS.

A.C.F. Thallium Sulphate Bait	0·16	Thallium (Tl) as Thallium Sulphate	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane

WEED KILLERS—*See also* ARSENICAL WEED AND VERMIN DESTROYERS AND CHLORATE WEED KILLERS.

2. 4–D.			
Nightingale 2–4 Di–Weed	70·0	2,4–Dichlorophenoxyacetic Acid	H. Blaiklock & Co. Pty. Ltd., 150 Mary street, Brisbane
Hardy's 2,4–D Powder	77·0	Sodium 2,4–Dichlorophenoxyacetic Acid	Brett & Co. Pty. Ltd., Grey street, South Brisbane
"Methoxone" Liquid	10·0	Sodium 4 Chloro, 2 Methyl Phenoxyacetate	Imperial Chemical Industries of Aust. & N.Z. Ltd., 293 Queen street, Brisbane
Dartormone 2,4–D Selective Weedkiller	80·0	2,4–Dichlorophenoxyacetic Acid	International Traders, 228 Roma street, Brisbane
Vallo 2,4–D Weedkiller	82·0	2,4–Dichlorophenoxyacetic Acid	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane
"Mactaggarts" 2,4–D Liquid Hormone Weed Killer	50·0	2,4–Dichlorophenoxyacetic Acid in form of Sodium Salt	Mactaggarts P.P. Co-op. Assn. Ltd., Eagle street, Brisbane
"United" Selective Hormone Weed Killer	50·0	2,4–Dichlorophenoxyacetic Acid as Sodium Salt	United Chemicals Pty. Ltd., 91–7 Montague road, South Brisbane
Hormex 5X	50·0	2,4–Dichlorophenoxyacetic Acid	Wilcox, Mofflin Ltd., 68–70 Albert street, Brisbane
MISCELLANEOUS.			
Dinoc Selective Weedicide	30·0	Sodium–Dinitro–Ortho–Cresylate	A. G. Bignold & Co., 169 Elizabeth street, Brisbane

ZINC SULPHATE.

Zinc Sulphate	22·7	Zinc (Zn) as Zinc Sulphate	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane
Lightning Brand Zinc Sulphate	22·7	Zinc (Zn) as Zinc Sulphate	A. Victor Leggo & Co. Pty. Ltd., 185 Mary street, Brisbane

MISCELLANEOUS PREPARATIONS.

Magnesite	46·0	Magnesium Oxide (MgO) as Magnesium Carbonate	A. C. F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane
Agricultural Tartar Emetic	75·0	Antimonous Oxide (Sb_2O_3) as Potassium Tartrate	A. G. Bignold & Co., 169 Elizabeth street, Brisbane
Wilto Soil Treatment	3·0	Potassium Permanganate	A. G. Bignold & Co., 169 Elizabeth street, Brisbane
	0·5	Ethyl Mercury Phosphate	
	3·0	Paradichlorbenzene	
	12·0	Copper (Cu) as Copper Oxychloride	
	5·5	Phenols	
	64·0	Calcium Hydrate	
Larvacide	99·0	Chlorpicrin	Houghton & Byrne Pty. Ltd., T. and G. Building, Queen street, Brisbane
"Phosfone"	20·0	para–nitro–phenyldiethylthiophosphate	Imperial Chemical Industries of Aust. & N.Z. Ltd., 293 Queen street, Brisbane
Baxter's Dog Soap	10·0	Carbolic Acid	D. Maclean Pty. Ltd., 119 Charlotte street, Brisbane
E. 605 "Folidol" Extra Conc.	22·4	Diethylparanitrophenylthiophosphate	Pope, Mayne & Southerden, Pty. Ltd., 300 Adelaide street, Brisbane
Red Comb Potassium Permanganate	98·0	Potassium Permanganate ($KMnO_4$)	Poultry Farmers Co-op. Soc. Ltd., Roma street, Brisbane
Rawleigh's Louse Powder	0·58	Nicotine	Robinson & Bott Pty. Ltd., 459 Adelaide street, Brisbane
	8·42	Sulphur	
	8·5	Naphthalene	
Shell D–D Soil Fumigant	100·0	Chlorinated C_3 Hydrocarbons	The Shell Co. of Aust. Ltd., 301–7 Ann street, Brisbane
Tephos	95·0	Esters of Polyphosphoric Acids, including 20 per cent. Tetraethylpyrophosphate	Taubmans (Qld.) Pty. Ltd., 95 Edward street, Brisbane
Austral Dog Soap	3·0	Cresylic Acid	Taylors, Elliotts Pty. Ltd., 150 Charlotte street, Brisbane

F. B. COLEMAN,
The Registrar of Pest Destroyers.

The Young Farmer.

Club Activities.

The value of work done by many of the older Junior Farmer clubs in Queensland is reflected in the reports submitted at their annual meetings, which have been held at many centres already.

These meetings have been combined with social gatherings, with the result that the year ended for many clubs with sufficient funds in hand with which to start reference libraries, comprising text books on practical and scientific agriculture. These will be found of considerable use to club members when engaging in club and inter-club debates and discussions from time to time.

Several of the clubs' office-bearers have been replaced by other members, in order that these official positions might go round and so give more members an opportunity of becoming familiar with procedure at meetings, and with club activities generally. Among recent changes in this respect are: Tiaro (W. Day, secretary); Bauple (Basil Gee, secretary; Marie Goobanko, treasurer; and Victor Chapman, club leader); Biloela—Mt. Murchison (George Melonas, secretary); Murgon (Edna Zische, secretary) and Jambin (George Emmert, deputy club leader in place of Geo. Cowan, who has gone to New Zealand for 12 months to make a study of sheep raising in that country).

North Queensland Activities.

As a result of a recent visit to the Mackay district, following an earlier organising tour of North Queensland centres towards the end of last year, Mr. T. L. Williams (State Director) reports a growing interest in the work of that organisation in the sugar-growing areas of the State.

Three strong branches (or "clubs") were formed as a result of this latter visit—Sarina, North Eton and Eungella—with the foundation laid for others at Mackay and Proserpine at a later date. Membership forms have been forwarded to these centres, and as in the case of the other places visited, well-represented clubs are assured.

Canegrowers and dairymen attended in large force and evinced keen interest in the addresses delivered by Mr. Williams on the aims and objectives of the organisation. Club officials appointed at both Sarina and North Eton were all sons of local cane farmers, whilst at Eungella these positions will be filled by dairymen's sons when the election of office-bearers takes place at an early date.

Sarina officials were:—Club leader, C. Langdon; Deputy leader, Stewart Smythe; Secretary, T. Lawrie; and Treasurer, W. Edwards; with the following adults comprising the advisory committee:—Messrs. John Lawrie, E. Atherton, J. Langdon, S. H. Scougall, J. H. O'Neill, N. E. Goodchild, J. Webster and Councillor J. P. Jackson.

At North Eton, where there is already in existence a strong branch of the Junior Canefarmers' Society of Queensland, office-bearers are to be elected for the club from existing members who are within the prescribed age limit of 15 to 25 years set down by the Junior Farmers' organisation.

ASTRONOMICAL DATA FOR QUEENSLAND.

June.

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

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.00	Cairns	8	50	Longreach	26	43
6	6.32	5.00	Charleville ..	25	29	Quilpie	37	33
11	6.34	4.59	Cloncurry	36	63	Rockhampton ..	1	19
16	6.36	5.00	Cunnamulla ..	31	27	Roma	15	19
21	6.38	5.00	Dirranbandi ..	22	16	Townsville ..	8	42
26	6.39	5.02	Emerald	11	28	Winton	29	52
30	6.39	5.03	Hughenden ..	21	9	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	p.m.	a.m.
1	5.29	7.06
2	6.33	8.15
3	7.42	9.17
4	8.49	10.09
5	9.53	10.52
6	10.53	11.29
7	11·49	Noon
		p.m.
8	..	12.29
	a.m.	
9	12.42	12.56
10	1.35	1.24
11	2.27	1.53
12	3.21	2.24
13	4.16	2.58
14	5.12	3.38
15	6.09	4.23
16	7.04	5.14
17	7.57	6.10
18	8.44	7.09
19	9.27	8.10
20	10.06	9.10
21	10·41	10.10
22	11.13	11.10
23	11.45	..
	p.m.	a.m.
24	12.17	12.12
25	12·52	1.15
26	1.31	2.21
27	2.17	3.30
28	3.10	4.42
29	4.12	5·53
30	5.19	6.58

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

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

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	30	9	46	24	21	0	54	26
6	24	14	40	29	15	4	46	33
11	15	24	30	40	6	16	35	47
16	9	30	25	45	0	21	26	54
21	14	23	30	39	5	14	34	45
26	26	13	43	29	18	3	50	32
30	30	9	46	23	21	0	54	26

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	55	3	68	32	51	18	45	4
3	54	3	67	32	51	18	44	4
5	45	10	61	37	46	23	37	10
7	34	21	54	44	38	29	29	18
9	29	31	50	52	35	37	25	27
11	20	41	43	58	28	44	17	35
13	10	50	37	63	22	49	9	42
15	3	56	34	67	18	53	4	46
17	2	56	33	67	17	53	3	46
19	8	48	36	62	21	48	8	40
21	18	38	42	57	27	42	16	33
23	28	27	50	48	34	33	24	23
25	41	20	57	44	42	29	34	18
27	52	8	66	36	50	21	43	8
30	56	2	68	32	52	17	46	3

Phases of the Moon.—Last Quarter, 7th June, 9.35 p.m.; New Moon, 16th June, 1.53 a.m.; First Quarter, 23rd June, 3.12 p.m.; Full Moon, 30th June, 5.58 a.m.

On 22nd June at 10 a.m. the sun will reach its greatest angle north of the equator. It will then rise and set 26 degrees north of true east and true west respectively. On the 9th and 23rd the moon will rise and set approximately at true east and true west respectively.

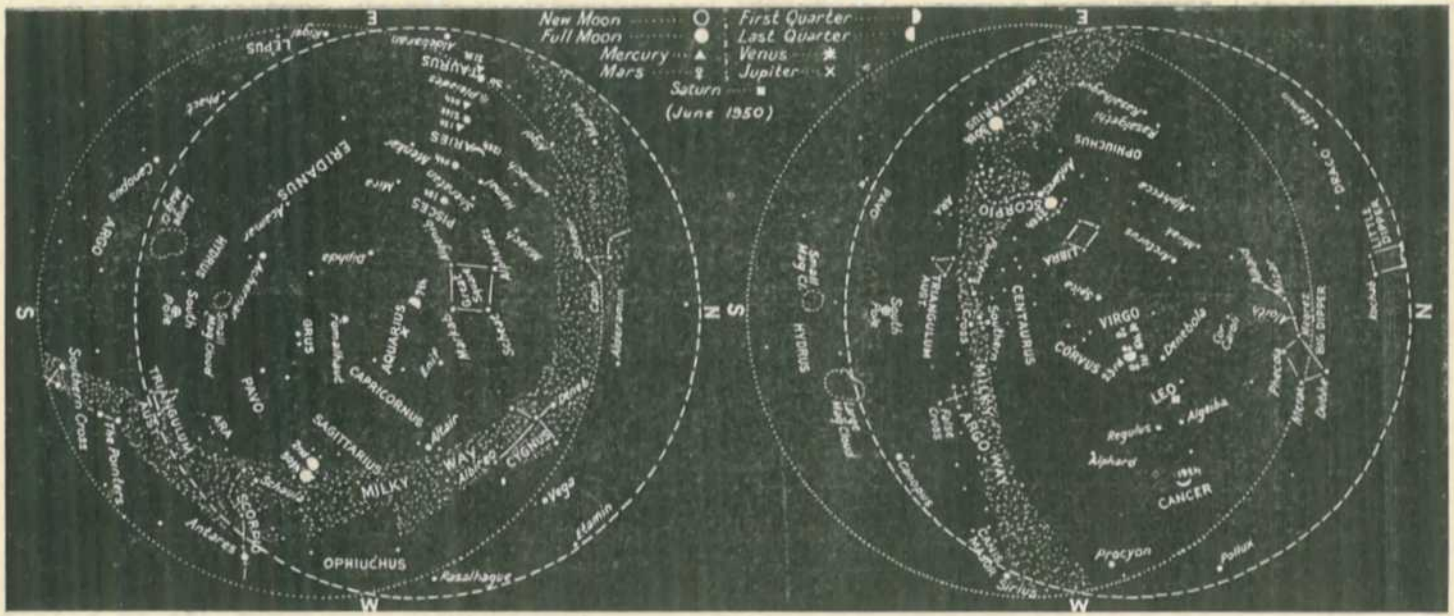
Mercury.—A morning object all this month. At the beginning in the constellation of Aries, it will rise 1½ hours before the sun, reaching greatest angle west of the sun on the 10th. By the end of the month, in the constellation of Taurus, it will rise about 1 hour before the sun.

Venus.—Also in the constellation of Aries at the beginning of June, rising 3 hours before the sun. By the end of the month it will reach the constellation of Taurus and rise 2½ hours before sunrise.

Mars.—In the constellation of Virgo, will be almost overhead at nightfall, setting about midnight. On the 23rd between 10 p.m. and 11 p.m. the moon will again pass in front of Mars.

Jupiter.—In the constellation of Aquarius, rising about midnight at the beginning of the month and between 9.30 and 11 p.m. at the end of June.

Saturn.—In the constellation of Leo about midway between Regulus and Mars. Setting about midnight at the beginning of the month and between 10 p.m. and 11 p.m. at the end of the month.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-eastern corner of the State to 8.15 p.m. along the Northern Territory border on the 15th June. (For every degree of longitude we go west the time increases by 4 minutes). The chart on the left is for 10 hours later. On each chart the dashed circle represents the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north, hold "N" at the bottom ; when facing South hold "S" at the bottom ; and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars, which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked, the position is for the middle of the month.