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A 2,000 LB. AN ACRE COTTON CROP AT THEODORE.

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Promise Seen In Schools For Farmers

By P. McCALLUM, Senior Dairy Adviser.

"These farmers' schools should bear fruit and could be enlarged upon, once farmers get used to the idea." That is what Mr. J. W. Lewis, a Laravale farmer, had to say about the Farmers' School held at Beaudesert on October 2 and 3, 1958.

The two-day school was arranged by the East Moreton Dairy Extension Advisory Committee. It was officially opened by the Minister for Agriculture and Stock (Hon. O. O. Madsen), who said he was pleased with the work being done by the Dairy Extension Advisory Committee. He felt the average farmer today realised the benefits of scientific farming.

The school was attended by 24 farmers from the Beaudesert, Beenleigh and Southport districts. The

Plate 1.

The Minister for Agriculture and Stock (Hon. O. O. Madsen) Opening the Farmers' School at Beaudesert. On his right is Mr. R. L. Harrison, M.L.A., who is chairman of the East Moreton Dairy Extension Advisory Committee.

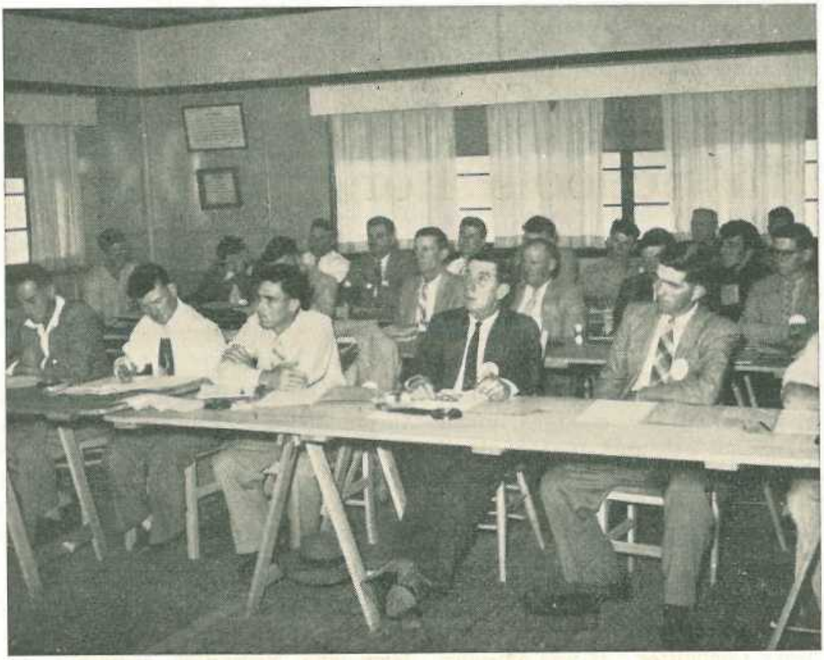


Plate 2.

Farmers Show Great Interest in a Lecture During the School.

Plate 3.

In The Field, the School Attends a Fertilizer Demonstration at the Tabragalba Property of Mr. B. Persse.

theme of the school was "The Maintenance and Improvement of Soil Fertility."

Lectures by officers of the Department of Agriculture and Stock were given on all aspects of soil management. Subjects embraced soil formation, land preparation and its aims, the role of legumes, the use of fertilizers, soil conservation and soil conditions and plant growth.

Coloured slides and movie films were also shown.

Visits were made to two farm demonstrations. On the first afternoon, a fertilizer trial was inspected on the farm of Mr. B. Persse, Tabragalba. The following afternoon the students viewed land preparation methods and the implements used, and soil conservation work on Mr. E. R. Schwarz's property at Christmas Creek.

Those who attended the school were a good mixture of experienced farmers and junior farmers. The older farmers were still young in thought and looking for new ideas. The younger farmers listened and learned and joined in the discussions.

Lecture periods lasted 25 min., followed by discussion periods of 20 min. Mr. G. Teese, Innisplain, commented that these discussion periods were very important. Evidence of this lay in the fact that not one discussion period lagged. He said that lecture periods should not encroach on the time allowed for discussions.

Points of interest which arose out of the school were:—

1. All farmers felt that they had learnt something from the school.

2. All stated they learned some improved farming practice from their association with the other farmers they met at the school.

3. Only one farmer considered a two-day school too inconvenient.

Plate 4.

Mr. E. R. Schwarz explains Methods of Land Preparation for Crops at his property at Christmas Creek.

Plate 5.

Mr. W. J. Roche, Adviser in Agriculture, Explains the Formation of Contour Banks Used in Soil Conservation Practice.

4. No one considered the lecture periods too long.

5. Only one farmer thought the lectures were too technical.

Generally, it was felt that there was great promise in schools for farmers throughout the dairying districts of Queensland.

Elephant Grass

"K.L.," of Yerra, has inquired about the value of Elephant grass.

Answer: Elephant grass is a highly productive plant producing a large bulk of feed. It is a good grass for dairy production. The most satisfactory way to use it is as "chop-chop," though with careful management it can be successfully grazed. It will ratoon well if properly managed.

The use of farmyard or nitrogenous fertilizers, together with the application of irrigation, generally enhances crop yield. In various parts of the world, yields from 10 tons to 40 tons an acre a year have been recorded. Under proper management, high yields are common. Although it is a fairly hardy grass, it does best under careful management.

It is planted in rows 4 to 8 ft. apart, with 2 ft. between the plants in the rows.

New Type Cream Cooler For The Farm

By F. G. FEW,
Dairy Technologist.

Efficient cooling of milk and cream by farm refrigeration can aid greatly in the further improvement of butter and cheese quality. A new type of farm refrigeration system is discussed:

Following importation by the Commonwealth Government of a number of farm refrigerator cabinets and compressor units, one complete cabinet and three condensing units were made available for farm demonstration in this State. They were all manufactured in U.S.A., and are commonly known as "in-tank" coolers with "drop-in" condensing units. Installation on cream-producing farms was carried out during the winter months of 1956.

Actually, in America, these units are used for the cooling of both milk and cream, but, having regard to their size and the general farm requirements for refrigeration, they were considered most applicable to cream-cooling under Australian farming conditions. They also offered the possibility of a cheaper unit than those already available on the market for this purpose Use for milk-cooling would be quite feasible although no such tests were carried out with the units available.

The prefabricated metal cabinet, sufficiently large to hold six cans of cream of the 8-gal. size, with one of the "drop-in" condensing units comprised the cooling installation which was placed on the one cream-supplying farm. Arrangements were made to check cooling efficiency, cream quality and the general suitability of the equipment; observations being made over more than a year and covering the whole of 1957. By submetering the compressor unit it was possible to record accurately the power consumed over a full year, the actual cost of refrigerating the cream being deduced, by proportion, from the total power used on the farm and its cost.

With the two remaining condensing units, refrigeration was provided on another two cream-producing farms, the cabinets being built-in at the dairy premises. Plans and specifications for a farm-built cabinet were taken from an Agricultural extension bulletin compiled by the U.S. Department of Agriculture, together with a State University. In one instance submetering of the compressor was again arranged, thus allowing a cost comparison to be made between a farm-made unit and the factory-constructed cabinet already installed on another farm. The following particulars are given so that a satisfactory unit can be built by any farmer, builder, or contractor undertaking the job.

Construction.

Construction of the farm-built unit is made in concrete with a hardwood

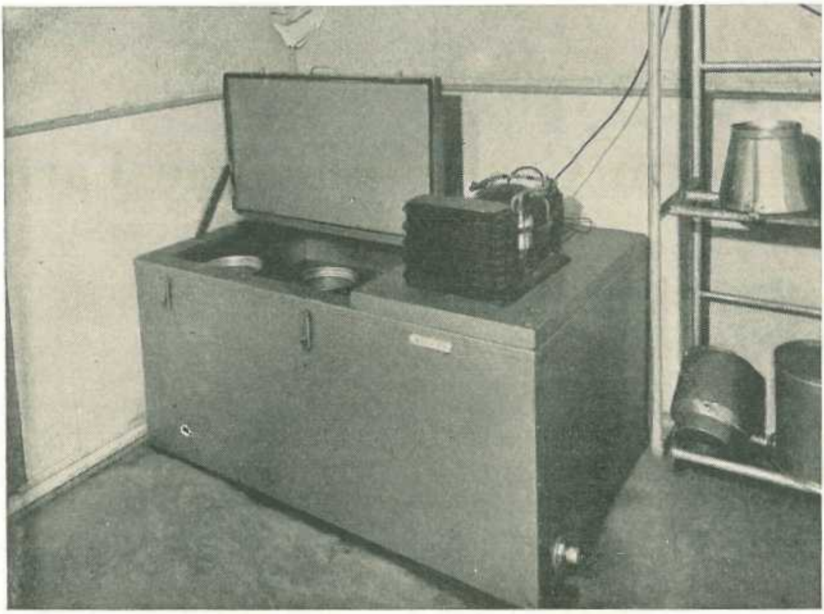


Plate 1.

American Factory-Built "In-Tank" Refrigerator.

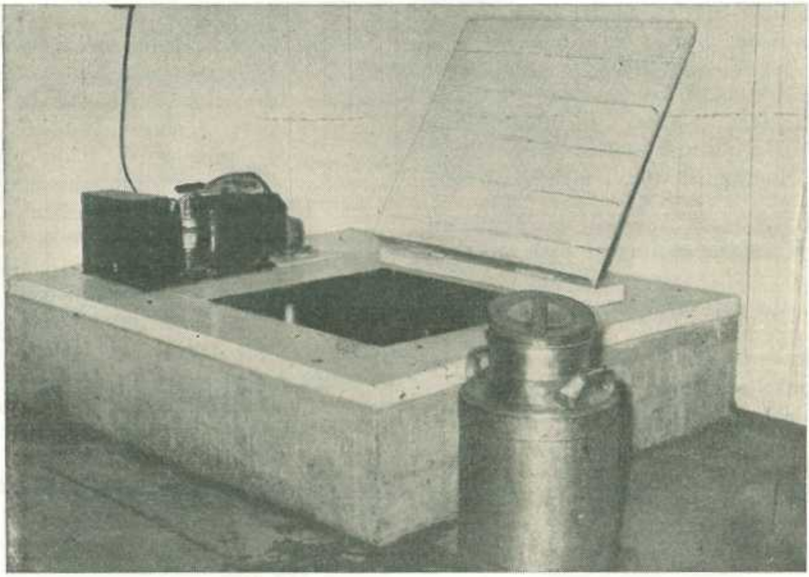


Plate 2.

Farm-Constructed Model of the American Prototype "In-Tank" Cream Refrigerator.

TABLE 1.

DIMENSIONS OF INSULATED CONCRETE COOLING TANKS.

Tanks are 36 in. wide, 27 in. deep inside.

Capacity in Number of 8 or 10 Gal. Cans.	Inside Length A.	Outside Length B.
4	4 ft. 0 in.	5 ft. 8 in.
6	6 ft. 0 in.	7 ft. 8 in.
8	8 ft. 0 in.	9 ft. 8 in.
10	10 ft. 0 in.	11 ft. 8 in.
12	12 ft. 0 in.	13 ft. 8 in.

TABLE 2.

MATERIALS REQUIRED FOR INSULATED CONCRETE TANKS.

Kind of Material.	Unit.	Amount of Materials Needed for Each Size of Tank.				
		4-Can.	6-Can.	8-Can.	10-Can.	12-Can.
Sand	cu. yd.	1·0	1·3	1·5	1·8	2·1
Gravel—¾ in. maximum ..	cu. yd.	1·1	1·4	1·7	2·0	2·3
Portland cement	bag	10	13	15	18	20
3 in. waterproofed insulation ..	sq. ft.	60	77	94	111	128
Tar paper (for cover)	sq. ft.	18	24	30	36	42
¾ in. x 6 in. boards (for cover) ..	lin. ft.	78	104	130	156	182
1½ in. x 10 in. boards	lin. ft.	30	38	46	54	62
1½ in. x 6 in. boards	lin. ft.	4	4	4	4	8

Add miscellaneous materials such as timber for forms, tar paper (where extra required), hinges, pipe and fittings, nails and screws, etc.

top that includes a hinged lid. The fixed top at one end serves as a rest for the compressor and cooling unit, a square hole being cut, through which the evaporating coil is passed when making the installation. A smaller square hole accommodates the separate motor-driven agitator to ensure water circulation within the cabinet.

Initially, the chosen site is excavated sufficiently so that the completed cabinet can rest approximately half above and half below the dairy floor level. This makes for easier lifting of the cans of cream, but makes the requirement of cabinet drainage a more difficult proposition.

Building the tank requires the use of both an inside and an outside form to contain the concrete, although the latter can be dispensed with where the tank abuts any walls of the dairy building. A thickness of suitable waterproof paper must, however, be placed against any such parts of the wall before the concrete is poured. The recommended mixture is 3:2¼:1, that is, 3 parts of gravel or crushed rock, 2¼ parts of sand and 1 of portland cement. None of the coarse material should exceed ¾ in. in size.

The concrete base is placed first and allowed to set and harden. The fill on which the base rests consists of cinders or coarse gravel about 6 in. deep. Base thickness is 4 in. and is made using a fairly stiff mixture which is levelled off to provide an even surface on which to lay the insulation. Rigid insulation of 3 in. thickness is used for the floor and walls and any recognised proprietary line should satisfy requirements. A material

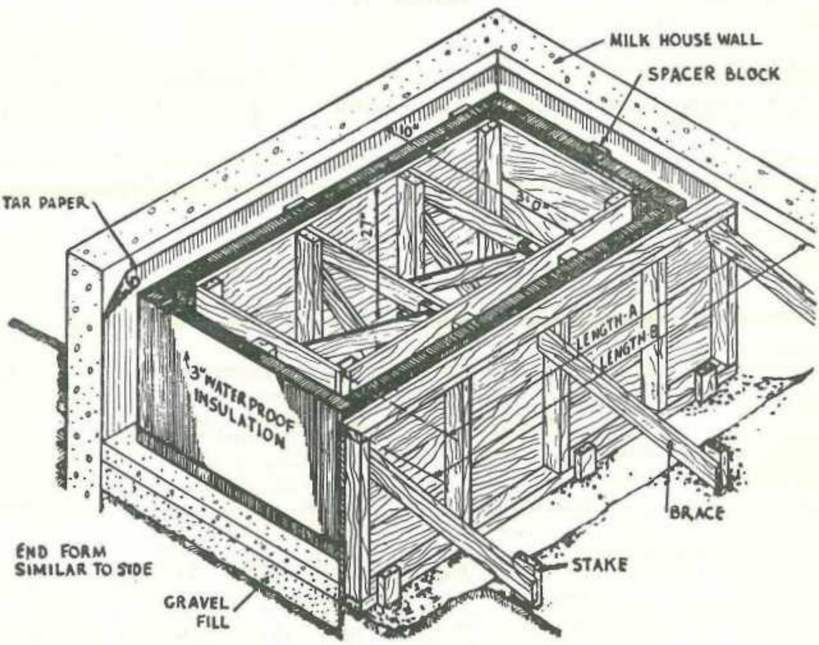


Plate 3.

Method of Forming the Insulated Concrete Tank.

immune to rotting is, however, desirable, and it must be waterproofed by dipping in hot bitumen. The wall insulation is erected after placing the floor insulation, care being taken so that the former will be exactly 4 in. from the outside face and 3 in. from the inner face of the tank. Provision for an overflow is made by fixing a length of 1½ or 2 in. piping in a horizontal position in the wall between the inner and outer concrete forms. Only a sufficient length to span this distance is required, although it can extend beyond the outer form if desired. A neat hole to accommodate the pipe must be cut in the insulation and the pipe should be heavily coated with bitumen along the portion between the forms. The pipe may be placed wherever convenient, which is usually above a point suitable for draining off the water which overflows. Its height is fixed to ensure that the water level is always constant, approximately shoulder height on the can.

Pouring of the concrete to form the cabinet floor and walls can now commence, particular care being taken to build the walls up evenly all around so that any displacement of the insulation is avoided. Thorough but gentle ramming is required to ensure smooth walls and dense concrete. When the forms are completely filled, ½ in. x 8 in. anchor bolts are set about 2 ft. apart around the top, the threaded ends projecting about 2 in. After the concrete has hardened and proper curing taken place, construction can be completed by adding the tank cover.

This cover is made, perferably, of a double layer of ¾ in. dressed hardwood boards with a thickness of heavy tar or other insulating paper between the layers. The layer of 1½ in. boards covering the 10 in. tank rim is bolted down using ordinary washers and square or hexagon ½ in. nuts. A thin layer of portland cement mortar is spread over the top of the wall before bolting down to secure a tight fit. The moveable tank cover is hinged to the wall cover using fairly heavy T hinges. A handle is fitted at the front for lifting, although the use of an overhead pulley and counterweight system is suggested to make the job easier. This is very simple to erect.

In some cases it may be found necessary to render all internal concrete sufaces with a rich cement—fine sand mixture incorporating a water-proofing agent with the mix. This is not required, however, if a thorough job is made of laying down the concrete, care in ramming down and avoiding the use of a too-large aggregate being the main points conducive to success. Particulars of construction are shown in Plates 3 and 4. Tables 1 and 2 give dimensions for various sized tanks and materials required.

The completed cabinet can be subsequently painted with a gloss, synthetic enamel to harmonise with the interior dairy walls, the underside of the tank cover being also treated to minimise moisture absorption. Provision for draining the tank can be made in several ways depending on circumstances. On sloping ground a drain pipe could be built into the bottom of the cabinet adopting similar principles as with the overflow pipe. Alternatively, the tank contents could be syphoned out, using a hose, when

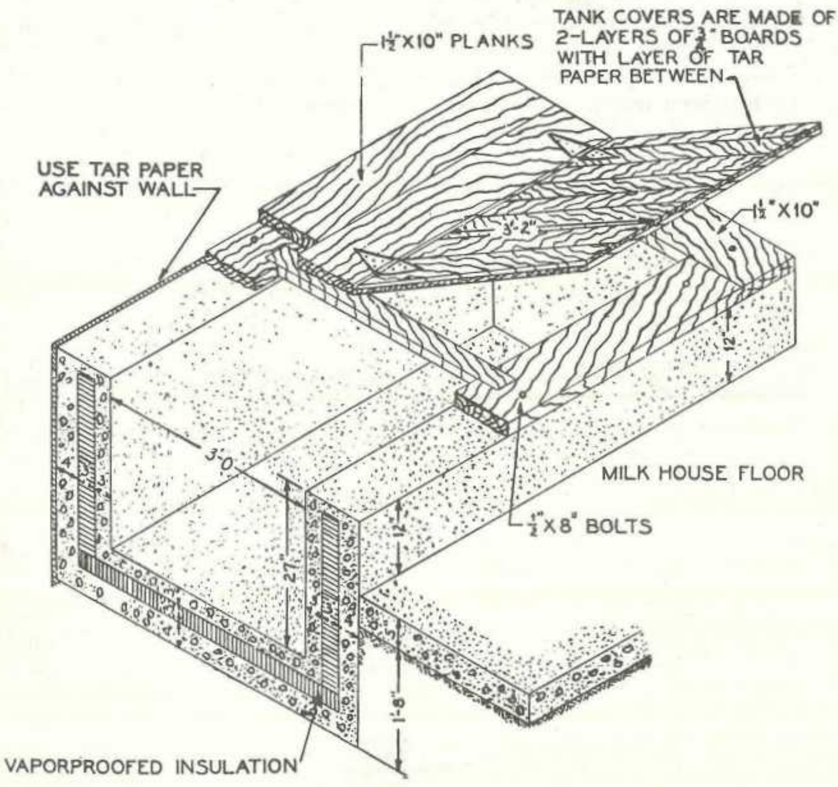


Plate 4.

Details of Insulated Concrete Tank.

such a procedure is required. On level ground a ½ in. or ¾ in. centrifugal pump can be used, driven by the electric motor operating the cream seperator where applicable. Provision of a separate electric motor would not be warranted for such infrequent use. A drive from shafting used in the dairy shed is quite feasible but, as electric power must necessarily be available where the "drop-in" type of refrigerating unit is used, it is most likely that some convenient type of electric drive can be devised. Views of both the factory-constructed and farm-built cabinets are shown in Plates 1 and 2.

Results.

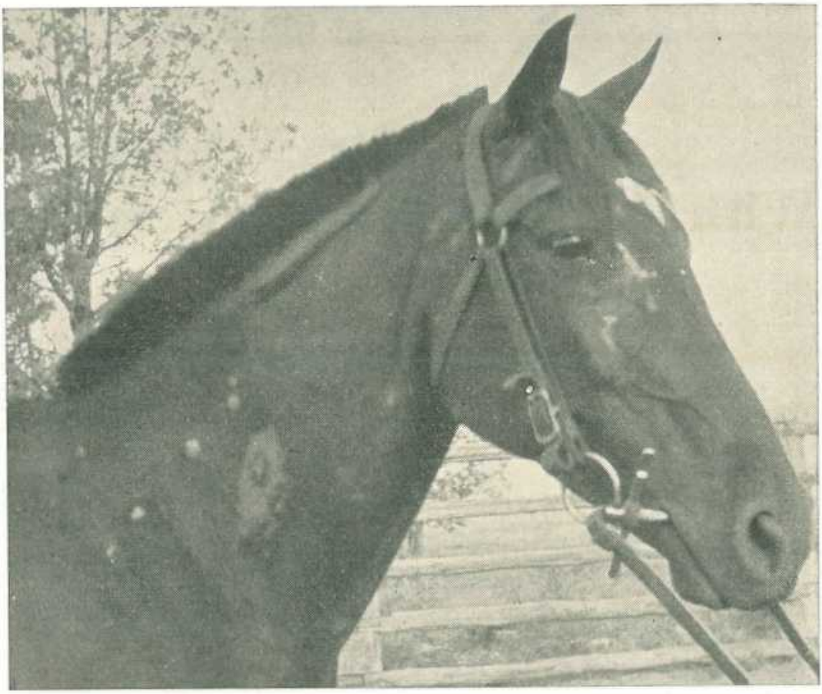
Observations made over the trial period leave no doubt as to the efficiency of both types of installation in preserving cream quality. Farm output in all cases was almost invariably of choice quality, although previously quite a percentage of lower grades had been noted. After several hours within the cabinet, cream temperatures were reduced to between 40 deg. F. and 45 deg. F., water temperatures varying from 34 deg. F. to 42 deg. F. On particular occasions, cream was only delivered weekly to the factory but no quality decline was noted as a result.

The farm-built insulated concrete tanks were made by contract for £72 each. Construction by the farmer would no doubt reduce this cost.

Although the prefabricated cabinet unit and the three "drop-in" condensing units were all of American manufacture, similar units are now being made in Australia. Complete units, that is, an immersion cooling cabinet and "drop-in" refrigerating unit, are available as well as either separately. For a farmer constructing his own concrete tank only the "drop-in" unit need be purchased. Installation is completed by merely plugging in to an ordinary 240 volt, single-phase, three-pin power point.

Running Costs.

So far as running costs are concerned, the recordings made on the two farms where units were submetered show the exact economic position. Cream was refrigerated for ·70 kw. hr. units per gal. in the prefabricated cabinet, the cost being 2.35d. a gal. Figures for the farm-built unit were ·58 units a gal. of cream costing 2·0d. The difference was mainly due to the considerably higher production of the latter farm and not a superior efficiency of the farm-built tank unit. Equal efficiency, can, however, be justly claimed. Milk cooling would be still cheaper per gallon although this point was not demonstrated with these particular units. Submetering of two other farm refrigerators, the type being already available in this State, showed that milk was being refrigerated for ·16 kw. hr. units a gal. at ·62d. Cream cooling consumed ·68 units a gal. and cost 2·7d. Production on both these farms was, however, somewhat small. All figures can be combined and costs quoted at 2d. to 2¾d. per gallon for cream and at something around ½d. to ¾d. a gal. for milk. Further trials would, doubtlessly, result in figures outside the ranges given and probably lower in the case of farms with a relatively large output. Those quoted should, however, effectively dispel any fear that cream and milk quality cannot be preserved economically by the application of refrigeration on the farm.



Ringworm is Infectious

THIS horse has ringworm.

You can see the hairless, crusty, roundish spots, large and small, down the side of the neck from the angle of the jaw to the shoulder.

This is an infectious disease. It's unsightly, worrying to the horse, and may be transmitted to man.

Treat it as soon as it crops up. Clip the hair short around the spots and then wipe the areas with 2 per cent. tincture of iodine. Don't rub it in or it will "blister"; just wipe it on with cotton wool.

Some cases don't respond to this treatment. If you have this experience, seek veterinary advice for further treatment.

Wheat for Pigs

"M.C.," of Rosewood, seeks a suitable variety of wheat for grain production for pig feeding. He asks when to plant and inquires if the crop can be grazed during the growing period.

Answer: There are two varieties of wheat which should be suitable for this purpose; they are Lawrence and Celebration. Both are good performers as dual purpose wheats.

Plant the varieties mentioned, in May, and under favourable growing conditions they will provide a good period of grazing prior to shutting up for grain production.

Dairying Success With Continuous Feed Supply

By J. B. WILSON,
Dairy Officer, Boonah,
and A. HUTCHINGS,
Senior Adviser in Cattle Husbandry.

A high level of production has been achieved by a Roadvale (Boonah district) family, whose 53 cows have averaged 700 gal. of milk and 258 lb. of butterfat. The key to their success has been that they have used every available method of providing a continuous supply of feed to their herd, rather than go in for maybe one or two spectacular feeding practices.

In 1923, Mr. and Mrs. W. A. Dull purchased the property which now forms part of the 521 acres they own at Roadvale. The area is rather hilly and consists of about equal areas of brigalow scrub and grey leaf ironbark country.

In their early years on the property, Mr. Dull and his son, Herb, did contract work in the district. At the same time they developed their farm. Today, they are reaping a reward for their hard work and enterprise.

PRODUCTION.

Mr. Dull and his son joined the district herd recording group when it first started. Production of their grade A.I.S. herd has been built over the years, as shown in Table 1.

Increasing production reflects improvement in husbandry and feeding.

Production records are used beneficially. Milking cows are divided into four groups based on butterfat yields, and concentrates are fed

TABLE 1.

——	50/51.	1952.	1953.	1954.	1955.	1956.	1957.
Average Butterfat per Cow (lb.)	166	129	182	184	..	259	258
No. of Cows	43	42	42	30	..	56	53
Average Butterfat First Calf Heifers .. .. (No. of heifers in brackets)	.. ..	68 (6)	.. ..	148 (8)	.. ..	182 (10)	192 (8)

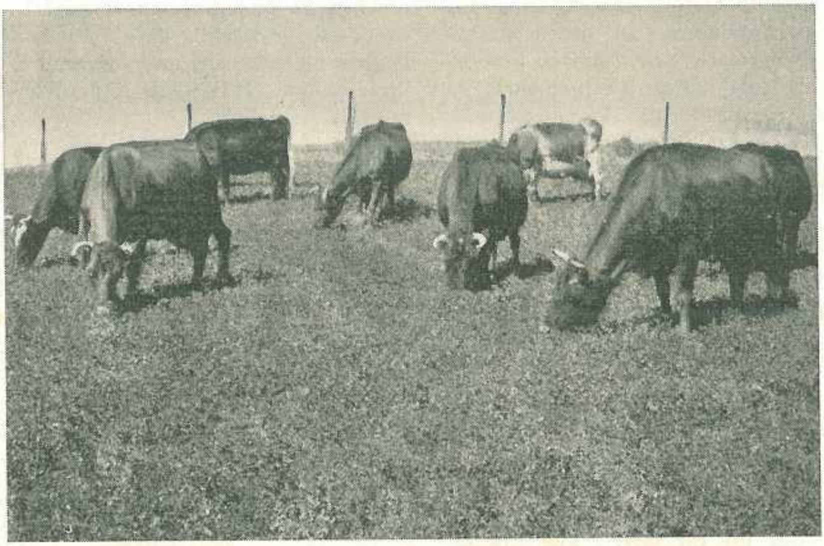


Plate 1.

Young Lucerne Growth Provides High Quality Grazing.

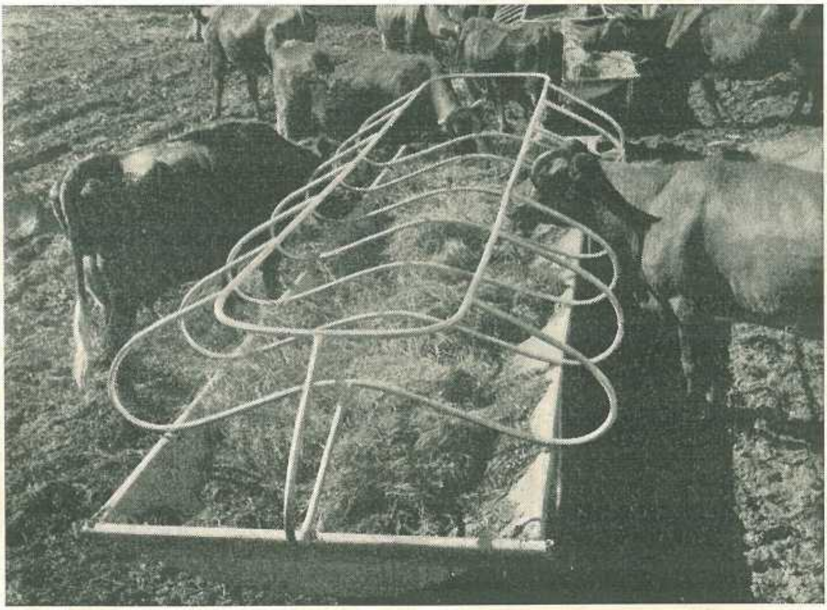


Plate 2.

Home-Made Portable Feed Troughs. Each trough has space to feed sixteen cows.

accordingly. Low producers are culled and heifers reared from the highest producers. A dozen heifers are reared each year. At the time of writing this article (September), 25 cows were producing 114 gal. of milk daily.

FEEDING THE HERD.

The property is divided into 30 paddocks and plans are afoot for much more fencing. Cropping is used extensively in providing a continuous supply of good quality feed for the herd.

Altogether, 340 acres have come under the plough, and 70 acres have been planted to lucerne. Last season, 80 tons of lucerne hay were made. Lucerne is systematically grazed when not shut up for hay. The life of lucerne on brigalow scrub is about four or five years. It is then ripped with a heavy-tined implement and oversown with oats in winter and sudan grass in summer. This is grazed off. A minor problem at this stage is that cows pick out the crop and leave the lucerne. However, other stock eat the lucerne later on.

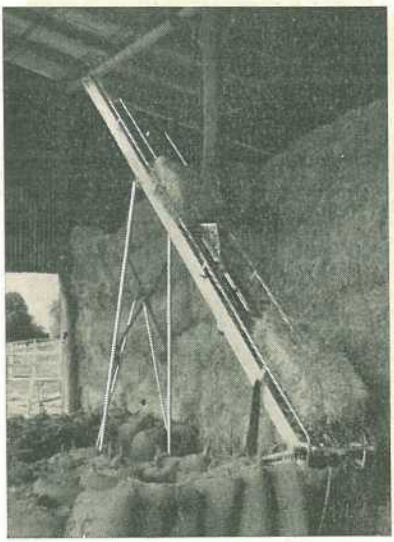


Plate 3.

Fodder Storage—the Labour-Saving Way.

Following the final grazing, the paddock is ploughed and a seed bed prepared for wheat. This is followed, in season, with corn and sorghum for three years. It is then replanted to lucerne.

To date, lucerne has not successfully been established on forest country.

As a grass-clover pasture has not yet been established, 40 acres of suitable crops are grown both summer and winter for grazing off. These crops are planted within reasonable walking distance of the bails, while crops for conservation are grown in the paddocks farther away. Thus, long daily walks by the milking herd are avoided.

During the past summer, two silos of 400 tons and 300 tons capacity were filled with sorghum silage. Home-made attachments enabled harvesting of a 12 ft. crop, which had fallen flat to the ground. A home-made, 6 tons capacity trailer with an ingenious unloading device has helped the silage making.

Storage has been built for 300 tons of hay. This shed is never empty. A galvanised iron tower silo has been built to hold 60 tons of grain. This will often be full but rarely empty.

About 100 acres of sorghum and 130 acres of wheat are harvested for grain.

Grazing of lucerne is supplemented with silage and lucerne hay, fed in well-constructed, portable troughs. A concentrate mixture is made of gristed sorghum, wheat and meat meal, with the addition of 1 per cent. bone meal. The proportion of meat meal is reduced from $\frac{1}{3}$ to $\frac{1}{8}$ of the mixture when lucerne grazing is plentiful.

Mr. Dull plans to introduce a roughage feeding system of silage and lucerne hay to supplement lucerne and crop grazing for the dairy herd, ewes, and lambs.

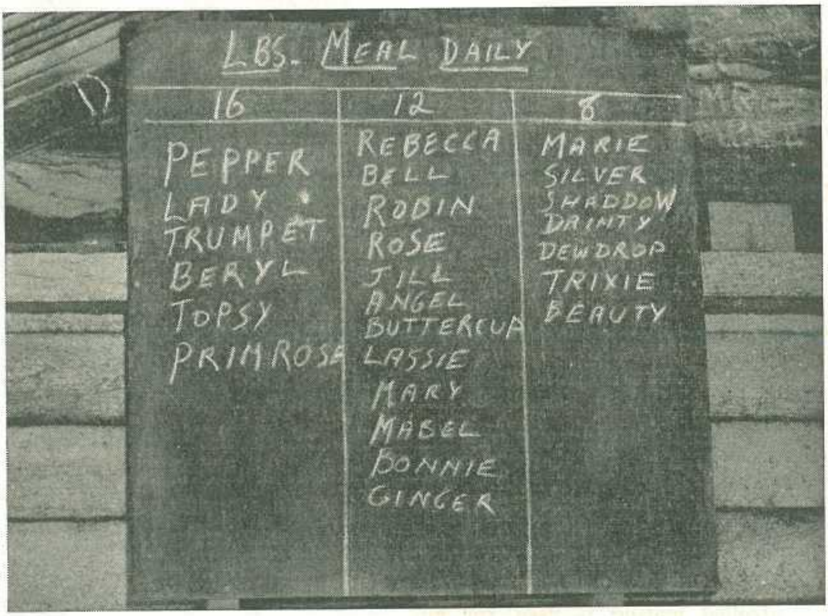


Plate 4.

This Blackboard in the Milking Shed Sets out the Meal Allowance for Each Cow.

Plate 5.

Sheep Eat What the Cows Leave and Turn It Into Cash.

MILKING PRACTICES.

Two operators handle the four-unit, doubled up machines, and no time is lost. Cows are fed concentrate, in proportion to their production, while being milked. A black-board placed at the end of the bails shows each cow's ration at a glance. Feed hoppers and boxes are fixed in each dummy bail.

Cows walk into the bails without being driven. Milk "let down" is stimulated by udder washing. To protect quality, chlorine sterilizing solution is added to this water. Machine stripping is practised. An average of close to 300 lb. of butterfat for mature cows disproves the old story still often encountered "that cows will dry off if not hand-stripped after machine milking."

Controlled mating is used for all cows except the "tail enders" and calvings are planned for June, July, and August. Very little infertility has been encountered.

Failure to come on heat is not a herd problem on this property, mainly because cows are always well fed.

MIXED FARMING.

Twenty farrowing sows are kept and from 150 to 200 baconers are sold each year. All pig feed except meat meal is produced on the farm.

Two years ago, 160 crossbred ewes, a Southdown and a Dorset horn ram were brought on to the property. The general practice is that sheep follow the dairy herd in all grazing. Thus most crops are closey grazed. Fat lambs and wool are sold.

Cattle, sheep and pigs contribute to maintain soil fertility and butter, wool, bacon and lambs are the products sold off the property.

MACHINERY.

A number of implements has been designed and built by Mr. Herb Dull. He is also skilled in machinery maintenance work.

An electric welding plant is used to great advantage in construction of trailers, gates and for repairs to farm equipment. This has provided substantial improvements at reasonable cost.

A forage harvester, hay baler, header, and a full complement of rugged cultivating machinery, together with ample tractor power, provide the means of handling most soils and crops.

While its capital value is high, this machinery ensures that planting and cultivation can be carried out at the most opportune time. Likewise, crop losses are cut because enough machinery is available to handle the material quickly.

Velvet Bean v. Reeves Cowpea

"K.A.," Caboolture, has inquired about the relative feeding values of velvet bean and Reeves cowpea.

Answer: There is little, if any, significant difference in the feeding value of the two crops. Reeves cowpea is susceptible to stem rot as is Poona cowpea. As this disease destroyed much of a previous planting of Poona the probability of Reeves cowpea being similarly affected commends a change to velvet beans. Velvet beans are frost-susceptible and so should not be planted until the danger of frost has passed. This bean has a much longer growing period than the cowpea and would need to be planted as soon as the danger of frosts had passed in order to get the best results. There are, however, stem-rot-resistant cowpea varieties and seed of these is being multiplied for release to farmers.

Dairy Parade

THE coming of summer underlines the need for an adequate and good-quality water supply on every dairy farm.

Most of the defects that reduce milk and cream quality occur in the summer, but they can be reduced almost to insignificance by paying strict attention to hygiene.

This is the time of the year to look after your storage facilities so that sufficient water can be held at the dairy shed. Storage for at least 2,000 gallons is a must at every dairy shed. A few hours spent repairing and cleaning guttering and roofs will allow the greatest possible quantity of water to be stored from summer rains. Your work on this job will pay for itself many times over in top prices for good quality produce. In addition, don't overlook the need for sufficient stock watering points in your paddocks.

—*W. D. MITCHELL,*
Dairy Technologist.

DAIRY refrigerators are becoming popular items of equipment in dairy buildings in Queensland. Normally, they give little trouble. One fault, however, is that the machine may run for an excessively long time. When this occurs, it suggests one of the following faults in the operation of the unit.

1. A low gas charge. This requires examination by a qualified mechanic to check the unit for leaks, and re-charging if necessary.

2. The refrigerator may be overloaded due to the farmer's failure to cool the milk sufficiently over a cooler before filling the can.

3. Insufficient water in the immersion type cabinet.

4. Insufficient ventilation around the compressor unit restricting the amount of air draught passing around and through the cooling fins.

5. Faulty rubber seals on the cabinet door allowing cold air to escape from the unit.

—*K. FITZGERALD,*
Dairy Officer.

UNSATISFACTORY dairy hygiene during the summer and autumn is the main cause of flavour defects in milk and cream.

At this time of the year it's necessary to pay close attention to cleaning the milking equipment and maintaining it free from milkstone. The acid-alkali type of cleansers are valuable aids in cleaning. Regular cleaning after each milking cannot be neglected. Boiling water, steam or chemical sterilizing solutions must also be used to finish the job of cleaning equipment.

Dirty udders and flanks on the cows are a potential source of dust and manure contamination of dairy produce. Udders and flanks should always be washed if defects from this source are to be avoided.

Inclusion of aged or stale milk in the cans, mixing hot and cold cream, and failure to stir cream thoroughly will all contribute to quality deterioration.

Faulty cooling or lack of cooling makes it difficult to produce choice grade quality consistently.

—*J. ARMITT,*
Dairy Officer.

Stock Gazette

WITH blowfly offering resistance to insecticides in increasing measure the cautious woolgrower will review the position in regard to his own flock. It might be worth trying to lessen the impact of the blowfly problem in the following ways:—

1. When picking replacement rams to make sure to get flock rams that are plain bodied, particularly in the breech area.

2. To carry out the Mules operation on all young sheep, both ewes and wethers, annually, so as to carry no sheep that have not been Mulesed.

3. To make sure that all lambs are marked with the most suitable tail length to resist fly; vulva length in ewe lambs and a similar tail cut in wethers.

4. By more careful supervision at shearing and crutching to ensure that tags of wool are not left around vulva or at tail-end.

—*R. B. YOUNG,*
Senior Adviser in Sheep and Wool.

Timely Tips for March

MARCH may see you in trouble with cases of footrot cropping up in your herd. Correct treatment is very effective early in the disease. When the infection has advanced it can be crippling. You can do a lot to stop its spread in the herd. See your veterinary surgeon for details.

If you see pigs with foot trouble, roughly like footrot in cattle, remember that pigs sometimes get footrot too. It responds very well to treatment.

Pleuro (contagious bovine pleuropneumonia) can be controlled by vaccination. With the mustering season starting in the next month or so, now is the time for cattlemen to start making arrangements to vaccinate.

Any unexplained unthriftiness of cattle should be investigated by a veterinary surgeon. Copper deficiency could be involved, especially if unthriftiness, black scour or yellowing of the coats of red coloured animals is seen. If the veterinary surgeon sees signs of copper deficiency he will take blood samples to check for copper.

Grasses will soon start to deteriorate as autumn comes on. Signs of phosphate deficiency may be seen more clearly when this happens. Watch for "bone chewing," rough coats, lameness and loss of condition. If you already know you have a phosphate deficiency on your place feed bonemeal (at least 2 oz. per head per day). Make inquiries from your nearest Agriculture and Stock office too, about other ways of rectifying phosphate deficiency.

Remember that calcium (chemical symbol Ca) and phosphorus (chemical symbol P) are two different minerals. In many ways their action in a cow's body is opposed. If your cows are phosphate deficient put it right with a supplement that is high in phosphate (P).

Farmer's Guide To Genetics And Breeding

By B. W. MOFFATT,
Adviser, Poultry Section.

POULTRY breeding practices are now receiving more attention than ever before in the history of the poultry industry. It has been realised that one of the best avenues open for improving the efficiency of egg production is through breeding. This also applies to other industries, such as the dairy industry, where testing of herds has shown that the best producers can be identified and bred from to improve the herd. In respect to poultry, the random sample tests conducted in Queensland and elsewhere have shown the wide variation in the performance of stock from different hatcheries.

In the case of the poultry industry, eggs and meat have many competitors for the housewife's purse. For this reason we are always ready to adopt improved techniques to "keep up with the times."

In the past few years many poultry breeders have realised that their breeding practices left much to be desired, for egg production per bird per year has not increased significantly over the past decade. Over this period, production costs have risen steeply and only by increased production per bird, can the poultry farmer gain a satisfactory reward for his labour and on his investment.

That breeders realised this need for improvements is shown by their enthusiasm in the recently introduced Queensland Poultry Improvement Plan (Q.P.I.P.). This is a scheme aimed at increasing efficiency of production by breeding fowls that will live longer and lay more eggs than did their predecessors. For breeders to understand the basic facts of the scheme and buyers of their chickens to have faith in the scheme it is considered essential to have a basic knowledge of genetics, which is the study of heredity.

What is Inherited.

No two people are exactly alike. Although it is not quite so obvious, the same applies to fowls and other animals. This is a basic point in any breeding scheme. This variation allows us to select the better individuals and breed from them. What are the principles behind this variation?

Many characters of economic importance, for example, body weight and egg size, are governed by many genes, which are carried on chromosomes in the body cells. These genes are passed onto the progeny, from the mother in the ovum, and from the father in the sperm, as ova and sperms are the only physical particles connecting one generation with the next. These genes start a chain of processes which eventually result in the character expressed.

In other words, the character is not actually inherited, but the animal

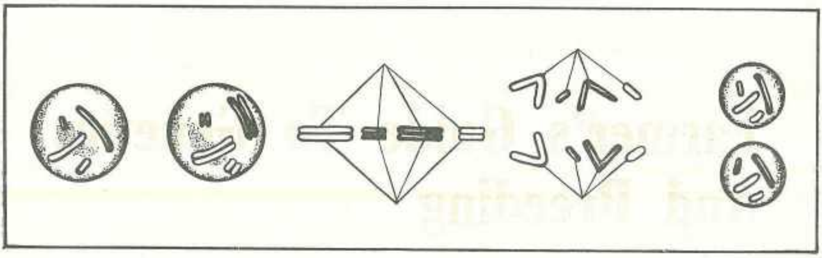


Plate 1.

Mitosis in Diagram Form. The original cell has four chromosomes which have shortened and thickened. The chromosomes divide into two chromatids and attach themselves to the spindle fibres at the "equator". The chromatids separate and travel to opposite ends of the nucleus. Thus two cells are formed with the same chromosome complement as the original cell.

inherits something which gives it the ability to express that character. This can be easily explained by the fact that sperm and ova from black cockerels and pullets, for example, Black Australorps, are not black. However, genes carried in these cells are capable of starting a biochemical process in the progeny, which will produce a black pigment, and so a black chicken. Most of the individuality of animals is inherited in this way. We can see from this that if a bird is a particularly good layer she has probably inherited certain genes from her parents which govern many of her body processes in such a way as to give her the ability to lay many eggs.

Environment's Part.

By environment is meant rearing conditions, housing, feeding and climatic conditions. What has been said about inherited characters is not the whole story. For instance, take the example of the hen that inherited from its parents the ability to lay many eggs. If this hen had been subjected to adverse rearing conditions or had not been fed properly, it certainly would not have laid many eggs.

It has often been said that 90 per cent. of the breeding goes down the throat. In other words, if the animal is not fed properly (and housed in good quarters) no matter how good its breeding, it will not produce efficiently or to its inherited capacity. Which then is more important, heredity or environment? We cannot choose, for they are so interwoven that only by a combination of good management with well-bred stock can best results be achieved. Too often people blame the hatchery for their own poor results. One farmer who had purchased chickens from 20 different hatcheries claimed that the Department should close them all down because of their poor class stock. Investigation of his complaint soon showed that his management would prejudice the successful rearing of any chickens.

This brings us to the concept of heritabilities. The heritability of a character is often closely associated with the environment under which the progeny have been reared. However, characters such as the black pigment in Australorps do not depend on environment. They will show up no matter what conditions prevail.

There are other characters such as body weight, egg production and egg size, that do depend, to a large extent, on the feeding and rearing practices. In such cases the heritability of a given character can be expressed as that fraction of the superiority of the parents over the flock from which they were selected, that is passed on to their progeny. If a group of parents averaged 10 units better than the average of the flock, and the progeny were also 5 units better, then the heritability of that character would be 50 per cent. This is regarded as a high heritability.

Heritability of "livability" (the ability to live) is very low (about 5 per cent.), and therefore, whether the bird lives or dies depends much more on the environment than it does on the genes the bird inherited. For this reason, breeding from hens instead of pullets gains very little in the way of "livability". In fact, it slows down the rate of progress because of the longer generation interval. The heritability of hen-housed egg production, that is, the total production of a pen divided by the original number of birds penned, is also low, being about 16 per cent. The reason for this low figure is because hen-housed production takes mortality into account and also the number of eggs laid by a bird is governed to a large extent by its environment.

Physical Basis of Inheritance.

The study of genetics is often made difficult for the average person by the use of many technical terms. However, for a basic study this can be overcome by explaining them as they occur.

To understand how genes and chromosomes are passed on from one generation to the next, it is necessary to know a little about the basic structure of the body cell.

The Body Cell.

The body of an animal is made up of millions of small living units called cells. These vary in size, shape and complexity, but basically are about 1/2,500th of an inch in diameter. Numbers of these cells with similar

Plate 2.

The Chromosomes of a Sperm Mother Cell (Magnified 1,500 Times) in the Process of Mitosis. These chromosomes are arranged at the equator. The spindle fibres are not shown.

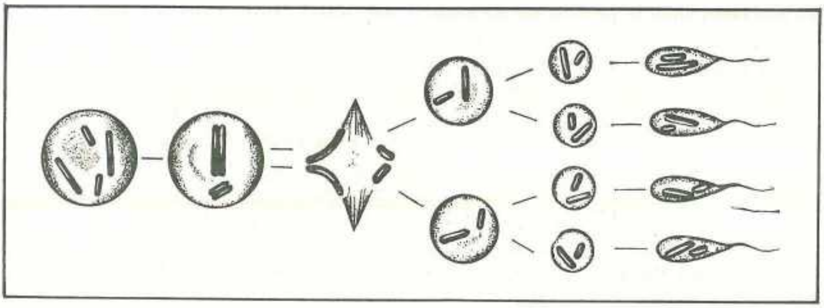


Plate 3.

Meiosis or Reduction Division in Diagram Form. The chromosomes pair and become arranged at the equator. The members of each pair separate and go to opposite "poles". Two cells with the haploid number of chromosomes result. The second meiotic division results in four cells each with the haploid number of chromosomes.

functions are held together to form a tissue. A number of tissues associated with one another, form organs such as the liver, muscles, bone and skin, and these in turn make up the whole of the body structure.

A single cell consists essentially of a drop of protoplasm, limited by a membrane. This protoplasm actually consists of two major parts, the cytoplasm towards the outside and a denser part in the centre called the nucleus.

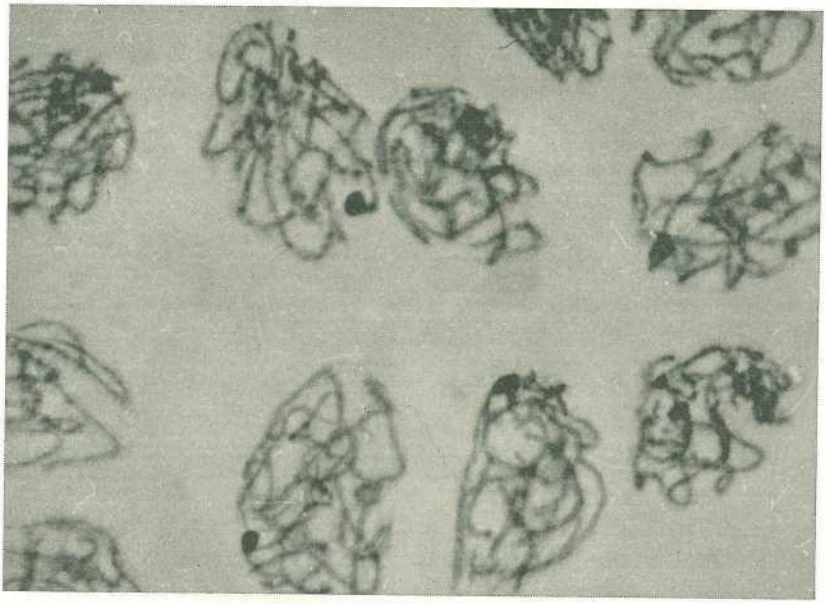


Plate 4.

A Section of a Grasshopper Testis Magnified 600 Times Showing Chromosomes Still in the Elongated State in the Early Stages of Cell Division. Each lot of chromosomes shown is the full complement for one cell but for the sake of clarity the cell wall and cytoplasm have not been stained.

Plate 5.

A Single Cell (Grasshopper Testis Magnified 1,800 Times) in the Process of Meiosis Showing the Arrangement of Chromosomes at the "Equator". Notice that the members of a pair have come to lie side by side so that when they separate one member of each pair will travel to each end of the cell. Compare with Plate 2 (Mitosis) to see that the chromosome number is halved by meiosis.

It is the nucleus in which we are mainly interested because it contains the chromosomes and genes.

These body cells are capable of dividing into two and so growth of the animal occurs. Actually the animal starts from the fusion of the sperm and the ovum and this resultant cell starts to divide so that one cell gives 2, then 4, 8, 16, and 32, and so on until the whole structure of the animal is completed. In the adult animal, cell division still goes on to replace those cells which are worn out.

Chromosomes and Genes.

In the nucleus of each body cell are located the chromosomes and, on these, the genes. For simplification, the chromosome can be regarded as made up of the organic substances, protein and nucleic acids. They are capable of elongation and contraction and when fully contracted look very much rod shaped. These chromosomes can be quite easily seen if cells are properly stained and examined under a microscope.

The number of chromosomes in each cell is constant in each species of animal. The numbers vary greatly in different animals from 2 in the parasitic large round worm (Ascaris) up to 200 in the crayfish. With high numbers it becomes difficult to count these small bodies and only recently it was found that there are 46 in man and not 48 as previously thought. The number in fowls has not been counted accurately but it is thought that there are 78 in the male and 77 in the female. This difference in number between the sexes is associated with the inheritance of sex which will be referred to later.

Plate 6.

Cell Division (Meiosis) Nearing Completion Showing That the Members of a Pair of Chromosomes Have Separated. Each lot of chromosomes will form a new nucleus. A cell membrane will form across the centre and two cells will result (Grasshopper testis magnified 1,080 times).

The genes are too small to be seen with even the best microscopes but from a number of lines of evidence it is now believed that they are probably composed of the organic substances called D.N.A. for short by geneticists. Each gene is situated at a definite point on a particular chromosome. Much breeding work has been done on the so-called fruit fly *Drosophila melanogaster* (not to be confused with the well-known parasite of fruit) which has only 4 chromosome pairs, and it is now possible to compile chromosome "maps" of the fly to show the actual positions of the genes in relation to the length of the particular chromosome on which they are located.

If we study the full complement of chromosomes for an animal we find that they can be arranged in pairs, each member of the pair being exactly like its mate. Each pair is termed an homologous pair. There is of course the exception in the hen where there are 77 chromosomes. In this case there are 38 pairs and one single one in the female, and 39 pairs in the male.

As the genes are located at definite points on the chromosome, and as the chromosomes can be arranged in pairs, it can be seen that when the members of a pair lie side by side there will be, at any particular point two corresponding genes opposite one another. The point where they are located is called a "locus" and the pair of genes which affect the one character are called "alleles." These two genes or alleles can be of the same kind or they can be different. If they are different, one is sometimes dominant over the other, which is then called a "recessive." The resultant character which they affect or govern will then be determined by the dominant one. The recessive character will only show if both of the genes are recessive. Where an animal carries two genes of the one kind at a particular locus (either both dominants or both recessives) that animal is referred to as being homozygous, and will breed true for that particular character. If on the other hand it carries one dominant and one recessive it is referred to as heterozygous for that character.

Very few characters are actually governed by only the one pair of alleles but to simplify matters we will give an example. In a fowl with a rose comb there would be two chromosomes, each carrying a dominant gene for this character. We could denote this bird RR. In a single comb fowl there would be two chromosomes each carrying a recessive gene for rose comb which could be denoted rr. Both of these birds are homozygous, but one is homozygous for rose comb and the other is homozygous for single comb, the recessive of rose comb. The genetic make up of these birds or genotype, as it is called, is RR and rr respectively, and the appearance or phenotype is rose comb and single comb respectively. If these two birds were mated, a bird would result with a genotype of Rr (heterozygous), which has a phenotype of rose comb, because R is dominant to r.

This is all very well, but you might ask how do these genes pass from parent to offspring so that each parent contributes one gene. The answer lies in the division of the body cells and the formation of sperm and ova.

Division of Cells.

There are two types of division of cells. The first type is called simple division or mitosis and goes on in all the body cells after the fusion of sperm and ova. This type of division results

Plate 7.

Chromosomes Magnified 1,230 Times in the Process of Meiosis at the Stage Where Crossing Over Occurs. Members of a pair can be seen to be joined in places along their length. Crossing over takes place at these points as in Plate 8.

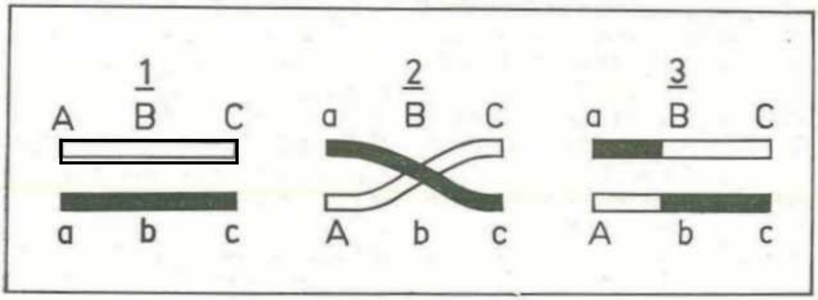


Plate 8.

A Simplified Version of Crossing Over, Which Will Result in New Combinations of Genes.

in the millions of cells that go to make up the animal. It really consists of exactly duplicating the cells. The second type of division, meiosis, is associated only with the formation of the sperm and ova in the testes and ovary respectively. From a genetic point of view this is the important division but so that it can be understood more fully both are described.

Mitosis or Simple Cell Division.

If a resting cell (one that is not dividing) is examined, we find that the nucleus looks like a mesh of not-clearly-defined threads. These threads are really the elongated chromosomes but their shape cannot be made out clearly. As the cell starts to divide the chromosomes contract in length and appear as rod shaped bodies. See Plate 1. About this stage, two "poles" appear, one at each end of the nucleus. From each of these "poles" a number of fibres can be seen radiating out and joining with those of the other "pole" so that we have a number of complete fibres from one end of the nucleus to the other. These are called "spindle" fibres because they are shaped like a spindle.

Each chromosome then becomes attached to one of these fibres at about the centre of the nucleus, often called the "equator." See Plate 2. Each chromosome then divides into two chromatids. Actually it reproduces itself so that there are two complete sets of chromosomes. The separation of the chromatids then takes place. They move along the spindle fibres towards the "poles," one chromatid of each pair going to each "pole" to become a chromosome of that cell. The spindle fibre system then disappears and a membrane forms across the centre of the cell to make two cells. Each cell thus contains the full number of chromosomes, which then begin to elongate, lose their shape and show the mesh-like structure of the resting cell.

If sperm and ova were formed as a result of mitotic division, each would have the full complement of chromosomes or as we say, the "diploid number" (78 in male fowl and 77 in female). When sperm and ova fused we would get 155 chromosomes. It is quite obvious that this process could not go on because after a few generations the chromosomes would fill the cell. For this reason nature has provided meiosis.

Meiosis or Reduction Division.

Meiosis consists of two distinct divisions but for all practical purposes the second division can be regarded as simple mitosis. In effect, the first meiotic division is concerned with the reduction of chromosome numbers to half, often referred to as the "haploid number" of chromosomes. See Plate 3.

The stages of meiosis are similar to those of mitosis except for a few technical details. In the first stages, the diploid number of chromosomes (78 in the male fowl) can be made out as long threads in the nucleus of the cell. See Plate 4. Then each member of an homoglogous pair is seen to come together side by side so that only the haploid number (39 in the male fowl) can be made out. See Plate 5. The spindle fibre system appears and the pairs attach to the fibres. Now instead of each chromosome dividing into two chromatids, one member of each pair goes to opposite "poles" of the cell to give only half the number of chromosomes (39) at each "pole." See Plate 6. As these chromosomes pull apart to travel to the "poles" it is noticed that they stick together at certain points. Actually what has happened here is that one small part of a chromosome has changed places with the same part of the other chromosome. This is called crossing over and it results in the "mixing up" of genes. See Plates 7 and 8. Thus each chromosome, although it still has the same number of genes as before, may get different genes, and so result in new combinations of genes, and hence more variation in the progeny, if this cell goes to make up a new individual.

When this first meiotic or reduction division is complete the cell divides again. This is called the second meiotic division and is similar to an ordinary mitotic division. This time the cell only has the haploid number of chromosomes (39) but they divide into chromatids and one goes to each "pole" of the cell. Each resulting cell has the haploid number (39). It can be seen that from these two meiotic divisions, four cells with the haploid number of chromosomes will result. This is how sperm and ova are formed with only half the chromosome number so that when a sperm and an ovum fuse the diploid number will be restored.

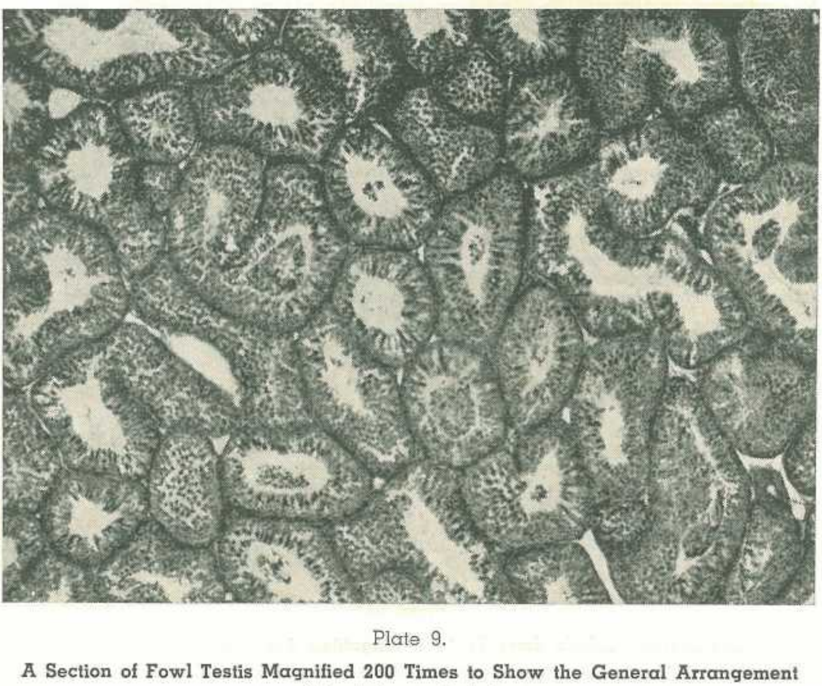


Plate 9.

A Section of Fowl Testis Magnified 200 Times to Show the General Arrangement of Seminferous Tubules.

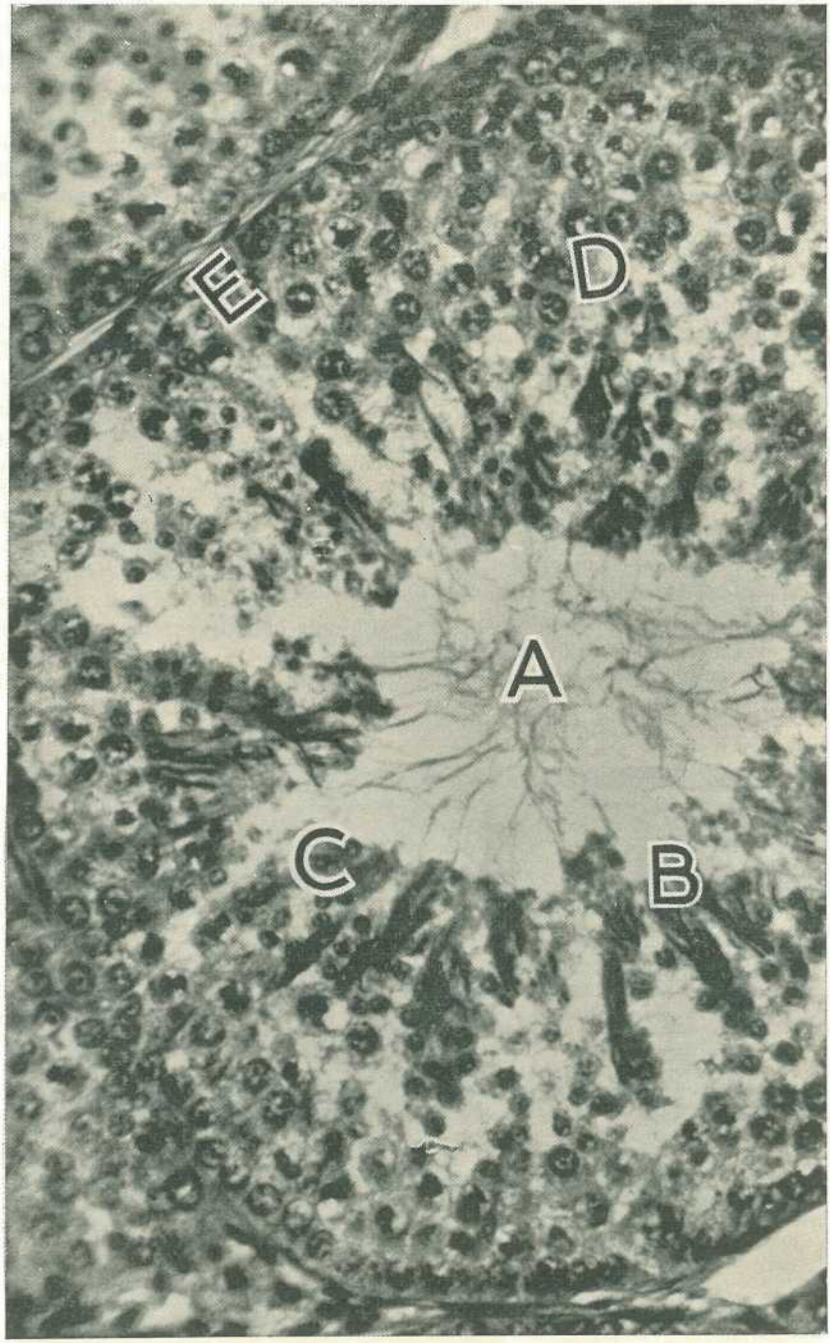


Plate 10.

One Seminiferous Tubule from Plate 9 Magnified 650 Times to Show Greater Detail. (A) Duct into which sperm are released. (B) Bundles of newly formed sperm. (C) The small cells are spermatids from which sperm are formed. (D) The larger cells are the primary and secondary spermatocytes which give rise to the spermatids by meiosis. (E) The sperm mother cells on the edge of the tubule give rise by mitosis to the primary spermatocytes.

Formation of Sperm.

To give a practical example of these divisions, we will refer to the formation of sperm in the testes of the cockerel. The tissues of the testes are arranged into a number of tubes called "seminferous tubules." See Plate 9. Actually they are very small and can only be seen with the aid of a microscope. Around the walls of these tubes are situated the sperm mother cells—cells that eventually give rise to the sperm by division.

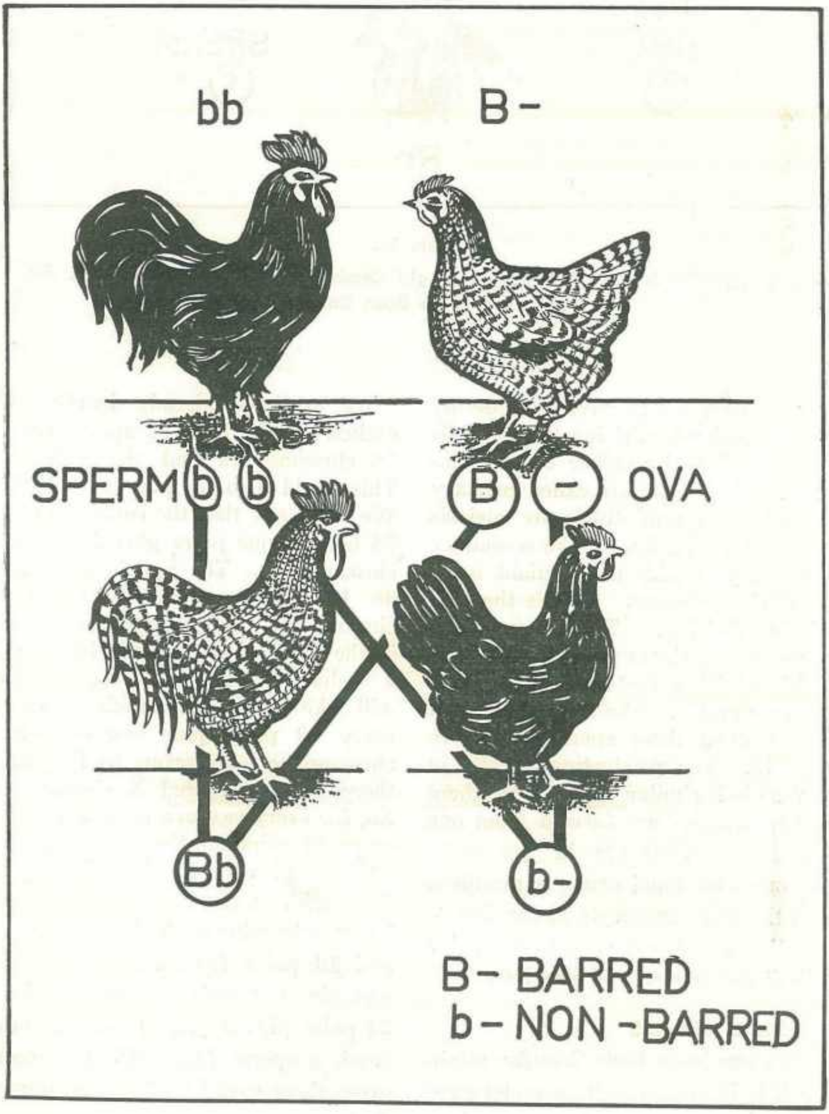


Plate 11.

A Cross Between a Non-Barred Male and a Barred Female Gives Rise to Barred Male and Non-Barred Female Progeny. This is a case of sex linkage where the female progeny inherits no gene for barring from the mother.

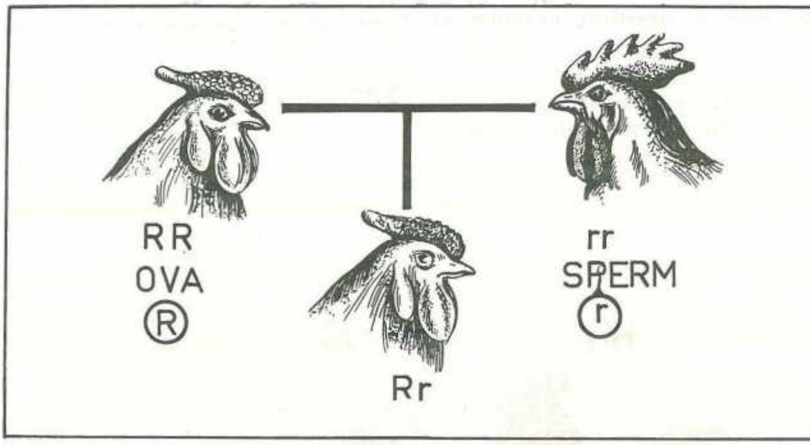


Plate 12.

If a Rose Comb Bird (RR) and a Single Comb Bird (rr) are Crossed, all the Progeny Will Be Rose Comb (Rr).

The sperm mother cells divide by mitosis or simple division to give cells with the diploid number of chromosomes. These cells are called primary spermatocytes and divide by meiosis or reduction division to give secondary spermatocytes with the haploid number of chromosomes. This is the first meiotic division. These secondary spermatocytes then undergo the second meiotic division (actually mitosis) to give spermatids. The sperm are then formed from these spermatids. See Plate 10. The production of ova in the female is similar except that where four spermatids are formed from one primary spermatocyte in the male, only one functional ovum is produced from the primary oocyte in the female and the other three, called "polar bodies" degenerate and are lost.

How Sex is Inherited.

With our basic facts thus far established, it is not difficult to understand the inheritance of certain simple characters. The inheritance or determination of sex is also relatively simple so it will be discussed here.

As we have already learned, the cockerel germ cells or sperm carries 78 chromosomes and the pullet 77. This could also be put another way. We could say that the cockerel carries 38 homologous pairs plus 2 sex of X chromosomes. The pullet would have 38 homologous pairs plus one X chromosome. When sperm are formed in the testes of the cockerel by meiosis, a reduction of chromosome number will take place so that each sperm will carry 19 pairs plus one sex or X chromosome. However, in the pullet there is an unpaired X chromosome. So, for every two ova formed, one will carry 19 pairs and the other will carry 19 pairs plus the X. Now if a sperm fuses with the first ovum, there would be 19 pairs plus an X from the sperm and 19 pairs from the ovum, which will give a female embryo containing 38 pairs plus an X. If on the other hand, a sperm fuses with the second ovum there would be 19 pairs plus an X from the sperm and 19 pairs plus an X from the ovum with a resultant male embryo having 38 pairs plus two X's.

The sex of the chicken is therefore determined by which ovum is present. As only two types of ova can be formed, 50 per cent. of the progeny will be pullets and 50 per cent. will be cockerels provided the different ova occur with the same frequency. Often in practice it is common in one lot of sexing to have many more pullets than cockerels or vice versa. However, if sex ratio figures were kept for many thousands of chickens it would be found to approach very closely to a 50–50 ratio.

If this sex ratio does not apply, it is usually found that there are more embryonic deaths in the group that is deficient in number, for example, if many more pullets are being hatched than cockerels then probably the cockerels are dying before they hatch. There is no truth in the statement that a cockerel will "throw" many more pullet chickens than cockerel chickens.

Of course the human element also comes into the picture. If more cockerels are sexed than pullets at hatching time it could be that the sexer is putting all the "doubtfuls" into the cockerel box so that customers won't complain that they got too many cockerels with their pullets. Often the person buying cockerels doesn't mind a few pullets for the price of cockerels.

The Importance of Sex.

How many people have stopped to consider why nature provided sex in animals? The most obvious reason of course is for the continuation or increase of the species. However, there is more to it than just this.

Meiosis (reduction division) is a complicated process, whereby the progeny will receive half of its chromosomes from the father and half from the mother. Thus the mating of two individuals allows new combinations of genes and hence more variation in their progeny. There is no doubt that many of these new combinations are worse than those of the parents. However, there are also many that result in more vigorous progeny or progeny better suited to their environment. This is, in fact, the basis of evolution. It is this variation in animals which has allowed man to select those best suited for his purposes and so produce the breeds of today. This is one of the basic principles of any breeding programme.

Linkage.

As many genes are carried on any one chromosome, then these genes must be inherited together. These are referred to as "linked" genes and all the genes on the one chromosome collectively are referred to as a "linkage" group. If there are 39 homologous pairs of chromosomes then there must be 39 linkage groups.

An important aspect of linkage is "sex linkage." This is associated with the difference in number of chromosomes between the male and female. We have seen that the female has only one X chromosome whereas the male has two.

One important aspect of this can be seen immediately with respect to dominance. Normally a recessive character will not show unless both recessives are present. However, in the female with only one X chromosome, recessives on this chromosome will be expressed even though only present singly because there are no dominant alleles to suppress them.

A simple example of this is the character "barring," which is a sex linked dominant. If we mate a barred female with genotype B– (the dash stands for the missing chromosome) and a non-barred male with genotype bb, we find that all the male progeny will be barred (Bb) and the female progeny non-barred (b–). See Plate 11. This is explained by the fact that the males inherit an X chromosome carrying the dominant B from their

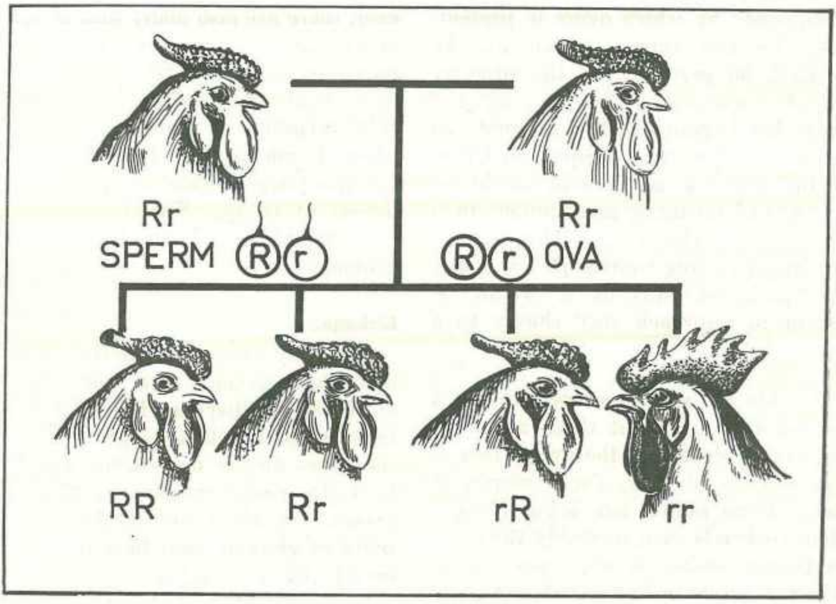


Plate 13.

A Cross Between Two Rose Comb Birds (Rr) (Plate 12) Will Produce Rose Comb and Single Comb Progeny in a Ratio of 3 : 1. Of these only one rose comb bird (RR) and the single comb bird (rr) will breed "true".

mothers and the recessive b on the X chromosome from their fathers.

As B is dominant to b, then all males will be barred. However, the females inherit no genes for this character from their mother and the recessive b on the X chromosome from their fathers. They will therefore be non-barred, as there is no dominant to suppress the recessive b.

The crossing over which occurs during meiosis (reduction division) has an important bearing on linkage. Linkage can be broken with respect to the genes that cross over. (See Plate 8). If we have three genes A B C on one chromosome and their alleles a b c on the other then a cross over of A and a will produce new combinations in the form of a B C and A b c. This new combination may have a different effect on characters in progeny which inherit either of these chromosomes. The different effect may be either better or worse than that of the original linked group (A B C or a b c). However, it produces more variation and hence more chance for selection of breeders.

Mutations.

Mutations are often referred to as "sports." They are actually brought about by a change in the structure of a gene. If we regard the gene as a D.N.A. molecule we could easily understand that a slight accident might alter the structure of this molecule. This altered gene would then have a different effect on its character than it did before mutation. Once altered, the gene reproduces itself at mitosis or meiosis in the altered state and if this gene goes to make up a new individual an altered character will result.

Mutations are more often detrimental to the individual but some lucky chances do occur and produce an individual with an improved character. This has been very important in evolution and also has produced a few good combinations for breeders.

Science has advanced sufficiently to be able to produce these mutations at will by the use of X-rays, radio-active bombardment of the reproductive cells, and certain chemicals. This is one of the reasons why radio activity is dangerous to humans.

The scientist, however, cannot predict what mutations will be produced and he merely hopes that some will result in better individuals. This has been realised in practice on many occasions. One good example can be quoted in the case of the fungus which is used for the production of penicillin. Many of these fungi were subjected to X-ray treatment in the hope that a new strain could be produced that would manufacture penicillin at a higher rate. After examining many of the mutant strains one was found that fulfilled this ambition, and was actually four times better than its forebears.

The Practical Application.

The problem now arises of applying the knowledge to animal breeding. This unfortunately is not so easy. The science of genetics is only 60 years old. In this time, advances have been rapid. However, many things are still uncertain. There are in fact many characters which can be explained in simple terms but unfortunately the economic characters such as "livability" and egg production are probably governed by hundreds of genes. This is one of the reasons why in our breeding schemes we test families of birds rather than individuals. The record for the whole family tells us more about the individuals in that family than would the records of any of the individuals by themselves.

Let us refer then to a simple case. In the cross previously mentioned between the rose comb bird and the single comb bird, you will recall that we referred to the rose comb bird as RR to indicate that on each member of a particular homologous pair of chromosomes there was a dominant gene R for rose comb. On the other hand the single comb bird was referred to as rr as it carried both the recessives for rose comb. It doesn't matter which way we cross these birds, but for purposes of illustration, we will use a single comb male and a rose comb female. When the sperm and ova are formed in these birds by meiosis (reduction division) the sperm will carry one of the genes (r) for single comb and the ovum will carry one of the genes (R) for rose comb. The resultant progeny will therefore be Rr which will be rose comb because the R is dominant to r. See Plate 12.

That is very simple. Now what happens when we cross two of the progeny together. As both the male and female will have the genotype of Rr then sperm and ova could be formed carrying either R or r. We must assume that any sperm can fuse with any ovum. See Plate 13.

We find there are three different types because Rr and rR can be regarded as the same. If we look at these birds (their phenotype) we find three have rose combs and one has a single comb. This is what we would have expected. The rr bird is single comb because it carries both of the recessives. In Rr and rR the R is dominant to r so the bird has a rose comb. However, there is an important point—only RR and rr birds will breed true. The Rr and rR will, if crossed together, again give the 3:1 ratio of rose to single comb.

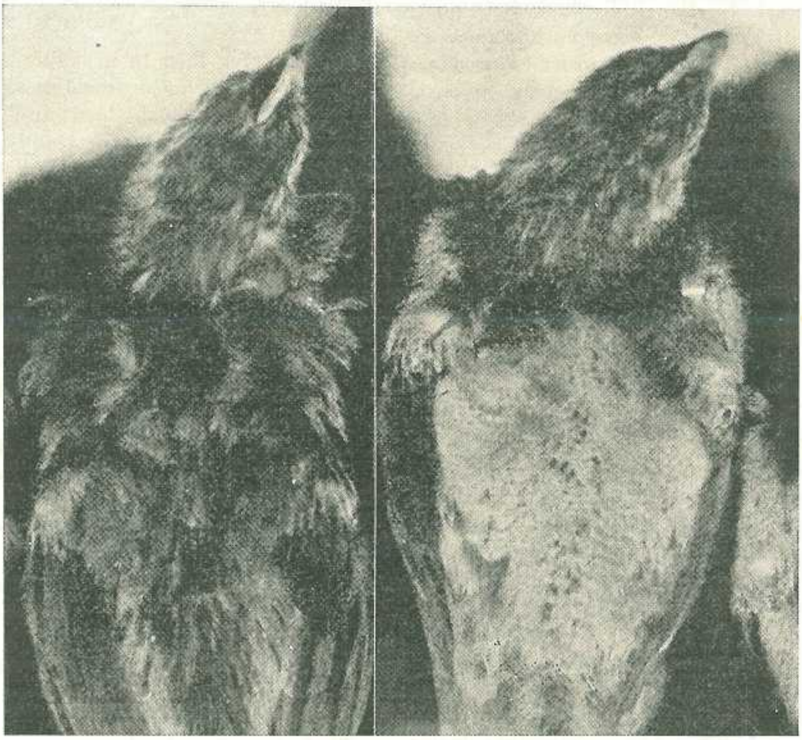


Plate 14.

The difference in the Rate of Feathering is Obvious in These Two Chickens, Both 5 Weeks of Age. The bird on the right (KK) is slow feathering and the one on the left (Kk) is intermediate between slow and fast feathering (kk).

Incomplete Dominance.

We have stated that with a pair of allelic characters one is sometimes dominant to the other (the recessive). On the other hand we may have incomplete dominance. In this case there is an additive effect, so that in the heterozygote with one dominant and one recessive gene the expression of the character will be intermediate between that produced by both dominants or both recessives. An example of this is the rate of feathering in fowls.

On the X chromosome is located a gene K which is dominant for slow feathering, its recessive k producing a fast rate of feathering. We could then say that males with a genotype of KK would be slow feathering, males with kk would be fast feathering and males with Kk would be intermediate. See Plate 14. As this gene is on the X chromosome and females only carry one X chromosome then they can only be K or k. In the case of genotype K they will be intermediate, with regard to feathering because only one "dose" of K is present. With a genotype of k they would be fast feathering.

Where Do We Go From Here?

Many books have been written on genetics. It is a study that is becoming increasingly popular. As we said previously, animal breeding will be one of the sciences used to increase the efficiency of production.

From an article as brief as this we could not hope to learn a great deal about animal breeding. Such an elementary study would, however, enable the reader to make a start. Without such a start it would be even more difficult to understand the books and papers written on the subject.

What We Should Remember.

We should keep in mind that genes and chromosomes are actual structures contained in the body cells. These cells divide by mitosis to produce more cells and by meiosis to reduce the chromosome number to half (the haploid number) in the sperm and ova. When the sperm and ovum fuse, the chromosome number is restored to the diploid number in the progeny. For this reason the progeny inherit half of their genes from each of their parents. Remember that the character is not actually inherited as such but the animal inherits the ability to express the character. Environment plays a big part in the ultimate expression of many characters in the progeny. Sexual reproduction is important because it produces new combinations of genes and gives the breeder scope for selection. In the future, induced mutations by X-rays and so on, may give us new useful combinations that we never dreamed of. So referring again to the Queensland Poultry Improvement Plan, there is every reason to believe that it will give us more efficient fowls than we have to-day.

A Little Water Can Go a Long Way

Irrigation studies by the Agriculture Department show that even limited supplies of irrigation water have a big place in fodder production. Used to supplement moisture stored in fallows and the normally irregular rains, these supplies can carry crops through to maturity.

A statement by the Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.), reveals that the ideal in growing dairy fodder is to irrigate perennial crops or pastures continuously. But the use of supplementary irrigation on annual crops is an economic alternative.

In almost every dry spell, there is the picture of watercourses and dams drying up, with the need to restrict irrigation. Ways of using restricted water supplies economically are being investigated by the Department and already a clear pattern is emerging.

A recent report by the Department's Irrigationist (Mr. A. Nagle) points out that grain sorghum needs 300 lb. of water to produce 1 lb. of dry matter. Sudan grass, maize, wheat, cowpeas and oats use more moisture, in that order, than does grain sorghum. But all these annuals need much less than the 800 to 1,000 lb. of water that lucerne and pasture use to produce 1 lb. of dry matter.

In trials at the Gatton Regional Experiment Station, the merits of giving fodder crops small supplementary irrigations have been examined. Results of some trials have shown that this watering has meant the difference between good yields and complete failure.

There is, for example, the case of a wheat and field pea planting. Here, the mixture was planted in a well-prepared, moist seedbed early in July. A 2 in. irrigation was applied in mid-August. There was no rain until a week before harvesting and this, of course, was too late to affect the yield. Ten weeks after planting, the crop cut 15½ tons of green forage an acre—an average production rate of 1½ tons per acre per week.

A summer crop of white panicum and Poona cowpeas also gave outstanding results. Planted in December on fallowed land, the crop was given a 1¾ in. irrigation early in January. Good rains were recorded prior to harvest on February 24, but they had little influence on the yield. The final yield was 22 tons of green material an acre—an average production rate of 2.2 tons per acre per week.

Mr. Madsen said comparable results were obtained in more than 10 other trials. This clearly indicates that crops planted on good fallows need only a small amount of irrigation to yield heavily.

Many parts of Queensland are poorly endowed with irrigation water, but these studies show what could be done in those areas with limited water. This work is a pointer to the growing importance of the small farm dam in growing fodder.

Keep Your Cattle Off Poison Peach

By O. H. BROOKS,
Divisional Veterinary Officer.

Feeding tests have shown that 5 lb. of poison peach leaf will cause death in cattle.

Wherever softwood scrub in coastal areas has been cleared there has usually been a problem with poison peach suckers. This plant remains a hazard to stock in scrub pastures especially during dry periods, when the leaves are attractive. In this respect it is very similar to lantana which remains harmless until hungry cattle are attracted to eat toxic quantities.

Peach leaf poison bush (*Trema aspera*) or poison peach, is commonly a shrub about 6 ft. high but may develop into a small tree up to 14 ft. The leaves, narrower and more elongated than those of lantana, are arranged alternately in two ranks on either side of the light brown twigs. They are rough on the upper surface, serrated along the edges, and usually emerald green in colour. The ripe fruits, which are nearly as big as a pea, are eaten readily by birds.

It occurs mainly along the fringes of rain forest, along gullies through forest country and as a second growth in cleared scrub. It has been seen occasionally growing along roadsides in open forest country where the soil has been banked and there is a good water run off.

As poison peach has been a problem since early settlement, it is not surprising that conceptions of the effect of the plant on cattle vary considerably.

Perhaps the most common opinion held is that poison peach causes "dry bible" which is impaction of the third stomach of ruminants. This conception in all probability arises from the association of cattle eating poison peach under drought conditions which cause dry bible. It is nevertheless possible that the toxic principle of poison peach may cause a form of paralysis of the third stomach (bible or omasum).

Painful Death.

During recent years the most serious losses have occurred amongst cattle which have shown acute and painful symptoms.

Some samples of peach have shown appreciable quantities of HCN (prussic acid) but it is generally agreed that deaths from this plant are not from HCN. The poisonous principle is unknown. Feeding tests have shown that 5 lb. of leaf will cause death in cattle.

Poison peach causes animals to become depressed, with obvious abdominal pain. The head is held low and the muzzle may reach the ground. Animals have been known to charge when the pain is severe.

Scouring is a feature. The dung becomes very dark due to bowel haemorrhages.

When the carcass is examined after death, the most obvious changes are haemorrhages under serous membranes covering the lungs and abdominal organs. These are usually striking. The fourth stomach and the first part of the intestines are inflamed. The intestine may be filled with blood. Large haemorrhages occur on the outside of the heart and in the lining of its cavities. These symptoms apply to animals which die within a few days of eating poison peach.

During drought, animals which browse on the plant for long periods may show dry bible without the severe irritation of the bowel appearing in the acute cases.

The danger of the plant appears to vary according to locality and predisposing factors rather than any particular stage of growth or season.

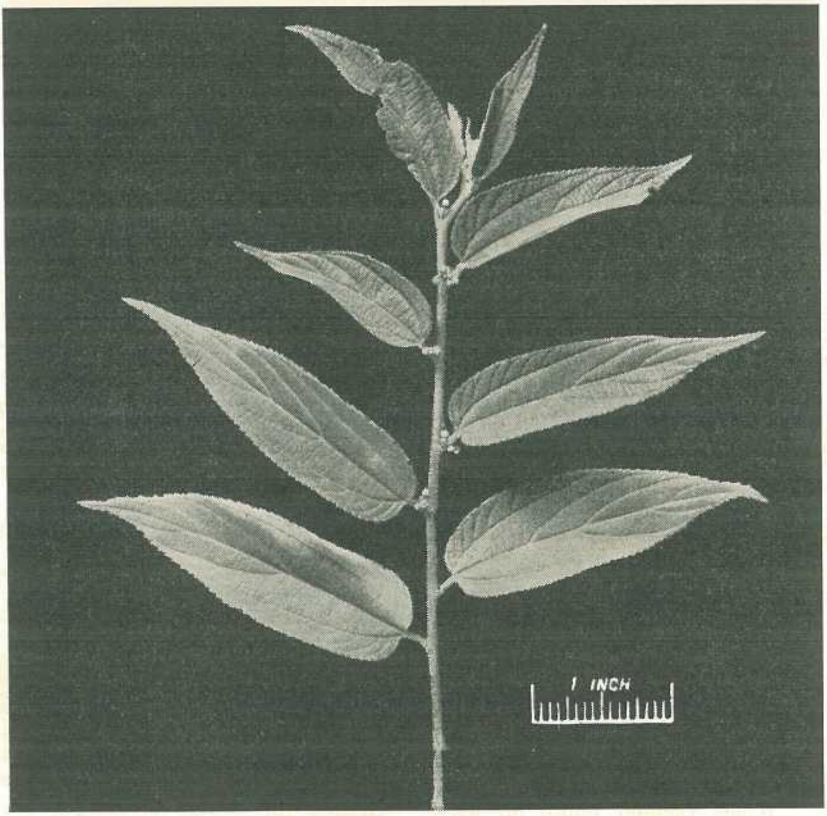


Plate 1.

Poison Peach, Showing Leaves and Berries.

Plate 2.

Poison Peach Occurs Mainly Along the Fringes of Rain Forest, Along Gullies Through Forest Country, and as a Second Growth in Cleared Scrub.

A popular belief is that the plant is more toxic when flowering or carrying berries but there is no evidence to support this observation.

Poisoning from regrowth and seedlings of poison peach may be seen following the clearing of scrub areas or when cattle are allowed access to a newly established pasture after a burn.

Unfortunately there is no known cure for poisoning by peach leaf poison bush. Some cases may be saved by drenching with astringents mixed with flour gruel. Paraffin oil may also soothe the inflamed bowel wall but in most cases symptoms have developed too far and it is usual to find animals dead.

Dairyman, Do It Now!

EXTEND grazing season, by mowing early. Change separator oil and renew vacuum pump oil wicks. Drench for worms to control heavy summer infestations. Quality counts, so follow Departmental recommendations for dairy hygiene.

Treating Scours In Young Pigs

By S. G. KNOTT,
Divisional Veterinary Officer.

The background to the development of scours in young pigs, and advice on prevention of the trouble, was given in an article in the January issue. The following article deals with treatment.

WHILE there is a tendency for some farmers to place more importance on treatment than on prevention, it would be to their advantage to reverse this attitude and to pay the greatest attention to the preventive measures outlined in last month's issue.

Diarrhoea in piglets can start soon after birth, but most commonly at 2-3 weeks of age. The droppings become fluid or semifluid, whitish or yellowish-white in colour, and are passed frequently. Often the young pigs strain while passing this. Eating is suppressed and they lose condition, the hair tends to stand on end and they often huddle in corners.

While scours in baby pigs in many cases results from a combination of several factors, the chief causes and their treatment will be discussed separately for clarity.

Piglet Anaemia

Although sow's milk is a near-complete food for piglets, it is deficient in iron. The result is that piglet anaemia is commonest in intensive piggeries or where the piglets do not have access to clean soil at an early age.

The condition generally appears between 1 and 4 weeks. When it is realised that piglets suckling on a good sow can reach 5 times their birthweight in 3 weeks, it is easy to appreciate why the condition is precipitated.

The piglets cease to be as active as previously and they lose their bloom; their membranes become paler and a scour develops. Breathing may become rapid.

Where piglet anaemia occurs occasionally or regularly, the following recommendations will ensure that the piglets should thrive right through until weaning time. They can also be used for remedial measures in cases of emergency:

(*a*) At 3-5 days, dose each piglet by mouth with 1 c.c. of a saturated solution of *ferri et ammon cit.* Your local chemist can easily prepare it for you. The easiest method of administration is to hold the piglet upright and give it through some valve rubber tubing on the nozzle of a graduated hyperdermic syringe.

(*b*) A 2 c.c. injection of an iron and dextran compound under the skin is very efficient. Manufactured by drug firms, this is used extensively overseas and will probably come into favour here soon.

(*c*) Scatter a handful of ferrous sulphate over the floor.

(*d*) Allow access to clean parasite-free pasture or supply a shovelful of fresh clean dirt in the pen daily.

Infectious Scours

The commonest cause of infectious scours is a bacteria known as *Escherichia coli*. This bacteria is a normal inhabitant of the gut, but under certain circumstances, for example, chilling, filthy udder and so on, it becomes virulent and overwhelms the resistance of the animal.

Other bacteria such as *salmonella* may be a cause of scours, while viruses have also been incriminated.

Treatment is as follows:

(*a*) Dose each piglet with 1-2 teaspoonsful of castor oil according to size.

(*b*) Treat immediately with a sulpha drug, preferably phthalyl sulphathiazole at the rate of 1 tablet per 10-12 lb. liveweight for 3 days.

Antibiotics such as Terramycin, aureomycin or chloromycetin are also effective provided they are used at a therapeutic and not at growth-stimulant level.

It should be added that very occasionally a scour will appear that is not influenced greatly by these drugs.

(*c*) Clean the sow's udder, remove any dirty litter and provide plenty of warm bedding and clean shelter.

(*d*) A subcutaneous injection of ½-1 c.c. of a vitamin B_{12} preparation helps scouring piglets to quickly become thrifty again and recover their appetite and bloom.

Secondary Manifestation

With scours, always be on the lookout for some other primary cause which may be in its early stages. For instance, piglets may start to scour if pneumonia is developing and is not evident. Also scours may precede and accompany pig pox in a litter.

Nutritional Scours

Nutritional scours have been dealt with extensively in the previous article last month. Remember that faulty feeding of the sow can affect the litter. Piglets may scour slightly and temporarily when they first attempt solid feed. The feeding of orphan piglets needs careful attention.

Watch These Points

If you have trouble with piglet scours, pay attention to the following points:

1. Wash the sow and arrange for her to farrow in clean surroundings with plenty of warm bedding available to avoid chilling.

2. Avoid piglet anaemia by supplying the litter with iron at 3-5 days of age.

3. Treat early with castor oil and phthalyl sulphathiazole (1 tablet per 10 lb.) or an antibiotic at the correct dose rate.

Injections of vitamin B_{12} aid in quick recovery.

4. Correct any nutritional faults.

Timely Tip

Order seed and fertilizer for autumn plantings.

Farm Wisdom

IT'S not too early to get ready for your lucerne planting next April or May. You lay the foundation for a good stand during the next six months.

Your first care is to select the right paddock and here the kind of soil you have will be the deciding factor. Lucerne needs a deep, well-drained soil. It's very sensitive to waterlogging and will die out on a badly-drained soil.

Whether the land is old or new cultivation, it should be pre-cropped before it's put under lucerne. If possible, the cover crop should not be grazed, but should be turned under for green manure a month or six weeks before working up the lucerne seedbed. For pre-cropping, cowpeas should be sown at 15 to 20 lb. per acre and treated with inoculum obtainable free from the Department.

—*V. J. WAGNER,*
Chief Agronomist.

THE potato tuber moth is the most destructive of the potato pests and may be more troublesome in the spring crop than in the autumn crop. Potato plants should be sprayed with DDT commencing soon after moths or leaf miners are noticed. Two sprayings, and possibly a third, spaced two to three weeks apart, will prevent damage to the tops and will reduce the likelihood of a large infestation developing before harvest. The DDT should be used at 1lb. per acre at each application.

As the crop approaches maturity, it should be hilled as an added precaution. But don't hill too early, as this can interfere with tuber formation. Dusting the crop with a 2 per cent. DDT dust during harvesting is needed to protect the bagged crop. A brown pigmented DDT dust may be used for tubers intended for table use.

—*W. A. SMITH,*
Entomologist.

SUMMER grazing crops deserve a place on every Queensland dairy farm. These crops are a standby to cushion the effects of hot, dry spells between storms. And if there's a surplus, it can be stored as hay or silage.

There's still time to prepare your land and plant these crops. White panicum and Japanese millet are the most popular crops in coastal districts, though giant and dwarf setaria are sometimes grown. In the drier, inland districts, Sudan grass is the most popular crop, but French millet is used occasionally.

Always include a legume in the planting to improve the fertility of the soil and provide a better balanced ration for stock. Cowpeas and velvet beans are the best summer legumes, and the recommended varieties are Cristaudo cowpeas and Mauritius velvet beans. Don't forget to treat the legume seed with inoculum which is available free of charge from the Agriculture Department.

—*O. L. HASSELL,*
Senior Adviser in Agriculture.

Brucellosis-Tested Swine Herds (As at 16th January, 1959.)

Berkshire.

S. Cochrane, "Stanroy" Stud, Felton
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
H.M. State Farm, Numinbah
G. L. Gabanko and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
C. E. Edwards, "Spring Valley" Stud, Kingaroy
V. F. Weier, "La Crescent," Clifton
N. Rosenberger, "Nevrose," Wyreema
L. P. Orange, "Hillview," Flagstone Creek
B. Osborne and Dr. J. W. Best, Miltown Stud Piggery, Warwick
W. Young, Kybong, via Gympie
E. J. Clarke, Mt. Alford, *via* Boonah
G. McLennan, "Murcott" Stud, Willowvale
C. F. W. and B. A. Shellback, "Redvilla" Stud, Kingaroy
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
E. R. Kimber, Block 11, Mundubbera
A. J. Potter, "Woodlands," Inglewood
Regional Experiment Station, Hermitage
J. W. Bukowski, "Secreto" Stud, Oxley
R. Astbury, "Rangvilla," Pechey
L. Pick, Mulgildie
D. G. Grayson, Killarney
A. French, "Wilson Park," Pittsworth
P. L. Pfrunder, Pozieres

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood.
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood.
H. R. Gibson, "Thistleton" Stud, Maleny
H.M. State Farm, Numinbah
V. P. McGoldrick, "Fairymeadow" Stud, Cooroy
S. T. Fowler, "Kenstan" Stud, Pittsworth
W. Zahnow, Rosevale, *via* Rosewood
Regional Experiment Station, Biloela
G. J. Hutton, "Grajea" Stud, Cabarlah
H. L. Larsen, "Oakway," Kingaroy
A. Palmer, "Remlap," Greenmount
G. I. Skyring, "Bellwood" Stud, *via* Pomona
G. Pampling, Watch Box road, Goomeri
M. Hall, "Milena" Stud, D'Aguilar
K. B. Jones, "Cefn" Stud, Pilton road, Clifton
Barron Bros., "Chiltern Hill," Cooyar
K. F. Stumer, French's Creek, Boonah
Q.A.H.S. and College, Lawes
R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri
L. Stewart, Mulgowie, *via* Laidley
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes, Brisbane
R. Kennard, Collar Stud, Warwick
A. C. H. Gibbons, Mt. Glorious
A. Kanowski, "Exton," Pechey
L. C. and E. Wieland, Lower Cressbrook
P. L. and M. T. D. Hansen, "Regal" Stud, Oaklands, Rangeville, Toowoomba.
J. C. Lees, "Bridge View" Stud, Yandina
R. Rhodie, Clifton
C. Assenbruck, Mundubbera
A. J. Mack, Mundubbera
J. & S. Kahler, East Nanango
C. P. Duncan, "Hillview," Flagstone Creek

Tamworth.

D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
Department of Agriculture and Stock, Regional Experiment Station, Kairi
F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
F. Thomas, "Rosevale" Stud, M. S. 373, Beaudesert
H. J. Armstrong, "Alhambra," Crownthorpe, Murgon
R. H. Coller, Tallegalla, *via* Rosewood
D. V. and P. V. Campbell, "Lawn Hill," Lamington
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
L. C. and E. Wieland, Lower Cressbrook
J. D. Booth, Swan Ck., Warwick

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
C. R. Smith, "Belton Park" Stud, Nara
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale" Stud, 492 Beenleigh road, Sunnybank
Kruger and Sons, "Greyhurst," Goombungee
A. Scott, "Wanstead" Stud, Grantham
G. C. Burnett, "Rathburnie," Linville
A. J. Mack, Mundubbera
J. Ashwell, "Greenhill," Felton South

Large Black.

E. Pointon, Goomburra

Plate 1: **Machine Harvester tipping Basket of Cotton for Baling.** A. W. Brownlie's irrigated property at Theodore.

Cash In On Irrigated Cotton

By I. J. L. WOOD,
Adviser in Agriculture.

Using irrigation, farmers of the Dawson and Callide Valleys in central Queensland, have lifted their yields of seed cotton up to 1,900 lb. an acre. At a minimum guaranteed price of 14d. a lb. for all cotton, except the lowest grades, these yields would mean a gross return of more than £100 an acre, and a net return of more than £55.

By using irrigation, yields can be more than doubled and what is more important, net returns per acre can also be more than doubled. With irrigation, there is no need to wait for planting rains. You can get your crop established at the most ideal time for a successful yield. Cotton which is planted early and develops unchecked by moisture stresses, sets a heavy early crop and usually is untroubled by major cotton pests. Harvesting can be completed early, followed by early ploughing, allowing the area to have a reasonable fallow period before next season's planting.

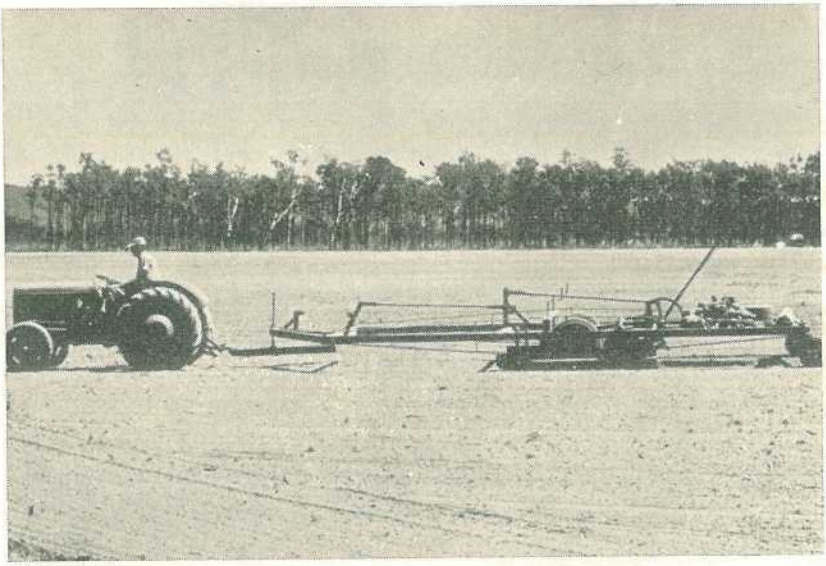


Plate 2.
Land-Levelling for Furrow Irrigation of Cotton. Mr. L. Drew's property at Gibbergunyah.

In districts such as the Dawson and Callide Valleys, where abundant water is available in weirs, creeks and from underground sources, there is a great potential for the expansion of cotton growing under irrigation.

Mr. A. W. Brownlie, of Theodore Irrigation Settlement, an experienced grower, irrigated 108 acres of cotton (Miller 43-9-0) during the 1957/58 season, which yielded 164,000 lb. of high grade seed cotton. Several areas included in the 108 acres yielded over 2,000 lb. of seed cotton per acre. This cotton should average at least 14½d. a lb., giving a gross return of about £10,000.

His costs totalled about £4,500, made up of:—

	£
Harvesting (hand)	3,300
Insecticide	100
Land preparation, seed, planting, cultivation, fuel, water, irrigation, spraying, rates, bales, etc.	1,080
	£4,480

This leaves a net return of about £5,500, which is over £50 an acre, and a net return of over £100 a week.

Light Equipment

Cotton, very fortunately, is one of those crops that requires only a simple set of implements to produce. Harvesting is done either by hand or by mechanical harvesters.

Mr. Brownlie's equipment consists of—

1 light 3 pt. linkage tractor.
1 2-furrow plough.
1 offset disc harrow with scalloped front discs.
1 spring tine cultivator to which is attached two single row planting boxes with trailing rubber tyre press-wheels.
1 set peg-tooth harrows.
1 wooden smoother (for levelling after cultivation).
1 6-row spray outfit.

With this equipment he is able to handle his cultivation area satisfactorily.

As can be seen, cotton growers are not overloaded with equipment of high capital cost except where a mechanical picker is purchased. This may be economically sound, too, where large areas are planted and high yields are obtained and hence depreciation costs would be comparatively very low.

Mr. Brownlie considers that the best results are gained with:

(1) Early planting (October);
(2) Early cultivation for weed control;
(3) Irrigating before moisture stresses occur in the plants.

Mr. L. Drew, of the new Gibbergunyah Irrigation Settlement near Theodore, had never seen cotton grown before this season. He planted 20 acres of the Empire variety on a newly cleared area of light alluvial soil which had been levelled for irrigation just before planting.

He harvested 39,500 lb. of high grade seed cotton, valued about £2,300.

Costs of production were:

	£
Harvesting (hand)	800
Other costs at about £8 per acre	160
Total	£960

No insecticidal control was necessary on this crop. Only part costs of initial levelling were included.

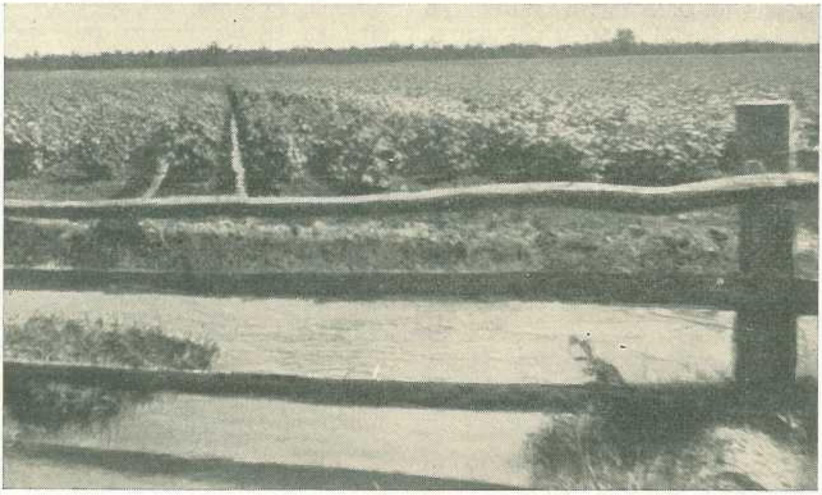


Plate 3.

Furrow Irrigation of Cotton on the Moura (Dawson Valley) Farm of Messrs. Fairweather Bros.

Plate 4.

Early Cultivation Means Clean Crops.

This leaves a net return of £1,440 from 20 acres, or £72 per acre.

Suitable Pioneer Crop

Cotton's ability to produce a worthwhile crop on newly cleared ground is well illustrated on this irrigated farm which was settled by Mr. Drew only in July, 1957. Full marks go to Mr. Drew and several of his neighbours who all grew very successful crops, maintaining a high standard of cultural practice right throughout the crop's growth.

Mr. Drew considers there is no better cash crop than cotton under his conditions.

At Thangool, in the Callide Valley, Mr. G. Burrows irrigated 50 acres of cotton, Empire variety, from Kariboe Creek. He harvested 62,000 lb. of high grade seed cotton. Only 33 acres were watered to near full requirements, the remaining 17 acres receiving only a watering before planting. Nevertheless the average for the 50 acres was 1,240 lb. of seed cotton an acre, worth £75 gross an acre.

This area was furrow-irrigated, but no preliminary grading was carried out and watering was rather irregular due to the uneven fall of the ground. It is essential that land for furrow irrigation of cotton be graded to a uniform fall. Efficient irrigation and economy of water usage are dependent on good land preparation.

Dryland Comparison

An area of Miller 43-9-0 cotton grown in a nearby paddock on comparable soil and under similar conditions, except that it was not irrigated, yielded only 600 lb. per acre which is less than half the yield off the irrigated area.

At Moura Irrigation Settlement on the Dawson River, Messrs. Fairweather Bros. had the following yields in the last two seasons from irrigated and dryland areas on similar soil types and conditions:

		An acre.
1957—		
Irrigated ..	100 acres yielded	860 lb.
Dryland ..	60 acres yielded	425 lb.
1958—		
Irrigated ..	110 acres yielded	798 lb.
Dryland ..	110 acres yielded	295 lb.

The increase in yields as the result of irrigation is well illustrated in these figures. The Fairweather brothers consider that they could raise their yields still further on the irrigated areas by more frequent watering during growth.

How You Can Do It

Summing up the results of these growers of irrigated cotton in Central Queensland, the following practices appear to be essential in the production of high-yielding crops of high grade seed cotton:

(1) *Early and thorough land preparation* preferably commencing in June for old cultivation land and much earlier for new ground. The bulk of the irrigated cotton crop is watered by the furrow method. Where furrow irrigation is used, levelling should be completed as soon as possible to allow shifted soils to settle. It needs to be done as accurately as possible. The length of furrows should be governed by the grade and the type of soil. In general, furrows with runs of more than 10 chains should be avoided, the area being subdivided by another supply ditch.

(2) *Early planting,* preferably in mid October. The seed-bed requires to be fairly fine and free from old stalks, sticks and stones, particularly if the area is to be machine-picked.

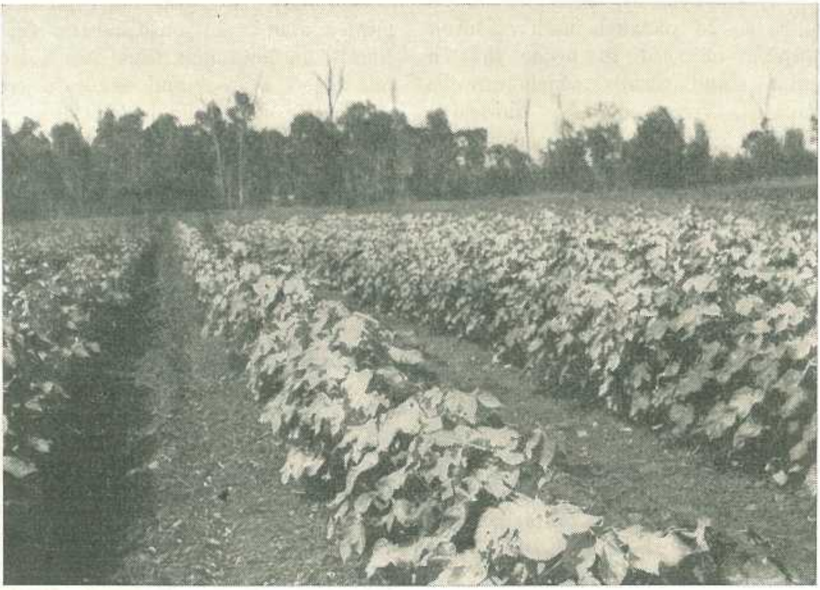


Plate 5.

Straight Rows Make Cultivation and Machine Picking Easier.

Plate 6.

Gappy Stands Increase Weeds, Decrease Yields.

Planting needs to be done as accurately as is physically possible. Rows require to be parallel, with an even dropping of seed in order that a regular stand results which can be cultivated, irrigated and harvested efficiently. This planting can only be done with a perfectly functioning planter with accurate row markers. The aim should be to plant so that cultivation tines can come within 2 in. on either side of the plants.

If planting rains do not fall it is preferable to irrigate and then plant, rather than plant and then irrigate.

(3) *Seeding rate* of 15 lb. an acre will ensure a good stand under most conditions. For machine harvesting, close spacing is an advantage. The use of a press wheel type of planter is recommended.

If for some reason such as a heavy storm after planting or a cut worm attack, a patchy germination occurs, immediately rip it out and replant. A gappy stand not only means fewer plants an acre and thus less cotton, but allows grasses and weeds to grow which will eventually lower the grades of cotton harvested.

(4) *Early cultivation* to eliminate weeds both in and between the rows. This usually takes the form of cross-cultivation with light spike harrows or fine fingered weeders—the latter doing by far the better job. This cultivation is done on a hot day when the cotton plants are supple and do not break off or pull out easily and the disturbed weeds die quickly. On clean lands, cross weeding is unnecessary, only inter-row cultivation being required. Cultivations then only follow irrigations or rain and are all inter-row. High clearance tractors with mid-mounted cultivators do the most accurate cultivating.

(5) *Early irrigation* to avoid moisture stresses and checks in the growth of the plant. In ground that has subsoil moisture down 2-3 ft. at planting, irrigation should not be necessary until the plants are squaring freely, which should be 6 weeks after planting. The plants at this stage should have a well-developed, deep root system, which could be prevented by earlier watering. Attention to watering from here onwards largely governs the ultimate yield of the plants.

The plants will rapidly develop heavy loads of squares, flowers and bolls. Some shedding occurs normally, but every endeavour should be made to enable the plants to hold most of their load. So watering to prevent any moisture check from now on is very important.

The efficient irrigator will measure soil moisture by using a soil auger frequently to anticipate moisture checks. The cotton plant itself has its own means of indicating approaching moisture shortage by accelerated flowering and colour changes along its growing stems. Cotton should be irrigated when flowering and/or a reddish stem colour approach within 9 in. of the top of the plant. But always the amount of available soil moisture should be checked with the soil auger.

This practice of anticipating moisture stresses is doubly important where large areas have to be irrigated as there is a considerable time lapse between commencement of watering and completion. It is also very important when heat-wave conditions are being experienced, as fruit-shedding then occurs even after a slight moisture stress. Furrowing out for irrigation is normally done immediately before watering and the furrows are filled in during the cultivation after watering. Furrows should be wide and shallow rather than narrow and deep.

Plate 7.

Mid-Mounted Cultivator Equipment Gives Clear View.

Early Insect Control

If insecticidal spraying is necessary, carry it out promptly and efficiently with equipment that can cover large acreages quickly.

Early Harvesting

Harvesting should be commenced and completed as soon as possible. A cotton crop produced without any checks to growth will open uniformly and thus the bulk of the crop can be harvested earlier than crops that have been subject to checks in growth. Early harvested cotton weighs well and grades well. Early harvesting allows for early land preparation for next season.

Early Crop Rotation

In irrigated areas it is customary to grow cotton on the same ground for several years without change due mainly to the limited areas that can be irrigated. This practice seems satisfactory to date but some rotation would be advisable after a few years' cotton, especially on the lighter soils.

Owing to the limited areas that can be commanded by an irrigation plant, other crops in the rotation must have a high return to the acre. A cotton, lucerne, cereal, cotton rotation would probably suit the irrigator who is essentially a cash cropper.

It's Wise To Grow Papaws From Local Strains

By J. B. DAVEY,
Experimentalist.

Queensland's papaw industry is based largely on district strains or types which have been developed from material of mixed origins. True or fixed varieties, such as those used in most other horticultural crops, are almost non-existent. Despite this, the industry is worth about £250,000 annually and some 430,000 cases of fruit are harvested from approximately 1,060 acres under crop.

Climate and soil have a profound influence on the performance and behaviour of papaws.

Essentially, the papaw is a tropical plant which thrives best in areas with a more or less equable climate characterised by high temperatures and rainfall. In Queensland, the crop is to be found growing along the coast in frost-free localities which permit more or less continuous plant growth throughout the year.

However, sizeable commercial production is limited to only a few areas, mainly on account of the rather precise soil requirements of the crop. A free-draining soil is essential; the papaw will not tolerate impervious soils which sooner or later in the life of the crop, become waterlogged. Deep sands and sandy loams are therefore the preferred soil types for the papaw, although the red-brown clay loams are used to some extent.

The chief centres of commercial production are Sunnybank, Rochedale and Brookfield in the metropolitan area, Mary Valley and Gunalda on the north coast, and Yarwun in central Queensland.

Acclimatisation.

It cannot be assumed that a variety or strain which performs well in one district will necessarily produce comparable crops of good quality fruit in other districts.

Pure lines such as the Bettina and Petersen strains, which were bred, and performed satisfactorily, on the north coast, proved rather disappointing when grown elsewhere. Locally developed strains such as those grown successfully at Yarwun, Sunnybank and Brookfield have likewise given unsatisfactory performances outside their own district. Similarly, material introduced from overseas has generally not lived up to its reputation when tested in Queensland.

Prominent among these introduced types were Hawaiian Solo—the leading variety in Hawaii, and Guagua, Cabacinha and Creme Caiena from South America. Their performance too

Plate 1.

Papaw Plantation. Trees in background are 15 months old; those in foreground are two months old.

has varied from one district to another as is the case with locally-produced types.

Hortus Gold, an importation from South Africa, proved the one exception. It has given reasonably good yields in most areas where it has been tried but fruit quality, particularly as regards flavour, has been somewhat variable. To its credit is its highly attractive skin colour, especially in the cooler months of the year when most tree-ripened papaws develop little colour.

Although climatic conditions have a tremendous influence on growth and ultimate yield, they also have a marked effect on fruit quality. Several factors are involved here, including external colour of the skin, internal colour of the flesh, flavour and firmness at maturity, and freedom from skin blemishes, particularly ripe fruit rots. Any one or more of these factors in fruit quality may be affected adversely when a variety or type is grown under a different set of environmental conditions.

It may be that winter temperatures are too low for satisfactory fruit development and ripening, that persistent cold winds cause skin blemishes, such as sun scald by reducing the leaf cover, or that the combined effects of high rainfall, temperature and humidity produce fruit lacking colour, firmness or good carrying capacity.

Hawaiian Solo is a typical example of a variety's inability to adapt itself to a change in climatic environments. In Hawaii, the climate is insular with more or less equable temperatures and an evenly distributed rainfall throughout the year. Under these conditions, Hawaiian Solo produces high quality fruit of excellent flavour and carrying ability during the whole cropping season. In southern Queensland, however, it produces quality fruit only during April and May; quality deteriorates sharply in the following months and is very much inferior to that of the best local types.

Utility Varieties.

Most of the locally developed strains of papaw serve two purposes at the moment; they supply the requirements of the fresh fruit trade and, to a lesser extent, the factory. Large papaws free from corrugations and skin blemishes are best suited to factory requirements. At present, a premium is paid by processors for fruit in excess of 3 lb.

Experience with other horticultural crops such as the pineapple, has shown that a cannery outlet for part of the produce improves the stability of an industry.

In view of the processor's need, it might therefore be desirable for plant breeders to develop large-fruited papaw types suitable primarily for factory use. The smaller types could be retained and improved to exploit the fresh fruit trade.

Local Strains.

Queensland's entire papaw production is based on locally-developed strains of the dioecious type with male flowers and female flowers in separate trees. Although somewhat mixed, these strains have distinctive characteristics in individual districts, due to mass selection over a number of generations by a few growers.

In these local strains, a large proportion of the trees are vigorous, high-yielding and produce fruit which, although somewhat variable, is of acceptable trade quality. Within some strains, material exists which possesses a high degree of resistance to ripe fruit rots. It seems that the local practice of mass selection has effected an improvement in this direction.

For some years now, there has been a growing awareness in the industry of the value of these local "varieties" for use in particular districts. Mass selection from high-yielding trees of good quality fruit is practised by the majority of papaw growers and a few practise hand-pollination in trees selected for seed which offers the best prospect of retaining the existing types.

Following upon the good performance of two local strains selected from Sunnybank and Brookfield material at the Redlands Experiment Station, a programme of purification of these local types was initiated. At the present time, third generation plants are under observation.

Plate 2.

Sunnybank. A local strain from the Sunnybank district which is now being purified at the Redlands Experiment Station.

Plate 3.

Ripe Fruit Rots in the Papaw. The lower fruit show typical symptoms. Some locally-selected strains show resistance to infection.

Where To Get Seed?

Until seed of purified types of papaw suitable for production in particular districts becomes available, the practice of mass selection from the best trees available to each grower should be continued. In selecting trees for seed extraction, attention should be paid to yield, fruit quality, freedom from ripe fruit rots, size and shape of fruit to conform with market requirements.

Controlled hand-pollination of selected trees is a highly commendable practice. It is extremely simple. Just prior to opening, flowers on selected trees are covered with small paper bags so as to exclude foreign pollen. When the flower opens, the bag is removed and the protruding stigmatic surfaces are brushed with pollen from a selected male tree. Unopened, but mature male buds, from which the petals have been removed are used for this operation. Finally the bag is replaced on the treated flower. Several days later, when the flower is no longer receptive to pollen, the bag is removed and the young fruit labelled for further identification.

New growers should obtain fruit from one or two of the best growers in their district and use the seed as planting material for the first crop. Selections can be made from these trees to provide their own seed for future plantings.

The practice of obtaining seed from canneries cannot be too strongly condemned; extreme variability in plant type is to be expected when plantations are established from such mixed material.

Grass For Levee Banks

"A.M.," of Dalby, requires a grass suitable for covering levee banks and at the same time one suitable for sheep grazing.

Answer: The selection of a grass for these requirements depends to some degree on the location of the levee banks and how often the banks are required to control surface water flow. Where the moisture conditions of the soil are suitable, either Kikuyu grass or African star grass should be satisfactory. Care must be exercised in the grazing of African star grass as it contains a prussic acid yielding compound. Experiments in grazing have not resulted in stock losses, though there is always a danger of such accidents occuring. There is quite extensive use being made of African star grass on the northern Darling Downs.

Both grasses may be planted with sprig planting machines, using roots as the means of propagation. Where conditions do not favour the use of sprig planters try Rhodes grass, Priebe's perennial prairie, lucerne and barrel medic.

Green Fingers

LEMONS are rather sensitive to a shortage of water, and efficient irrigation is essential if the trees are to produce consistent crops of good quality fruit.

The really critical time is at flowering and immediately after. Any deficiency in soil moisture at this stage might result in a poor set. Even if the set is satisfactory, a heavy drop of immature fruit may occur later.

Keep an auger handy and use it every three or four days to check soil moisture in the root zone. The bulk of the feeding roots are in the upper 12 in. of soil. If these roots don't get enough water, the trees will be short, not only of water, but also of the plant nutrients which are taken up with it. The auger takes the guesswork out of irrigation and lets you know just when the crop needs water.

—*E. L. HASTIE,*
Adviser in Horticulture.

A COVER crop established in banana plantations in late spring helps to prevent loss of soil during the wet season. Besides reducing soil losses, a cover crop checks weed growth during summer and early autumn, and usually little cultivation is needed before March or April.

The Cristaudo and Reeves Selection varieties of cowpeas are recommended for cover crops. The seed should be broadcast at 20 lb. an acre. An application of 1 to $1\frac{1}{2}$ cwt. of superphosphate and $\frac{1}{2}$ cwt. of sulphate of ammonia to the acre at planting will help to produce a good ground cover and a bulky green manure crop.

In January and February, when growth of the cover crop is most vigorous, a light brushing may be necessary to prevent the cowpea growing onto the banana plants.

—*J. McG. WILLS,*
Senior Adviser in Horticulture.

Beaudesert Pasture

Tuberculosis-Free Cattle Herds. (As at 16th January, 1959.)

Aberdeen Angus.

G. H. & H. J. Crothers, "Moorenbah," Dirranbandi
A. G. Elliott, "Ooraine," Dirranbandi
W. H. C. Mayne, "Gibraltar," Texas

A.I.S.

M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
F. B. Sullivan, "Fermanagh," Pittsworth
D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
W. Henschell, "Yarranvale," Yarranlea
Con. O'Sullivan, "Navillus" Stud, Greenmount
H. V. Littleton, "Wongelea" Stud, Hillview, Crow's Nest
J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy
Sullivan Bros., "Valera" Stud, Pittsworth
Reushle Bros., "Reubydale" Stud, Ravensbourne
A. C. and C. R. Marquardt, "Cedar Valley," Wondai
A. H. Sokoll, "Sunny Crest" Stud, Wondai
W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
W. H. Thompson, "Alfa Vale," Nanango
S. R. Moore, Sunnyside, West Wooroolin
H.M. State Farm, Numinbah
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
D. G. Neale, "Grovely," Greenmount
A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
W. D. Davis, "Wamba" Stud, Chinchilla
Queensland Agricultural High School and College, Lawes
C. K. Roche, Freestone, Warwick
Mrs. K. Henry, Greenmount
D. B. Green, "Deloraine" Stud, Durong, Proston
E. Evans, Wootha, Maleny
T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
J. Crookey, "Arolla" A.I.S. Stud, Fairview, Allora
M. F. Power, "Barfield," Kapaldo
A. H. Webster, "Millievale," Derrymore
W. H. Sanderson, "Sunlit Farm," Mulgildie
R. A. and N. K. Shelton, "Vuegon" A.I.S. Stud, Hivesville, *via* Murgon
R. R. Radel & Sons, "Happy Valley," Coalstoun Lakes
C. A. Heading, "Wilga Plains," Maleny
G. S. and E. Mears, "Morden," M.S. 755, Toogoolawah

Ayrshire.

L. Holmes, "Benbecula," Yarranlea
J. N. Scott, "Auchen Eden," Camp Mountain
E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
T. F. Dunn, Alanbank, Gleneagle

Friesian.

C. H. Naumann, "Yarrabine" Stud, Yarraman
D. J. Pender, "Camelot," Lytton road, Lindum
S. E. G. Macdonald, "Freshfields," Marburg

Guernsey.

C. D. Holmes, "Springview," Yarraman
A. B. Fletcher, Cossart Vale, Boonah
W. H. Doss, Degilbo, *via* Biggenden
A. C. Swendson, Coolabunia, Box 26, Kingaroy
C. Scott, "Coralgrae," Din Din Road, Nanango
R. J. Wissemann, "Robnea," Headington Hill, Clifton
G. L. Johnson, "Old Cannindah," Monto
A. Ruge & Sons, Woowoonga, via Biggenden
G. Miller, Armagh Guernsey Stud, Armagh, M.S. 428, Grantham
N. H. Sanderson, "Glen Valley," Monto

Jersey.

Queensland Agricultural High School and College, Lawes
J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
J. F. Lau, "Rosallen" Jersey Stud, Goombungee
G. Harley, Hopewell, M.S. 189, Kingaroy
Toowoomba Mental Hospital, Willowburn
Farm Home for Boys, Westbrook
P. J. L. Bygrave, "The Craigan Farm," Aspley
R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
E. A. Matthews, "Yarradale," Yarraman
A. L. Semgreen, "Tecoma," Coolabunia
L. E. Meier, "Ardath" Stud, Boonah
A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
F. W. Verrall, "Coleburn," Walloon
C. Beckingham, Trouts road, Everton Park
W. E. O. Meir and Son, "Kingsford" Stud, Alberton, *via* Yatala
G. H. Ralph, "Ryecombe," Ravensbourne
Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
J. W. Carpenter, Flagstone Creek, Helidon
H. G. Johnson, "Windsor" Jersey Stud, Beaudesert
W. S. Kirby, Tinana, Maryborough
S. A. Cramb, Bridge st., Wilsonton, *via* Toowoomba
J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
W. C. M. Birt, "Pine Hill" Jersey Stud, Gundiah
T. Nock, Dallarnil
P. Fowler & Sons, "Northlea," Coalstoun Lakes
F. Porter, Conondale
H.M. State Farm, Palen Creek
B. T. Seymour, "Upwell" Jersey Stud, Mulgeldie

Poll Hereford.

W. Maller, "Boreview," Pickanjinnie
J. H. Anderson, "Inverary," Yandilla
D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick.
E. W. G. McCamley, Eulogie Park, Dululu
Wilson and McDouall, Calliope Station, Calliope

Poll Shorthorn.

W. Leonard & Sons, Welltown, Goondiwindi

Butter of good keeping quality, with an even colour and texture can be made on the farm, provided certain procedures are followed.

Butter-Making On The Farm

By D. C. KEATING,
Dairy Officer, Bundaberg.

MAKING butter is still a regular home task on many properties throughout the State. This is particularly so in those areas in which dairying is not an established primary industry. Frequently the quality of this farm butter is not all that is desired and for those at a loss to explain why a knowledge of the correct method of churing and possible causes of the more common defects should prove valuable.

The quality of the raw material used in the manufacture of any food has a marked influence on the quality of the finished product and in this butter is no exception. Because dairy produce is subject to bacterial spoilage, every care must be taken both during the milking and subsequent cream churning and butter working operations to ensure that contamination does not occur.

Ripening of Cream. A certain degree of acid production occurs in cream which is stored for farm butter making. This is particularly so where cream is hand-skimmed after settling in open shallow bowls. In this instance the cream contains much skim milk. This acidity is not undesirable, if it is a result of the right types of bacteria, and therefore it is necessary to ensure that clean milking methods are used.

A ripening period of 12 to 24 hours between separation and churning is usually sufficient to produce enough acid.

Acid creams churn more rapidly and produce a butter flavour which is pleasant but not flat.

Pasteurising. While the natural bacteria found in cream form desirable acid, there are often undesirable types present also. These produce by-products which give rise to off-flavours and if in sufficient numbers will continue growing in the finished butter and affect its quality. In addition, raw cream may contain enzymes, for example, lipase which can cause off-flavours. In a manner similar to commercial practice, cream may be heat treated on the farm to restrict the activities of these bacteria.

The recommended method is:—

(1) Pour the cream into a billy and place the billy into a larger vessel of boiling water on the stove. A lid should not be placed on the billy as this will prevent the escape of volatile flavours.

(2) Raise the temperature of the cream to a minimum of 145 deg. F. and hold it at this level for some 20–30 minutes. During the period of heating and holding the cream should be stirred.

This operation can be done when the cream is fresh or after the ripening period depending on individual tastes.

It is necessary, however, to cool cream adequately after heating and store for at least three hours under cold conditions before churning is commenced.

Temperature. The temperature of the cream at churning plays a big part in determining the churning time and the body condition of the completed butter. A cream temperature of 50 deg. F. is most suitable. Storing cream in the household or dairy refrigerator overnight (prior to churning) should produce about the desired temperature.

A dairy thermometer for checking temperatures of cream is a most useful, if not essential, tool in butter-making operations.

Cream with a butterfat content of 35–40 per cent. is easiest to churn and butterfat losses from this cream should not be high. A low butterfat content in cream means longer churning times. The excess skim milk cushions the fat globules and prevents them from being brought together to form grains. Too high a fat content will cause unnecessary loss of butter fat in the butter milk.

For these reasons, cream from the farm separator is superior to hand-skimmed cream for churning operations.

When churning cream, do not fill the churn more than half full, nor less than a quarter full. This is important when enclosed churns are used. Too much cream in the churn will "whip up" and fill the churn with cream and air, thus preventing the bumping together of the fat globules. Too little cream in a churn, on the other hand, allows the cream to adhere to the walls of the churn and prevent adequate bumping together of the fat globules.

Before filling the churn it should be sterilized with boiling water and allowed to cool.

Churning. Churning is the most tedious part of home butter-making, and any reduction of effort involved is most appreciated. However, a certain minimum time will always be necessary if a good quality butter is to be produced. Usually cream at the correct temperature will churn in 25–35 minutes.

The hand-operated revolving churn is the most common type in use on Queensland farms. However, modern kitchen appliances such as electrical mixers are becoming increasingly popular as churns. While they possess the disadvantage of throwing the cream to the side of the bowl, no effort is involved and the cream can be watched during the whole churning process. The continued removal of whipped cream from the upper sides of the bowl will give complete and even churning in these appliances. The advantage of being able to watch the cream is that churning can be stopped at the correct stage.

With enclosed churns it is not possible to view the churning process. In this case the churn should be opened periodically to check the progress of the churning. With experience, the butter-maker will be able to assess approximately the time required between commencement of churning and when the buttermilk begins to separate from the butter grains.

The completion of churning. This is the most crucial stage in butter-making. Cream should be churned until the butter milk has run free and the butter fat is in the granular form, roughly the size of grains of wheat. The butter milk is then run off through a gauze strainer until the butter is completely free of milk.

A fault which occurs frequently is that the cream is churned until a large lump of butter is floating in the butter milk. This presents difficulties in draining, washing, and salting.

The butter should not be pressed with a pat to assist the removal of the butter milk, but merely allowed to drain freely.

After Churning. Washing of the butter serves two purposes: (1) It removes the final traces of buttermilk adhering to the butter grains. If this buttermilk is allowed to remain it may cause a sour-flavoured butter and reduce its keeping quality. (2) It will harden the butter grains sufficiently to allow better conditions for working of the butter while incorporating salt and water. Use wash water at a temperature slightly below that of the cream at the commencement of churning as this assists in hardening the butter. If a refrigerator is available the wash water can be cooled in this. Enough water should be added to cover the butter grains and allow them to float freely around when stirred.

The butter should be allowed to stand in contact with the water for some 5 to 10 minutes with light stirrings. Move the churn stirrer slowly through the water and butter to prevent packing of the butter. Do not use mechanical household mixers at this stage. If a revolving churn is being used a slow rotation of the churn will be sufficient. The butter can be washed more effectively when it is in small grains, and very little buttermilk remain.

Be certain the water is pure and free from any contamination, as certain water bacteria, if present, will cause off-flavours in the finished butter.

The quantity of salt to add is a matter of individual taste; it is necessary, however, to use a fine grain salt free of lumps. As a useful guide, one ounce of salt for each 3 lb. of butter should give satisfactory results.

Sprinkle the salt evenly over the butter grains and stir the mixture lightly to obtain an even distribution and allow the salt to dissolve.

Working the Butter. This operation has a major influence on the quality of butter and demands every attention. It is essential that the moisture and salt be evenly incorporated throughout the butter.

As no mechanical butter workers are available for home use, small wooden pats are often used for this operation. A tablespoon is a useful alternative or equipment of similar size.

Work the butter with the pats by pressing it to the sides of the bowl. Continue this process around the bowl, then bring the butter to one heap and press together. Drain off any free water which has left the butter.

This working and draining operation should be continued until no more free water leaves the butter. The butter has now incorporated the water or salt solution into its make-up.

A final working is now necessary to ensure that this moisture and salt is in as fine a form as possible. It should not be visible to the naked eye.

When patting the butter, press it firmly together and exclude air holes as much as possible.

Problem Churnings. The more common problems encountered with farm butters are listed, with the probable cause of the defect:

(1) *Extended churning time.* This could be a result of churning low fat cream or an incorrect amount of cream in the churn.

(2) *Uneven colour; Free moisture.* This usually indicates insufficient working to distribute the moisture and salt evenly. When cream churning temperatures are high the butter may not be firm enough to permit adequate working. This will sometimes occurr in the autumn months when low churning temperatures are necessary.

(3) *Rancid flavour.* This suggests chemical breakdown resulting from the action of raw cream enzymes. This fault is more common with late lactation milk and could also occur with the milk from a single cow rather than bulk herd milk. In these instances pasteurisation of the cream will correct the fault.

(4) *Sour flavour.* This is a result of bacterial spoilage. Butter should be washed more thoroughly and worked more evenly. In addition, check on the cleanliness of all utensils.

(5) *Bitter.* This defect may arise with late lactation milk.

(6) *Off-flavours.* Where milk is drawn from individual cows undesirable flavours may arise because of physiological disturbances in the animal. Milk from late lactation cows often gives rise to such defects. In addition feed or absorbed flavours may be the cause of this off-flavour.

Commercial butter-making is an art which requires much specialised equipment and attention to detail to ensure a uniform product. Its quality and composition is governed by regulation. Butter made on the farm for home use does not enjoy the special facilities, and in addition is not governed by such regulations. However, farm butter of good keeping quality can be produced with an even colour and texture, provided the procedures outlined are followed.

Cow Manure as Fertilizer

"L.R.," of Proston, inquires about the value, use and application of cow manure.

Answer: Cow manure is a bulky but useful fertilizer. It is particularly beneficial when used as a top-dressing for pastures. When used for crops, an application of 10 tons an acre is generally required to produce an appreciable yield increase. Such quantities require the use of a manure-spreader even when the material is fine.

Ten tons of manure obtained from cows fed on other than highly nutritious rations, would supply plant nutrients equivalent to:

4½ cwt. ammonium sulphate;

1½ cwt. superphosphate; and

1½ cwt. muriate of potash.

Heavy applications of cow manure may on some soils require the application of additional potash.

The physical condition of the soil is improved when cow manure is applied, giving better soil structure and related benefits.

for the junior farmer

by J. PARK,
State Organiser,
Queensland Junior Farmers' Organisation.

Making Decisions

In club affairs, a great many questions crop up that might be settled in any one of several ways, and no one much minds which course is followed provided that the matter is dealt with promptly. Many of these are matters of routine, and are best left to be dealt with by the officers of the club. They are the day-to-day acts needed to carry out the policy laid down by the club.

On the other hand, there are matters on which people have very different views. If compromise is impossible, then the minority has to give way to the majority. This they probably do without too much fuss, because most people learn fairly early that they cannot have all they want all the time. In other matters, compromise between opposing views is often possible and advisable. Then, each side gives way a little in favour of the other, and the matter is settled in a way that gives each party some but not all of what it wants. On all matters on which conflicting views are held, spokesmen must have freedom to express their views at reasonable length, but what should they do if they find themselves in a minority and defeated in a vote? There is only one course of action open to them if they sincerely want their club to be a success: having heard the decision they must stick by it, repaying with loyalty the benefits they will obtain from membership.

Majority rule and comprise are often criticised, and sometimes a good case can be made out against them. As, however, the alternative is to hand over control of affairs to one person, or to a small group of people, it is better to learn how to follow these methods as necessary parts of the machinery of management. The principles on which this works should be that every individual is allowed to hold his own opinions, that he must have liberty to express these opinions at all reasonable times and in a reasonable way, that he must have some influence over the choice and actions of those set in authority, and that his rights must be safeguarded by the community as long as they do not interfere with the rights that belong equally to others.

An organisation that sets out to do all this cannot, in the nature of things be an easy one to handle, but when properly managed it can produce results that will be got in no other way. Its use, therefore, has to be learnt, by practice and by a critical examination of its results, by everybody. One of the things to be remembered is that the machinery of management, with all its meetings, debates, voting, committees, sub-committees and officers—not to mention majority rule and compromise—must not be allowed to become an end in itself. This can easily be prevented if all the members have clearly in their minds what it is that they want to get out of their clubs. If in the turmoil of committees, meetings and conferences they can produce a satisfactory answer to the question "What is the end in view?", then all is well.

Every word spoken in discussion, every resolution passed should be a definite step, however small, towards a definite end. Those who frame a resolution or motion that gives someone else a job to do should ask themselves if the wording gives all the instructions and guidance they themselves would need if the job were their responsibility. There is always a danger, even in a Junior Farmers' Club, that those who govern by passing resolutions do not give enough clear thought to the ways in which the resolutions can be translated into action. Resolutions should be clear-cut and practical, and be so worded that something *has* to be done.

Delegates

When a person is appointed by a group to represent them and voice their opinions at a meeting, that person is called a delegate. Thus, a club will send two delegates to a zone council meeting, and these delegates will vote on resolutions according to instructions received from their club. Some people make a difference between a "delegate" and a "representative" by saying that a delegate is obliged to act strictly according to instructions received from those who have appointed him, and that a representative has more freedom to act for himself. If we accept these definitions, then junior farmers attending council meetings and conference are part delegate and part representative. Delegate or representative, he must never fail to report back to those he represents.

Ideas Worth Trying

More and more Junior Farmers' Clubs are investing in a tape recorder. The purchase of such instruments for educational purposes can now be made without paying sales tax. The tape-recorder is invaluable for speech training, for recording talks and debates, and for recording music for the club social.

Many members living or working in towns see little or nothing of farm life, and have no real appreciation of the hardships and the pleasures of that way of life. If these members could visit farms, preferably those of club members, and if they could be given an opportunity to join in the normal farm activities, their interest in rural matters would be awakened or quickened, and they could be expected to become better club members.

Clubs might consider giving a subscription to some good farming magazine as a prize for club competition. After the winner reads each issue the copy could be placed in the club library.

Going camping this year?

Here's a Handy Guide to make your Camping Holidays Safer and Healthier:

BE CLEAN.

Be carefree, but not careless. Be proud to have your family set a fine example in personal and camp cleanliness. What you do or fail to do can affect the entire community.

BE DECENT WITH TOILET.

Always leave a public convenience the way you like to find it. This is one vital way to help prevent disease epidemics.

WASH HANDS.

Keep soap and water between you and disease! Make it a strict family rule always to wash hands thoroughly immediately after toilet and before touching food.

USE THOSE BINS.

Wrap all refuse in paper and put it in the bins provided. Always put the lid back on tightly to keep out flies and rats. If you're camping, clean up around the camp every day.

BEAT FLIES.

In crowded holiday areas, flies threaten clean people with diseases from the careless ones. Keep food and milk always covered. Spray regularly.

LEAVE NO LITTER.

Wherever you go picnicking, leave the place as clean as you found it. Burn or bury refuse and leave nothing to encourage disease-spreading pests.

BOIL WATER.

Water from a fast-running stream isn't necessarily safe. For drinking, boil any water that doesn't come from a tap.

PREVENT FIRES.

Take every care with your camp stove. Don't have clothing hanging near it. Light camp fires in well-cleared spaces and make sure they're completely extinguished.

KEEP SAFE IN SURF.

Foolhardiness costs lives. Obey all the rules of safe surfing. Bathe between the flags. Co-operate with life-savers.

GUARD AGAINST SUNBURN.

Don't ruin your holiday with the crimson misery of sunburn! Expose briefly at first and then a little longer each day. If you're fair take extra care!

DON'T OVERDO SUNGLASSES.

If you must wear sunglasses, make sure they don't magnify or distort in any way. Choose a light colour and wear goggles only when there's glare.

PREVENT ATHLETE'S FOOT.

Don't go barefoot into public bathrooms or dressing sheds. When you bathe, soap well between the toes, and dry thoroughly. A light application of zinc ointment is helpful.

DEFEAT MOSQUITOES AND SANDFLIES.

As a protection from bites, ask the chemist for a preparation containing dimethylphthalate. Rub a few drops on the exposed parts. To soothe bites, rub with calamine lotion or methylated spirits.

BE MODERATE.

Don't try to cram a year's fun into your holiday and so make recreation "wreck creation." Get ample sleep and regular meals.

Make commonsense your constant companion throughout your holiday.

—*Q. Health Education Council.*

Before Your Child Goes To School

TWO PRE-SCHOOL PRECAUTIONS THAT ALL PARENTS SHOULD SEE TO ARE IMMUNIZATION OF THEIR CHILDREN AGAINST DIPHTHERIA AND TETANUS.

Why should your child have a booster injection against diphtheria?

Because, although he may have been immunized at six months, by the time he is approaching school age, its effect will be wearing off.

He will soon be entering a new period in his life and spending a lot of time in the company of a great many other children in classrooms and playgrounds. There could be diphtheria carriers among them. And he might become infected. No matter how careful you are of his personal cleanliness, there is still a risk. Diphtheria plays no favourites. Rich or poor, clean or dirty, children are targets all the time they remain unprotected.

He is at a stage when any interference with his progress, through illness, can be a serious setback,

A booster injection will revive his earlier resistance to diphtheria and protect him throughout the years and in places where he is most likely to be exposed to infection.

This injection will not only protect *your* child, but it will also help stop the spread of diphtheria among other children.

Why should school children be immunized against tetanus at 18 months and booster injections given at proper intervals?

Because, though tetanus is not peculiar to children, they do run a much greater risk of infection. Their vigorous games, especially at school, bring minor injuries often caused by contact with the ground. The ground may harbour tetanus germs.

If the school-child is not already protected by immunization and the wound is not thought serious enough to warrant medical attention, tetanus may develop and then it may be too late.

Tetanus germs can live in dust and dirt for many years. They will lie in wait for such an opportunity as that afforded by the seemingly unimportant wounds children receive in the course of their play out of doors. In about one-third of cases tetanus enters wounds so small as to be practically invisible.

Tetanus develops quickly and its effects are horrible to see and to feel. It is often fatal.

Though difficult to cure, tetanus is easy to prevent. Children up to 15 years of age are most vulnerable to its attacks.

Do something about this danger right away . . . save your children and yourself from the terrors of tetanus.

Make your inquiries now. Your town or shire council may have facilities for free immunization. If not, ask your doctor.

—*Q. Health Education Council.*