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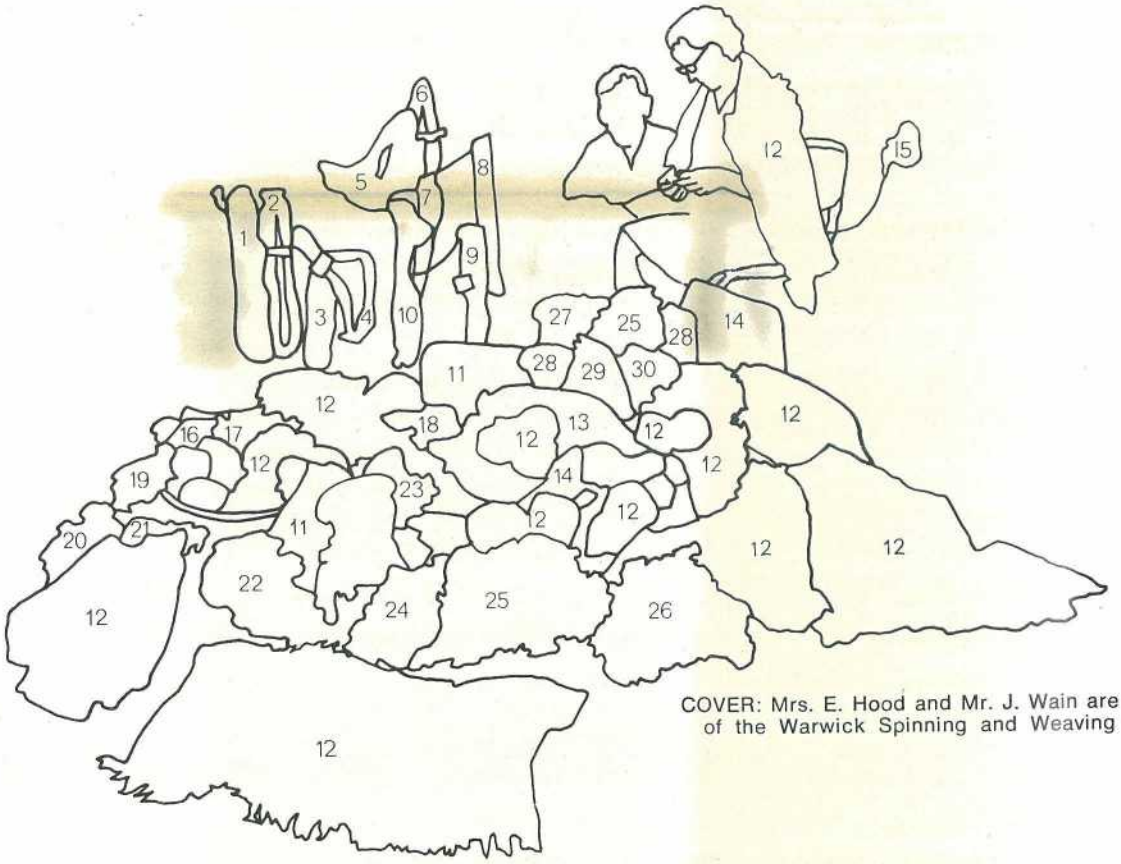
Key to natural and dyed wools



COVER: Mrs. E. Hood and Mr. J. Wain are members of the Warwick Spinning and Weaving Group.

	PLANT MATERIAL	MORDANT
1.	Ripe mulberry fruit	Oxalic acid from rhubarb leaves with alum and salt
2.	Cochineal crystals	Tin and cream of tartar
3.	Iron-bark bark	Nil
4.	Purple stock flowers	Tin, cream of tartar and oxalic acid
5.	Ripe mulberry fruit	Iron
6.	Mulberry leaves	Chrome, iron and alum
7.	Walnut husks in iron container	Nil
8.	Ripe mulberry fruit	Chrome
9.	Lichen	Nil
10.	Ripe mulberry fruit	Oxalic acid
11.	Seaweed	Nil
12.	Natural wools	
13.	Natural and vegetable-dyed wool jumper	
14.	Camel hair	
15.	Spun dog's hair (from Samoyed)	
16.	Stinging nettles	Alum
17.	Purple stock flowers	Oxalic acid and tin
18.	Carded mixed coloured wools	
19.	Russian comfrey	Alum and cream of tartar
20.	Mistletoe twigs	Nil
21.	Lichen	Nil
22.	Sorrel roots	Alum
23.	Wisteria blossoms with 1 teaspoon of commercial green dye	Nil
24.	Mint	Alum and cream of tartar
25.	Mistletoe leaves	Nil
26.	Wisteria blossom	Alum
27.	Kangaroo apple *(Solanum aviculare)*	Alum and cream of tartar
28.	Purple stock flowers	Tin and oxalic acid
29.	Ripe mulberry fruit	Chrome in an aluminium saucepan
30.	Mint	Iron

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QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES

Of particular interest

Items of news recently released by the Minister for Primary Industries, the Hon. V. B. Sullivan, M.L.A.

Campaign to ensure top quality eggs

DURING the last 12 to 18 months, the egg industry in South Queensland has implemented a campaign to ensure that top quality eggs are supplied to the consuming public.

All producers are required to meet the quality standards prescribed in the regulations. This has involved many of them in considerable expense.

The Egg Marketing Board has done its part in this campaign by instituting new handling procedures which cut down the delay between producer and consumer.

As another forward step in safeguarding the interests of consumers, the Board introduced the "open-dating" programme on cartoned eggs on January 1 this year.

Under this scheme, all one-dozen cartons and 15-dozen outer cartons of eggs marketed by the Board are stamped with a "use-by" date at the time of grading and packing.

The aim is to ensure that no unnecessary delays occur in the distribution of good quality, fresh eggs to the retail market and from retailer to consumer.

Reports indicated that the programme, which the Board had undertaken on a voluntary basis, was operating successfully.

Producers appreciated the potential benefits of keeping consumers happy with their product.

I consider it should be obvious to both producers and retailers that the marketing of poor quality, underweight eggs will do untold harm to the industry.

I can assure consumers that my Department will not tolerate this practice and will have no hesitation in cracking down on offenders.

Cover story . . .

Wool Dyeing with Natural Plant Dyes

by J. NATION, ROSLYN GRANT and R. T. F. ARMSTRONG, Sheep and Wool Branch.

Home dyeing with natural plant dyes is a challenging and rewarding hobby that is attracting a growing band of enthusiasts. Wool and other home spun fibres can be dyed in attractive colours with home-made natural plant dyes.

MANY delicate colours can be obtained, from pale lemons to golds, beiges, pinks, browns, greens, blues, lavenders, purples.

Plant material commonly used for dyeing includes fruit skins, berries, bark, leaves, flowers, lichens, mosses, twigs.

Preparation of dye

The plant material is placed in cold water, brought to the boil and simmered till the desired colour is obtained. The solution should not boil fiercely: a long, slow simmer gives a deeper colour. The amount of water and duration of simmering will depend on the type of material used.

The dye is usually made as a concentrate (approximately 0·9 kg plant material in 2 *l* water) and diluted before use. It can also be made as a dilute solution and used directly. As a guideline, 0·9 kg of plant material in 18 *l* of dye should be sufficient for 0·45 kg of wool.

Some plants and their preparation are listed below.

Wood and bark

Wood, e.g., red cedar, is cut into fine pieces (plane shavings), covered with water, soaked for 24 hours and simmered for several hours. Bark is smashed into very small pieces and treated in the same manner.

Flowers

Large numbers of flowers are needed to make a strong dye. These are pressed down in the container with just enough water to prevent burning. As they pulp readily they need to be simmered for a short time only. The liquid is strained off through several layers of cheesecloth, fine hessian or similar material.

Leaves

Chop the leaves finely and simmer in as little water as possible for 1 hour (water can be added if required). A small quantity of alum can be added to help release the dye. The liquid is strained off in the same way as for flowers.

Berries

Berries should be placed in a cotton bag, soaked and simmered. To help release the dye they can be squashed in the bag against the side of the container with a wooden spoon or stick.

Checking the depth of colour produced during dyeing.

Skins and peelings

These are treated the same as berries.

Lichens

Cut or mince the lichens, soak at least 24 hours and simmer several hours. Long, slow simmering applies particularly to lichens.

Seaweed

Should be soaked for about 48 hours and simmered for several hours.

Preparation of the wool

Scouring

The wool has to be scoured (washed) before dyeing. It can be scoured in the fleece, but normally is spun, plied and wound into a skein beforehand.

It is scoured by soaking for approximately 30 minutes in warm water (35°C) with a soft soap or detergent recommended for woollen garments. Approximately 21 g soap to 23 *l* water is required for 0·45 kg raw wool. At intervals the wool should be squeezed gently to assist the removal of grease. It must NOT be rubbed.

Rinse in several changes of cold or lukewarm water, squeeze gently and dry.

If necessary, the wool can be stored damp in a pillow case in a dark cupboard for up to 2 days.

Wool must be damp when immersed in the mordant or dye.

Mordanting

A mordant is a chemical which fixes the dye colour in the wool fibre. Immersion in a mordant ensures good, fast dyes. Common mordants are:

Alum (potassium aluminium sulphate)

85 g alum and 29 g cream of tartar are added to 18 to 20 *l* water per 0·45 kg dry wool. Immerse wool in the solution, bring to the boil and simmer for 1 hour. Leave to cool in the solution (overnight).

Gently squeeze the wool and rinse in clear water to remove excess mordant. It can be dyed immediately or stored in a dark place (in a pillow slip or plastic bag) for 2 to 3 days.

Too much alum can cause hardening of the wool and in some cases make it feel sticky.

Chrome (potassium di-chromate)

Dissolve 7 to 14 g chrome in 18 to 20 *l* water per 0·45 kg dry wool, bring to the boil (with a lid on) and simmer for ¾ to 1 hour. The wool must be fully submerged as chrome is sensitive to light.

Gently squeeze the wool, rinse well and dye immediately. It is possible to store chrome-mordanted wool for 2 to 3 days in a dark place but as it is sensitive to light it is preferable to dye immediately.

Chrome softens wool.

Tin (stannous chloride)

7 to 14 g stannous chloride and 57 g cream of tartar per 0·45 kg dry wool are dissolved separately in small amounts of cold water. These are then added to 18 to 20 *l* cold water, brought to the boil, simmered for a few minutes and cooled. Immerse the wool, heat slowly, and allow to simmer for 20 to 30 minutes. Rinse in soapy water and then fresh water until all the soap is removed.

Tin brightens colours but tends to make the wool slightly harsh and brittle. A few drops of baby oil or olive oil in the last rinsing water will help counteract this.

Tannic Acid

This can be used alone or added to other mordants at the rate of 7 g to 18 *l*.

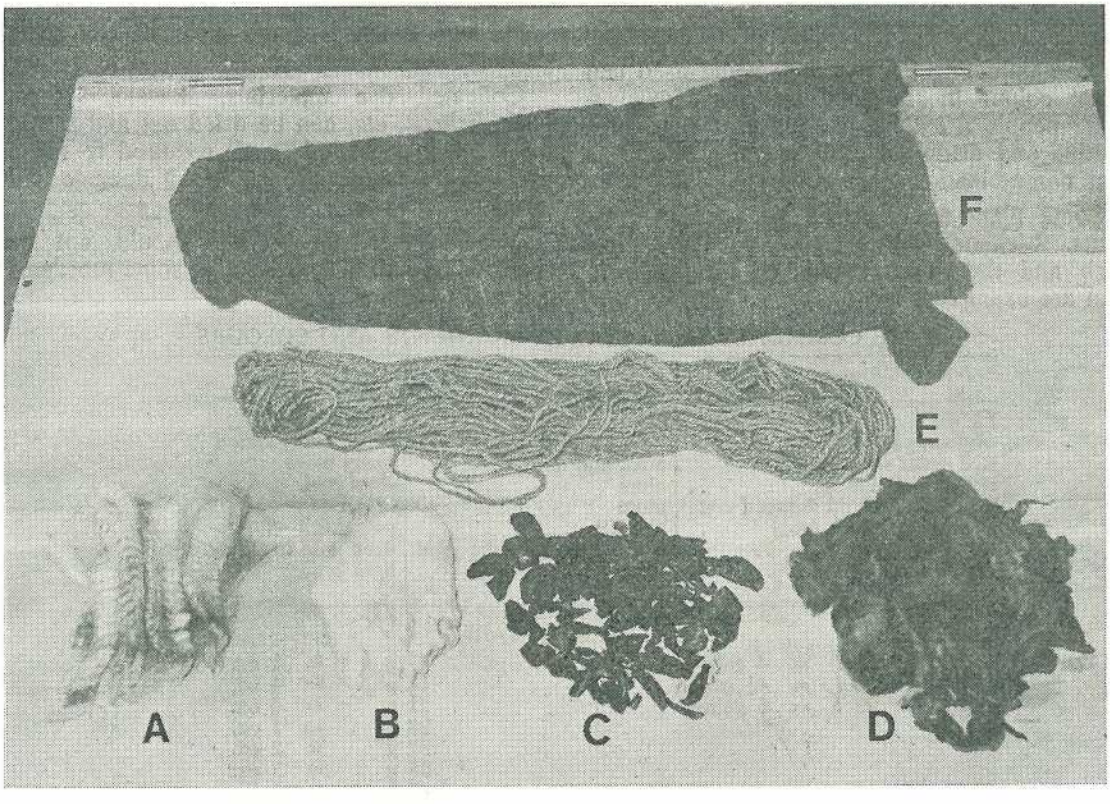
Oxalic Acid

This is normally added to other mordants at the rate of 7 g per 18 *l*.

Copper (copper sulphate)

Copper is used as a saddening agent. A saddening agent is added to the wool after dyeing to fix the colour. Either of two copper solutions can be used:

Stages in dyeing of wool—(a) Greasy wool; (b) Scoured wool; (c) Plant material (walnut husks): (d) Dyed unspun wool; (e) Dyed spun wool; and (f) Finished garment.



1. Dissolve 7 to 14 g copper in 18 to 20 *l* cold water per 0·45 kg dry wool
   OR
2. Dissolve 7 g copper and 28 g cream of tartar in a little hot water and add to 18 to 20 *l* cold water.

Bring to boil, simmer gently for a few minutes, cool, add dyed wool and simmer for a further 10 minutes. Cool and rinse well.

Iron (ferrous sulphate)

Iron is a saddening agent also. After simmering the wool in the dye for 1 hour remove and add to a batch of 7 to 14 g ferrous sulphate and 28 g cream of tartar dissolved in 18 to 20 *l* cold water per 0·45 kg dry wool. Stir the batch frequently, bring to the boil and simmer for a few minutes. Rinse the wool thoroughly, as iron weakens the wool fibre and hardens the yarn.

Vessels for mordanting

Enamel, glass or stainless steel vessels are recommended for mordanting. Iron, copper and aluminium are mordants themselves and by contaminating the mordant being used can affect colour in the final dyeing. However, some people use these vessels as a matter of routine and disregard the variations in shades that contamination may cause.

Some plant materials do not require mordants. Lichens, walnut husks, mistletoe, rhubarb and the green fronds of the staghorn fern are examples.

Dyeing

Once the wool is mordanted it is ready for dyeing. Wool must be dampened before immersion in dye. Bring to the boil and simmer for about 1 hour. The dyebatch must not be overboiled as this could impair the colour.

After dyeing, the wool is either rinsed in hot and then progressively colder water until clear, or left in the dyebatch till cool and then rinsed in cool water till clear. It is squeezed out gently and dried in the shade. Spun wool in the skein is dried at a slight tension.

Keep details of your dye lots

There is a wide variety of plant material which can be used. The degree of colour obtained varies with the type of material, the time of year it is collected, the mordant, the duration of soaking, simmering, washing, etc. Complete details of each dye lot should be kept along with a sample in a glass jar so that similar shades can be closely reproduced in the future.

No two batches of dye produce the same shade.

Collected dye materials, flowers, leaves, bark, lichens, etc. can be dried out and stored for quite long periods until required to make dye liquor—watch out for insect damage and moulds.

Vessels used for dyeing should not be used for household purposes as some mordants are poisonous.

SOME COMMONLY USED PLANTS, MORDANTS AND COLOURS

Plant	Mordant	Colour
Lichen	nil	lemon to gold
Mulberry leaves	tannic acid	pale creamy lemon
Red cedar shavings	alum and tannic acid	pinky beige
Brown onion skins	alum	deep gold
Privet berries and seaweed	alum	off white
Coral tree flowers (red)	chrome	pale green
Ink weed	chrome and oxalic acid	deep gold to pale cream
Wattle bark	alum	light brown

CONVERSION TABLE

18 *l*	= 4 gallon	7 g	= ¼ oz.
20 *l*	= 4½ gallon	14 g	= ½ oz.
23 *l*	= 5 gallon	21 g	= ¾ oz.
		28 g	= 1 oz.
		57 g	= 2 oz.
		85 g	= 3 oz.
		0·45 kg	= 1 lb.
		0·9 kg	= 2 lb.

A Q.A.J. special feature . . .

Permanent Electric Fencing For Cattle And Sheep

by K. F. HOWARD, Beef Cattle Husbandry Branch, Toowoomba

The high cost of renewing fencing is one that continually faces the grazier. This feature examines a new concept in fencing—a concept that can save money.

Beating fencing costs

1. A property may have to renew say 20 kilometres of fence over the next 20 years. At the present price of $400 per kilometre for suspension fence, this would mean a total cost of $8 000 on today's prices for labour and materials. By upgrading say 15 kilometres at present with offset wires for an average of $80 per kilometre and by building 5 kilometres of new fence for $150 per kilometre, the total fence cost would be $1 950 or less than a quarter the cost of suspension fencing. This type of difference in fencing costs can be expected to induce many producers to electrify some or all of their fences over the next few years.

A different concept

2. Cattle see fences as both obstructions to their course and as conveniences on which to rub themselves. However, once having been bitten by a sizeable electric shock from a fence, the beast has had its mind implanted with a completely new fence concept. It is this concept of fear which brings respect. It explains how a fence hurdler may be effectively restrained by a top wire that is only knee high. At the same time, fence rubbing and pushing with the resultant fence damage can be brought to a halt.

3. A stockman who for the first time sees a low, light, electric fence is unlikely to be favourably impressed. If, however, such a fence is proved to hold stock permanently in paddocks at less than half the price of the next cheapest fence, we can expect that prejudice will eventually be overcome. **(Photos. 1 and 31.)**

The electrical principle

4. The modern high powered low impedance energisers are capable of giving an effective shock even when the live wire passes through tall green grass. **(Photo 3.)** Electric fences can be effective in most of the circumstances in which conventional fencing is effective. **(Photo. 2.)**

5. Some of the modern units have a voltage output of 5 000 volts and current flow of 30 to 40 amperes in a short circuit when the earthed animal touches a live wire. The current is put out at approximately one pulse per second. The actual current flow is limited to 3/10 000 of a second per pulse.

6. The effectiveness of the shock depends on the animal being well earthed at the same time that it touches the live wire. When the ground is moist, this in itself provides an adequate earth but in dry times, the animal should be earthed by touching a well earthed wire in the fence line at the same time that it touches the pulsed wire.

Possible uses

7. *Wherever Conventional Fences are Subject to Deterioration, a Permanent Electrified Wire is worth considering.* An offset electrified wire will make a fence more stockproof and could feasibly add 20 years of life to the fence. **(Photos. 4, 5, 6, 32 and 33.)**

8. *Wherever new or replacement fences are required, the extremely low cost and effectiveness of the new high powered low impedance type electric fence is worthy of investigation.*

9. The best guide would be a small experiment on the property where new fences are required. Firstly, place cattle in a small conventionally fenced paddock which carries an offset electrified wire. This will educate the cattle to a new bovine concept. Next, let these initiated cattle drift into a paddock which has a cheap low electric fence of the type recommended in this booklet. Try a variation in the height of the top wire. You could be satisfied with a 70 cm (28″) top wire though some may go up to 90 cm (36″).

Queensland's need

10. This article on Electric Fencing has been written to meet an obvious need in Queensland—especially where millions of dollars worth of fences have been destroyed in floods. **(Photo. 42.)**

11. The suggestions that follow are based on individual experiences, composites, and some personal experience.

Reasons for success

12. Permanent electric fencing with high powered energisers is developing at a rapid rate throughout Victoria and South Australia for both cattle and sheep. It has been going now for ten years and several thousand energisers a year are now being marketed throughout Australia. There is no question that many of the methods being used in the south have direct application to Queensland and some Queensland producers have already proved this.

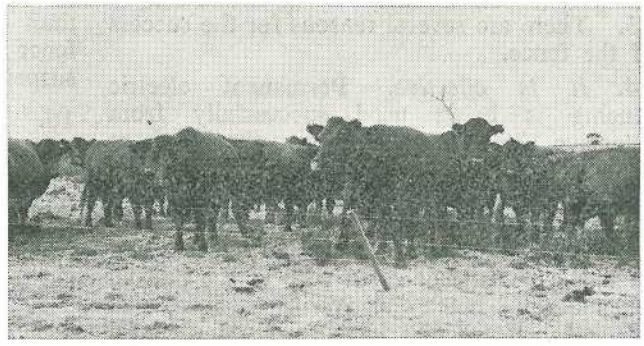


Photo. 1 This permanent electric fence with a top wire 62 cm (25") from the ground was containing these Shorthorn cows at A.I.A. Exmoor Station, Naracoorte, S.A. (Paragraphs 3 and 89).

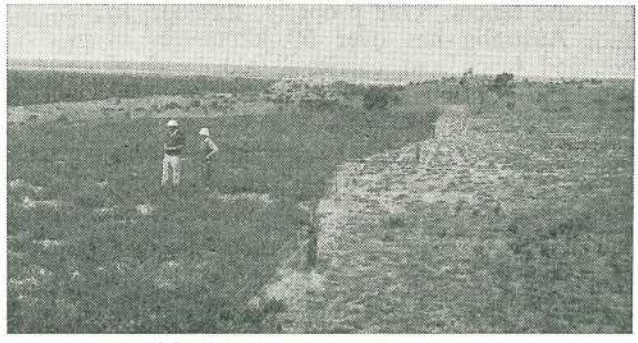


Photo. 2 The eaten out paddock at Exmoor with attractive lucerne in the adjacent paddock demonstrates the reliability of the electric fence. Note the Read Offset Lift Gate. (Paragraph 4).

Photo. 3 This electric fence on the Darling Downs still threw a savage spark in spite of the green grass which covered it for three kilometres. (Paragraph 4).

Photo. 4 An offset energised wire can prevent this. (Paragraph 7).

13. There are several reasons for the success of the fence.

14. *It is effective.* Permanent electric fencing is being used successfully from intensive Victorian properties to the Northern Territory. A three wire fence having the top and bottom wires live and the centre as an earth has kept freshly weaned calves from their mothers on at least one Queensland property. A further earth wire at the bottom can make the fence effective for sheep as well as cattle. Emus and kangaroos are plentiful on some of the South Australian properties but they are not regarded as a great menace to electric fences. One property, Exmoor, in South Australia has over 60 kilometres of electrified fence and carries 2 000 head of cattle and 19 000 sheep. Electricity stops fence crawling.

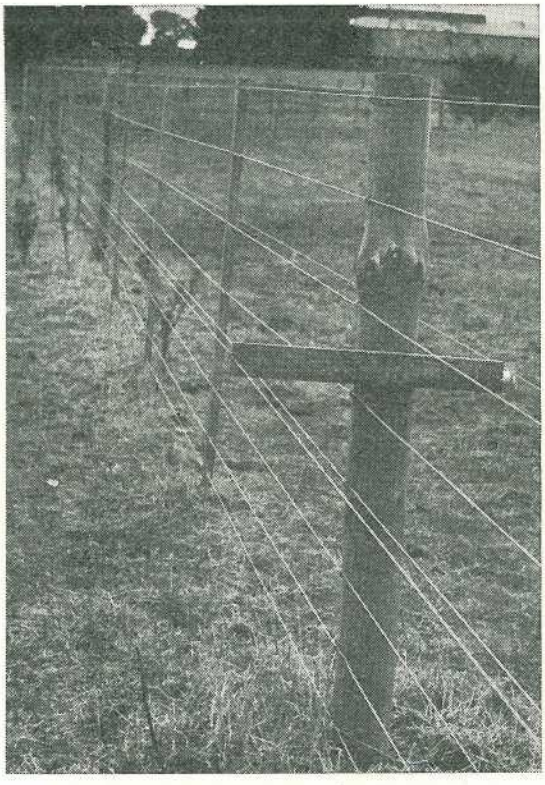
15. *The cost is greatly lower than any other type of fence.* An electric fence would be less than one quarter the cost of a conventional fence and less than half the cost of a 4 barb suspension fence.

16. *When properly erected it can reduce the cost of fence maintenance* and by using a single electrified wire on an old fence, the life of even a fence in disrepair can be rejuvenated so that it could well last another twenty years or more. Electricity cost is about ten cents per week per energiser.

Easy access and cheap gates

17. Where three droppers are used between running posts, motor bikes and vehicles can be taken over the fence. Gates can be built for a very low cost. An electrified 'cocky' gate would cost four or five dollars. A lift gate costing about thirty dollars is an alternative to an ordinary gateway. **(Photos. 9 and 10.) (Photos. 36, 37, 38.)**

Photo. 5 An offset electrified wire can add 20 years to an existing fence. As well as preventing physical pressure on the fence, the live wire can turn a poor fence into a stockproof one. (Paragraphs 7, 80, 81). See also Photos. Nos. 47 and 49.



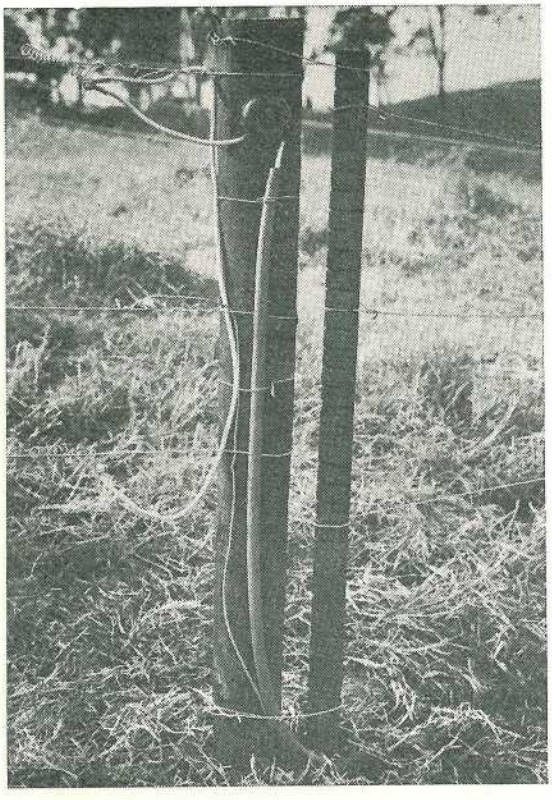
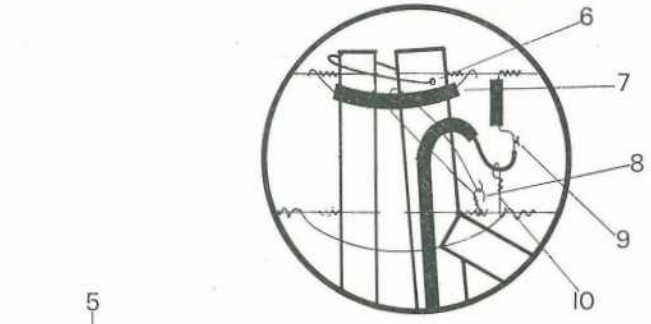


Photo. 6 Top Left: A Victorian example of an offset live wire on each side of the fence. Hardwood battens do not require insulators. (Paragraph 7, 80).

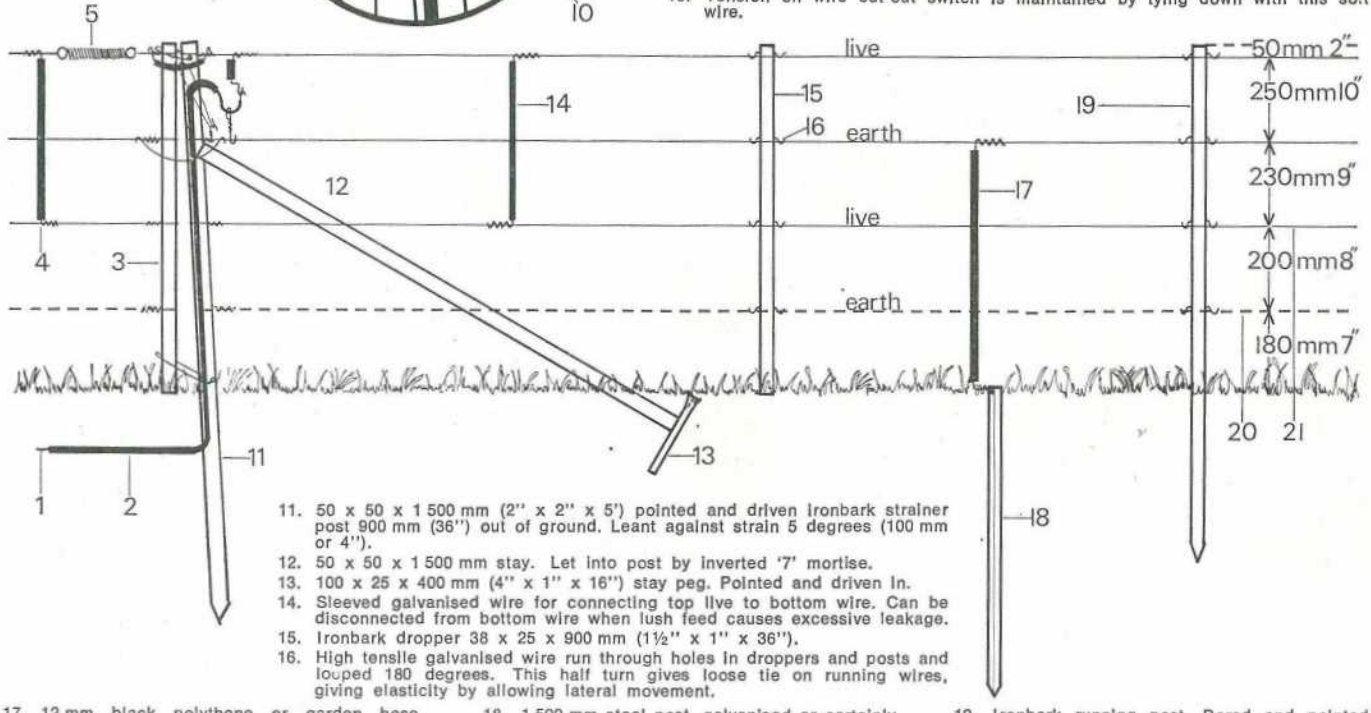
Photo. 7 Top Right: This light 1·8 metre (6 ft.) hardwood post requires no insulators. It was pointed and driven in for half its length. The strain on each wire is 80 kg (175 lb.). Wire is high tensile. Top wire is 800 mm (32 inches) from the ground. The earth wire and live wire come underground at the gateway. The insulated live wire is protected by putting it inside a length of garden hose when underground. In clay soils the earth wire need not be continuous provided the earth wires in the fence are connected to the ground by a steel post. Note the Ring grip D.C. switch which is a cheap and effective cut out. A single strainer with a low top wire and light strain is one reason for a greatly reduced fence cost. The top and bottom wires in this fence are alive. A further earth wire could be added at the bottom if sheep were to be run. The cheap wire or cocky gate is effective when electrified. (Paragraphs 27, 47).

Photo. 8 Bottom Right: This bull paddock has a top wire 700 mm (28") from ground level. (Paragraph 90).



LEGEND

1. Double insulated galvanised wire coming from fence at other end of gate.
2. 12 mm polythene pipe as protective sleeve.
3. 38 x 24 x 900 mm dropper as gate-end batten. Wires in gate separated by lengths of polythene bored for tying on wires.
4. Insulated wire for connecting top wire to bottom.
5. Tent spring maintains tension and allows easy stretching when opening and closing gate.
6. Hole bored 75 mm from top of post to take fastening loop.
7. Bridging cut-out wire with plastic hose sleeve. Tension maintained by tying down with soft wire to (8).
8. Tension wire to hold bridging cut-out firm.
9. Wire cut-out switch connecting live current wire to top wire of fence. Wire connecting at top has plastic hose sleeve which permits handling to hook and unhook.
10. Tension on wire cut-out switch is maintained by tying down with this soft wire.



11. 50 x 50 x 1 500 mm (2" x 2" x 5') pointed and driven ironbark strainer post 900 mm (36") out of ground. Leant against strain 5 degrees (100 mm or 4").
12. 50 x 50 x 1 500 mm stay. Let into post by inverted '7' mortise.
13. 100 x 25 x 400 mm (4" x 1" x 16") stay peg. Pointed and driven in.
14. Sleeved galvanised wire for connecting top live to bottom wire. Can be disconnected from bottom wire when lush feed causes excessive leakage.
15. Ironbark dropper 38 x 25 x 900 mm (1½" x 1" x 36").
16. High tensile galvanised wire run through holes in droppers and posts and looped 180 degrees. This half turn gives loose tie on running wires, giving elasticity by allowing lateral movement.
17. 12 mm black polythene or garden hose insulates earth connecting wire from live wire.
18. 1 500 mm steel post, galvanised or certainly free of paint and firmly connected with wire. Galvanised pipe is effective.
19. Ironbark running post. Bored and pointed 50 x 25 x 1 350 (2" x 1" x 4'6").
20. Bottom wire for sheep.
21. Strain on wires 70-90 kg (150-200 lb).

18. *Labour for mustering can be reduced.* The low cost of erection has opened the way for *laneways* running from one end of a property to another. If these are 50 metres wide they can also be used as paddocks.

19. *Fencing on the contour for soil erosion control is greatly simplified* as the lightness of posts and the light strain required on wires means that straight line fencing is no longer essential.

20. *Quick erection is a feature of the fence.* Two men can erect 2 kilometres of fence in a day with no machinery being necessary. One southern contractor uses a 40 mm (1½") circumference rope with a wrap-on technique to strain his wires.

Electricity failures

21. A common question asked is how long does the fence remain effective when there is a complete absence of electricity either through a bad short or a power failure? Under normal grazing conditions it is likely that the uncharged fence could remain an effective barrier to cattle and sheep for several weeks.

22. Under highly intensive grazing however, a fault may be discovered by cattle within an hour or so of it occurring. This would be when cattle are forced to eat the last mouthful in a paddock before being moved to attractive feed in the adjoining paddock. Under such extreme conditions there are usually some cattle which are continually reaching for a bite underneath the bottom wire. This type of animal occasionally touches the wire by accident and if it receives no shock, it may keep pushing until through.

23. *New techniques are being developed almost weekly* by producers and fencing consultants who are on the look-out for improvement. In many cases, we can expect to see educated cattle being held by one and two wire fences.

Seven musts for successful electric fencing

24. There are *several musts* if electric fencing is going to be used successfully. If these points are not going to be observed it would be better not to embark on an electric fencing programme.

The seven musts for Electric Fencing concern:—

INSULATION;
CONNECTIONS;
EARTHING;
CUT-OUT POINTS;
ENERGISERS;
TESTING FOR FAULTS; and
STOCKMANSHIP.

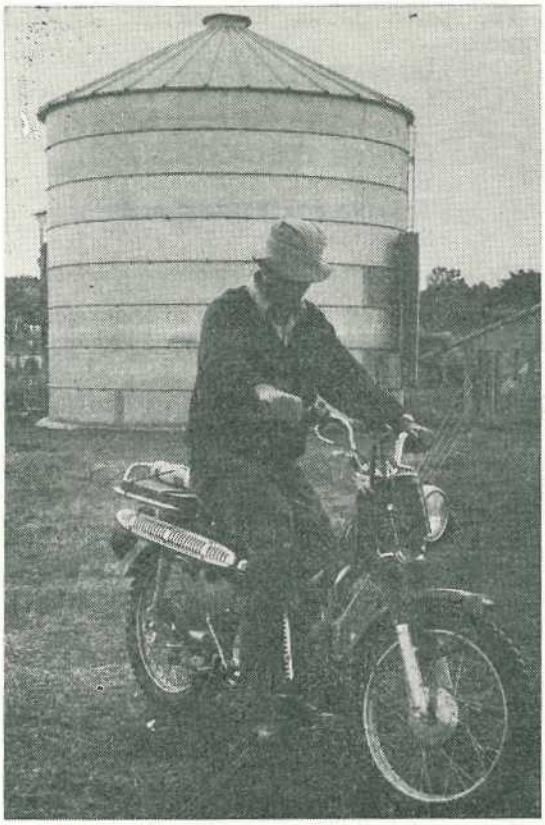
Insulation

25. The greatest hindrance to the electric fence is the short-circuit which is usually avoidable.

26. High density timber such as ironbark is in itself a great insulator and it is possible to have many kilometres of effective electric fence with posts and droppers made from this timber. This means that the problem of earthing out onto iron posts has been eliminated and broken insulators do not exist. High density posts when wet from rain do not present a problem. Attachment to droppers and posts is best done by tying on. One Queensland property at Goomeri has successfully used 4 000 split, untreated ironbark posts without insulators. One energiser in this case was giving an effective shock along 16 kilometres of fence. As the posts were at 3·1 metre intervals, there was about ten times the contact of timber to ground as with the long panels suggested in this article. (**Photo 11**). This example shows that under such circumstances, insulators are unnecessary. Though barb wire is not recommended it was being used in this instance and was strained onto ironbark posts in the conventional way.

27. Some of the less dense hardwoods may need to be creosoted. The principal advantages of this would be to reduce moisture absorption and increase life. Where doubt exists, insulators could be used at strainer posts where the pressure of wire on the strainer makes a much firmer contact. (**Photo 7**).

28. By far the best insulator to use is the porcelain one. A cotton reel or bobbin type 38 mm (1½") in diameter is adequate for straining. Porcelain is superior to any of the plastic type insulators—being unaffected by sun and fire. Where there is no porcelain available, use black synthetics which resist the sun's ultra-violet rays more effectively than white or coloured synthetic insulators. (**Photo 41**).



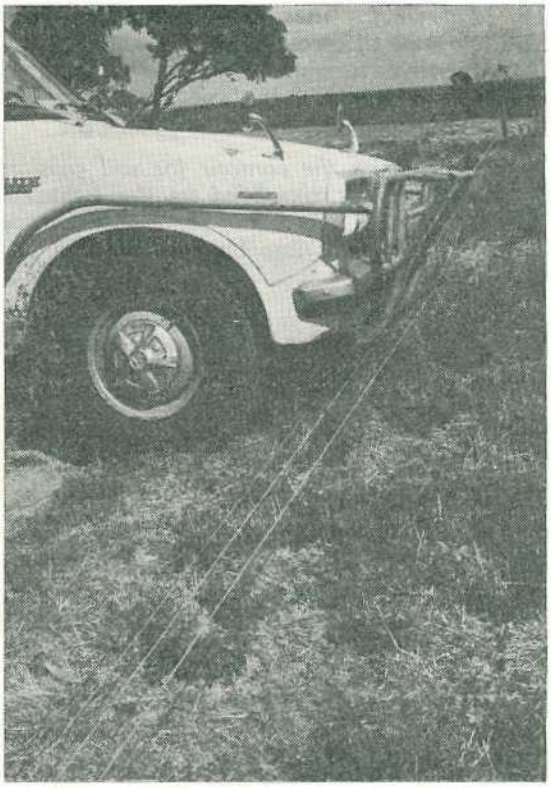


Photo. 9 Top Left: Mr. Robert Rymill, Penola Station, South Australia, uses his gumboots to ground the wires while he crosses on motor bike. Where battens are used, the bikes are put over at the batten. (Paragraph 17).

Photo. 10 Top right: This angled bull bar is used to flatten the fence at almost any point on Exmoor Station, South Australia. To avoid the wire becoming caught on the back springs, an inverted spring leaf is attached underneath the vehicle on each side in front of the rear spring. Paragraph 17).

Photo. 11 Bottom left: This electric fence was part of 16 kilometres which involved 4 000 split ironbark posts which were untreated. As the fence in the Goomeri district has proved satisfactory over a number of years it provides practical evidence that high density timbers such as ironbark do not require treatment nor insulators, under normal circumstances. (Paragraph 26).

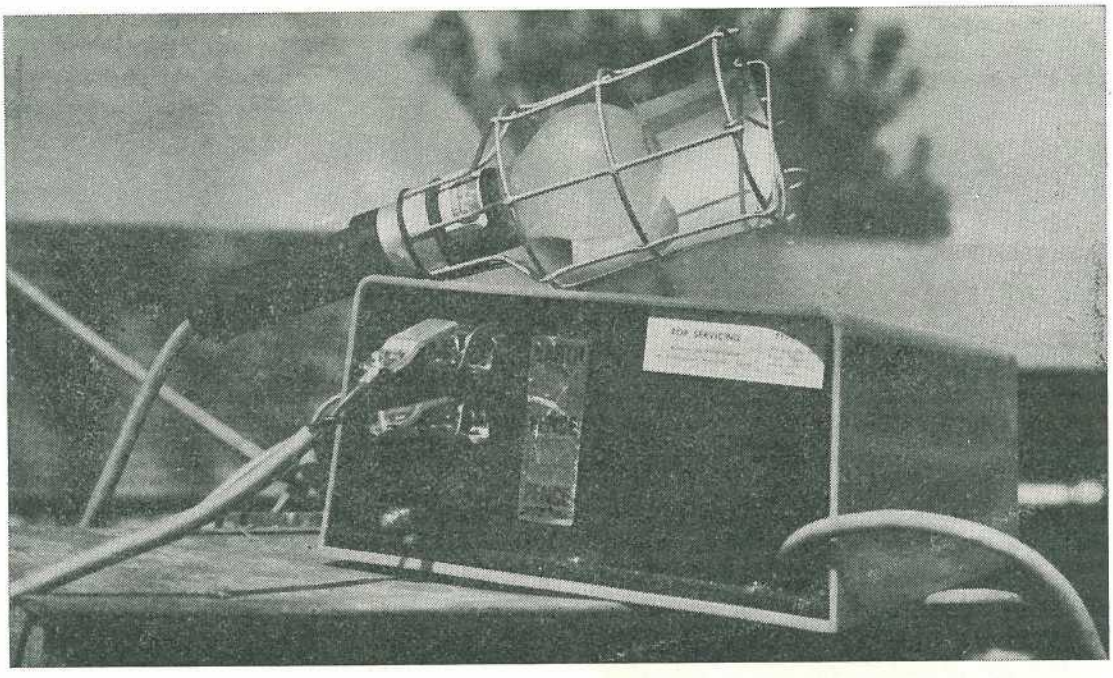


Photo. 12 The highest powered energisers such as this one will flash a 240 volt, 150 watt globe. This test of output gives a basis of comparison. Units which will flash a 25 watt bulb have proved satisfactory for 10 to 15 kilometres of fencing. (Paragraph 51).

29. If untreated hardwood is decided against, hardwood treated with creosote under pressure can be purchased. Droppers (38 mm x 25 mm), running posts (48 mm x 38 mm) and round posts are available in Toowoomba. Untreated ironbark posts pointed and bored are available at Toowoomba and Chinchilla.

30. The next choice would be creosoted pine. This is used extensively in the south—mainly because there is no ready access to sufficient quantities of high density hardwoods. (**Photo 21).** Copper, chrome, arsenic (CCA) treated posts do not compare with untreated hardwood or creosoted timber because the salt in the treatment is a conductor of electricity.

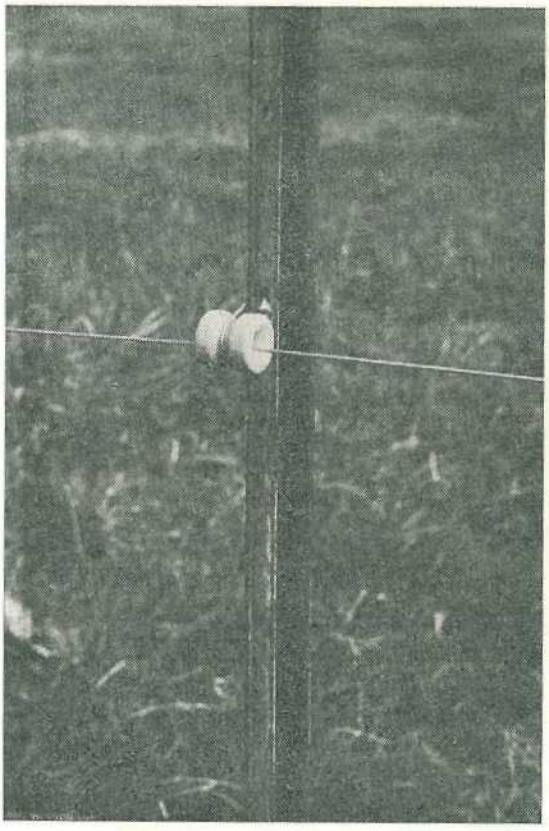
31. Steel posts have many advantages but their high conductivity sends any electric current direct to earth when touched by a live wire. Where length of fences are great this is a risk that is best avoided. Also, steel posts are over three times the price of hardwood running posts.

32. Where especially moist circumstances apply as in wet coastal areas, slit nylon sleeves can be used where tie-ons are made to droppers and posts though sleeves encourage rust.

33. The producer who goes to buy insulators could easily be bewildered by the limitless array of plastic and polythene insulators. Although the artistry of some is worthy of a prize, porcelain is still the best.

34. Where a live wire is passed underground, such as at a conventional gateway, the wire should be thickly insulated—preferably galvanised and encased in plastic garden hose or 12 mm ($\frac{1}{2}$") polythene pipe.

35. Care in insulation is critical though it will be appreciated that more attention will be required under moist conditions than say in the dry inland. Also, where long lengths of fenceline—say 30 km—are run off the one high powered energiser in high rainfall areas the compounding effect of imperfect insulators could well justify more care with droppers and posts. In such cases any tying of wires to droppers and posts should be no tighter than necessary as subsurface moisture of posts and droppers may be contacted. Loose tying also permits wires to run—increasing elasticity.



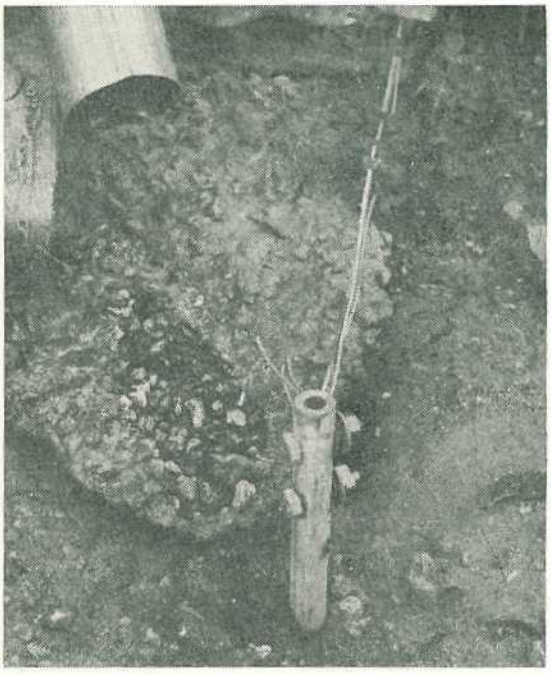


Photo. 13 Top left: This 30 mm (1¼") diameter porcelain insulator with prefabricated wire clip and bolt have proved satisfactory where steel posts have to be used. (Paragraph 37).

Photo. 14 Top right: An effective earth is essential. The casing for a bore makes an excellent earth. The galvanised pipe in the photo has been driven 2 metres into the ground at a permanently moist spot, and is connected by wire to the energiser's earth terminal. (Paragraph 41).

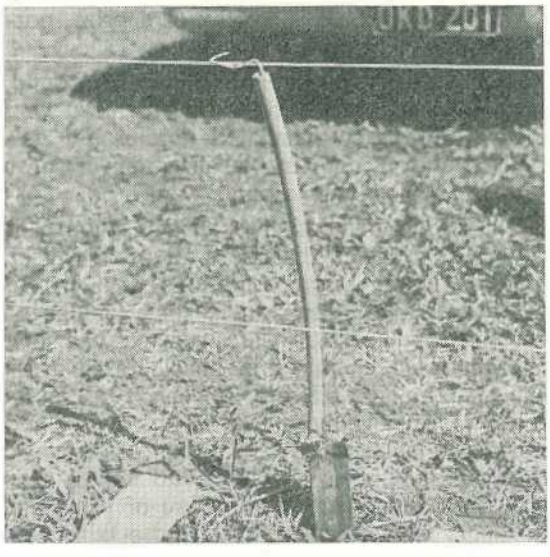


Photo. 15 Bottom left: The earth wire is made effective by firmly tying to unpainted steel posts. A sleeve of garden hose insulates the connecting wire from the bottom live wire. Steel posts are driven in full length about every kilometre. Use galvanised post or pipe in ground when steel posts rust or corrode quickly. (Paragraph 42).

36. Staples should be used sparingly as staples can cause splitting of timber and so protect moist areas.

37. Where steel star posts are used, the best insulator in terms of a combination of cost and effectiveness is a porcelain bobbin 30 mm (1¼") in diameter which is threaded onto the wire and attached by a simple prefabricated clip that is bolted to a hole in the post. Where the wires have been already run, a special porcelain insulator can be bolted to the post and the run wires inserted. (**Photo 13**).

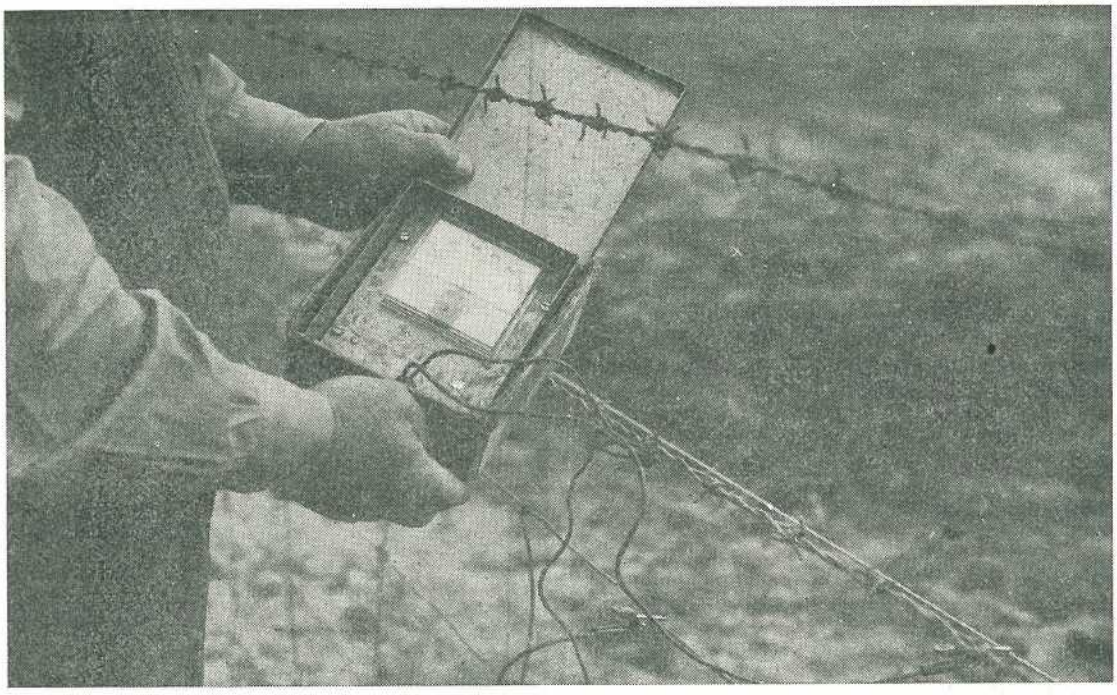


Photo. 16 This voltmeter will tell immediately if there is a power leakage on the fence line. The voltage drops between the energiser and the fault but after the fault it remains constant. This will enable the operator to tell whether the fault is between him and the energiser or whether the test is being made between the fault and the energiser. (Paragraph 61).

38. Loose wires or pieces of wire lying about should be continually guarded against.

Connections

39. These should be firm yet not conducive to rust or corrosion. As galvanised high tensile wire is recommended for electric fences, the rule should be 'connect galvanised to galvanised'. It is now possible to buy galvanised insulated wire. This means that this can be directly connected to the energiser terminal. The connection to the fence wire can be made effectively by a galvanised high tensile spiral (or curl-on terminator). This spiral has a galvanised bolt at one end to connect to the insulated galvanised wire and contact on the fence line is made by virtue of the pressure from the spiralled high tensile design. If simply using a length of high tensile wire for a connection, be sure that the contact points are firm. This can be achieved by using garden hose over the connecting wire which can be firmly secured as illustrated.

40. Wrapping any wire round and round looks neat but invites rust. Initial attention to good connection points could avoid hours of fault finding over the years.

Earthing

41. The principle of the electric shock is based on the animal completing the circuit from the live wire to earth. The earth terminal on the energiser is connected by wire to a permanently moist area. The ground casing of a bore or a 2 metre galvanised stake or pipe driven full length into a moist area will be effective where the connections are well made. When the animal is standing on moist ground, it will receive the full effect of the shock when it touches the live wire. **(Photo 14)**.

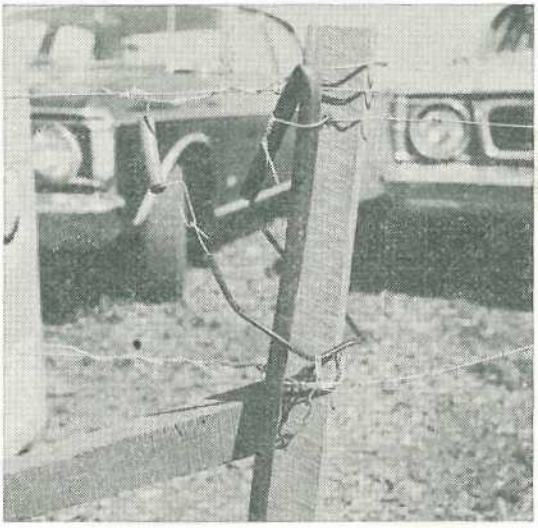


Photo. 17 Cheap, yet effective cut out. High tensile 1·6 gauge wire is connected to the top wire and shaped to keep plastic grip in place and with the hook at the end. Insulated galvanised wire carries power from under the gateway. Both wires can be handled when live. Firmness of contact is maintained by tying insulated galvanised wire down to earth wire. (Paragraph 48).

Photo. 18 This energiser has been set up in a control box designed by Mr. Robert Rymill of Penola Station. An energiser, centrally situated with cut out switches and a voltmeter enables the operator to quickly identify the section of fence in which the fault exists. (Paragraph 47). See also Photo No. 50.

Photo. 19 This wind charger has kept a 12 volt battery effective for 3 years on Exmoor Station. A 12 volt car battery will keep 12–15 kilometres of fence electrified for 2–3 weeks with an energiser that gives a good spark. (Paragraph 55).

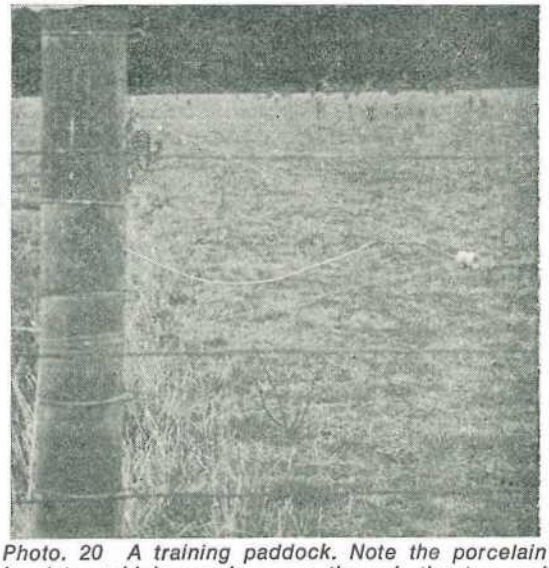


Photo. 20 A training paddock. Note the porcelain insulator which can be seen through the top and second top wires of the conventional fence. The live wire is run inside the paddock at a distance of about 800 mm above the ground and 800 mm in from the conventional fence. (Paragraph 75).

42. In most of Queensland, the ground develops a dry insulating surface for several months of the year. This dry surface can render the electric fence ineffective unless at least one of the wires in the fence is in contact with subsurface moisture. In some cases, this is done by connecting the earth wire or wires to the moist ground by means of steel stakes driven 2 metres into the ground at intervals of about one kilometre. (**Photo 15**). Where steel posts are used in the fence itself, these alone will commonly provide sufficient earth contact for the earth wires. Sandy soils are more insulating than clay soils.

43. In many cases an earth wire is run continuously throughout the total electric fence system, having contact with the energiser and the earth electrode to which the energiser's earth terminal is connected. The effectiveness of the earth wire can be tested by connecting it and a live wire to a voltmeter or even by seeing what sort of spark can be produced between the two wires. Where 2 earth wires are used, these should of course be connected. Take care to connect them with insulated wire so as to avoid shorting out against live wires.

44. When the animal makes contact with both the live wire and the earth wire, it completes the circuit and gets the full jolt of the 4 500 volts or so. Experienced users of an electric fence under dry conditions appreciate that taking much care with the earth return wire is a priority.

45. Where moist conditions prevail, the ground will provide a sufficient earth contact for the animal. In such cases, it is best to have all of the wires in the fence electrified or at least insulated as this eliminates the short circuit which occurs when the live wire makes contact with an earthed wire.

46. Touching the live wire with a piece of green grass will usually give a small bearable shock but if the earth wire is well earthed, grabbing it with the other hand will result in a much bigger shock through the grass contact. When earthing is not effective, holding the earth wire with one hand and pressing firmly on the ground with the other hand will result in a small shock.

Cut out points

47. Troubles can be best traced if the various electrified sections radiate from the energiser and each line in turn can be disconnected. Some properties use D.C. Ring Grip switches costing about $2.00. These have a much wider gap than modern 240 volt household switches. The spiral terminators are sufficient—provided of course that you earth out the live wires before handling the terminator. Where connection is made by hooking on wire, be sure that the contact is firm and secure. Control boxes with several switches can be purchased. **(Photos. 7 and 18).**

48. At fence line junctions and every kilometre or so along a straight line, a cut out point will aid in locating where a fault lies. Cut outs are also made from fuse plugs but the type used may depend on the cost. Insulated wire that is hooked at each end has been used effectively. (**Photo 17**). The wire should be galvanised to avoid corrosion.

Energiser

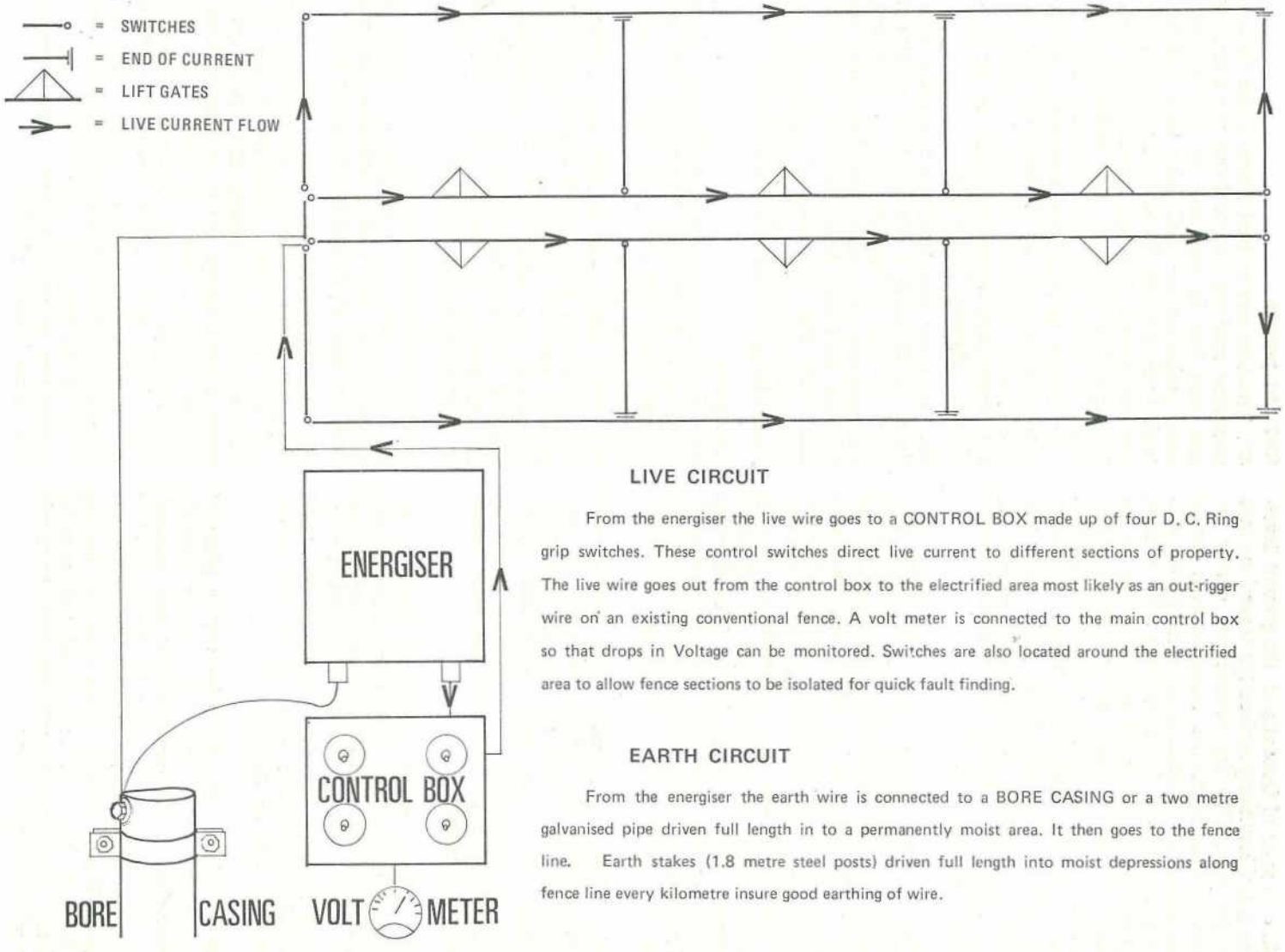
49. The high voltage low impedence energisers range up to 5 000 volts. The mains units are plugged into a 240 volt system with an ordinary three-point plug.

50. High voltage, in practical terms, means that there is a build up of a high electrical pressure and 'low impedance' means that the electrified wire will stand a considerable quantity of green vegetation on it before it fails to produce an effective pulse at the end of several kilometres of fence.

Comparing Energiser Output

51. Many energisers will give a reading of around 5 000 volts with a voltmeter, but this does not give an indication of current flow.

52. The highest powered units allowed under safety regulations will flash a 150 watt, 240 volt light globe when connected to the live and earth terminals. (**Photo 12**). These energisers should charge 30 to 40 km of fence. Smaller powered units will flash a 25 watt bulb and give a weaker flash with a 40 watt globe. These will energise about 15 to 25 km of fenceline—depending largely on the efficiency of the insulation; the gauge and condition of the wire and whether the fence is in a long line or radiates from a central point. The latter is more efficient.



LIVE CIRCUIT

From the energiser the live wire goes to a CONTROL BOX made up of four D. C. Ring grip switches. These control switches direct live current to different sections of property. The live wire goes out from the control box to the electrified area most likely as an out-rigger wire on an existing conventional fence. A volt meter is connected to the main control box so that drops in Voltage can be monitored. Switches are also located around the electrified area to allow fence sections to be isolated for quick fault finding.

EARTH CIRCUIT

From the energiser the earth wire is connected to a BORE CASING or a two metre galvanised pipe driven full length in to a permanently moist area. It then goes to the fence line. Earth stakes (1.8 metre steel posts) driven full length into moist depressions along fence line every kilometre insure good earthing of wire.

53. Under ideal conditions, energisers may prove to be effective over greater distances than have been indicated here. The use, however, of more than one energiser over long distances may amount to a cost of less than ten dollars per kilometre and at the same time a fault on one line of fence will still mean that fences energised by the other unit will not be affected by the short.

54. The cost of electricity for a mains powered energiser is usually less than 10 cents per week when the energiser is run continuously.

55. Some makers produce a high voltage —low impedance energiser that is powered by a 12 volt car battery. Units which will flick a 40 watt globe will energise up to about 15 km of fence. The batteries need to be changed every two or three weeks. One property, Exmoor, in South Australia, powers the battery with a wind generator. **(Photo. 19).**

56. The two most common brands of high powered energisers used in Queensland are imported from New Zealand where the mains type high powered permanent electric fencing system originated.

57. Some Energisers available in Queensland with their input power ratings are:

High Powered (Mains)	Input Rating
Gallagher BEV11	17 watts
Waikato E/4	20 watts
Medium Powered (Mains)	
Electra 240	5 watts
Waikato E/3	5 watts

Battery Operated Units

58. The Gallagher SB 24–32 volt unit will give the same output as the high powered mains units though, because it draws 300–400 mA. It is only suitable when the batteries are consistently being charged such as with a 32 volt lighting plant.

59. The Gallagher E12 runs from a 12 volt battery drawing 100–150 mA. Another fairly commonly used unit is the Electra HV12 volt which draws 60 mA. In addition to these commonly marketed energisers, there are many others.

60. Most energisers of the modern type fell within the price range of $90 to $145 in October, 1976. The input power rating while being a general guide to the current output, is not necessarily exactly relative.

Testing for faults

61. Testing is best done with a voltmeter, **(Photo. 16).** There are some on the market which cost less than forty dollars. Cheaper testers can be purchased to indicate the relative shockability of the fence.

62. If caught out on the fence line without a voltmeter, you can still test for the pressure of current by connecting any piece of wire with the earth wire and then hold the wire very close to the live wire to see if there is a spark. A piece of green grass held by the hand on the live wire will also indicate if there is any current. With experience, an operator will get a fair idea of the degree of electricity leakage by the size of the spark.

63. When there is a short on the line the voltage continues to drop from the energiser to the short. After the short, the voltage is either zero or constant. *It is a sound plan to have a voltmeter available at the energiser and to develop the routine of a daily check.* Most energisers flash a built-in light with each pulse to indicate that the fence is alive. Provided it is carefully treated a voltmeter can also be carried on a motor bike or in a vehicle as a standard piece of equipment.

64. Well over 90% of weak shocks result from shorting out, poor connections or a poor earthing system. Rarely is the energiser at fault and this can always be tested by disconnecting the fence and testing the energiser at its terminals.

65. The experiences of southern cattle and sheep men is that they might have a fault in the fence at the rate of one a week to one in three months. A number of these were caused by wires crossing after a motor bike or vehicle had crossed over the fence.

66. The time taken to find a fault usually varied between five and thirty minutes. Gathering up stray pieces of wire and tightening loose wires will reduce faults considerably. Quick location of faults depends much on the basic layout of the total fencing system. Ideally the energiser would be near the house in the middle of the property with the sections radiating out—perhaps in four or more sections. If the daily check at the energiser indicates a loss in voltage, the fault can then be systematically and speedily located.

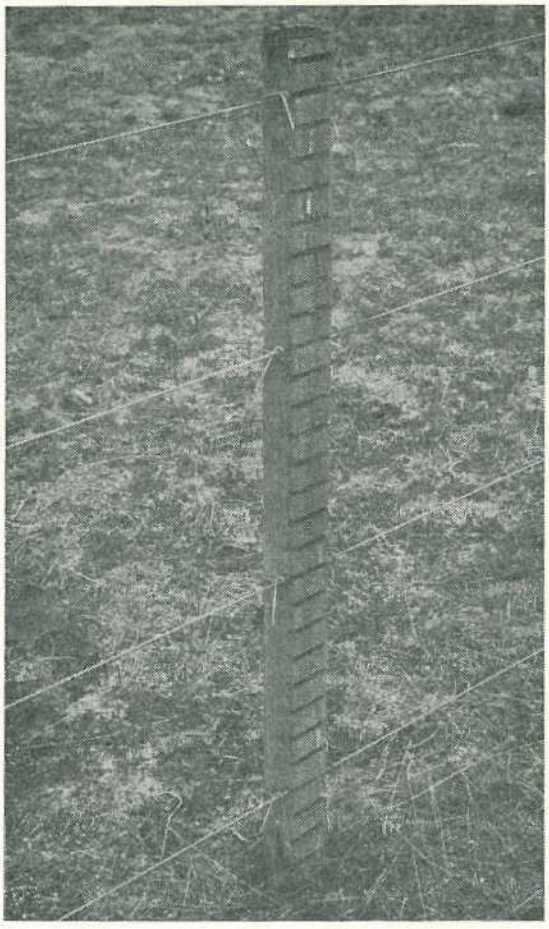


Photo. 21 This easyset post is the standard permanent electric fence running post in western Victoria and south-east South Australia. The post is made of semi-dense hardwood, is multi-grooved and creosoted. Its measurement is 50 mm x 37 mm x 1 350 mm (2" x 1½" x 4'6"). It is driven in the ground 450 mm so as to be 900 mm (36") above ground level. The wires on both this and the droppers (or battens) are wired with G4P clips. High density hardwood such as ironbark does not need to be creosoted and can be bored so as to attach the wires to the post with tie wire. (Paragraphs 29, 110–117).

67. By switching each section off in turn, the section on which the fault exists can be identified. This is because the voltage will pick up immediately the faulty line is switched off. Whilst a voltmeter is ideal for checking voltage drop, the cheaper indicators can be used. Some producers tell by the intensity of the flashing light on the energiser or by the sound of the energiser as to whether there is any appreciable leakage.

68. After the section of fence has been identified, it is then a matter of having it switched on and going along to that section and switching each sub-section off at junctions and then follow along the line which continues to show a leakage as shown by the indicator or by a weak spark. A piece of wire held onto the earth wire and held close to the live wire, will show a spark without giving a shock. Mr. E. Wark of Tingha, N.S.W., uses a carpenter's pencil for this purpose.

69. Once the sub-section is located, it is a matter of finding the fault in that section. Where lines of electric fence are several kilometres long, it would be wise to keep sections between junctions to 1 kilometre or less.

70. Some basic planning before electrifying will reduce to a minimum the loss of time in fault finding. When handling wires, the connecting of the live and earth wires will short out the whole fence and so prevent shocks.

Stockmanship

71. For a stockman to appreciate an electric fence it is necessary that he attempts to see the fence from the animal's point of view. The whole system is built on the animal's respect for the fence. This respect is created by the animal associating the wire with an overwhelming, unpleasant shock to his system. This means he must experience at least one shock, and preferably by a gentle touch, so that he mentally registers exactly what he did to receive the shock. If the shock is a sizeable one, you can be sure that he will aim at avoiding the fence while memory lasts.

72. Many southern properties take no particular pains in educating the cattle to permanent electric fencing except to have fresh uneducated cattle drifting into a paddock rather than rushing in. With the low fences, which are becoming commonplace in the south, new cattle should not have any attraction across the fence, such as other cattle, otherwise the uninitiated cattle are likely to run across the fence and have too much momentum for the pulse to stop them.

73. A sound idea is to have a small but substantial holding paddock adjoining the yard where cattle enter the property. This could be a 5 wire fence with 3 live wires. A conventional fence with an offset live wire will usually do. Spreading some hay around the fence will ensure fence contact by cattle and so develop a respect for other wire barriers.

74. Most users of electric fences have no complaints about stock getting through fences. It is, however, often necessary to put a live wire across conventional gates as they can be worn out by rubbing.

75. Some cattlemen have a live wire in a small paddock about ·6 metres inside a conventional fence and this is used to educate weaners and new cattle. An offset wire on a conventional fence is ideal. **(Photos 20 and 33).**

76. Sheepmen say that sheep are best taught to have respect for the fence as lambs when they have little wool to insulate them. Otherwise sheep can be educated when they are freshly off-shears.

77. Cattlemen will realise that at times when a beast is in a frenzy, it may blindly attack any barrier. In these circumstances it could be argued that a low, elastic fence with no barbs is the one which is more likely to remain undamaged from such an animal.

78. Where animals are so frightened that it is difficult to get them through a gateway, they can be conditioned by leaving the gate in the open position and spreading some hay on either side of the opening.

79. While the electric shock is painful, the animal quickly recovers—far quicker than if it were ripped by barb wire.

Photo. 22 A 50 x 50 x 1 500 mm ironbark post with angled ironbark stay makes a suitable strainer when stayed with a piece of 50 x 50 x 1 800 mm. The stay is best attached to post and peg by boring each end and inserting 100 mm lengths of ⅜" steel rod at each end which are inserted into the post and peg respectively. The top of the peg is driven to ground level. (Paragraphs 111 and 113).

Photo. 23 This 75 x 75 x 1 500 mm ironbark corner post in clay and loam soils is more effective if stayed on the inside in a similar manner to the strainer in Photo 22. Wires are loosely stapled to the post to allow lateral movement when tension is applied to the wire. When driven the post remains 900 mm (36") out of the ground. (Paragraph 108).

Uses and erection of electric fences

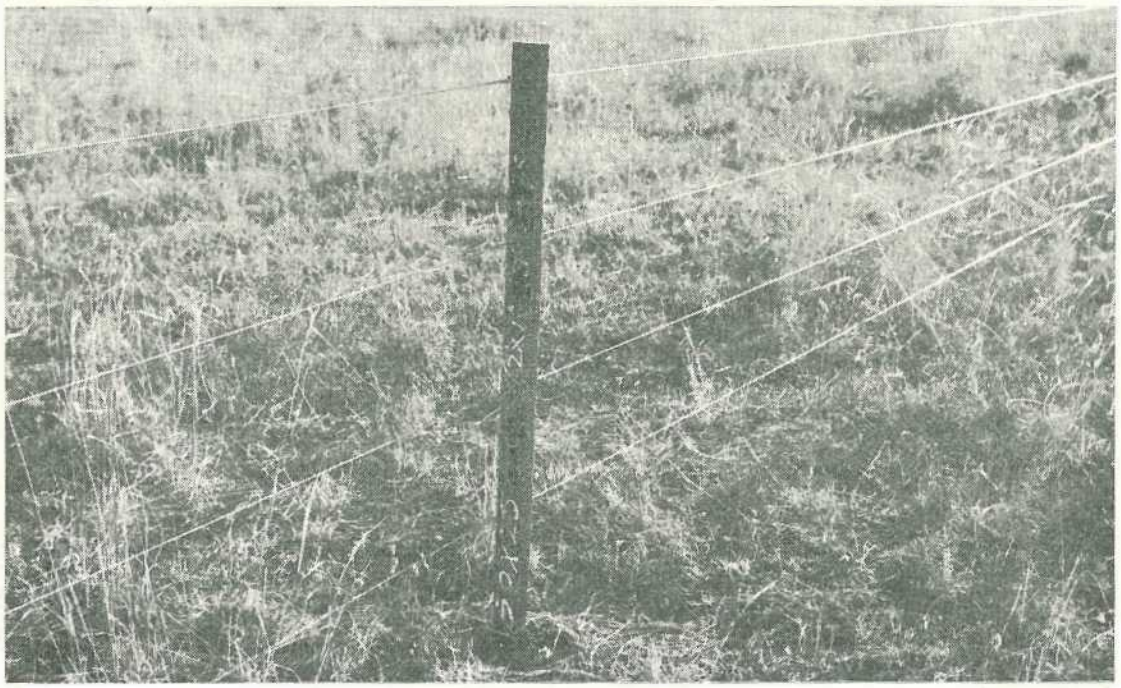
Existing fences improved

80. Existing fences on a property can be far more effective if they are upgraded by running a live wire along them. This will result in longer fence life as physical pressures such as rubbing and pushing through the fence come to an immediate end. This running of a live wire along an existing fence is also an ideal method of taking the power from your energiser to an outlying area which requires electrified subdivision. Where conventional fences that are in a state of disrepair are to be upgraded, loose wires must be eliminated. Otherwise they will cause constant earthing-out problems. **(Photos. 4, 5, 6, 32, 33).**

81. There are several methods of running an outrigger along existing fences. They include—

(i) a 'V' shaped heavy high tensile wire which has a porcelain insulator at its angle and the ends of the V's legs are bent so as to attach to two wires of the existing fence. Usually such a wire should be about ·8 metres

Photo. 24 A 50 x 25 x 1 350 mm (2" x 1" x 4'6") ironbark running post. It is pointed and bored. Spacings from the top, in imperial measurements, are 2", 10", 9", 8" and 7" The fourth wire is for sheep. Distances between posts are from 14 to 20 metres. (Paragraph 102).



above ground level. If the wire droppers that are used for suspension fences are on hand, these can be bent to hold the insulators in a similar way. **(Photo. 5).**

82. (ii) Where wooden or steel posts are in the fence a hardwood batten about 400 millimetres long with a hole bored in each end and two holes bored close to the centre can be tied on every 30 metres with soft wire. It is often preferable to run a live wire on each side of such a fence. When all posts in the fence are hardwood, it could be preferable to energise one of the wires that is already in the fence.

83. (iii) In some circumstances it could be just as cheap and effective to support the wire on 50 mm x 25 mm hardwood posts driven in every 30 metres, or at more frequent intervals where the country is hilly or undulating. This live wire would be offset from the fence by about 200 mm.

Photo. 25 Mr. R. Pontifex, Biddeston, with a post driver made from bore casing. (Paragraph 114).

84. (iv) Two wooden battens bored at each end can have the offset wire running through the holes at one end while the other ends form the legs of the V and are wired to the wire on opposite sides of a post. A Y offset can be made by shortening one of the battens and bolting them.

Paddock layout

85. Thought should be given to fencing the property in a way which will best fit management of feed, handling of cattle, avoid soil erosion and allow ready tracing of faults.

86. Special consideration should be given to labour saving lanes. Narrow lanes are a problem as they can result in worn, overstocked and overtrampled areas which encourage weed growth and erosion. Also, when driving cattle along there may need to be sufficient width to allow the musterer to overtake the stock when necessary.

87. If lanes are about 50 metres or more wide they can also be used as paddocks.

88. Offset, lift-gates, or electrified cocky gates, because they are cheap and effective, can be placed wherever they are required.

Fence design

89. The effect that the electric fence has on livestock is the real test as to whether it is stockproof or not. At one watering point on Exmoor Station, South Australia which runs 2 000 cattle and 19 000 sheep, the fences came to an acute angle with the top wire being as low as 650 mm (25″) above ground level. The Shorthorn cows in this paddock had made no attempt to go over the fence in the few weeks that they had been there—even though feed was in short supply. This situation was quite normal in the extensive experience of the manager, Mr. J. Rose. **(Photo. 1).**

90. When you see this type of scene repeated many times under different circumstances and hear the evidence from cattlemen who have used electric fences successfully for years, you have strong reason to believe that the principle of operation is quite different to that of a conventional fence. **(Photo. 8).**

91. Nevertheless it is understandable that Queenslanders, used to 1·2 metre (46″) top wires will find an 850 mm (34″) fence almost unthinkable. If, however, the cattleman is interested in cutting fencing costs by more than half, this should provide sufficient incentive to try a small section of low electric fence to prove to himself its effectiveness or otherwise.

92. The main reasons for the low cost of the electric fence are that the posts are lighter and fewer, the wires are plain and fewer in number and the lighter strain on the wires does away for the need for costly strainer assemblies.

93. If a beast is being chased at the gallop, the electric fence is unlikely to stop him. On the other hand if cattle are rushed over a light elastic fence, the time and cost of repairing the fence is likely to be much less than a tightly strained conventional fence that is hit by a mob at the gallop.

Photo. 26 A Piesse Pylola is used for putting down pilot holes for posts. The diamond point is rammed down in post driver fashion. Two bolts near the bottom of the handles act as stops so that when bumping the bar upwards out of the hole, the bolts contact the head of the bar which slides inside the hollow section. The ledge can be used for driving running posts though close fitting drivers allow better control of the post. (Paragraph 114).

Type of wire

94. For long distances of fence, say over 10 kilometres, the best wire to use is 2·50 mm (12½ gauge) plain, high tensile, heavy galvanised with a breaking strain of 390 kg (850 lb.). This wire is marketed in Australia by Australian Wire Industries as Flexabel Heavy Galvanised. In September, 1976, the price in Brisbane for this product was $31.90 per 1 500 metre coil. The same wire in Standard galvanised was priced at $25.40. The heavy galvanising is considered by the manufacturers to give at least three times the life of the standard galvanising under average conditions. 2·50 mm gauge is the most efficient gauge for carrying current. Though it requires heavier staining than smaller gauges, it is stronger and can be seen more easily by stock. This can be an important point where paddocks are bigger and cattle are not as familiar with the placement of fences as those in smaller paddocks.

95. Many producers have used 1·80 mm (15 gauge) successfully though it has double the resistance to 2·50 mm wire. 1·6 mm (16 gauge) wire is only sold in the heavy galvanised form. While it is more difficult to see, it is very cheap, easy to handle when erecting the fence and is so light that it can be strained up by hand. A 50 kg coil of this wire cost $34.55 in Brisbane at September, 1976, and contained 3 040 metres or sufficient to build a kilometre of three wire fence.

96. Barb wire is not as efficient with electricity nor as easy to handle but apart from that, it could prove unpleasant to an animal or human who became caught in the fence and sustained a series of shocks.

97. High tensile wire is easily kinked when running it out from the coil. For this reason it is best run with the aid of a spinner. A suitable method is to tie the wire to the strainer post and place the spinner and wire on a carry-all or vehicle. Every effort should be made to keep joins to a minimum—thus reducing the possibility of hooked wires.

98. Mr. H. Beasley, Chinchilla, has made a simple but effective wire spinner from two one metre lengths of 75 mm x 50 mm hardwood. These are both joggled at their centres so as to form a cross. A hole is bored through the intersection sufficient to take a 1 metre

length of steel rod 20 mm in diameter. The cross is placed on a plough disc (convex side up) which in turn sits on a car wheel. The wire coil is held in place on the cross by 4 upright steel lengths about 10 mm in diameter, which fit the inside diameter of the coil. The spinner is anchored by driving the length of steel rod through the holes of the cross, disc and wheel and into the ground. **(Photo. 35).** Alternatively the spinner could be anchored to the vehicle or carry-all and the wire unwound from the coil as it travelled along the fenceline.

Photo. 27 This "Piesse Pylola" is a combined crowbar and post driver. The crowbar slides inside the pipe until it hits solid metal—driving the bar into the ground. Then, to drive an easyset post, the point of the bar is positioned 6 or 8 centimetres from the hole. The post is placed in the hole and driven by a metal plate which can be seen protruding near the operator's hands. The crowbar acts as a guide while the driving section is slid up and down the bar in order to drive the post. (Paragraph 114).

Number of wires and spacings

99. Of five leading properties using electric fencing that were visited in South Australia and Victoria, which ran both sheep and cattle, the highest top wire was 900 mm (36″) and the lowest top wire was 700 mm (28″). All properties had four wires and all ran both sheep and cattle. One manager with considerable experience had found that a three wire fence was adequate when cattle only were run.

100. When only cattle are being run, three wires are adequate. The top and bottom can be live with the centre wire earthed. This order can be reversed and could enable a longer length of fence to be energised. When a body of lush pasture growth causes severe leakage of current, only electrify the top one or two wires—depending on the height of the vegetation. With ironbark posts, the advantage of being able to electrify any wire readily is considerable.

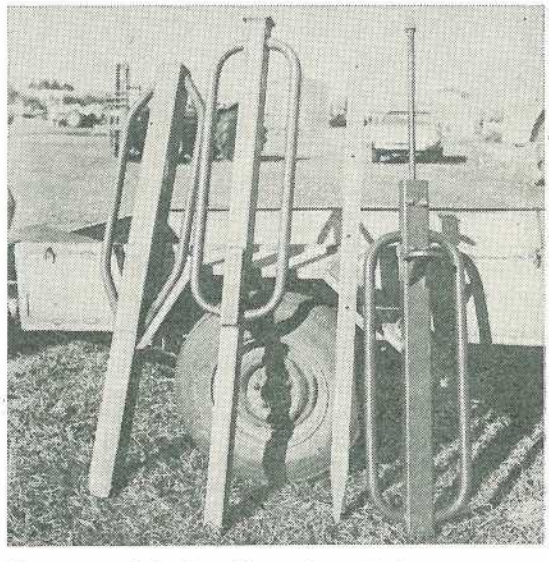


Photo. 28 Suitable drivers for milled posts shown with a Pylola. (Paragraph 114).

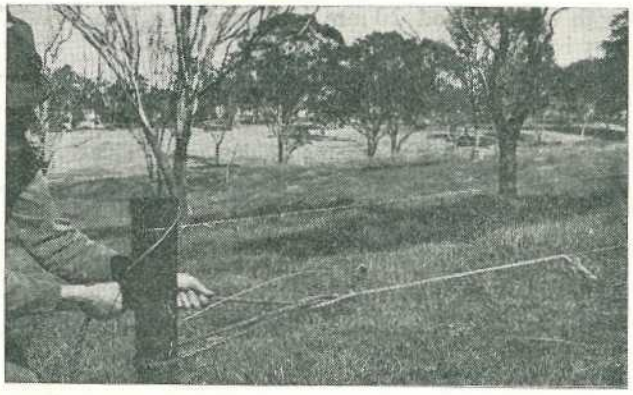


Photo. 29 This 7 metre length of 37 cm circumference rope will enable the operator to put over 90 kg (198 lb.) strain on a wire. About 500 mm of the end of the rope is wrapped around the wire so that the wire runs through the centre of the rope. (Paragraph 107).

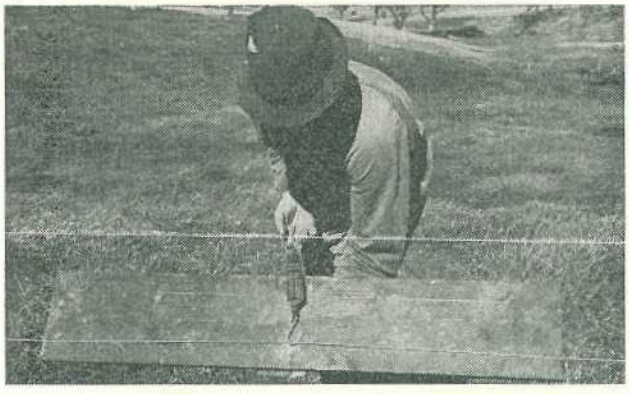


Photo. 30 This simple wire strain gauge can be constructed with a board, 3 nails and a spring scales. The two extreme nails are 1 000 mm apart and are placed below the wire. The centre nail is midway but offset by 15 mm. The weight required to pull the wire to touch the offset nail should be multiplied by 20, e.g. 4 kg on scales x 20 = 80 kg on the wire. (Paragraph 106).

Photo. 31 Though at least 2 wires (one earth and one live) are recommended, this single wire on flood flats at Ellangowan on the Condamine has effectively kept cattle out of crop for 15 months. (Paragraph 3).

101. With a four wire fence all spacings are about 200 mm (8″) and from the bottom, the wires are earth, live, earth, live. This has proved effective for cattle and crossbred and Merino sheep. In some cases the top spacing was 250 mm (10″).

102. With imperial measurements, a handy rule is to have posts out of the ground 36″. The top wire is 2″ from the top at 34″ then the spaces between wires from the top to the bottom are 10, 9, 8 (being to the fourth wire for sheep) and 7 to the ground. **(Photo. 24.)** In metric, these distances are post 900 mm above ground then holes at 850, 600, 375 and 175 mm (for sheep). Where sheep dogs are used, it is important that the bottom wire of the four wire fence always be earthed.

103. Some properties were set up so that all wires could be insulated from the ground. When the ground was damp all of the wires would be electrified and in this way there could be no short circuit between wires. When cattle are educated, two wire fences could prove adequate and where the ground provides an effective means of earthing. One wire has been used to hold cattle off crop, over a period of two years on the Downs.

Wire tension

104. Because the fence is a psychological rather than a physical barrier, it is not necessary to have any more tension than is necessary to avoid undue sag in the wires.

105. The tension on high tensile wire should vary according to the gauge used. The following tensions are suggested: 1·6 mm (16 gauge) 40 kg (90 lb.); 1·80 mm (15 gauge) 60 kg (132 lb.); and 2·50 mm (12½ gauge) 80 kg (176 lb.). Usually the tension drops lower than these figures without any sag in the wires being obvious.

106. These relatively light tensions which are less than half those in conventional fencing have the advantages of being easy to strain, putting far less pressure than normal on the strainer post and allow a much greater degree of elasticity in the wire. Much of the elasticity is lost from wire when it is overstrained. Wire tension meters can be bought. A simple one is illustrated. **(Photo. 30.)**

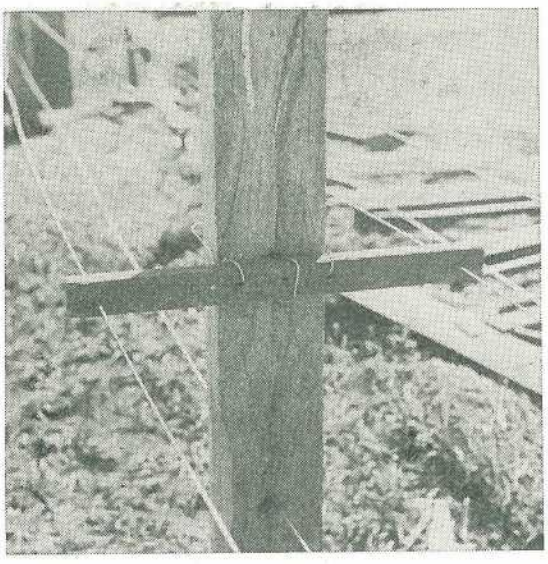


Photo. 32 A double sided offset ironbark batten, 38 x 25 x 500 mm (1½" x 1" x 20") is of best use for a fence in bad condition. (Paragraphs 7, 80).

107. Mr. Brian Baulch of Hawkesdale, Victoria, uses a 6 metre length of hemp rope of 37 mm (1½″) diameter. About ·5 metres of this rope is wrapped around the wire and by using a hay knot the wire can be strained to 110 kg before it slips. To wrap the rope around the wire, the rope is untwisted a little at a time (not unravelled) and allowed to twist back over the wire so that the wire is actually running through the centre of the rope. **(Photo. 29.)**

108. Where practicable, wire should be strained around corners. If a beast runs into the fence near such a corner, fence elasticity will minimize broken wires. With dense hardwood corner posts, run the wire outside and hold in position with 20 mm staples which are not driven fully home. This permits horizontal movement of the wire. Where insulators are necessary, use porcelain bobbins (50 mm) on the inside so that they act as pulleys. An unstayed corner post should be leant out about 7 degrees (175 mm with a 900 mm high post) and driven in ·6 metres in say black soil. **(Photos. 23 and 43.)**

Photo. 33 These two battens, 38 x 25 x 350 mm (1½" x 1" x 12") are for offsetting a wire. Another method is to have the battens unseparated by the post. Tie them together where they meet and tie on the running wire. Price is around 18 cents per pair. (Paragraphs 7, 80 and 84).

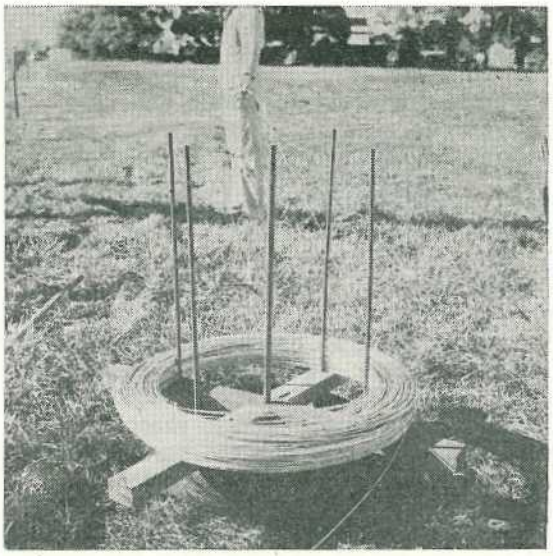


Photo. 35 A useful home-made wire spinner made from 2 pieces of timber 75 x 50 x 1110 mm (3" x 2" x 44"). Timber is joggled at point of intersection and bored to take metal axis rod. The cross sits on an old plough disc which in turn sits on a car wheel and tyre. (Paragraph 98).

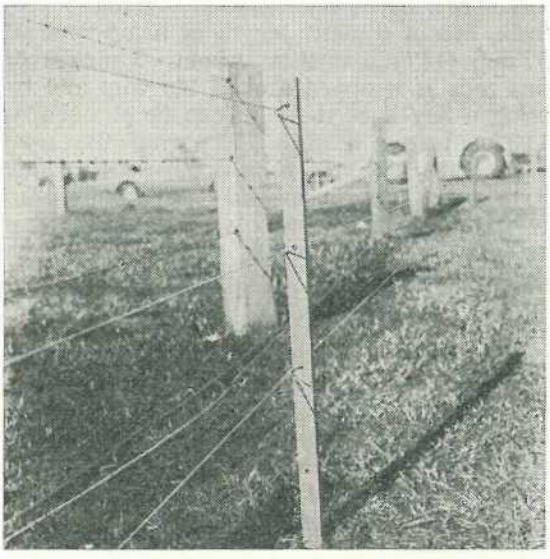


Photo. 34 A 38 x 25 x 90 mm dropper can be alternated between posts. The advantages are flexibility and lower cost while a disadvantage is that ironbark droppers are heavy and tend to lean over. Wires are tied to droppers with high tensile wire in a 180 degree turn so as to permit lateral movement of wire. (Paragraph 112).

109. Aim at as few knots as possible in the wire. A figure of eight makes a good join but avoid wrapping wires around wire as much as possible. Try to avoid crossing over fences in a vehicle where there are knots as these can cause the hooking of a live wire to an earth.

Posts and droppers

110. Because designs for electric fences are still in their infancy, we can expect to see many further developments over the next decade or so. There is good reason to believe that sawn ironbark posts and droppers, free of sap, in an untreated state will last for between 15 and 30 years—depending on the effect of country on the timber. In Toowoomba, half inch palings are still standing which were put in the ground 50 years ago.

111. At September, 1976, Hines & Sons Mill at Chinchilla and Standard Timbers' Harlaxton Mill at Toowoomba, expressed interest in supplying timber to suit the following requirements. Prices are subject to variation.

—	mm	Imperial	Pointed Bored	Price Range
End Strainer	50 x 50 x 1 500	2″ x 2″ x 5′	P	61–79 c
Stay for strainer	50 x 50 x 1 500	2″ x 2″ x 5′	..	55–76 c
Running Post	50 x 25 x 1 350	2″ x 1″ x 4′ 6″	P and B	38–39 c
Dropper	38 x 25 x 900	1½″ x 1″ x 36″	B	18 c
Unstayed Corner Post ..	75 x 75 x 1 500	3″ x 3″ x 5′	P	$1.60–$1.77
Stay Pegs	100 x 25 x 400	4″ x 1″ x 16″	P	28 c
Bed Battens	100 x 25 x 300	4″ x 1″ x 12″	..	20 c

112. Holes in posts and droppers are 8 mm (5/16). Wires are wired on to posts and droppers with only about half a turn so that wires will still run. Both droppers and posts stand with the broad edge at right angles to the fenceline. **(Photo. 34.)**

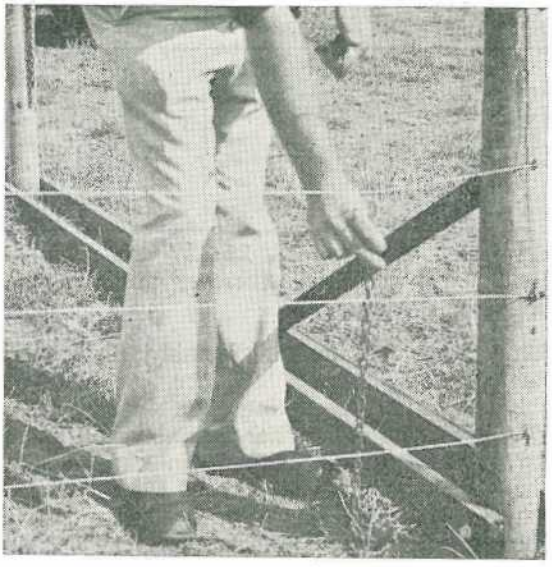
113. The strainer is driven with a 5 degree lean against the strain which is about 100 mm (4″) in a post which is ·9 metres above ground level. **(Photo. 22.)**

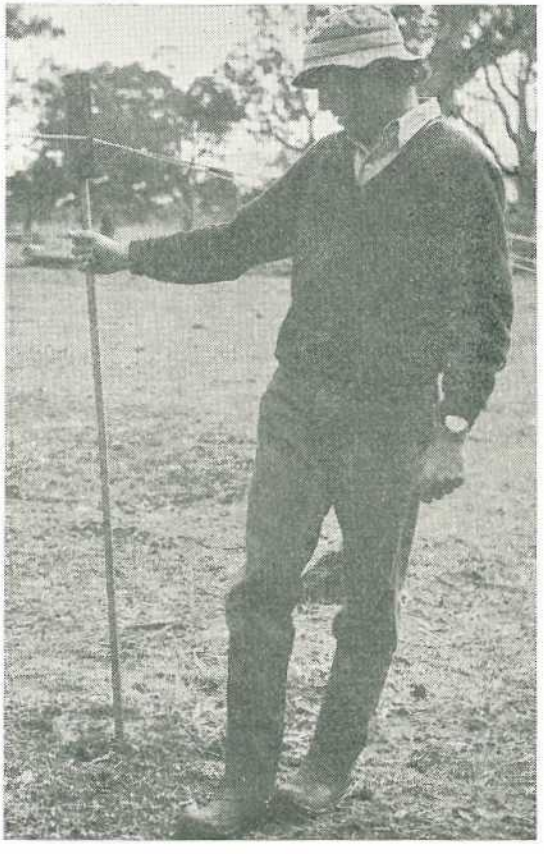
114. A Piesse Pylola (pictured) design is excellent for putting down a crow bar sized hole as a starter for the post driving. If holes are bored, they should always be smaller than the post so that the fit is a tight one. In most conditions, posts can be driven with hand drivers. **(Photos. 25, 26, 27 and 28.)** A Pylola will go down wherever an iron post could be driven.

115. With the strainer assembly, the stay is angled to the second top wire and fitted to the upright post by cutting out a small inverted '7'. This type of strainer assembly will stand up to 4 wires at 90 kg strain on each. If the ground is too soft to hold the strainer a stay holder can be driven down to give double the bearing surface at ground level.

116. Where a horizontal stay is required, the diagonal wire brace can cause a short circuit. If this brace is only one strand, it can be run through polythene for its length and so be kept insulated.

Photo. 36 Mr. E. Bullough manages 11 properties around the 90 mile Desert area. He is shown with a Read offset light gate which gives a gateway 4 metres high at the apex and allows stock to move under for a width of about 30 metres. (Paragraphs 17, 118).





117. Distances between posts and droppers will vary according to the lay of the country though 15 metre panels make a reasonable fence with alternations of running posts and droppers. Where more flexibility is required for running over the fence, 2 or 3 droppers in succession should be used. The above type of fence has a timber cost of about $20.00 per kilometre which is less than the cost of a single strainer assembly in some conventional fences.

Gates

118. A simple solution for a gate is to have a 'cocky gate'—being sure to have electrical and earth connections to the wires of the gate. **(Photo. 40).** All gateways should have an insulated wire (preferably galvanised) running through a length of polythene or garden hose in a 100 mm deep trench. **(Photos. 7 and 22).** This permits the current to flow without interruption when the gate is open. The Read Offset Lift Gate is the most common form of gate used in the south for allowing movement of stock from paddock to paddock. This is illustrated and consists of a piece of timber lying on the ground but holding the fence 3 or more metres off the existing fence line. The horizontal arm of timber is pivotted at a post which is in line with the rest of the fence. The fence is lifted through a quarter circle to the upright position. **(Photos. 36 and 37).**

119. Mr. Robert Rymill of Penola carries a slotted length of wood which is used to prop up the fence to allow stock to be moved. **(Photo. 38).**

120. In a normal fence where there is an offset electrified wire, this also should pass underground or overhead so that both sides of the fence remain alive when the gate is in the open position. A live wire can be placed parallel to a conventional gate. **(Photo. 39).**

Photo. 37 Above: This offset lift gate at Exmoor Station, Naracoorte is made of hardwood. It can be lifted open or closed with finger tip pressure. The gate pivots on the post that is behind the operator. (Paragraphs 17, 118).

Photo. 38 Below: A low cost mobile "gate". Mr. Robert Rymill of Penola Station lifts the fence for stock to walk under. If left open, the wooden head of the lift can have a separate slot for each wire and so avoid earthing out. (Paragraphs 17, 119).

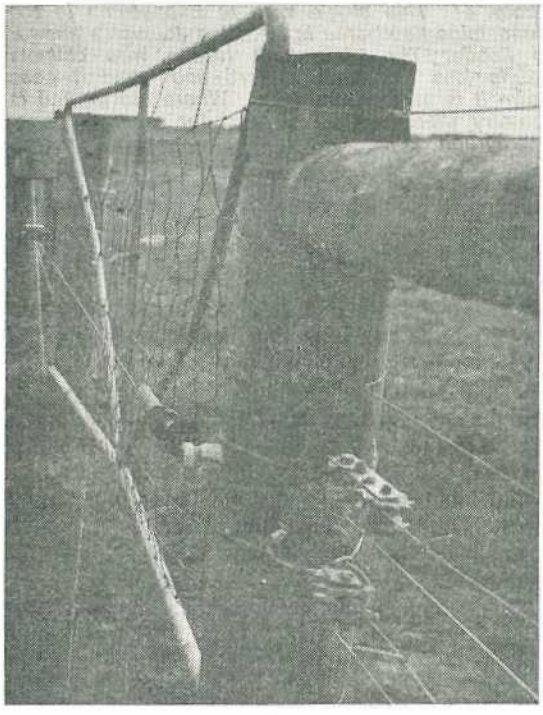
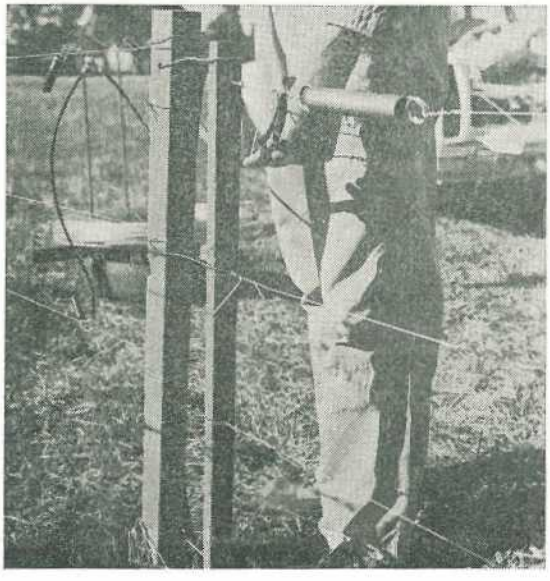


Photo. 39 Above: A live wire across a conventional gateway prevents cattle rubbing on the gate. (Paragraph 120).

Photo. 40 Below: This cocky gate is energised by a piece of high tensile wire running through a piece of 12 mm polythene. The connection or 'switch' is held firmly in position by a wire tied lower down on the post. The tent spring prevents sagging. (Paragraph 118).



Riding and driving over

121. Where motor bikes are used the front wheel of the bike is manoeuvred onto the lower end of a dropper. The fence will then lie flat under pressure and spring back to normal once the back wheel his passed over.

Vehicles used for driving over fences should be equipped with an angled bull-bar which pushes the fence over. Some vehicles have two lengths of galvanised pipe attached underneath the vehicle so that the fence wires will not catch. One vehicle used an inverted spring leaf that was attached just in front of the vehicle's rear springs and this prevented the wires from being caught underneath.

123. On one property, the driver put the vehicle into low gear and allowed it to keep moving while he hopped out and stood on the fence and then got back into the vehicle after it had passed over. He was feeding hay and had much less trouble than is normally the case when going through a normal gateway with hungry cattle following.

Fences in flooded areas

124. The perfect answers to flood fences and flood crossings have not been found. Some floods have relatively clear and slow-moving water. In other circumstances there may be heaps of debris and big logs dragging along the ground which can ruin a crossing that lies on the ground.

125. It is certain that plain high tensile wire catches far less debris than other wire so it will often stand where others go over. When it does go down it is much easier to free than, say, barb or netting.

126. There are two possibilities for flood crossings. Droppers in the fence line can be anchored from the bottom to a solid post but tied lightly at the top so that the fence can go down under flood pressure but remain anchored. This method, however, is of restricted advantage where dragging logs are concerned. It could be best to allow for the wires to wash down but have an electrified aerial wire carrying the power across to the other side. Mr. R. L. Piesse recommends a crossing that will disconnect up on the bank when under pressure and this will avoid shorting out of the fence line.

Photo. 41 This single wire at Ellangowan in the Condamine flood area is Mr. Glen Joppich's answer to floods. The plain high tensile wire collects debris less readily than barb and when it goes down it is easier to re-erect. Where the ground is too dry there will be a need for an earth wire. (Paragraph 28).

127. In broad flat flooded areas, it could pay to have the fenceline lightly tied to posts with 16 gauge soft wire, have the fenceline securely hinged at one end of the flooded area and lightly secured at the other. If some 5 gallon drums were attached at the lightly secured end, it is feasible that the flood section could float down stream yet remain secured at the other end and offer little resistance to logs as the wire is no longer across the path of the moving obstacles.

Photo. 42 Short panels and barb wire make repairs costly in flooded country. (Paragraph 10).

Photo. 43 This corner post has been leant out so as to cope with the additional strain. The wires on the right are part of a laneway gate and are applying no appreciable pull. The post was driven in ·9 metres and is the same length out. The black soil was moist and the post moved in about 30 mm at ground level. A stay is advised for soils that move. (Paragraph 108).

Photo. 44 This offset live wire used by Mr. P. McLennan, Yuleba has proved effective in fencing out wallabies and kangaroos for 20 kilometres around a wheat paddock. The fence was originally a 4 barb suspension type but has had the two plain earth wires added at the bottom together with the live wire. The wallaby is usually in contact with the live wire at the same time as it touches one of the earth wires. This means that the shock is received before much of the animal is through the fence. This design has proved superior to when the electrified wire is in line with all the wires. (Paragraph 128).

Photo. 45 Strainer assembly. The horizontal stay is held in position with $\frac{5}{16}$" steel rod in each end of stay. Diagonal wire brace is single, run through 12 mm polythene to avoid earthing of live wire. The grace wire is tightened with 25 mm galvanised pipe with hole bored for inserting wire, rod for turning and rod for holding in position though tying of the wire should be adequate. (Paragraph 116).

Kangaroos and wallabies

128. In areas of cropping and/or improved pasture, the control of marsupials can avoid expensive losses. The natural habit of these animals is to crawl under or through rather than jump over the fences. As a live wire is often useless under dry conditions it is essential that the animal contacts both live and earth wires at the one time. This necessitates the bottom wire being an earth but close enough to the ground and with sufficient strain to force the animal to go above it so as to contact live and earth wires together. Suggested spacings from the ground up are 100, 125, 125 mm and then a further 2 wires above these to stop cattle. Mr. P. McLennan of Yuleba has had success by offsetting a live wire about 300 mm from the fence so that the contact with live and earth is made before any more than the animal's head has gone through the fence. This gives more opportunity for the animal to bounce back rather than forward when it receives the shock. Some wallabies have developed the habit of jumping about 900 mm (36") so as to avoid the live wire. **(Photo. 44).**

Wild pigs

129. A fence on a similar principle to the marsupial fence can be used for pigs though any measure for excluding pigs should be combined with some more permanent measure such as trapping and poisoning.

Boundary fences

130. It is considered that a boundary fence should not be the low type. This is mainly because uneducated cattle that do not belong to the property could run over the fence at the first contact if there were cattle attracting them from the other side. It is still a sound policy, however, to have at least one live wire in a boundary fence. This might be in the line or offset inside the fence.

Fire risk

131. Considering the many thousands of high power energisers that are now used continuously in many parts of Australia, it can be concluded that the risk of fire from electric fences is very low. At least one fire has been reported as having started by the repeated arcing from a live wire to an earthed wire through a heap of inflammable weed seeds. One method of reducing the risk is to connect the high powered units at the low power terminal when the grass is very dry. Mr. McLennan of Yuleba chooses a windy day to burn a break under his suspension fences. The fences are propped up at the droppers and the grass is lit with a flame thrower. In this way, fire damage to the high tensile wire has been successfully avoided, and, when electrified, such a technique could eliminate fire risk.

Safety

132. The high powered energisers put out a high powered pulse at the approximate rate of one per second. This short shock is the basis of the fence not being lethal to man or beast. Even so, care should be taken to avoid being caught in a fence, which is more likely with barb wire. Uninsulated wires at head height should be avoided as these could give a dangerous shock. The law states that the energiser must conform to the Australian Standard Specification number 129. The energisers are tested by the appropriate State authority and carry the test number issued by that authority.

133. The earth stake should be at least 2 metres away from the earth system of any other electrical installation. When electrifying boundaries, there needs to be agreement between neighbours. It is a sound idea to display a notice of electrification at the property entrances.

Telephone lines

134. Live wires should never be carried parallel and within close proximity to a telephone line as this can cause considerable interference to the telephone. Earth circuit phone lines have bad electric fence interference when a phone line 50 metres away ran parallel to the fence for 1 500 metres.

Costs and Comparisons

135. Because of its lightness, the recommended low electric fence with sparsely placed posts and droppers can be erected for less than quarter the cost of a conventional fence.

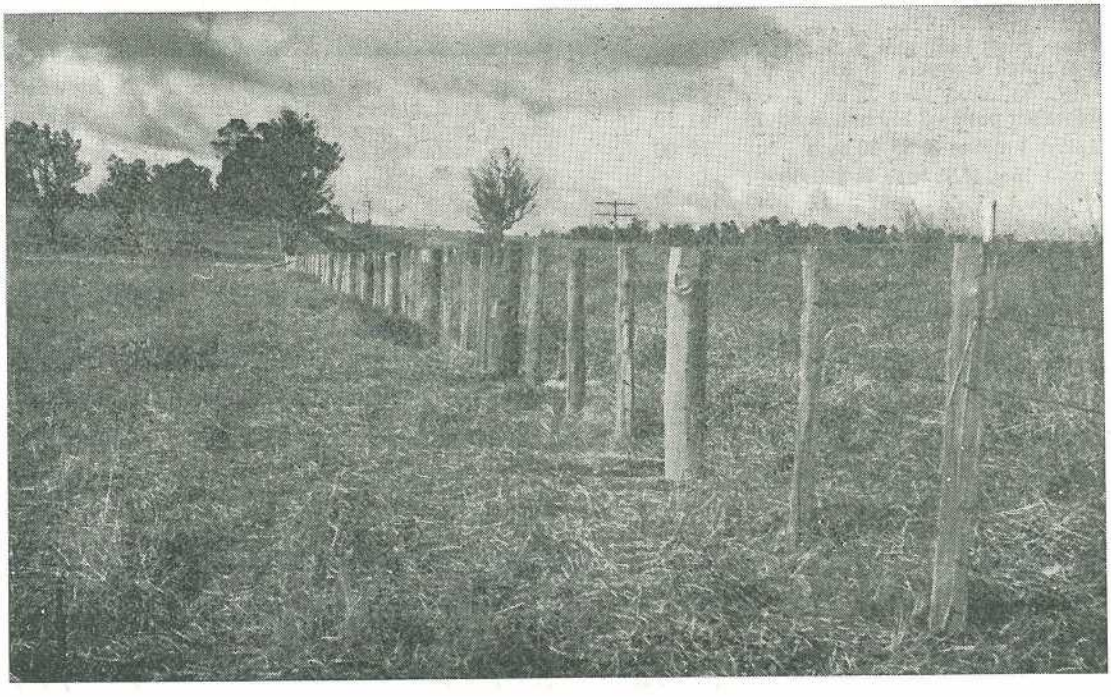
136. By far the most acceptable non-electric fence for cattle on the basis of low cost and effectiveness is the four barb suspension fence, but a permanent electric three wire fence can be erected for less than half the cost of a suspension fence.

137. *Estimated cost of 1 km of three wire Electric Fence* (Toowoomba prices—September, 1976).

Only 10 km of fencing has been allowed per energiser.

	$
3 Strainer Posts 50 x 50 x 1 500 mm @ 70 cents	2.10
3 Stays 50 x 50 x 1 500 mm @ 60 cents ..	1.80
3 Stay Pegs 100 x 25 x 400 mm @ 28 cents ..	0.84
33 Running Posts 50 x 25 x 1 350 mm @ 38 cents	12.24
33 Droppers 38 x 25 x 900 mm @ 18 cents ..	5.95
1 Corner Post 75 x 75 x 1 500 mm @ $1.60 ..	1.60
1 Bed Batten 100 x 25 x 300 mm (for corner) @ 18 cents	0.18
2 Coils 12½ g. Flexabel Heavy Galvanised @ $31.90	63.80
8 metres of 12 mm polythene @ 29 cents per metre	2.32
Miscellaneous pieces of wire and garden hose	1.00
Steel post for earthing fenceline	1.20
9 metres of Insulation galvanised wire @ $8 per 45 m	1.60
1/10 Energiser @ $145 (10 km fence)	14.50
1/10 Voltmeter @ $35	3.50
Gate (cocky type) included in above	
Labour and vehicle—1 man day @ $40 per day	40.00
	$152.63

Photo. 46 This new fence would have cost 5 to 6 times more than an electric fence. A standard suspension fence with an offset live wire makes an excellent boundary. (Paragraph 1).



138. Over 80% of the cost of this fence is made up of timber $23.71, Wire $63.80 and Labour $40.00. Where 1·6 mm wire is used, the cost of wire would be $34.58—a saving of $29.25 but possibly substitute 25 running posts for 33 droppers. The cost of such a fence would be about $123 per km.

139. For comparison, the approximate cost of a four barb suspension fence would be as follows.

Suspension Fence—Particulars and Cost

PARTICULARS

4 barb wires 16 gauge high tensile
Wire spacing 250 mm (10 inches)
Steel Waratah posts 1 680 mm (5′ 6″)
Waratah droppers 960 mm (38″)
Spaces between posts 30 metres
Strainer Posts. Diameter 150–200 mm (6″–8″) and 2 250 mm (7′ 6″) long, 900 mm (3′) in ground and 1 350 mm (4′ 6″) out.
Stays, 3 metres (10 ft). Diameter 100–125 mm (4″–5″).

Approximate cost of the 1 km of the above type of fence at September, 1976

MATERIALS	$	$
32 steel posts 1 680 mm @ $1.24 ..	39.68	
90 Waratah droppers @ $36.50 per 100	32.76	
6 Strainer posts—2 250 mm @ $5.25	31.50	
2 stays 3 metres @ $5.00 each ..	10.00	
8 coils 16 g. H.T. barb @ $20.00 per 600 m	160.00	
		273.94
LABOUR		
6 Strainers @ $4.00	24.00	
2 Stays @ $4.00	8.00	
32 Steel posts @ $0.80	25.60	
96 Droppers @ $0.25	24.00	
Running and Tying included		81.60
½ Gate and Gateway @ $80.00		40.00
Total Cost of 1 km of Fencing ..		395.54

140. The cost of the three wire electric fence then is only 40% of this suspension fence.

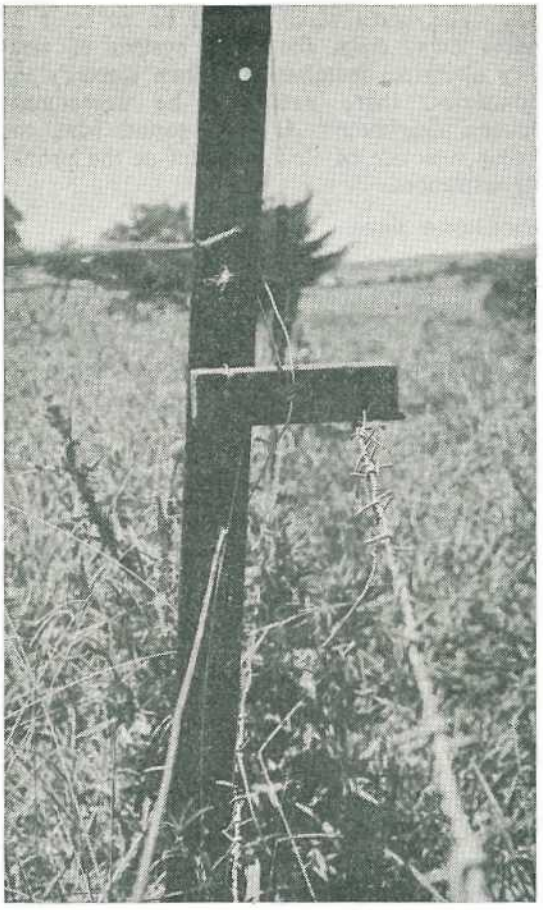
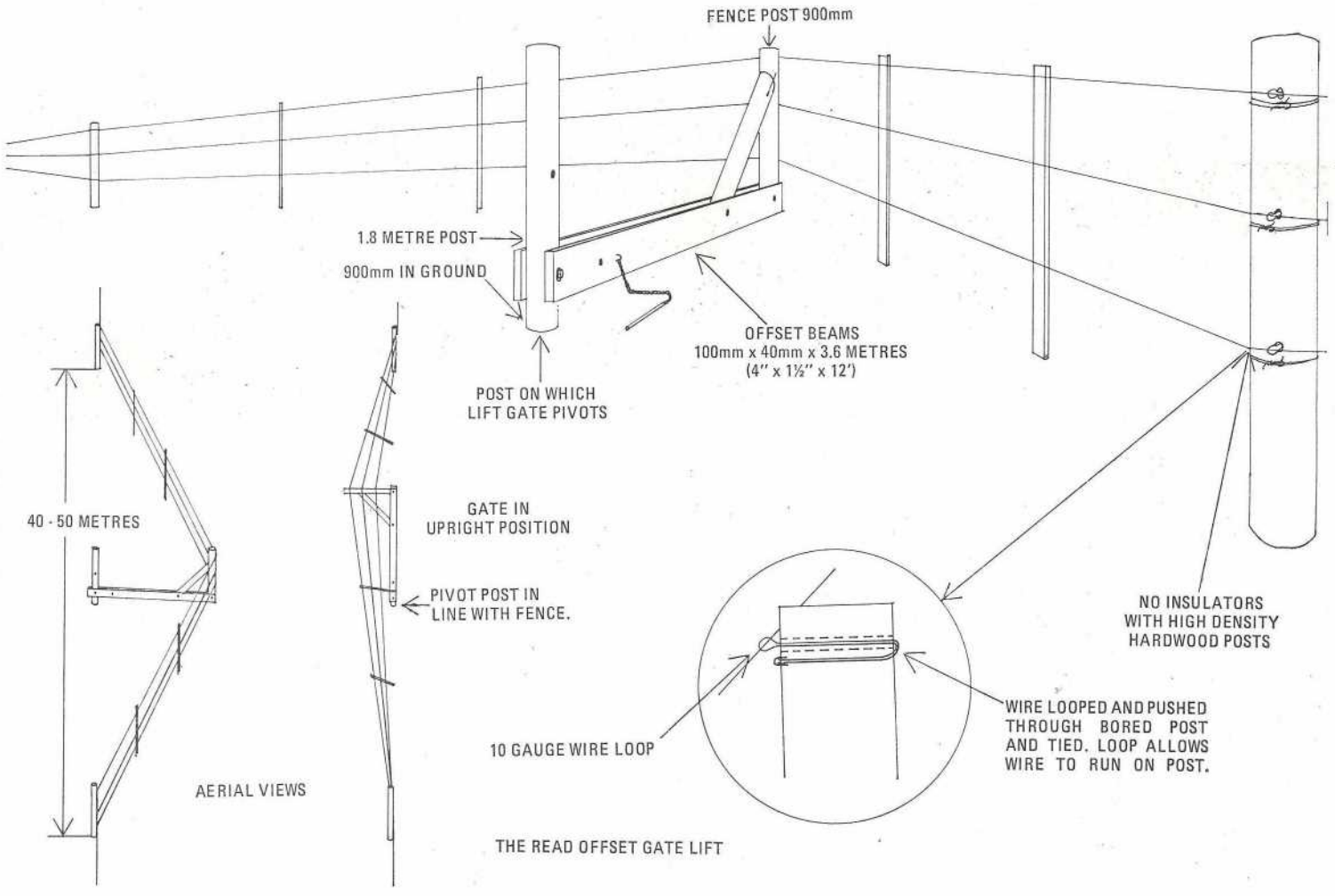


Photo. 47 A 25 x 38 x 100 mm block of wood bored in 3 places can be tied like this. In this case a barbed wire already in the fence was untied at the posts and tied to the offset blocks. (Paragraph 7).



THE READ OFFSET GATE LIFT

Photo. 48 Above: Cows being introduced for the first time to an electric fence. One or two shocks are generally all that is required to give cattle respect for fences. (Paragraph 2).

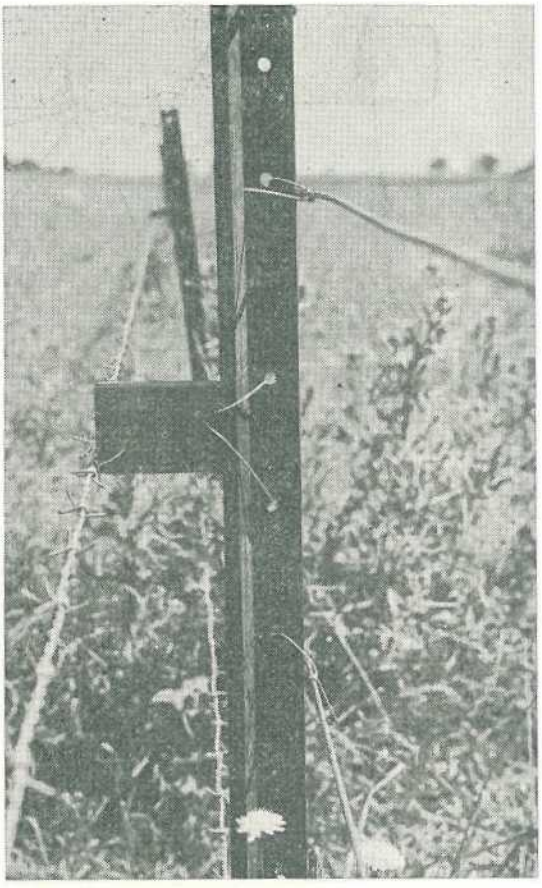
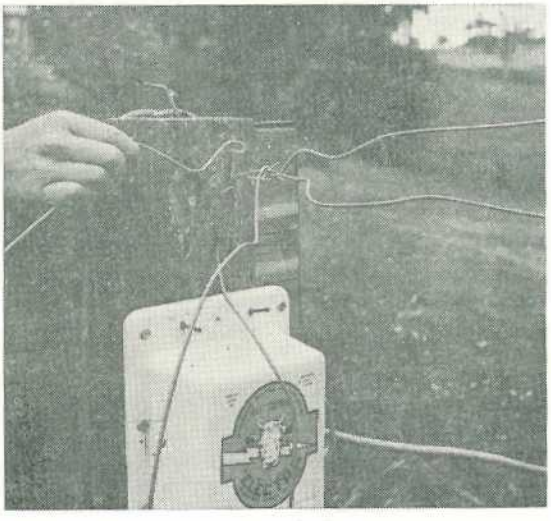


Photo. 49 Upper right: This 38 x 25 x 90 mm ironbark insulator is ideal for offsetting a wire on the "flat" side of a star post. By being offset only about 50 mm from the normal wires, the live wire is effective on cattle that are running on both sides of the fence. In this case, one of the existing wires on the fence was energised. About 60 insulators are required per kilometre for a total cost of under $5 plus tying on.

Photo. 50 Lower right: This simple set-up allows faults to be readily traced. An insulated wire has been brought from the power terminal of the energiser, attached to the post, cleaned of insulation and looped at the end. Four insulated wires going to four sections of the property are hooked to the loop. When the fence is shorting out, each wire in turn is unhooked. When the wire going to the faulty section is unhooked, the energiser which has been pulsating weakly, or not at all, will re-commence normal pulsation. The wire is then re-hooked and the operator follows out along that section to locate the fault.



141. *Specifications for Electric Fencing at Penola Station, South Australia*

POSTS	Creosoted pine, 50–75 mm x 1·8 m. These do not require insulators
STRAINERS	150–200 mm x 2·4 m
POST SPACING ..	33·3 m (3 posts per 100 m)
WIRE	2·50 mm, 386 kg H.T. galvanised
WIRE SPACING FROM GROUND	300 mm earth 200 mm live 200 mm earth 200 mm live
STRAIN	135–165 kg
GATES	Offset arm lifts. These gates enable stock to pass under the fence and give an effective opening of about 90 m. (One post on each side of the gate is replaced with a dropper). Portable " prop gate " devices are carried on vehicles and motor cycles

142. *Costs per km of above fence, January 1975 Prices*

				$	$
Posts	29	@	0.65		18.85
End Assembly	2	@	5.86		11.72
Wire	4 km	@	12.16		48.64
Earth Peg	1	@	3.00		3.00
Switches	1–2	@	0.50		1.00
Insulators	4	@	0.27		1.08
Staples			..		1.00
*Energiser			75–125.00		6.25
*Testing Equipment ..			50.00		2.50
Gate—1 Offset Arm Lift ..			7.60		7.60
Labour—Approx. 10 hours			3.70		37.00
Wire Strainers	4	@	0.90		3.60
Miscellaneous			0.76		0.76
					$143.00

* The cost of items marked thus is spread over 20 kms

Note:

The energiser cost has been spread over twice the distance as that for the three wire fence.

143. A high powered unit when run continously uses approximately 10 cents worth of electricity.

The life of existing fences

144. It is feasible that by the use of wooden cross battens on the posts and a live wire each side of existing fences, the lives of these fences could be increased by 20 years. The cost would be approximately $40.00 for wire and $10.00 for battens plus energiser. Few investments could compete with such a saving.

145. In existing fences where wooden posts are used, it is possible to electrify one of the wires already in the fence.

146. Conventional and suspension fences have served our livestock industries well. They still can be expected to be used for a long time—especially as boundaries.

147. We can expect however that high costs will eventually cause a tremendous swing to some form of fence electrification.

Acknowledgements

The writer was sent by the Queensland Department of Primary Industries to inspect developments in this field in areas of South-eastern South Australia and Western Victoria where many properties have been involved for a number of years in electric fencing.

The following people kindly co-operated in providing a mixture of information, transport and hospitality. The list is in the order of which the people were met.

Mr. Michael Milne, Beef Cattle Officer, Department of Agriculture, Naracoorte, South Australia.

Mr. Robert Rymill, Penola Station, Penola, South Australia.

Mr. E. Bullough, Australian Agricultural Consulting and Management, Border Town, South Australia.

Mr. J. Rose, Manager, A.I.A., Exmoor Station, Naracoorte, South Australia.

Mr. C. Boord, Beef Extension Officer, Warrnambool, Victoria.

Mr. H. Bishop, Officer in Charge, Hamilton Research Centre, Hamilton, Victoria.

Mr. B. Baulch, Beef and Sheep Producer and Electric Fencing Contractor, Hawkesdale, Victoria.

Mr. N. Grimshaw, Midfern, Riddells Road, Kirkstall, Victoria.

Mr. R. L. Piesse, Kew, East Victoria—A Consultant and acknowledged leader in technical and practical aspects of electric fencing.

The information and assistance from these people is gratefully acknowledged.

In Queensland, producers such as Mr. B. McCay, Macalister, and Mr. I. McDonald, Hopelands, have been effectively using permanent electric fencing for some years, though the low light fence has not been tried to any degree.

APPENDIX

Sales Tax Exemptions

Motor vehicles used in agricultural Industry

THERE is no specific exemption for motor vehicles for use for agricultural purposes but subject to certain conditions certain types of motor vehicles may qualify for exemption. What types of vehicles can qualify and what are the conditions? What procedure must be adopted if sales tax exemption is being sought?

In the First Schedule to the Sales Tax (Exemptions and Classifications) Act, Item 13 (1) exempts machinery, implements and apparatus for use in agricultural industry (this includes the pastoral industry) if, in the opinion of the Commissioner, the goods are of a kind used exclusively or primarily and principally in that industry. Motor vehicles, taken overall, are not used principally in agricultural industry.

The Commissioner has determined, however, that certain four wheel drive vehicles are used mainly in the agricultural industry and, therefore, exemption is accorded to those particular classes of four wheel drive vehicles when purchased for use in the agricultural industry.

Vehicle Conditions and Specifications

Conditional exemption is allowable for any four wheel drive vehicle (including cab/chassis units) with a gross vehicle weight rating not exceeding 4 090 kg when fitted with approved body types of the required specifications. The exemption covers jeep type vehicles comprising a basic metal body with free access between driving and goods carrying compartments and fitted with the following optional cabin or body coverings:—

Canvas hood and canopy
Full length canvas hood
Canvas top
Canvas full top
Metal hood and canopy vehicles
Hard top
Metal hard top
Full length metal cab
Truck cab
Truck cab and length hood
Metal top
Half metal top
Canvas hood
Canvas half top

NOTE: *Vehicles fitted with station wagon or panel van type bodies are outside the scope of the exemption provision.*

Procedure for claiming exemption

If you consider that you are entitled to exemption from the payment of sales tax on the purchase of a four wheel drive vehicle you should complete an exemption and usage certificate in the form shown on the next page. This form should then be forwarded to the Deputy Commissioner of Taxation, Australian Taxation Office, 320 Adelaide Street, Brisbane for consideration. Note conditions of ownership and disposal on this certificate.

AGRICULTURAL INDUSTRY

ITEM 13 (1)

SALES TAX (EXEMPTIONS AND CLASSIFICATIONS) ACT

To

The Commissioner of Taxation and the Commonwealth of Australia.

I hereby certify that [*Engine number & description of vehicle*] purchased from [*Name of supplier*] on [*Date*] and registered in the name of [*Name*] is for use in agricultural industry in the course of my business as [*Occupation*].

THE VEHICLE WILL NOT BE SOLD OR OTHERWISE DISPOSED OF BEFORE THE EXPIRATION OF 2 YEARS OF OWNERSHIP OR 40 000 KILOMETRES (25,000 MILES) OF ACTUAL RUNNING. Exemption from sales tax is accordingly claimed under Item 13 (1) in the First Schedule to the Sales Tax (Exemptions and Classifications) Act.

Signature
Address
Date

The vehicle being purchased—

* (a) will not replace a vehicle purchased free of sales tax.

* (b) will replace the following vehicle previously purchased free of sales tax—

Engine number
Description
Date of purchase
Actual distance run

* Strike out whichever does not apply and complete "(b)" if applicable.

Statutory organization of pig producers

A POLL of commercial pig producers is to be held on the question of establishment of a statutory organization for pig producers in Queensland.

The Minister for Primary Industries, Mr. V. B. Sullivan, said that, in his initial statement outlining details of the proposal, he had indicated he would instruct that a poll be conducted should sufficient objections be received.

"While the number received is not great, it is felt the fairest method of ensuring that all commercial producers can voice their opinion on the matter is by holding a poll," Mr. Sullivan stated.

He added that the poll would be conducted by officers of the Department of Primary Industries and would be confined to producers with holdings of 70 pigs and over.

A date for the holding of the poll will be announced.

Scab Diseases of Potatoes

by I. K. HUGHES,
Plant Pathology Branch.

SOME diseases cause surface damage or scabs on potato tubers resulting in down grading or condemnation of market consignments. In this article, powdery scab, common scab and rhizoctonia scab or black scurf are discussed.

Powdery scab

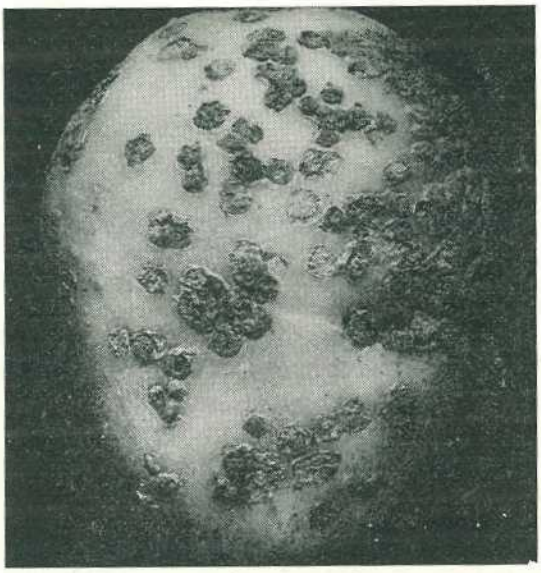
Powdery scab is caused by the slime mould *Spongospora subterranea*. The first symptoms are small swellings on roots, stolons and tubers. Those on tubers enlarge to form warts which may cover much of the surface particularly at the stolon end.

The symptoms before harvest are difficult to distinguish from those caused by root-knot nematodes. After harvest, the warts break open leaving sunken scabs up to 1 cm in diameter. Normally the potato skin persists at the edge of the scab and a dry, powdery mass of collapsed tissue and fungal spore balls fills the cavity. It is from this last symptom that the disease acquired the name of powdery scab.

The causal organism persists in soil for many years and is readily spread by mechanical means. It is also carried on seed potatoes.

Infection occurs at early tuber formation and is favoured by soil temperatures below 17°C. After the disease was first recorded in Queensland in 1963, it spread rapidly, probably due to increased plantings of winter crops. These were watered heavily to reduce frost injury and the cold, wet conditions favoured the disease. Powdery scab does not affect autumn and late spring crops.

Powdery scab, which occurs on all soil types, is affected by soil reaction, and is negligible on acid soils with pH below 4·5. This information is relevant to potato growing on light soils of low pH where lime is regularly required. Lime should not be used before growing winter crops on such soils.



Powdery scab.

The cultivars Sebago, Bungama, Exton, Kurrel, Kennebec and Pontiac are more resistant than Sequoia and Tasman. The decline in use of Sequoia in favour of Kurrel and Exton has seen a decrease in the importance of powdery scab.

The fungicide quintozene applied in the row with fertilizer will reduce infection. Care should be taken to ensure that neither the fertilizer nor the fungicide contacts the seed-piece.

Crop rotations where potatoes have not been grown for one year or longer and the use of resistant cultivars have allowed potato growers to produce winter crops without chemical soil treatments.

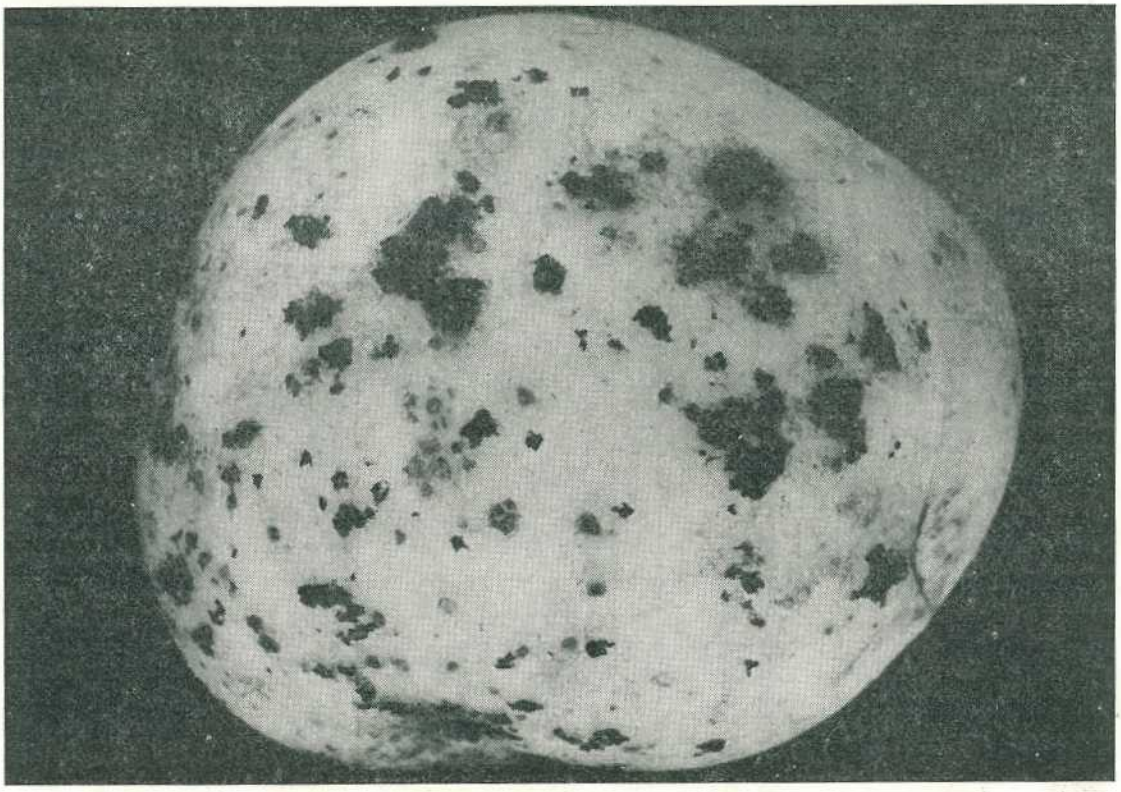
Common scab

Common scab, caused by the organism *Streptomyces scabies,* produces a range of symptoms on the tubers varying from light superficial russetting to deep depressions up to 2 cm in diameter over much of the surface. The extent of the damage depends largely on the size of the tuber at the time of infection.

Common scab—note the deep pits in the tuber.

Early infection shows as small, corky spots, often on very young tubers. As the tuber enlarges the infection develops, resulting in tissue breakdown often accompanied by surface cracking, corking and the formation of deep depressions in which saprophytic organisms cause further breakdown. The lesions of common scab are much larger than those of powdery scab.

Common scab is less serious when large quantities of irrigation water are used and, of recent years, increased water usage by south Queensland growers has decreased the importance of this disease. However, disease inoculum is readily available and an increase in disease incidence could follow changes in agronomic practices, particularly those reducing water supply during the tuber forming period.



Rhizoctonia scab or black scurf—the black sclerotes are most obvious when the tubers are wet.

Rhizoctonia scab (black scurf)

Rhizoctonia scab is recognized by the presence of hard, soil-like particles adhering to the tuber. These resting bodies (sclerotes) of the causal fungus *Rhizoctonia solani* are dark in colour, becoming black when wet.

Rhizoctonia scab is rarely found on crops grown in Queensland but is important on seed potatoes from other States especially when they have been ground stored for some time. The mycelium growing from the sclerotes attacks eyes, young shoots, roots, stolons and stems causing poor growth or death.

Seed showing severe Rhizoctonia scab should be rejected. Lightly affected consignments can be dipped in a proprietary organomercurial compound for 15 minutes. This treatment will also reduce inoculum of the other scab diseases carried on seed potatoes.

Sprout damage caused by Rhizoctonia solani.

Stone Fruits

Summary of Insect Control Recommendations

prepared by Entomology Branch Officers.

THE following tabulation summarises the pesticide recommendations for stone fruits. Further details on identifications, control of the pests listed, and of minor pests not listed, where necessary, should be sought from extension officers of the Department.

Pest	Description of Pest	Damage to Crop	Control Pesticide	Notes
San Jose Scale *Quadraspidiotus perniciosus*	Sedentary scale insects located on wood, foliage, and fruit of all varieties of stone fruits. The adult female is a yellow, soft-bodied insect covered with a hard, circular grey-dark brown scale cover, with a darker central raised area about 1 mm diameter. The male scale covers are eliptical, with the raised area towards one end	Adults and nymphs pierce and extract sap from plant tissues. Infested trees show reduced vigour and large scale populations can kill trees. Scale infested stone fruit trees usually exude gum. Damage to fruit causes gumming and also assists the entry of rot organisms	Superior dormant oil 2%	San Jose scale is potentially a very serious pest but populations occur sporadically in orchards in the Stanthorpe district. Superior dormant oil sprays should be applied during the dormant to bud-swell stages of tree growth. Thorough spray coverage is essential for control
Grape-vine scale *Eulecanium persicae*	Large (up to 8 mm long), brown, rectangular shaped, sedentary scale insects with a characteristic raised area in the form of an H on the top of the scale cover	The adults and nymphs pierce and extract sap from the plant tissues. Infested trees show reduced vigour	Superior dormant oil 2% + azinphos-methyl 0·05%	This is a minor pest of stone fruits in the Stanthorpe district. The azinphos-methyl sprays used for light-brown apple moth control will also control this pest
Green peach aphid *Myzus persicae*	Adults are green, soft bodied, slow moving, sap sucking insects, up to 3 mm long. Colonies of adults and nymphs may be found on curled leaves in early spring. During winter, shiny black, oval-shaped eggs are found on bark around the buds	The feeding of colonies of aphids on the newly developed foliage and fruit in spring, causes the curling and discolouration of foliage and subsequently the shedding of foliage and fruit and dieback of the affected terminals	Superior dormant oil 2% or thiometon 0·02%	Superior dormant oil should be applied during the dormant to bud-swell stages of tree growth. This spray controls the over-wintering egg stage. Thorough spray coverage is essential. Thiometon should be applied in early October, if aphids are active

Diseases of ginger--I

Rhizome, root and basal stem rot

A rhizome, root and basal stem rot caused by an unidentified white, sterile fungus is widespread in Queensland's ginger-producing areas and has caused serious losses on some farms.

The fungus infects the rhizome beneath the scale leaves producing sunken spots. As the disease develops, a deep brown rot of the rhizome occurs and the roots are attacked and killed. In severe cases, the base of the stem is attacked and hollowed-out. The most conspicuous symptom is the white fungus enveloping the rhizome and also filling the hollowed-out stem base.

Above ground symptoms are a yellowing and drying out of the stems and leaves. When plants are pulled, the stems invariably break away from the rhizomes.

The fungus survives in the soil on plant residues from which it sends out white strands through the soil to infect ginger plants growing in the vicinity.

Because the fungus persists in this way, control can be achieved by preparing land early, allowing cover crops and weeds ample time to decompose. This will not eradicate the fungus but reduces it to such a low level that it will not be a problem.

The most serious outbreaks of this disease have occurred in areas previously used for sugar cane where a large quantity of sugar cane trash has remained in the soil. However, the disease is not confined to these areas and may occur in any soils with undecomposed plant trash.

Big bud

Big bud caused by the tomato big bud organism is a minor disease of ginger.

Symptoms are a cessation of plant growth and a bunching of leaves at the top of the stem. In advanced stages, affected plants yellow and are easily recognized.

The organism causing big bud is spread by a leafhopper which can acquire it from a wide range of infected weeds and other crop plants.

Incidence of the disease is seldom of economic importance but infected plants should be removed from areas being grown for seed.

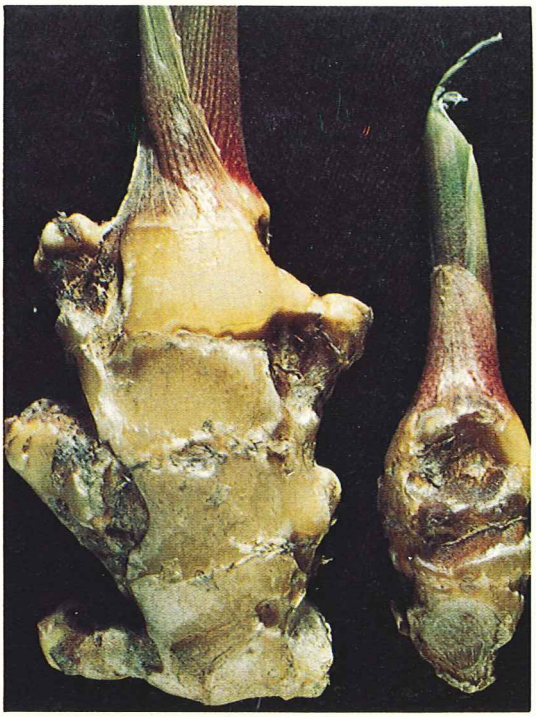
Compiled by N. T. Vock, Plant Pathology Branch.

(Further information can be obtained from your nearest Plant Pathology Branch office or by writing to the Director, Plant Pathology Branch, Department of Primary Industries, Meiers Road, Indooroopilly, Q. 4068.)

Diseases of ginger--I

Rhizome, root and basal stem rot

Affected plants.



Sunken spots on rhizomes.

Big Bud

Affected plants showing the yellowing and bunching of leaves.

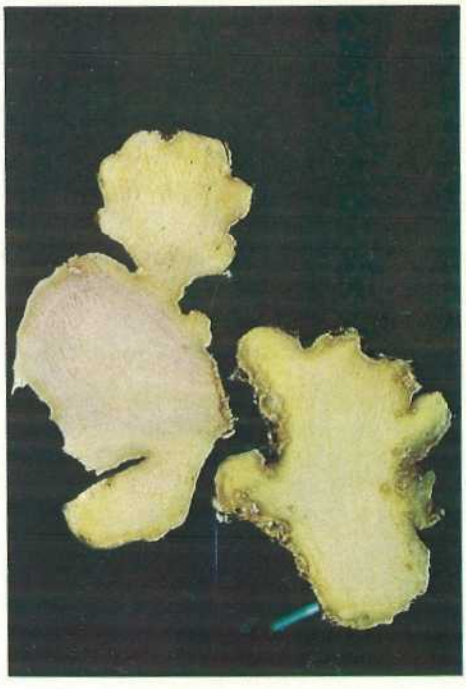
Diseases of ginger--2

Root knot

Upper left. The infested rhizome at the top is compared with a healthy one.

Above. The advanced stage with secondary rots developing. Healthy rhizome at bottom.

Left. A cut section of a rhizome showing the internal breakdown. Section of a healthy rhizome at left.



Armillariella rhizome rot

Affected rhizomes. Note the 'shoestrings' of the fungus on the surface of the rhizome at lower right.

Diseases of ginger--2

Root knot

The root knot nematodes *Meloidogyne javanica* and *Meloidogyne incognita* are important and widespread pests of ginger in Queensland. They occur in virgin soils, have many alternative hosts and are spread in planting material.

Symptoms

Symptoms of nematode infestation are stunted growth, yellow leaves with marginal browning and swollen, distorted roots. Affected rhizomes have brown, watersoaked areas in the outer tissues, particularly in the angles between shoots. Nematodes continue to develop after the crop is harvested and may cause breakdown of rhizomes held over for planting.

Control

Control involves planting nematode-free seedpieces in fumigated soil.

Nematode-free planting material is produced in the following way:

1. Select an area where ginger was not grown in the previous season and with no history of severe nematode infestation.
2. Begin land preparation in late autumn so that the soil is suitable for fumigation by August. Allow at least two weeks between fumigation and planting.
3. Select planting material as free from nematodes as possible and treat in hot water at 48°C for 20 minutes. Cool the rhizomes before cutting and dipping in recommended seedpiece fungicides. Seed should be planted within one week of hot water treatment.
4. Grow under a sawdust mulch. Hold rhizomes from the crop for planting in the following season.

Armillariella rhizome rot

The fungus *Armillariella* sp. may sometimes cause a rhizome rot of ginger planted in recently cleared forest areas.

Symptoms aboveground are similar to those of Fusarium rhizome rot. However, when affected rhizomes are examined, black, string-like threads can be seen adhering to them. These are special structures of the fungus and are often known as 'shoestrings' because of their appearance.

This fungus is a common parasite of many forest trees, so removing roots and stumps before planting newly-cleared areas will reduce the chances of infection.

Compiled by N. T. Vock, Plant Pathology Branch.

(Further information can be obtained from your nearest Plant Pathology Branch office or by writing to the Director, Plant Pathology Branch, Department of Primary Industries, Meiers Road, Indooroopilly, Q. 4068).

Pest	Description of Pest	Damage to Crop	Control Pesticide	Notes
Rutherglen bug *Nyzius vinitor*	Adults are active, dark grey, rectangular shaped bugs, about 4·5 mm long, with two pairs of silvery-grey wings	Bugs pierce and extract sap from fruit, causing browning of the tissues. The feeding activities of large numbers of bugs can cause withering of the fruit. The feeding punctures also allow the entry of rot organisms	Fenthion 0·04% ..	This is a sporadic pest of peaches and apricots. The bugs feed and breed on composite weeds and migrate to orchards during hot dry weather when their weed hosts suffer moisture stress. Control measures are only warranted when large numbers of bugs are observed on trees. The elimination of composite weeds in orchards assists in reducing bug populations
Light-brown apple moth *Epiphyas postvittana*	Adult moths have a wingspan of about 20 mm. The basal half of each forewing is light brown while the remainder is dark brown. The hindwings are a uniform light brown. The green caterpillars which grow to about 25 mm long, are found in silken shelters, webbed between leaves and/or fruit, and are recognised by their fast wriggling movements and their habit of parachuting on a strand of silk when disturbed	Caterpillars web leaves and/or fruits together to form a shelter wherein they feed. Leaves are skeletonised and appear ragged. Fruits have large irregular-shaped areas chewed into the skin surface	Azinphos-methyl 0·05% or carbaryl 0·1%	This is usually a minor pest in orchards in the Stanthorpe district. LBAM has a wide range of host plants, including many orchard weeds. Clean cultivation in orchards assists in reducing LBAM populations. Chemical control measures should only be applied if the pest is active
Queensland fruit fly *Dacus tryoni*	Adults, which are about 7 mm long, are brown wasp-like flies, and have yellow markings on the thorax and a yellow band on the abdomen, just behind the thorax. The adult females may be observed walking over fruit surfaces with their wings held out at right angles to the body. While walking over fruit surfaces, they repeatedly pierce the skin with the ovipositor and deposit eggs just below the surface. The pale cream maggots, which grow to about 13 mm long, tunnel extensively through fruits	The stings made by the females when laying eggs appear as small discoloured spots, often with small amounts of gum exuding from them. Rot organisms are introduced with the eggs. Internal tissues of fruit are destroyed by the tunnelling of the maggots and the development of the rot organisms	Dimethoate 0·03% or fenthion 0·04%	A serious pest of stone fruits throughout Queensland. Dimethoate should not be applied to apricots and early maturing peaches. Both dimethoate and fenthion kill adults by contact action, and eggs and larvae inside fruits. Fruit fly activity can be gauged with proprietary lure traps. Azinphos-methyl sprays will control this pest during the period in which it is used for LBAM control

Pest	Description of Pest	Damage to Crop	Control Pesticide	Notes
Two-spotted mite *Tetranychus urticae*	Adults and nymphs are white-yellowish, spider-like mites, with two dark spots on the back. Adults are up to 0·5 mm long. Eggs are clear-white and are spherical. Colonies of mites produce webbing on the leaves, usually the undersides. This species overwinters as orange coloured adult females sheltering in litter and soil at the base of trees or as the two-spotted form breeding slowly on evergreen alternative hosts	Mites feed on leaves by piercing the surface tissues and extracting sap from the underlying cells. Subsequently, trees become mottled and bronzed and defoliate prematurely. This impairs the photosynthesis and respiration of the tree and can cause a reduction in crop yield in the " next-season's " crop	Cyhexatin 0·02% or wettable sulphur 0·3%	Two-spotted mite is a pest of plums and, to a lesser extent, peaches and nectarines. Apricots are rarely attacked. One cyhexatin spray should be applied in November. If resurgence occurs, wettable sulphur should be used as it will suppress mites and allow an increase of beneficial mite predator populations. Wettable sulphur will also control rust. Some orchard workers are allergic to spider mites
European red mite *Panonychus ulmi*	Adults and nymphs are green-dark red, globular shaped spider mites. Adults are up to 0·5 mm long. Eggs are orange-bright red and are spherical with a fine hair projecting from the upper surface. This species overwinters in the egg stage, large numbers of which are located on the bark, especially around buds. This species does not produce webbing on foliage, but adult females may be observed suspended on long silken threads from badly damaged leaves	Mites feed on leaves by piercing and extracting sap from the underlying cells. Trees subsequently become mottled and bronzed and defoliate prematurely. This impairs the photosynthesis and respiration of the tree and can cause a reduction in the " next season's " crop	Superior dormant oil 2% or cyhexatin 0·02% or wettable sulphur 0·3%	This species is a major pest of plums. Superior dormant oil should be applied during the dormant to bud-swell stages of tree growth. Cyhexatin should be applied in November-December. If mite populations resurge after harvest, wettable sulphur should be used as it will suppress mites and allows populations of beneficial mite predators to increase. Some orchard workers are allergic to mites

QUANTITY OF MATERIAL PER 100 LITRES OR 100 GALLONS TO OBTAIN RECOMMENDED SPRAY CONCENTRATION AND NECESSARY WITHHOLDING PERIODS*

Material (Common Name)	Percentage Concentration	Strength of Product (no particular company's formulation is favoured)	Quantity per		Withholding Period (Days)
			100 litres	100 gallons	
Azinphos-methyl	0·05%	25% wettable powder	200 g	2 lb	14
		50% wettable powder	100 g	1 lb	
Carbaryl	0·1%	80% wettable powder	125 g	1 lb 4 oz	3
		50% emulsifiable concentrate	200 ml	1 pt 12 fl oz	
Cyhexatin	0·02%	50% wettable powder	40 g	6·4 oz	2
Dimethoate	0·03%	30% emulsifiable concentrate	100 ml	16 fl oz	7
Fenthion	0·04%	55% emulsifiable concentrate	75 ml	12 fl oz	7
Mineral Oil	2·00%	100% emulsifiable concentrate	2 l	2 gal	1
Thiometon	0·02%	25% emulsifiable concentrate	80 ml	13 fl oz	21
Wettable Sulphur	0·3%	95% wettable powder	315 gm	3 lb 2 oz	withholding period not required

* *Note.*—To ensure that spray residues diminish to an acceptable level, the number of days indicated must be allowed to elapse between the last application of the pesticide and harvest.

Skip-a-milking

by R. HUMPHREYS,
Dairy Field Services Branch.

DAIRYING normally involves milking cows night and morning, 7 days each week. This is a tie which keeps dairy farm families from many of the social relaxations available to other farmers. If they could avoid even one milking a week it would provide a very important break.

Experiments carried out in South Australia in 1972 indicated that it is possible to miss one milking each week with very little loss of income and with no adverse effects on the cows.

Since then, the proposition has been looked at in Queensland. The results supported those of the South Australian work.

The project was carried out over an 11 week period in the Gympie area. The herd consisted largely of late lactation cows for the first 7 weeks of the demonstration and largely of fresh cows for the last 4 weeks.

Twenty-seven cows were involved in the first month, 32 in the second month, 34 in the third month and 58 in the final month.

Sunday afternoon milking was omitted on a regular basis. No attempt was made to milk later on the Sunday morning or earlier on the Monday morning.

Milk yields were recorded at each milking and a composite sample taken for butterfat testing.

Monthly mastitis tests were carried out on the milk from each quarter of every cow using the Wisconsin Mastitis Test. Clinical cases of mastitis were recorded.

Over the 11 week period, the average weekly loss in production as a result of missing one milking per week was 62·1 litres (1·9%) of milk and 0·6 kg (0·5%) of butterfat. This represents a daily loss of 8·8 litres of milk and 0·08 kg of butterfat.

WEEKLY PATTERN OF MILK AND BUTTERFAT PRODUCTION ASSOCIATED WITH MISSING SUNDAY AFTERNOON MILKING

Day	MORNING		AFTERNOON		TOTAL		
	Milk (litres)	Butterfat (kg)	Milk (litres)	Butterfat (kg)	Milk (litres)	Butterfat (kg)	Butterfat (%)
Thursday ..	198	5·3	157	6·8	355	12·1	3·3
Friday ..	202	5·9	162	7·2	364	13·1	3·5
Saturday ..	207	5·6	153	5·6	360	11·2	3·1
Sunday ..	198	6·0	—	—	198	6·0	3·0
Monday ..	324	11·4	126	7·4	450	18·8	4·1
Tuesday ..	184	6·1	135	6·1	319	12·2	3·8
Wednesday ..	216	6·1	144	6·5	360	12·6	3·4
Thursday ..	211	5·9	139	6·0	350	11·9	3·3

The Table indicates that after missing the Sunday afternoon milking both milk and butterfat production fluctuated for 2 days and returned to normal by the Wednesday morning.

Although cows were found to bag-up tightly especially early in the lactation there was no evidence of any increase in leucocyte counts. Chronic mastitis cases tended to show up clinical on the Monday morning. There was, however, no increase in the incidence of new infections.

It appears that in a predominantly manufacturing milk economy, the financial loss associated with missing one milking per week is minimal. The loss, however, may be greater with early lactation cows.

There does not appear to be any adverse effects on the cows as a result of missing one milking per week.

What's in a lime label?

by Registration Control Staff,
Chemical Services Section,
Standards Branch.

DO you take full advantage of the information which appears on the label of an agricultural lime? This information provides a means of comparing one lime with another lime. Some labels may also provide instructions for use and safety precautions.

Labels are required on all bags of lime sold in Queensland. These labels, along with inspection procedures, provide a means of control on the quality of agricultural limes in this State. Labels themselves form a part of the registration procedure which agricultural limes undergo before being offered for sale in Queensland.

When limes are sold in bulk the label is attached to the invoice or delivery docket.

The following definitions are set out in the *Agricultural Standards Act* 1952–1972:—

LIME—Any material containing lime used or intended for supplying lime in the practice of agriculture. The term includes magnesium limes, dolomite, and gypsum.

NEUTRALIZING VALUE—Used with reference to any prescribed material or any ingredient of any agricultural requirement, neutralizing value means capacity to neutralize acidity (such capacity to be ascertained by the prescribed method).

(The method is prescribed in "The Agricultural Standards [Fertilizer and Lime] Regulations of 1967").

Registration

Before any lime for agricultural use is placed on the market in Queensland, an application for registration must be made by the Queensland primary dealer and such application renewed every three years, that is 1977, 1980, and so on, during the month of January. Registration fees are payable annually. No sales should take place until registration has been effected.

An application for registration or re-registration comprises a statutory declaration, setting out the formula of the preparation, a specimen label and the necessary fee of $7.50. The application is lodged with the Standards Branch. Registration is effected when the requirements of the Act are satisfied.

Labels

Each lime label must set forth:—

- Name of the lime.
- Net weight contained in the package to which it is affixed.
- All directions or recommendations for use, if any.

- A statement setting out—
  - (a) The names and respective percentages of active constituents and the form or forms in which they occur, for example:—
    .... % calcium (Ca) as .....
    .... % magnesium (Mg) as ....
  - (b) The neutralizing value, except in the case of gypsum.
  - (c) The degree of fineness set out as—
    .... % Fine
    .... % Coarse
    (Not required for burnt or slaked lime).
- Name and sole or principal place of business of the primary dealer or manufacturer, proprietor or distributor. The details required on labels or packages should be legibly and indelibly printed by a printing press.

Farmers and other buyers would be well advised *never to accept* delivery of any lime unless it has affixed to the package a plainly printed label setting out the required information, or in the case of a bulk delivery to the delivery documents.

In the absence of a label, the buyer should at once communicate with the Standards Branch, Department of Primary Industries, Meiers Road, Indooroopilly, Brisbane. Qld. 4068.

The limes as set out in the accompanying list are those that have been registered up to August 24, 1976, for the 3-year period January, 1974 to January, 1977 under the Agricultural Standards Act. These and any published in subsequent lists are the only limes that should be offered for sale or requested by prospective purchasers.

It should be noted that the sale of any unregistered lime would render the seller liable to a penalty not exceeding $200.

Further particulars may be obtained from the Standards Branch, Department of Primary Industries, Meiers Road, Indooroopilly, Brisbane. Qld. 4068.

Lime for Agricultural purposes

Registered under the Agricultural Standards Act 1952–1972 as at August 24, 1976

Name	Guaranteed Analysis						Name and Address of Dealer
	Calcium (Ca)		Magnesium (Mg) as Magnesium Carbonate %	Neutralizing Value	Fine %	Coarse %	
	%	Form					
BURNT LIME							
Ambrose Burnt Lime	64	Oxide ..	..	160	..	..	Ambrose Lime Works Pty. Ltd., Ambrose
PULVERISED LIMESTONE							
Ambrose Pulverised Limestone	35	Carbonate ..	..	90	84	16	Ambrose Lime Works Pty. Ltd., Ambrose
Barmac Greenkeeper Spray Lime	38·8	Carbonate ..	..	97	100	0	Barnes McGrath Pty. Ltd., Annie and Dawn Streets, Rocklea
Pulverised Limestone	36	Carbonate ..	..	90	100	0	Central Queensland Cement Pty. Ltd., Parkhurst
Chillagoe Super Blue Pulverised Limestone	37	Carbonate ..	..	103	80	20	Chillagoe Limeworks Pty. Ltd., Golf Links Road, Atherton
Garden King Garden Lime ..	35·7	Carbonate ..	..	90	55	45	Consolidated Fertilizer Sales Pty. Ltd., Gibson Island, Hemmant

Name	Guaranteed Analysis						Name and Address of Dealer
	Calcium (Ca)		Magnesium (Mg) as Magnesium Carbonate	Neutralizing Value	Fine %	Coarse %	
	%	Form					
PULVERISED LIMESTONE—*continued*							
Flinders Lime	30	Carbonate ..	..	80	60	40	Flinders Limestone Pty. Ltd., 160 Robinson Road, Geebung
Hortico Garden Lime	32·5	Carbonate ..	..	91	42	58	Hortico (Qld) Pty. Ltd., 911 Lytton Road, Murarrie
Lane's Agricultural Lime ..	38	Carbonate ..	..	90	50	50	Lane Limited, 261 Tingira Street, Pinkenba
Pulverised Lime	36	Carbonate ..	..	94	60	40	Bert Leoni Crystal Lime Works, Bruce Highway, Gordonvale
Warwick Pulverised Lime ..	33	Carbonate ..	..	90	60	40	Stanthorpe Mining Co. Ltd., Links Avenue, Eagle Farm
Tamaree No. 1 Pulverised Limestone	34·5	Carbonate ..	..	87	50	50	Tamaree Lime Works, Tamaree
EARTHY LIME							
Earthy Lime for Agricultural Purposes	23·7	Carbonate ..	..	67	50	50	Burdekin Lime Company, Homestead Road, Home Hill
MAGNESIUM LIME							
Garden King Dolomite ..	13	Carbonate ..	8	70	80	20	Consolidated Fertilizer Sales Pty. Ltd., Gibson Island, Hemmant
Flinders Dolomite—72 ..	14	Carbonate ..	8	70	40	60	Flinders Limestone Pty. Ltd., 160 Robinson Road, Geebung
Hortico Dolomite Lime ..	14·5	Carbonate ..	9	72	50	50	Hortico (Qld) Pty. Ltd., 911 Lytton Road, Murarrie
Agrico Dolomite	15·7	Carbonate ..	8·43	70	80	20	Lane Limited, 261 Tingira Street, Pinkenba
Harvest Dolomite	13	Carbonate ..	8	70	80	20	Minerals (Qld) Pty. Ltd., Randolph Street, Rocklea
GYPSUM							
ACF–Austral Dump Gypsum	18·5	Sulphate also 14·5% Sulphur (S) as Sulphate	..	..	15	85	Consolidated Fertilizer Sales Pty. Ltd., Gibson Island, Hemmant
Rockard Fertilizer Gypsum ..	22·8	Sulphate also 18·2% Sulphur (S) as Sulphate	..	..	90	10	New Farm Plaster Mill, Lamington Street, New Farm
MISCELLANEOUS LIME							
Tamaree No. 2 Pulverised Limestone and Serpentine	28·8 0·2	Carbonate .. Silicate ..	3·0 as Silicate	..	50	50	Tamaree Lime Works, Tamaree
Tamaree No. 3 Pulverised Limestone and Serpentine	17·25 0·75	Carbonate .. Silicate ..	9·0 as Silicate	..	50	50	Tamaree Lime Works, Tamaree
Tamaree No. 4 Pulverised Serpentine	1	Silicate ..	18·0 as Silicate	..	50	50	Tamaree Lime Works, Tamaree

Economics of Beef Production on Coastal Speargrass

by L. T. WICKSTEED, Economic Services Branch.

WHEN considering the future of beef production in the spear grass zone, it may be helpful to examine a typical property in this area.

The example property selected for analysis is considered typical of beef cattle properties in the spear grass zone of the central coast.

The property, of 4 050 hectares is situated in the sub-coastal foothills in the Miriam Vale Shire. It has an effective area of 3 240 hectares, and the cover is 3 160 hectares of open, undulating spear grass country with no timber but some regrowth. There are 80 hectares of fair quality pasture, fenced into six paddocks plus holding paddocks and yards. Water is available in all paddocks from dams and natural streams. The carrying capacity is the equivalent of one adult beast to 3·6 ha. The labour input is the owner and one permanent stockman.

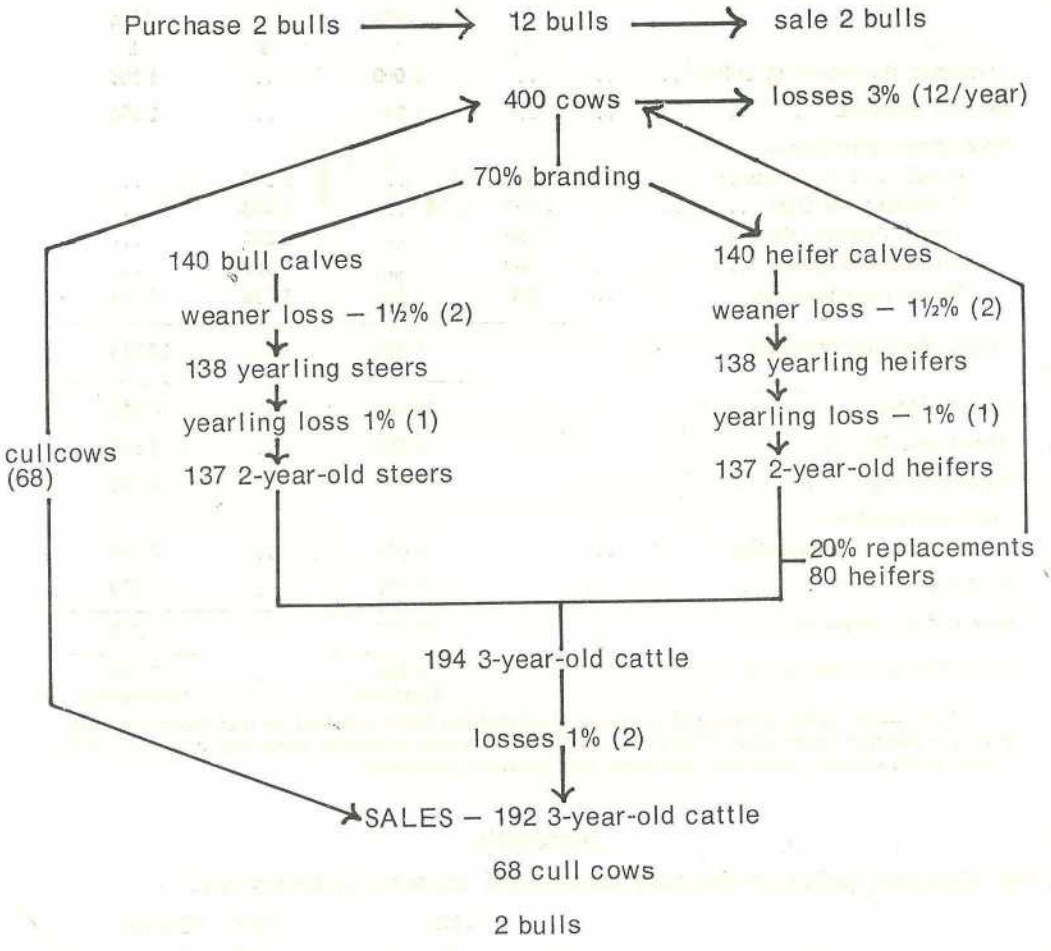
The owner is 45 years old. He is married with three children.

The property was purchased in 1965 for $125 000 as a going concern. The purchase of the property was financed as follows: Agricultural Bank (20 year first mortgage) $20 000; Vendor (15 year second mortgage) $30 000; Trading Bank overdraft $5 000; Cash contribution $70 000.

A livestock flow diagram is used to show livestock production and sales each year. Note: turn-off is 3½-year-old fat cattle.

Cash income and expenses

Cash income and expenses are shown for 1973. To show the effect of recent changes in the cost/price structure affecting beef producers, budgeted figures for 1976 are also shown. To make sure that the figures for both years can be compared directly, it has been assumed that the standards of property management and maintenance and the living standards are the same in 1976 as they were in 1973.



Livestock Sales—		1973		1976	
		$		$	
136	3½ yr. steers (250 kg D. Wt.*) ..	32 164	(94·6 c/kg)	17 000	(50 c/kg)
56	cull heifers (205 kg D. Wt.*) ..	9 296	(81 c/kg)	5 150	(45 c/kg)
34	fat cows (182 kg D. Wt.*) ..	4 488	(72·6 c/kg)	2 176	(35 c/kg)
34	boner cows (136 kg D. Wt.*) ..	2 543	(55 c/kg)	1 122	(24 c/kg)
2	bulls (273 kg D. Wt.*)	396	(72·6 c/kg)	191	(35 c/kg)
		$48 887		$25 639	

* approximate.

		1973		1976
	$	$	$	$
Livestock Purchases (2 bulls)	..	2 000	..	1 100
Selling Expenses	..	1 240	..	1 400
Production Expenses—				
Repairs and Maintenance	2 600	..	3 500	..
Veterinary and Dips	1 567	..	1 984	..
Timber Control (120 ha)	750	..	1 250	..
Fertilizer (60 kg/ha)	200	..	350	..
Other production exp.	840	5 957	1 130	8 214
Total Variable Expenses	..	9 197	..	10 714
Gross Margin	..	39 690	..	14 925
Permanent Wages	..	5 000	..	7 500
Administration	..	4 895	..	5 880
Debt Repayment—				
Interest and Redemption	..	5 915	..	6 755
Personal Living	..	5 000	..	7 500
Total Cash Expenses	..	30 007	..	38 349
Cash Surplus/Deficiency	..	18 880 (surplus)	..	12 710 (deficiency)

Note.—The cash income and expenses summary has been prepared so that figures in both years are directly comparable. The cash surplus in 1973 would in fact be lower due to development expenditure, capital equipment purchases and taxation payments.

Highlights

The important points in the cash income and expenses summary are:

	1973	1976	Change
	$	$	
Gross Margin/Breeder	99	37	(Down 63%)
Total Cash Income	48 887	25 639	(Down 48%)
Total Variable Expenses	9 197	10 714	(Up 16%)
Variable Expenses as % of Cash Income	19%	42%	
Total Cash Expenses	30 007	38 349	(Up 28%)

Break Even Analysis

To break even in 1976 under the same management system as in 1973, this property requires an increase in net livestock sales of $12 710 (a 50% increase). This represents an equivalent bullock price of 75c per kg D. Wt. To restore net cash flow in 1976 to the equivalent 1973 level, livestock sales of $57 299 are needed; (i.e. 123% increase on 1976 prices to an equivalent bullock price of $1.10 per kg D. Wt.).

Management Strategies

Short Term

The immediate short term management objective is to avoid, as far as possible, the projected cash deficiency.

Alternatives which may be considered are:

Off-property work—The main advantage is an immediate and steady supplement to cash income.

Diversification—Opportunities for cropping in the spear grass zone are very few. Timber harvesting is possible in some cases.

Sale of non-essential assets.

Strategic cutting of projected cash expenditure.

Budgeted cash expenditure includes the following categories:—

Partially controllable—	$	$
Total variable expenses ..	10 714	..
Permanent wages	7 500	..
Personal living	7 500	25 714
Fixed-uncontrollable—		
Administration	5 880	..
Debt servicing	6 755	12 635
Total		$38 349

NOTE.—" Controllable expenditure " is intended to denote expenditure which may be influenced by management in the short term.

Variable expenses have increased since 1973 by 16% and total cash expenditure by 28%. The main increase in cash expenditure has therefore occurred in the non-variable category. The only items in this category over which management has some control in the short term are permanent labour and personal living expenditure. Savings of $12 710 in controllable expenditure are needed to avoid the budgeted deficiency. Savings must be made to minimize short term detrimental effects on property output and income.

An example of cost cutting strategy might be:

	Savings
	$
Replace permanent labour with casual labour	6 500
Reduce repairs and maintenance	2 000
Cancel timber treatment and fertilizer ..	1 600
	$10 100

It is important to remember that low levels of expenditure on maintenance, regrowth control and fertilizer over time, lead to reduced productivity and further reduction in income.

The remaining deficiency of $2 610 may be absorbed by reduced living expenditure and borrowing for 'carry on'.

Borrowing for 'carry-on'

Beef producers unable to secure 'carry-on' finance through normal sources have recourse to the following:—

(a) Commonwealth Development Bank.

(b) Rural Reconstruction Board (R.R.B.).

(c) Special State and Federal Beef Assistance (administered by R.R.B.).

Unemployment benefit is also available in special circumstances.

LONG TERM

The 1976 Commodity Outlook Conference has forecast a very slow recovery in the beef market with no significant increase in price before the early 1980's. Combined with this, a continued increase in farm input costs is forecast.

If these projections are accurate, short term strategies of 'cutting costs' and borrowing for 'carry-on' will be insufficient. Long term strategies are needed to ensure survival of the family grazing property in a viable form, which will take advantage of any significant market recovery.

The main long term management strategies to be considered are:

Improved livestock performance

Branding percentage is the main factor affecting livestock performance. Property income can be expected to increase by about 10% for each 10% increase in branding percentage. This results from higher annual turn off and reduced breeder and replacement numbers.

A 10% increase in income for the property analysed would yield about $2 600/yr. Although property income is quite responsive to changes in livestock performance (branding percentage), successive increases in branding percentage become increasingly more difficult to obtain.

Labour efficiency

Increased cattle numbers handled per labour unit are necessary to overcome increasing labour costs and reduce labour cost/breeder. If $7 500 is regarded as the labour cost of the owner for the property analysed, then total labour cost/breeder in 1976 is budgeted to be $37.50. The labour/breeder with one labour unit is only $18.75.

Capital development expenditure may be necessary to achieve this.

Examples include mustering laneways and improved yards.

Debt reconstruction and farm build-up

Debt restructured over a longer term with lower interest rates may be necessary to reduce debt servicing charges. Funds for worthwhile cases are available through the Rural Reconstruction Board and Commonwealth Development Bank. Similarly, loan funds are available for purchase and amalgamation of properties.

Summary

If the current recession in profitability of beef properties can be regarded as temporary, then deferred maintenance and other short term 'cost cutting' strategies may be sufficient to meet financial commitments.

However, if the current recession marks the beginning of a permanent change in the cost price structure affecting beef properties, then long term strategies, aimed at low cost production with an emphasis on maximum beef output per labour unit, will be necessary to ensure viability.

Comfort for man and cow

HOW important is it to look after the comfort of your cows during milking? Some dairymen think it is very important.

Harold and Malcolm Thompson of Alfa Vale A.I.S. Stud at Nanango believe that both the cows and the milkers should be kept comfortable. During milking they all enjoy a cooling breeze provided by electric fans.

Harold and Malcolm noticed that the dairy cows, packed in a holding yard awaiting milking, became hot, particularly on summer evenings. They were also annoyed by large numbers of flies.

Harold said that under these conditions not only do the cows become agitated but so do the operators. To make things more pleasant for the cows and themselves they installed two ceiling fans in the dairy. Each fan is directly above the rails between the cows in the first and second bail and the third and fourth bail.

Since the fans were installed, the Thompsons have found that the cows are more contented while the down draught of air rids the bails of flies and dust. Working conditions are more comfortable for all.

The fans are three bladed, 1·4 m in diameter, silent running, with a variable speed control. The capital cost of the two fans including installation was only $124.50. Power required is only 98 watts per fan at full speed.

contributed by R. R. FANNING, Dairy Field Services.

Scouring in pigs, with the emphasis on prevention

by W. R. WEBSTER, Veterinary Officer.

Scouring is a major cause of losses in many piggeries. Deaths, drug bills and slow growth in recovered pigs all contribute to the monetary losses.

IN pigs, the gut is the part of the body that is working "hardest" and most "stressed" and therefore is most subject to dysfunction and disease.

Similarly, dairy cows are kept to produce milk and their mammary glands are most frequently involved in disease while horses are most prone to injury of the muscles and bones.

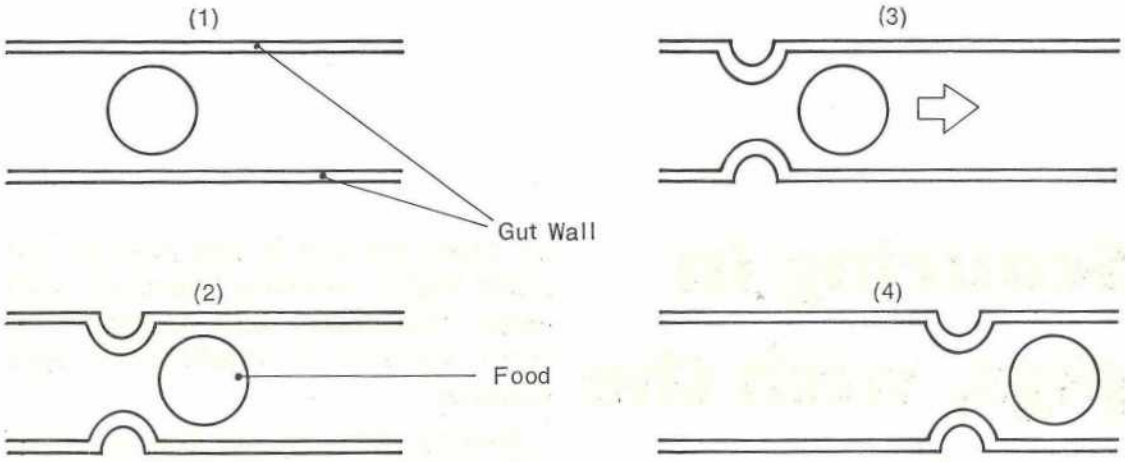
Digestion

Before considering scouring, one must first have a basic understanding of the processes involved in normal digestion. For clarity we will consider that food in the gut is not yet in the body and only nutrients from the food actually enter the body when they pass through the gut wall.

In the stomach and upper small intestine, enzymes are produced by the body that act on food to break it into the simpler chemicals that can then be absorbed into the body. Absorption occurs in the stomach and upper small intestine. Enzymatic digestion and absorption continue in the lower small intestine and here bacteria also act on the gut contents. Bacterial breakdown continues in the large intestine (the caecum and colon) and absorption of nutrients continues. However, the most important function of the large intestine is absorption of water.

The end product of non-utilisable feed is expelled from the body as faeces.

Different parts of the gut have different jobs to do and each part has an optimal "climate" in terms of acidity, bacterial populations and the physical state of the gut contents. Feed moves along the digestive tract by co-ordinated gut wall movements known as peristalsis. Peristalsis can be represented diagramatically thus—



Under normal circumstances, feed passes along the gut at a speed that allows efficient absorption of nutrients and water from the feed and the re-absorption of water and chemicals that are released (or secreted) into the gut from the body as a part of the digestive process. Faeces of normal consistency and composition are thus voided.

Bacteria are a vital part of normal digestion. Scouring would occur if there were no bacteria present just because food in the gut would not have been properly processed.

The pathology of scouring

Scours are liquid faeces. Simply, insufficient water is absorbed from the gut and so faeces are more liquid. As well as less water, less nutrients are absorbed and water and some chemicals (known as electrolytes) secreted into the gut as part of the digestive process are not re-absorbed. Therefore there is a nett loss of water and electrolytes from the body in addition to the non-absorption of water taken in through the mouth. Hence the body becomes dehydrated.

An increased rate of peristalsis is generally responsible for the incomplete absorption of nutrients, chemicals and water from the gut, because the feed spends too short a time within the gut to be thoroughly processed and absorbed. Many things can increase the rate of peristalsis. For example, the gut lining may be attacked by a virus such as swine fever or transmissible gastro enteritis, a chemical such as lead might be taken orally, or excessive bacterial multiplication may irritate the lining of the gut.

Scouring can kill in different ways—

(1) *Due to dehydration*—water and electrolyte loss. All internal body activities ranging from the movement of an arm to the functioning of the brain and beating of the heart require sufficient water and electrolytes to be present in the body to function properly. Severe dehydration prevents such essential body functions so the animal dies.

(2) *Due to septicaemia*—an overwhelming infection due to the spread of bacteria into the blood stream from the gut and the multiplication of these bacteria within the blood streams.

(3) *Due to toxaemia*—toxins or poisons produced by excessive bacterial multiplication within the gut can severely affect other organs and can cause death.

Less directly, death may follow scouring due to starvation. A piglet feeling too ill to feed may die or an older pig weak through blood loss due to swine dysentery may be killed by his pen mates.

The different forms of scours

E. coli scours

E. coli bacteria are normally present in large numbers in the intestines and are vital to normal digestion. However, the correct number of E. coli must be present in the different locations of the gut. Any upset in this balance can cause scouring. Certain strains, or serotypes, more readily cause disease. These are known as the more pathogenic serotypes.

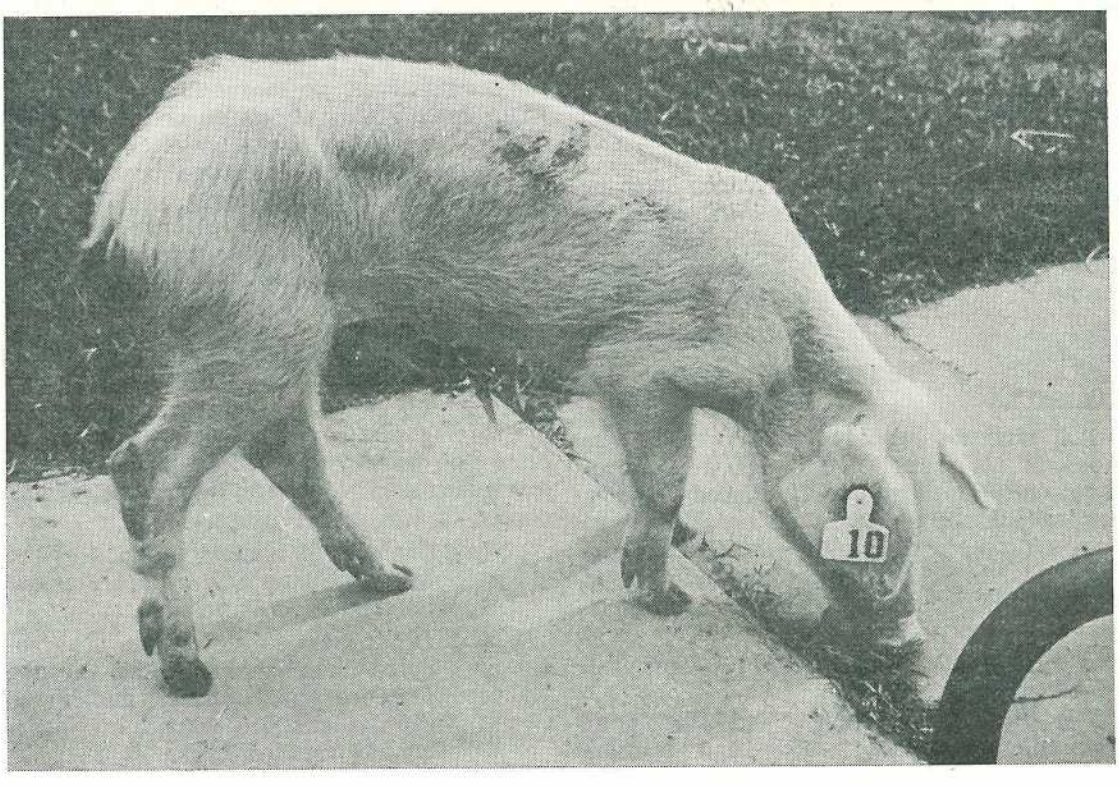
Different serotypes cause different forms of disease; for example some are associated with bowel oedema. Most animals contain within their intestines some pathogenic serotypes, therefore severe disease will occur if these bacteria are allowed to dominate in the intestine. "Stress" can permit this serotype to multiply within the gut at the expense of other less pathogenic serotypes.

The upper parts of the small intestines are likely to contain significantly larger numbers of E. coli when a pig is suffering from E. coli scours. Normally, relatively few bacteria are present in the region due to the higher acidity there.

Salmonella scours

The Salmonella family is a group of bacteria that are not truly normal inhabitants of the gut. They are, however, frequently present. Some members of the family can produce a severe scouring disease killing large numbers of pigs. Other bacteria in the family do not cause disease. Scouring due to Salmonella is generally a more serious condition than E. coli scours. Large numbers of animals can die very quickly. Death is frequently caused by septicaemia or toxaemia, or due to very rapid dehydration. Salmonella can kill so

The serious effects of scouring. This pig weighed 10·5 kg when weaned at five weeks of age. When the picture was taken six weeks later it weighed 9 kg. The cause—Swine Dysentery.



quickly that liquid faeces may not have even been passed, but the insult is severe enough in the upper parts of the intestine to cause rapid death.

Salmonellas frequently cause a blood stained scour.

Salmonellas can be contaminants of feedstuffs, particularly meat and bone meals and grains infested by mice. These contaminating salmonellas may or may not cause disease in pigs.

Swine dysentery—also known as blood scours or vibrionic dysentery.

This is a form of scours that is now thought to be principally caused by a particular bacteria called a Spirochaete. Other organisms then multiply once the disease has started. The most characteristic sign is dysentery or blood in the faeces which often is partially digested and brownish. Mucus is also frequently seen. However, blood in the scour does not always mean that swine dysentery is present.

Salmonellosis can cause bloody faeces also and in general terms blood in the scour is an indication of the severity of the condition rather than a diagnostic feature of one type of scouring. When bloody scours are seen, the lining of the gut has been destroyed down to the level of the small blood vessels and hence bleeding occurs into the bowel.

Other distinct forms of scours include swine fever, transmissible gastro enteritis (both of which are not present in Australia) and Clostridium welchii scours in baby piglets. Intestinal worms can also contribute to a scouring problem.

Prevention

Quarantine

All piggeries would have fewer disease problems in general if no pigs were introduced onto the property. Introduced breeding stock should be blood tested or at least be from a property of known health status and ideally should be isolated for two months and certainly for one month. When pigs are consigned the carrier's vehicle should be kept well away from your piggery (at least fifty metres).

The ideal arrangement is to load your pigs into your own vehicle and transfer them to the carrier's vehicle; failing this a long race should be made to drive pigs along to a loading ramp. Such quarantine measures should ensure that swine dysentery is kept off your property.

Immunity

Baby piglets obtain antibodies by taking colostrum from their mothers. The ability to absorb colostral antibodies from the gut into the body lasts for twelve hours to twenty-four hours after birth. Without colostrum one can expect a higher incidence of baby piglet scours. This "passive" immunity only lasts a matter of weeks and then "active" immunity takes over.

The distinction between "passive" and "active" immunity is that young piglets absorb preformed antibodies from the colostrum into their blood streams in the first few hours of life and their bodies are not involved in the manufacture of the antibodies. This is passively acquired immunity.

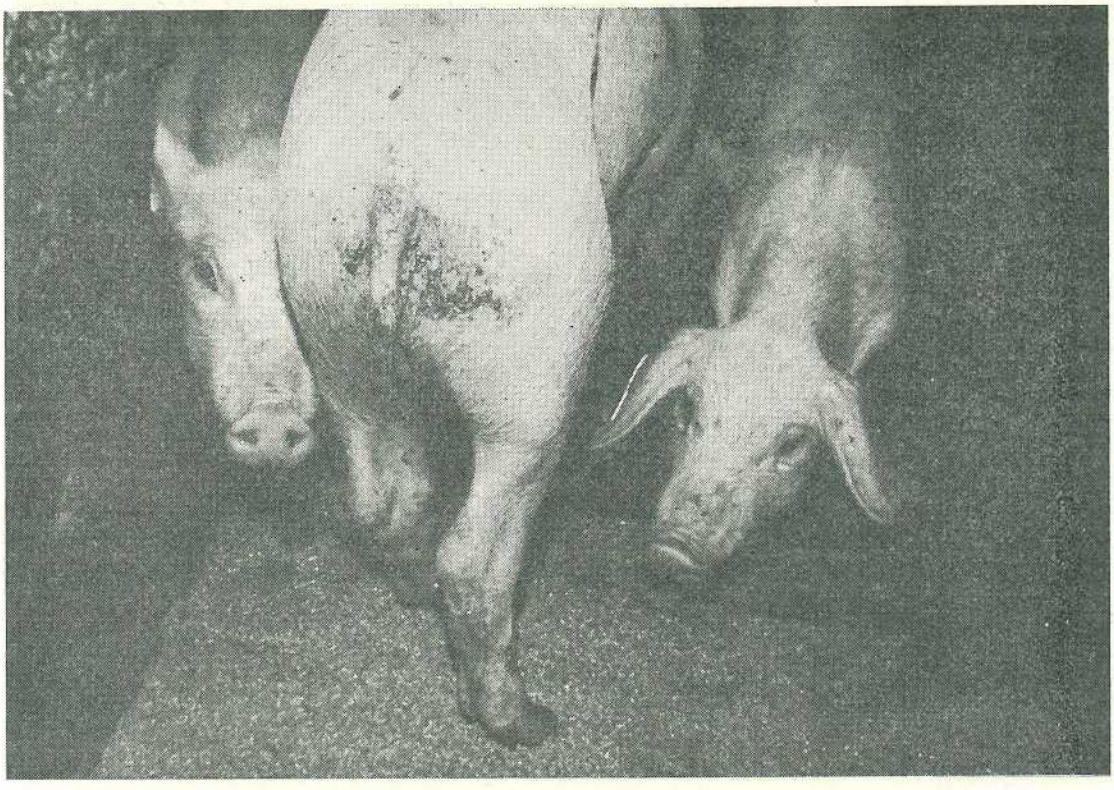
"Active" immunity is acquired when an animal develops its own antibodies when it comes in contact with bacteria or other foreign material. Development of immunity to scouring and some other conditions is a subject that is by no means fully understood. If for some reason piglets do not suckle their mothers in the first few hours after birth they are more prone to piglet and post weaning scours. Also, in general terms, pigs that have been recently introduced to a piggery are more susceptible to scouring than stock reared on the piggery which have developed an immunity to the strains of bacteria present on the property.

Hygiene

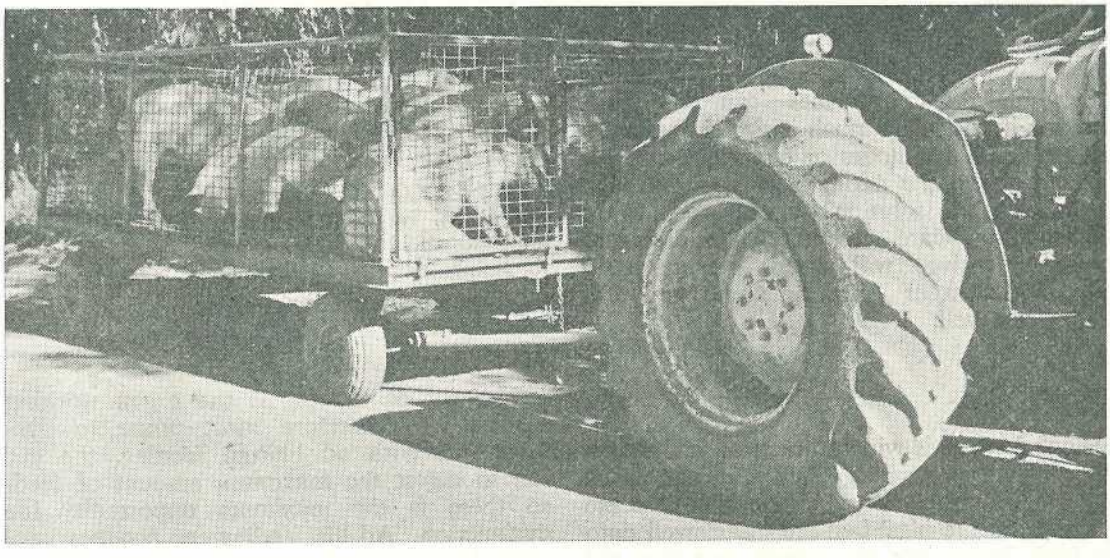
Cleaning of pens is a complete topic for discussion on its own. Briefly, preparation of accommodation for new inhabitants should consist of two distinct steps.

(a) *Cleaning* to remove as much of the organic matter left by the previous inhabitants as is possible.

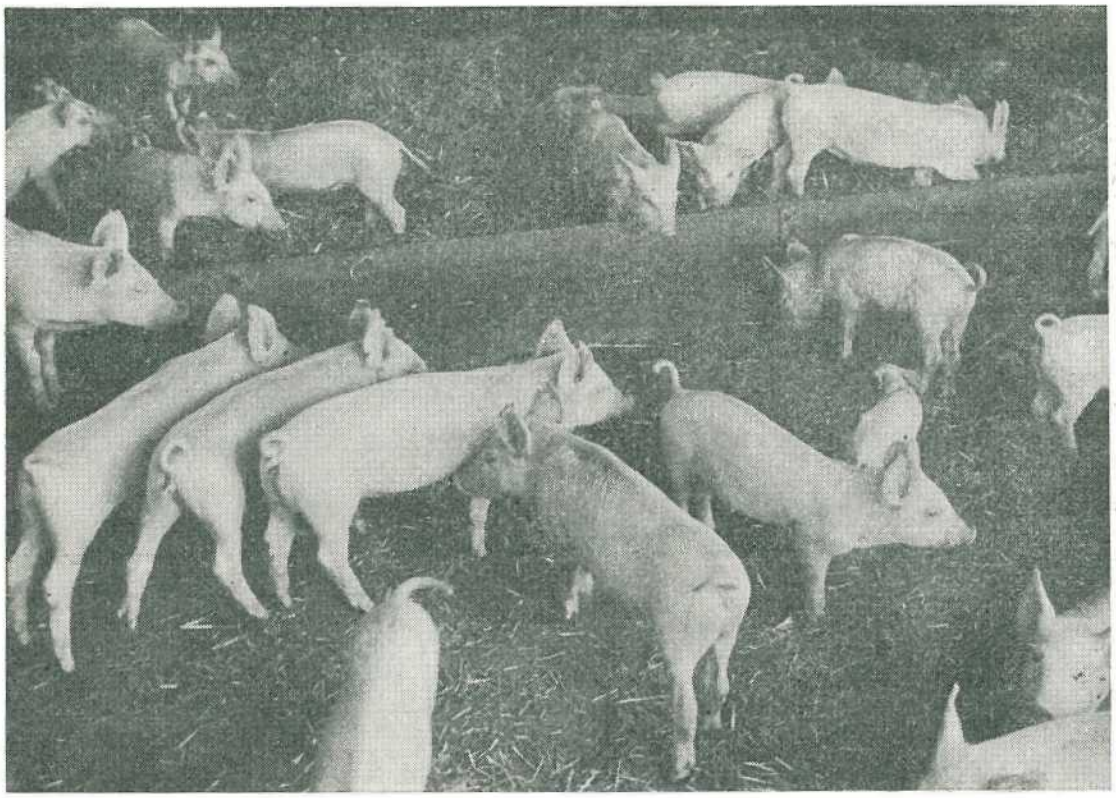
(b) *Disinfection*—disinfectants are rendered much less effective by the presence of organic matter so disinfectants are wasted on inadequately cleaned pens.



Uneven growth due to scouring. These three pigs were of approximately equal weight when weaned.



Pigs to be sold awaiting the carrier. On this property, carriers' vehicles and feed trucks are not allowed within 200 metres of any pig.



Weaner nest. Part of the regime that overcame a severe E. coli scouring problem on this property was that a wooden floor was constructed over the cold concrete in the weaner pens. The floor was covered with straw and the nest completed with an insulated roof and bags hanging down to prevent draughts (not in position for photograph). The stress of weaning was thus markedly reduced.

Scrubbing with brushes can be back breaking but is made much easier if one soaks the pen for a few hours or overnight prior to cleaning. Also the addition of washing soda (to make a 4% solution), caustic soda (1 or 2% solution—care needed) or a detergent (more expensive) will speed this chore no end. Power hoses (working at up to 3 500 kPa) clean well.

Floor feeding

Floor feeding is widely practised and works well when it is working well! Ideally, when pigs are scouring, floor feeding should cease as faeces on the pigs' feet are transferred onto the feed, hence into the mouth and thus the bacteria are recycled. This is not always possible. I also advocate that weaners should not be floor fed as weaners are the class of pigs most susceptible to scouring.

Almost all dispensers of creep feed are likely to be contaminated by the piglets climbing in. Therefore creep feeders should be regularly emptied, the waste given to older pigs, and fresh feed substituted.

Ad libitum feeding

The gut of the pig is the organ working hardest and therefore most prone to dysfunction. With ad libitum feeding, the gut has to digest the maximum amount of feed, so there is the maximum opportunity for dysfunction. Ad lib. feeding can produce very good looking, fast growing weaners with a beautiful "bloom".

However, excessive feeding can and frequently does upset the gut balance and start scouring. Furthermore, the feed conversion of ad lib. fed weaners falls below those on restricted feeding. With current feed costs, we should perhaps be thinking of optimal growth rates rather than maximum growth rate.

Stress

Stress is an easy word to say but difficult or perhaps impossible to define precisely. Nevertheless stress frequently tips the balance between no scouring and scouring.

A list of examples never defines a word, however, the following are circumstances where stress can contribute to the onset and continuation of scouring—

- Cold weather.
- Hot weather.
- Humid weather.
- Change in the composition of the diet—this includes *weaning* where there is a dramatic change in diet—from a milk diet to a non-milk diet.
- Change of pens.
- Fighting or even just a change of penmates.
- Castration.
- Other routine treatments such as vaccinations, etc.

Pig keeping, like life, is a compromise. One of the compromises is trying to keep stress at any one time to a minimum and yet rear your pigs in an unnatural intensive or semi-intensive unit. For example, it is unwise to castrate at weaning and some pig farmers make a point of mixing litters or multi-suckling prior to weaning just to reduce the stress at weaning.

Treatment

Treatment of scouring pigs frequently poses a dilemma but *prevention is always better than cure.* After curing or failing to cure some scouring pigs one should look at one's management and see what can be done to prevent having to treat pigs in the future.

Frequently, people think that treatment is synonymous with administration of drugs. In human medicine nursing is a very important part of treatment, and "nursing" of scouring pigs is also very important.

The first thing to do when you see a pen of pigs scouring is to improve their environment. Shelter and bedding and the provision of troughs for feeding at a reduced level rather than floor feeding are basic steps that can make a vast difference.

One can then consider drug treatments which can fall into the following categories:—

- Electrolyte replacers.
- Drugs that protect the lining of the gut.
- Drugs that slow the rate of peristalsis.
- Antibacterial agents—
  - (i) Sulphonamides.
  - (ii) Nitrofurans.
  - (iii) Antibiotics.

These drugs can be administered in different ways—

(a) Individual oral dosing.

(b) Water medication.

(c) Feed medication.

(d) Injection.

Electrolytes are available commercially as balanced preparations to be administered to scouring animals—they work well.

Gut protectors—These include kaolin, pectin and chalk.

Peristalsis slowers—These are the anticholinergic or sympathomimetic drugs.

Antibacterial agents—Again this is a major topic for discussion on its own. Individual antibiotics will not be discussed. If a specific antibiotic was previously effective and is now apparently less effective it is likely that antibiotic resistance has developed. Antibiotic resistance is widespread in Queensland and is largely due to unwise feed medication.

Administration of drugs

The animals most in need of antibiotic therapy are frequently those that received the least. The most common means of administering antibiotics to scouring pigs is in the feed and the sickest pigs, those in most need of medication, are the poorest eaters of the group. Therefore when antibiotic therapy is indicated for the treatment of scouring, water and not the feed should be medicated.

Individual oral dosing of young piglets works well but as pigs grow heavier this becomes a Herculean task!

The value of injectable antibiotics in the treatment of scouring pigs is exaggerated by many. In cases of septicaemia, injected antibiotics have a definite role to play; however in order to be active within the gut, the drug has to be secreted into the gut in fairly high concentrations. Injections are therefore an indirect and inefficient approach to the problem. Nevertheless this may be the only way to individually treat large pigs.

Prevention is better than cure. Attention to disease control during the initial planning of a new piggery right through to the everyday management routine will pay dividends in the long run.

The effects of stable fly

THE previous issue of the *Queensland Agricultural Journal* contained an article by L. N. Corbet and J. W. Turner on stable fly.

This photo shows Mr. L. N. Corbet of Kingaroy examining the legs of a cow severely affected by this pest. It is easy to see how the painful bites and irritation severely limit production until control measures are effective.

Chemical Weed Control Guide Winter Cereals 1977

Compiled by S. R. WALSH and J. M. T. MARLEY, Agriculture Branch.

This chart is a guide to the chemical control of weeds in winter cereal crops. While chemical herbicides have a valuable part to play in supplementing mechanical weed control, they can never be used to replace sound cultural practices.

Each year the number of chemicals commercially available increases. The successful use of these chemicals depends on a number of factors. These include the choice of the most efficient chemical, the correct timing of the spraying, and the rate and method of application. Careful attention should also be given to applying the chemical at the correct stage of crop growth so that injury to the crop can be kept to a minimum.

It is important that the weed should be identified correctly before selecting the chemical to be used. The weeds listed in the guide are those that occur most frequently in winter cereal crops. The explanatory notes below are most important and should be read in conjunction with this guide. When applying herbicides, producers should take care to avoid spray drift. Further information on weed control may be obtained from your local agricultural adviser.

HERBICIDE RATES IN MILLILITRES PER HECTARE

Cereal Weeds	Avadex BW	Treflan	Avenge 650 SP	2,4–D Amine (50% W.V.)	MCPA (27% W.V.)	Tordon 50D	Brominil	Buctril MA Brominil M	Dicamba (20% W.V.)
Wild oats	*2 100	1 000	1·15 kg	..	..	..	..	..	..
Paradoxa grass	..	*1 000	..	..	..	..	..	..	..
Climbing buckwheat	..	..	..	1 100 (+W)	2 800	*470	1 400	1 400	700
Wireweed	..	1 000	..	*1 700 (+W)	..	470 + 2,4–D †	1 400 + 2,4–D ††	1 400	700
Turnip-weed	..	..	..	*700	1 400	470 + 2,4–D †	1 400 + 2,4–D ††	1 400	700 + 2,4–D ††
Mustards / Radish§	..	..	..	*1 100	2 100	470 + 2,4–D †	1 400 + 2,4–D ††	1 400	700 + 2,4–D ††
Variegated thistle	..	..	..	*1 100	2 100	470 + 2,4–D †	1 400 + 2,4–D ††	1 400	700
Saffron thistle	..	..	..	*1 700 (+W)	3 500	..	..	1 400	..
Hexham-scent	..	..	..	*1 700 (+W)	..	470 + 2,4–D †	..	1 400	700
New Zealand spinach	..	..	..	..	..	*470	..	..	700
Spiny Emex	..	..	..	1 700 (+W)	..	*470	..	1 400	700
Docks	..	..	..	1 700	..	*470	..	..	700
Mintweed	..	..	..	*1 100	..	470 + 2,4–D †	..	..	700 + 2,4–D ††
Sunflower	..	..	..	*1 100	..	470 + 2,4–D †	..	..	..

Cereal Weeds	Avadex BW	Treflan	Avenge 650 SP	2,4–D Amine (50% W.V.)	MCPA (27% W.V.)	Tordon 50D	Brominil	Buctril MA Brominil M	Dicamba (20% W.V.)
Paterson's curse	..	..	..	*1 700	..	..	..	..	..
Bindweed (perennial)	..	..	..	*1 700	3 800	..	..	..	..
Hoary cress (perennial)	..	..	..	*1 700	..	..	..	..	..
Mexican poppy	..	..	..	*1 700	..	..	..	1 400	..
Growth stages for application to—									
Crop	Pre-sowing	Pre-sowing	post emerge	Tillering	Tillering	Tillering	2-leaf through tillering	3-leaf through tillering	Tillering
Annual weeds	Pre-emerge	Pre-emerge	2½ leaf to tillering	Young	Young	Young	Young	Young	Young
Perennial weeds	..	..	..	PRE-FLOWERING	PRE-FLOWERING	PRE-FLOWERING	NOT EFFECTIVE	NOT EFFECTIVE	PRE-FLOWERING
Crop tolerance—									
Wheat	2 100	Not recomm.	Tol.	2 200	5 600	Tol.	2 100	2 100	700
Barley	2 100	1 000	Tol.	1 700	4 200	Tol.	2 100	2 100	700
Oats	Non-tol.	Non-tol.	Non-tol.	1 100	4 200	Tol.	2 100	2 100	700
Canary seed	Non-tol.	Non-tol.	NA	1 100	NA	NA	NA	NA	NA
Undersown lucerne	2 100	Not recomm.	Tol.	Non-tol.	Non-tol.	Non-tol.	NA	Non-tol.	Non-tol.
Methods of application—									
Boom sprayer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Aircraft	No	No	Yes	Yes	Yes	Yes	No	MA. No M. Yes	Yes
Misting machine	No	No	No	No	No	No	No	No	No

NOTE:—

1. The treatment marked with an asterisk is the usual suggestion for cost efficiency.
2. (+W) indicates to add non-ionic wetting agent at 1 part of 50% to 60% product to 1 600 parts of spray mixture.
3. 2,4–D and MCPA formulations vary in the percentage of active ingredient—check the label and adjust the rate accordingly.
4. Tol. indicates the crop is normally tolerant at the suggested rates of application.
5. Not recommended indicates the chemical should NOT be used on this crop as crop damage may occur.
6. NA indicates crop tolerance data not available.
7. 2,4–D esters must NOT be used in declared hazardous areas.
8. + 2,4–D † indicates add 470 ml per hectare of 50% 2,4–D amine.
9. + 2,4–D †† indicates add 700 ml per hectare of 50% 2,4–D amine. When 2,4–D is added to Brominil application must be restricted to the tillering stage of the crop.
10. For linseed and safflower Avadex at the rate of 4 200 ml per hectare is recommended as a pre-sowing application for wild oats control. It is cheaper than Avadex BW but SHOULD NOT be used on wheat or barley.
11. (§) For adequate control of radish extra 2,4–D above the rate indicated in this guide may be required. Consult your Agricultural Adviser.
12. Residual activity of Treflan or Tordon 50D may restrict the choice of the subsequent crop. Consult the manufacturers' labels.
13. For cereals undersown with lucerne 2,4–DB may be used to control some broad-leaved weed species. Consult your Agricultural Adviser.
14. Sprays should be thoroughly mixed before application.
15. To convert millilitres per hectare to pints per acre divide by 1 400.
16. The best results are obtained from post-emergence wild oat sprays if both the crop and oats are growing vigorously. Crop competition is important for subsequent control.
17. The best results are obtained if Avenge 650 SP is applied when the wild oats are in the 2½ to 3 leaf stage, but it may also be applied through the tillering stage.
18. It is important that the recommended rate of surfactant (wetting agent) be added to the Avenge. The required amount is contained in the commercial pack marketed by the company.
19. Avenge should **not** be mixed with any other herbicides.
20. **ALWAYS READ LABELS CAREFULLY BEFORE USING CHEMICALS**

The Shaggy Peas of South-eastern Queensland

by BERYL A. LEBLER,
Senior Botanist.

IN 1807, Henry Andrews, an English botanical painter and engraver, described and illustrated 'a butterfly flower from New Holland' to which he gave the name *Oxylobium cordifolium.*

It had been found by Sir Joseph Banks in New South Wales, and raised from seed in London at Kew Gardens. The generic name is a combination of two Greek words *oxys* which means sharp and *lobos* meaning a bud. It describes 'the pointed, egg-shaped pod' of this plant.

Shaggy peas are erect woody shrubs or prostrate to half-climbing undershrubs. Their leaves are simple and either distinctly opposite or in whorls of three. The margins are either entire or with lobes which end in pungent points.

The first species described had scarlet-orange flowers. In Western Australia and New South Wales some species have orange-red and deep red flowers. In south-eastern Queensland the flowers are always some shade of yellow or orange.

The flower has the typical pea-flower shape and formation with five sepals, five petals, and ten stamens, the filaments being free from one another. The ovary is usually covered with hairs, and contains four or more ovules. The inflated pod is ovoid or oblong in shape and is either sessile or stalked. The common name describes the appearance given by the hairy calyces to the inflorescences.

Shaggy peas are found only in Australia. Five species grow in south-eastern Queensland:—*Oxylobium scandens, O. aciculiferum, O. ilicifolium, O. robustum, and O. arborescens.*

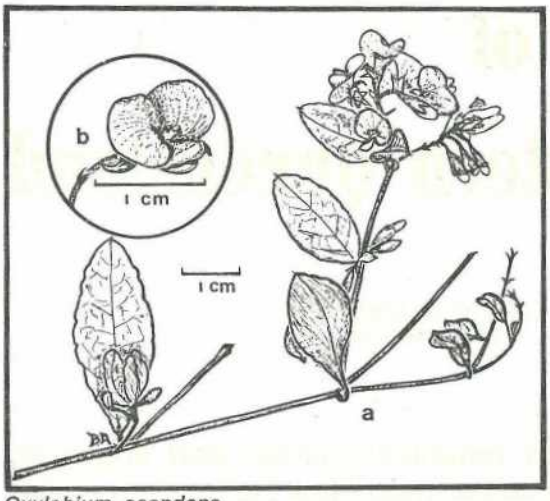
Oxylobium scandens

The Latin adjective meaning climbing or twining was chosen as the specific epithet for this plant. It describes the habit of the plant when other vegetation is close by to support it.

DISTINGUISHING FEATURES. The growth habit is sufficient to distinguish this shaggy pea from the others in south-eastern Queensland.

DESCRIPTION. It is an undershrub with trailing, very thin wiry stems which sprawl over the ground, often covering large patches when growing on bare, stony soil. In such situations most of the stems are prostrate and only the ends of the branches are ascending. The leaves are usually opposite. They vary in shape from obovate to ovate-elliptical. They also vary considerably in size. On sterile branches they can be 6 cm long and 2 cm wide. On flowering twigs they are usually much shorter and narrower.

The leaf tip is rounded and the midrib is produced to form a short, stiff mucro and the leaves are narrowed gradually to the base. The leaf stalks are very short and usually lie very close to the stem with the leaves held out at an angle. They are firm in texture and the margins crenate. The upper surfaces are dark green and they are paler beneath. The reticulate venation is more evident on the lower surfaces.



Oxylobium scandens

As many as eight flowers are grouped in loose racemes which can be axillary or terminal. Minute, appressed, white hairs are found on the young portions of the plant, but the older portions are glabrous. The flowers are on pale green pedicels about 0·5 cm long.

The widely spreading, pointed calyx lobes are the same length as the pale green calyx tube. The two upper lobes are joined together for half their length. The petals are yellow and the colour of corn. The emarginate standard spreads widely; and in mature flowers is very recurved.

It is 1·5 cm wide and 1 cm deep. In most flowers there is a conspicuous red arc at the base of the standard, but on some plants the colour is so faint, at first glance the standard appears to be plain yellow.

The wings are 0·8 cm long, 0·4 cm wide and are almost rectangular in shape. The keel is almost as long as the wings and the two petals forming it are joined together only at the base.

The fruit is dark brown, transversely wrinkled and about 1 cm long, with a conspicuous upturned tip. The withered calyx surrounds the stalk at the base of the pod and on most fruits at least some of the short, spreading hairs on the outer surface can be seen.

The pod does not split into two separate valves but begins to split at the tip and separates along both sutures for only a portion of their length; to release two or three dark brown, shiny seeds.

FLOWERING TIME. There appear to be two flowering flushes, one in late summer to early autumn and the other as winter changes to spring.

HABITAT. This plant grows in grassland in open eucalyptus forest on sandy loam, or on bare, stony, poor soil.

DISTRIBUTION. It is found only in New South Wales and Queensland from as far south as Bateman's Bay to as far north as Rosedale, just north of Bundaberg.

GENERAL REMARKS. This would be a useful ground cover plant if brought into cultivation.

Spiny Shaggy Pea

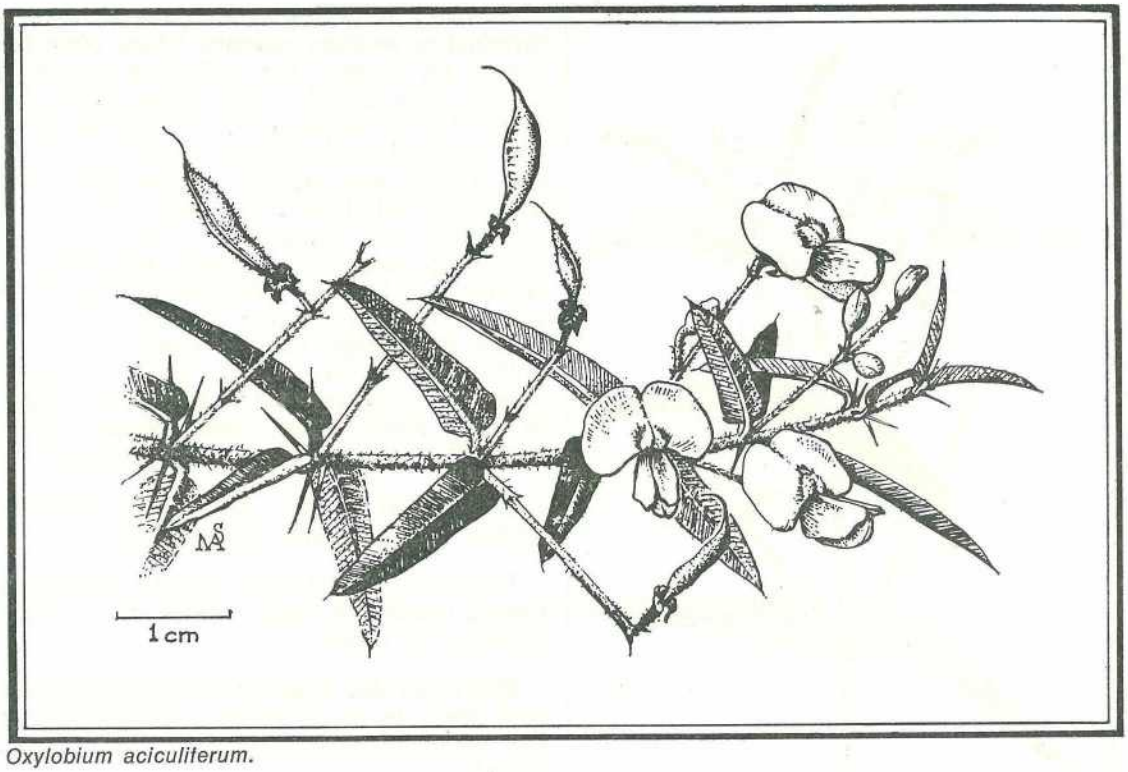
(*Oxylobium aciculiferum*)

The specific epithet of this plant is the Latin word meaning needle-bearing. It refers to the short, needle-like spines on each side of the base of the petioles.

DISTINGUISHING CHARACTERS. The spines which give this plant its name are sufficient to distinguish this shaggy pea from the others.

DESCRIPTION. This is a very prickly, erect shrub about 1·5 cm high with slender divaricate branches. The leaves, on extremely short petioles, are mostly opposite, and their laminas spread widely from the stem. A pair of divaricate, slender stipular spines is at the base of each petiole.

The stems are covered with minute, spreading, brown hairs. The leaves are dark green and leathery in texture. They are lanceolate in shape and can be up to 3·5 cm long and 1 cm wide. The leaf base can be rounded or truncate and the margins are entire. The midrib is the most prominent vein on the upper surface, showing as a lighter green line, but pinnate veins, joined by reticulations can also be seen. The midrib is produced into a rigid spiny mucro 0·2 cm long.



Oxylobium aciculiferum.

The flowers are pale golden yellow and are either solitary or in loose, few-flowered axillary racemes which are usually much longer than the leaves. The standard is reflexed, 0·6 cm long and 0·9 cm wide. It is only slightly emarginate, very spreading and very reflexed. The wings are very slightly shorter than the standard. Their upper edges touch and the wings are at an acute angle with the top of the keel. All the petals are orange-yellow.

Although this plant does have linear bracteoles inserted about halfway down the pedicel, they are deciduous and are usually shed long before the bud opens. Then the only evidence of their presence is the thickening left by their scars.

FLOWERING TIME. The main flush of flowers is in early spring, but occasional flowers can sometimes be found from mid winter onwards.

HABITAT. It grows in sandy soil on the margins of tea-tree swamps, in scrub along creek banks, and in sclerophyll forest containing rain-forest trees.

DISTRIBUTION. It grows only in New South Wales and Queensland from Port Macquarie in the south to as far north as Mt. Larcom.

Native Holly

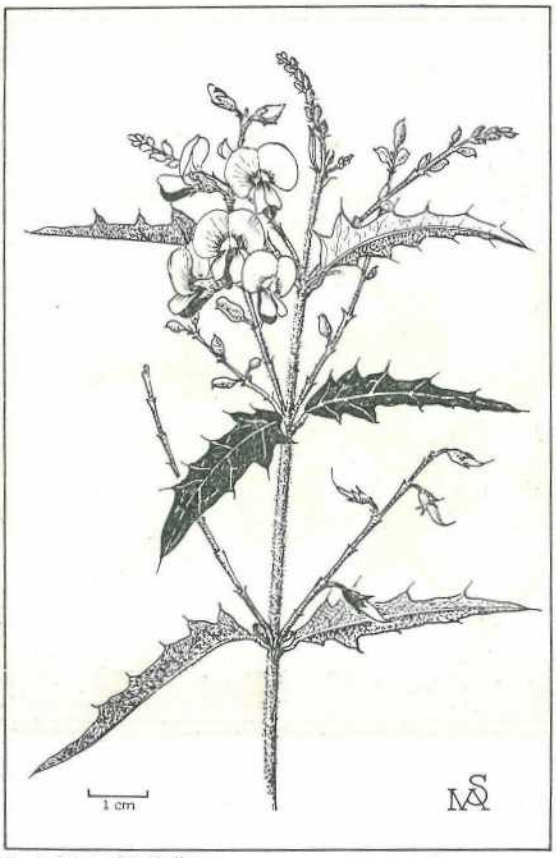
or

Prickly Shaggy Pea

(*Oxylobium ilicifolium*)

Ilex is the Latin name for holly and the Latin word meaning holly-leaved used for the specific epithet of this plant is self-explanatory.

DISTINGUISHING CHARACTERS. The shape of the prickly leaf is sufficient to distinguish this plant.



Oxylobium ilicifolium.

DESCRIPTION. This is an erect shrub to about 2 m high. Sparse, very short hairs are scattered on the new growth. The leaves are opposite and up to 7·5 cm long and 2·5 cm wide towards the base. The margins are flat and are bordered by triangular lobes. These are at irregular intervals along the margins, with one or two on each side near the base usually larger than the others. A pungent spine 0·2 cm long is at the tip of the leaf and of each lobe.

Leaves from plants growing on mountain peaks are usually shorter and broader and have fewer lobes. Mature leaves are dark green and somewhat shining on the upper surface and paler beneath. Both surfaces are distinctly reticulate. A lateral vein connects the midrib to the spine at the end of each lobe. The leaf texture is leathery.

As many as 18 flowers are grouped in loose terminal or axilliary racemes. These often far exceed the leaves. The peduncles are about 0·2 cm long and the calyx about twice that length. Minute, appressed hairs cover the calyx. The standard is emarginate, about 1 cm wide and 0·5 cm deep and is golden-yellow with an arc of red lines at the base. The wings are golden and the keel red. The pods are 1 cm long, nearly 0·3 cm deep, and, although swollen, are laterally compressed. The tip of the pod is curved upwards. A loose network of raised thickenings on the outer surface is visible beneath the minute, appressed white hairs which are scattered over the pod. Three or four black, shiny, kidney-shaped seeds about 0·1 cm long are inside the pods.

FLOWERING TIME. The main flowering flushes are in autumn and spring.

HABITAT. It is found in open eucalyptus forests usually in shady slopes or in moist gullies or on ridges.

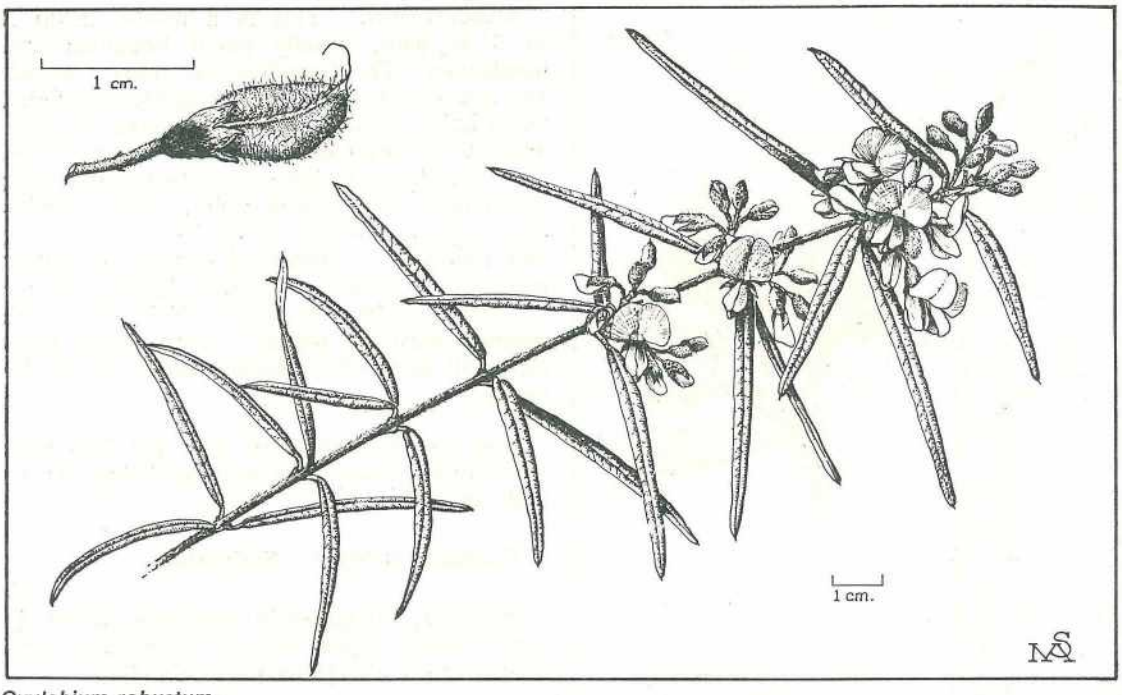
DISTRIBUTION. It grows in the eastern mainland States to as far north in Queensland as Esk on the Coastal lowlands and Isla Gorge inland.

Oxylobium robustum

The specific epithet chosen for this plant is a Latin adjective meaning strong in growth. It probably refers to the large size of this shrub.

DISTINGUISHING CHARACTER. The only Shaggy Pea in south-eastern Queensland with which this plant could be confused is *O. arborescens*. Both are tall shrubs with narrow-lanceolate leaves and entire margins, and many-flowered racemes of bright yellow flowers. The pod of *O. robustum* is short-oblong and strongly laterally compressed, while *O. arborescens* has an ovate accuminate pod which is much shorter.

In the absence of fruits they are so similar that until 1971 it was not realised *O. arborescens* grew in Queensland. However habitat alone will separate *O. robustum* as a plant of the coastal lowlands, while *O. arborescens* grows in the mountainous regions on the border of Queensland and New South Wales.



Oxylobium robustum.

DESCRIPTION. This is a slender shrub often 3 m high with long, ascending branches which tend to droop at the ends particularly when the plant is in full bloom. The stems, petioles and lower surfaces of the leaves have a dense covering of white, spreading hairs. The leaves are in whorls of three or four. They are narrow lanceolate to linear, frequently 7 cm long, 0·5 cm wide and end in a blunt tip. Their texture is leathery and the upper surface is dark green, while the lower is grey-green. The midrib is prominent, sunken on the upper surface and forming a raised ridge on the lower surface. The margins are recurved and the midrib is produced beyond the lamina to form a blunt mucro.

As many as ten orange-yellow flowers on pedicels about 0·5 cm long are in terminal and axillary racemes up to 3 cm long. The flowers are over 1 cm long. The calyx tube has a golden sheen because of the covering of appressed hairs. The standard is 1·3 cm wide, 1 cm deep and only slightly emarginate.

The stipitate ovary is pale green and densely covered with long, white, silky hairs. The pods are short-oblong, about 1·25 cm long and 0·3 cm deep. They are strongly laterally flattened but still swollen. They contain about ten small black kidney-shaped seeds.

FLOWERING TIME. It usually blooms from late winter to early spring.

HABITAT. It is common on sandy wallum flats, on the margins of tea-tree swamps, in scrub along creek banks, and in sclerophyll forests.

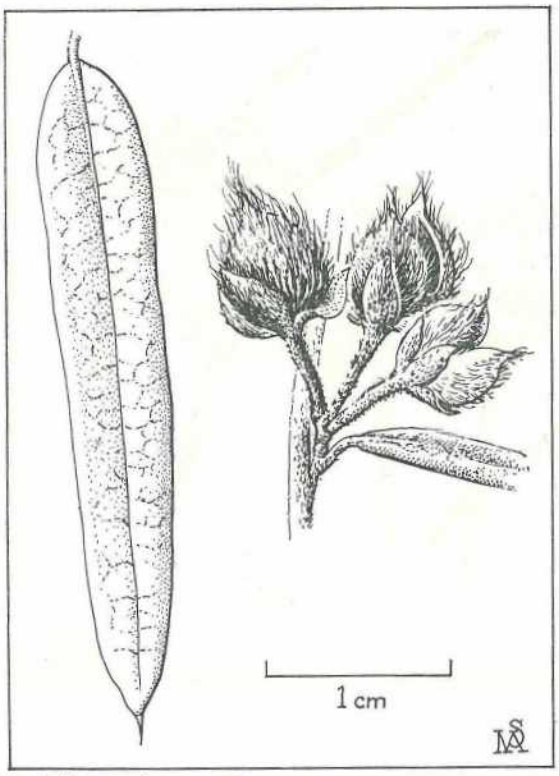
DISTRIBUTION. It is found in the coastal lowlands of northern New South Wales, to as far north in Queensland as Bundaberg.

GENERAL REMARKS. This is a worthy addition to any garden, particularly if it is fingertip pruned several times in the early stages of growth. It flowers profusely within several years of planting and contrasts beautifully with Hoveas.

Tall Shaggy Pea

(*Oxylobium arborescens*)

The Latin word *arborescens* means resembling a tree or tending to be woody. When the plant was first collected from Tasmania and described it was referred to as 'Tall oxylobium'.



Oxylobium arborescens

DESCRIPTION. This is a robust shrub 2 to 3 m high, usually much branched and handsome. The branches are often whorled, and are densely covered with appressed, short, white hairs. The leaves are in whorls of three or more and are narrow-linear to linear oblong, 3 to 5 cm long, leathery in texture and ending in an acute or pungent point. The margins are recurved and the upper surface is shining and reticulate. Appressed opaque or silvery hairs are on the lower surface. The flowers are in dense axillary racemes which are much shorter than the leaves. Long, silky hairs cover all parts of the inflorescence except the petals.

The pod is ovate, 0·6 to 1 cm long with very convex valves, the outsides being shaggy with soft hairs.

FLOWERING TIME. Springtime.

HABITAT. It grows in eucalyptus forest, in the transition zone between fern forest and mallee scrub, always on mountain slopes.

DISTRIBUTON. It is found in the eastern states, including Tasmania to as far north as Mt. Tamborine, Binna Burra and Mt. Norman.

FIELD KEY TO SHAGGY PEAS IN SOUTH-EASTERN QUEENSLAND

1.	Procumbent or trailing undershrub with ovate-elliptical, ovate-lanceolate or narrow-oblong leaves	*Oxylobium scandens*
	Erect shrubs or small trees	2
2.	Leaves mostly opposite	3
	Leaves mostly irregularly verticillate	4
3.	Stipular spines present, leaves entire	*Oxylobium aciculiferum*
	Stipular spines absent, leaf margins bordered by triangular lobes tipped with pungent spines	*Oxylobium ilicifolium*
4.	Slender shrub or small spreading tree; leaf tips blunt; midrib produced to form a mucro; pod 1 cm long, oblong, pubescent, strongly laterally compressed, obliquely beaked ..	*Oxylobium robustum*
	A low or tall shrub, much branched; 6-10 ft. high; leaves acute and pungent; pod 0·8 cm long, ovate-attenuate with very convex valves, shaggy with short, soft hairs	*Oxylobium arborescens*

Close versus wide spacing of apples

by B. C. DODD,
Supervising Horticulturist,
Granite Belt Horticultural Research Station.

THE traditional method of growing apples has been through wide spacing, 6 metres by 6 metres on the square. This practice was established under dryland conditions where closer spacing led to excessive soil moisture competition with reductions in tree growth, fruit size and yield.

The tree that developed under such conditions was extremely variable in size, depending on soil fertility, moisture availability and rootstock used, but average tree size in the Granite Belt would be 3 metres wide by 3 to 4 metres high.

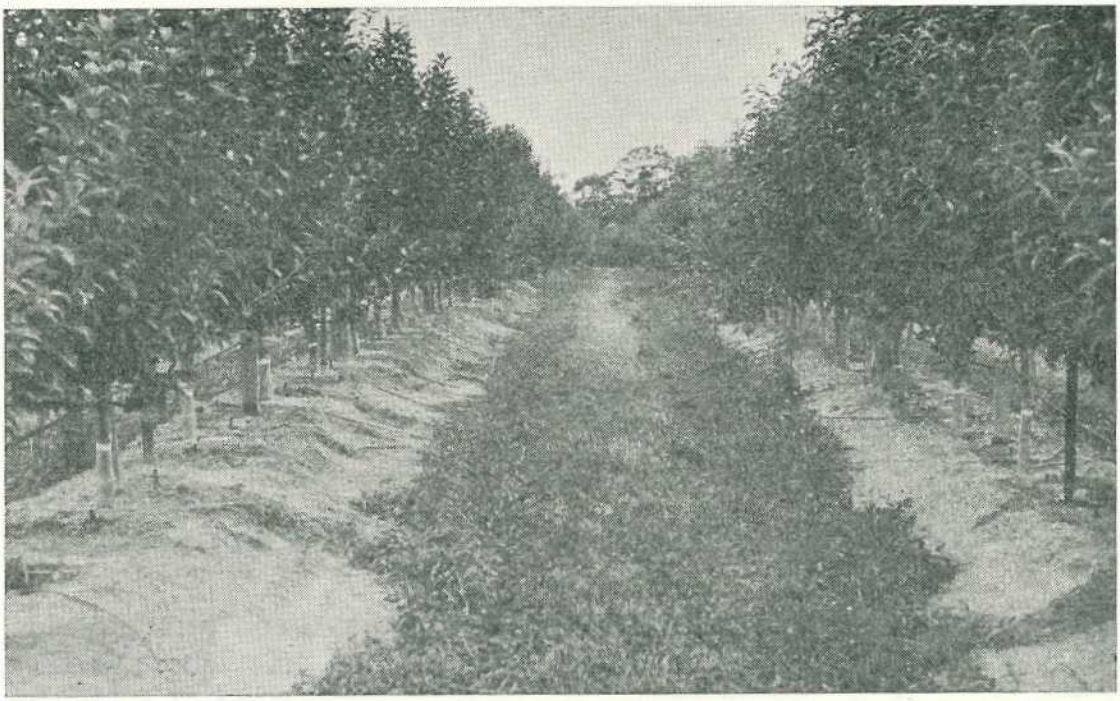
This led to large, vacant inter and intra-row spaces, which helped cultivation practices, but were extremely wasteful in the trapping and conversion of sunlight into components of tree growth, such as yield. Also, the general size of trees resulted in pruning and harvesting delays, plus problems with protectant spray covers.

Average production in the Granite Belt is 400 to 500 bushels per hectare. However, any wide spaced orchard should be able to produce 750 bushels per hectare without much difficulty. Experimental close planting trials at the Granite Belt Horticultural Research Station have attained up to 4 000 bushels per hectare in their fifth year. There is also one grower who has almost reached this figure with mature trees.

Close planting is based simply on the most efficient use of all the factors needed for tree growth and production whether they be sunlight, moisture or plant nutrients.

It is obvious that a continual hedgerow system provides a more efficient means of using sunlight than one with large intra-row spaces. Hedgerows should be no more than 1 metre wide or shading may occur in the middle of the leaf canopy. Inter-row width is determined by width of drive past equipment and expected tree height. A tall tree causes shading in the lower part of the tree, suppresses bud development and raises the cropping zone. It can also lead to shading problems in adjacent rows.

Soil moisture becomes of extra importance under this form of management. Trees must provide moisture through leaf transpiration for sunlight to be effective in the manufacture of food reserves. A close planted system provides greater root exploitation, greater leaf transpiration surfaces and therefore greater moisture demands.



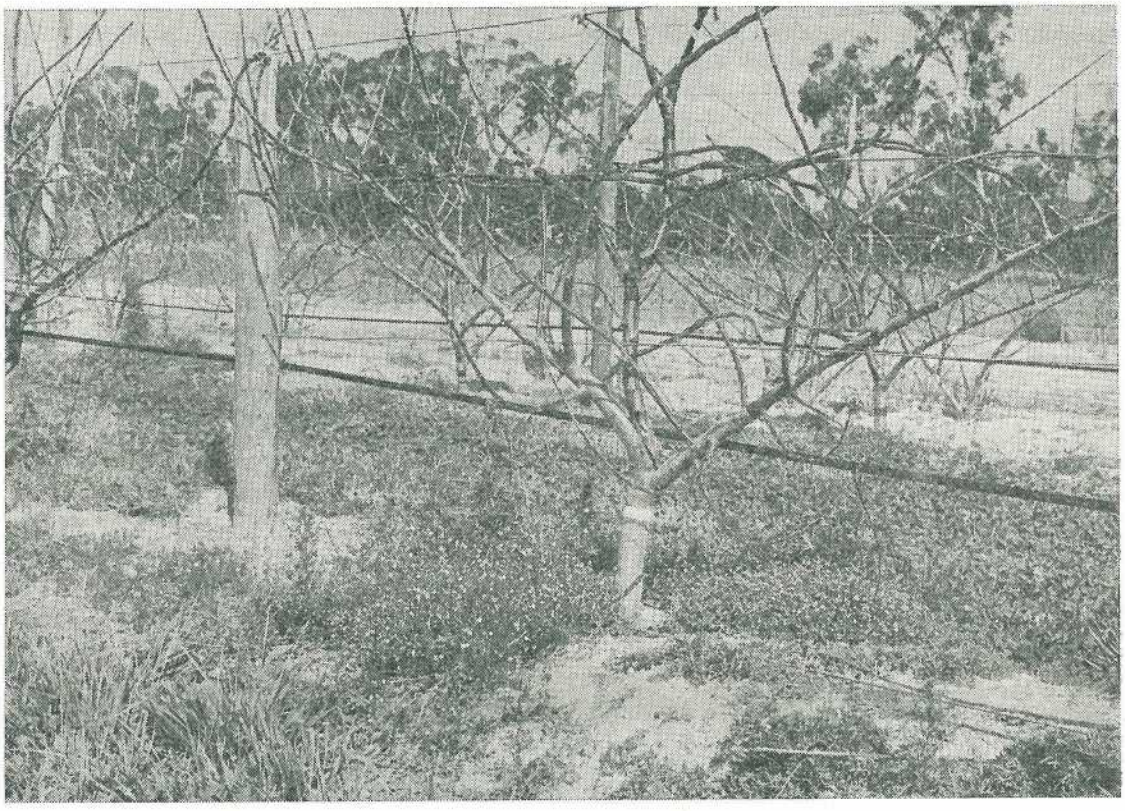
Growth of close planted apple trees in their third year. Note solid row effect, controlled sod culture and weedicide, and hilling up along the row.

When the tree canopy is fully developed, moisture demands are approximately 70% of the water losses from a free water surface (this can be readily measured from a Class A meteorological pan), and water replacement should be based on this figure. A carefully monitored system where moisture replacement takes place frequently, say three times a week, and soil moisture is maintained close to the optimum gives the best results. Trickle irrigation provides the most efficient means for this. These conditions are more difficult to attain with spray irrigation.

If sunlight is used to the fullest, and moisture supply is adequate, then chemical fertility should not be allowed to become the limiting factor. Apple trees build up reserves of plant nutrients which are stored in the trunk, branches and roots. Under high cropping pressures, these reserves can become depleted. Fertilizer practices on sandy soils should be mainly based on the concept of little and often. Nitrogen is readily leached and potash reserves may be lost. These elements can be applied weekly through the irrigation system. However, the normal phosphatic fertilizer, superphosphate, is virtually insoluble, has long term soil effects and can be applied separately as a soil dressing. Foliar analysis can confirm whether applications are adequate. Obviously with greater yields and greater tree demands per unit area, fertilizer requirements will be considerably greater than for wide spacing.

Having looked at the philosophy behind close planting, it now becomes necessary to apply these reasonings to defined recommendations.

These have been formulated from trial work and experience over the past ten years. As establishment costs are far greater with close planting, not only must greater yields be obtained but earlier returns are necessary to help defray the initial costs. The major management factors to consider are the choice of rootstocks, the spacing distances and the pruning and training techniques.



Central leader pruning system. Note the leaders pulled down along the row and the central leader.

The ideal rootstock is one that grows quickly to the height required and then settles down to heavy cropping which stabilises its size. The standard rootstocks used for wide spacing in the Granite Belt at present are Merton 778 and Seedling. These come too slowly into bearing and produce too large a tree for efficient management in close spacing. Semi-dwarf rootstocks, such as MM 106, provide the required characteristics. Some trees propagated on MM 106 are now available at local nurseries, and its supply is increasing.

As previously mentioned, inter-row spacing depends on the width of drive past equipment and tree height. The desired tree height is a maximum of 3 metres for ease of harvesting and cultural operations. Drive past equipment requires approximately a 4 metre inter-row space. If vigour of rootstock and soil fertility causes trees to grow above 3 metres, shading effects may occur in adjacent rows unless the 4 metre inter-row space is widened. Intra-row spacing is determined by the ability of trees to fill in along the row without causing overcrowding. For the recommended rootstock and pruning system, a 2 metre spacing is ideal. At 3 metres, vacant spaces occur in the hedgerow and at 1 metre overcrowding occurs.

The vase pruning system used in the Granite Belt for many years has proven to be unsuitable for high density plantings. This system promotes cropping in the top part of the tree and shades out the bottom portion. Also large spaces, which should be part of the cropping zone, are left close to the ground. A central leader pruning type which fills in along the row and has a pyramidal Christmas tree effect allows sunlight to reach the bottom of the canopy and promotes strong fruit buds in this section.

This is brought about in the first few years near the end of each growing season by tying down a pair of leaders to an angle of 45 degrees along the row. Another leader is left to grow as a strong central leader. Leaders that are pulled down lose vegetative vigour and come into cropping more quickly. Upright leaders are strong and vigorous and slow croppers.

For a semi-dwarf, early bearing rootstock pulling down and tying is of some importance, but if the rootstock used is vigorous, tying down is essential. A training wire running along the ground is a good tool for this purpose.

A change to the intensive close planting system, where both costs and returns are greatly increased means the importance of good management practices is emphasised. Where possible good, fertile, virgin soils should be used, but these are becoming scarcer and it may be necessary to use replant areas. These should be allowed to lie fallow for several years and allowed to improve in fertility and structure through green manuring. Full attention should be paid to any drainage or soil acidity problems, and pre-planting fumigation becomes essential. Without this necessary pre-planting management, trees on semi-dwarf rootstocks may not reach the desired height and size, thereby limiting cropping. Vigorous rootstocks may be stunted to a reasonable height but will still lack the necessary precocity. Virus free trees should be obtained if available.

Heavy cropping in the third year. Trees on MM106 rootstock at 2 metre inter-spacing. Note the trickle irrigation.

After planting with desired irrigation facilities established at an early stage, sod culture strips should be developed in the inter-row in preference to bare cultivation. This means the whole soil profile can be used by the tree roots instead of losing the top 10 cm through cultivation. A permanent sod allows ease of entrance of equipment after rain. Sod should be kept down by frequent mowing. A strip along the row should be kept clean through weedicides.

Of course, a major change in orchard practices should not be contemplated unless there are sound economic reasons behind it. The benefits of close planting through quicker harvesting and pruning, the more efficient use of equipment, irrigation, fertilizer and plant protection sprays are readily appreciated but growers have doubts about the economic benefits because of the higher establishment costs.

Certainly costs are considerably greater in the early stages because 5 times the number of trees are planted and training techniques take longer in the first few years. However, the overall costs and returns in the complete cropping cycle should be looked at rather than the initial charges.

Surveys in other apple areas have shown that close planting is more expensive than wide spacing up until the sixth year, but from then on the benefits of close planting take over. A recent costing by the Department's Economic Services Branch has verified these findings for local conditions. Information on this is available at the Department's office at Stanthorpe.

A further criticism levelled at close planting is that there would be problems in disposing of the increased production. It is not envisaged that all wide spaced areas should be replaced. Rather that equivalent, more efficient and economic production be obtained from considerably smaller areas.

The Bean Pod Borer in North Queensland

BEAN pod borer is the common name given to the larval (or grub) stage of a medium sized moth. It derives this name from a preference for feeding inside the pods of the French culinary bean.

The pest's diet is not confined to cultivated beans, nor does the larva restrict feeding to pods. Bean pod borer attack has been recorded on the leaves, stems, and fruiting structures of a diverse variety of legumes (Leguminosae), and this wide host range is one reason for its importance as a crop pest.

Host range

In Queensland, legumes are grown for many different purposes. Some, such as Siratro, are produced mainly for stock food; others like cowpeas are used as green manure to improve soil fertility, while a few, including French beans and navy beans, are grown for human consumption. Bean pod borer, as well as infesting plant species in these commercial categories, also breeds on native legumes. The host plants include:

Fodder legumes—Siratro, Pidgeon Pea, Dolichos, Peuro and Stylosanthes.

Green manure legumes—Cowpeas.

Food legumes—French beans, soybeans, navy beans, peanuts, long beans and mung beans.

Native legumes—*Sesbania* sp.

Distribution

This pest is widely distributed throughout the world, and has been taken from: Southern Asia (Japan to India), Philippines, New Guinea, West Irian, Africa (south of the Sahara), Malagasy Republic, West Indies, Eastern and North-eastern South America and parts of Central America including Mexico. It has not been introduced into North America, where authorities pursue a vigorous quarantine programme against its entry.

In Australia, the bean pod borer has been noted in eastern coastal, and sub-coastal regions from central New South Wales to Cape York, areas where intensive cultivation of legumes is carried on.

Life history

Moths

Slim bodied pod borer moths have a wing span of approximately 2·5 cm, and can often be flushed from infested crops during daylight hours. Although a casual inspection suggests that moths are medium-brown in colour, closer scrutiny reveals an absence of flattened scales on certain segments of the wings.

by R. H. BROADLEY,
Entomology
Branch

This lack of scale development creates a series of small, transparent, irregularly shaped areas near the leading edge of the forewing, and a larger transparent area in the basal portion of the hindwings. Wings of quiescent moths are only partly folded over the abdomen. Female moths may lay several hundred eggs, mainly on or near the flowers.

Eggs

Eggs, which measure 0·65 mm x 0·45 mm, are deposited while it is dark. The female is able to extend her abdomen in a telescope-like fashion to place eggs on the selected parts of the plant. The newly laid eggs are pale white, cylindrical in shape with bluntly rounded ends. They are difficult to locate on the host plant.

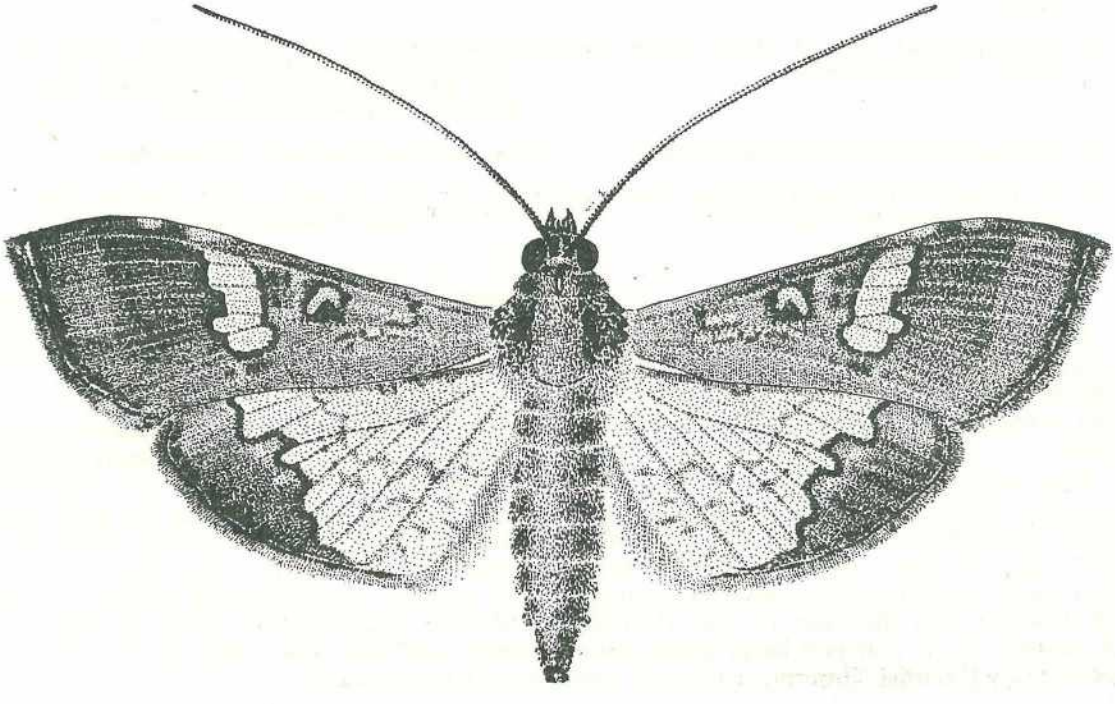
Larvae

After an incubation period which is primarily dependent on prevailing temperatures, larvae hatch and start feeding. Three types of feeding patterns have been recorded, and these are related to the stage of plant growth and location of the egg.

- *Non-flowering plants.*—Larvae mine inside stems and leafpetioles of certain legumes (peanuts and cowpeas) causing structural damage. This type of feeding behaviour, in peanuts at least, may also be linked to the fact that the "peanuts" or seed pods are formed below ground, and are not readily accessible to larvae.
- *Flowering plants.*—Young larvae often bore into unopened flower buds, leaving a 'pin hole' in the petals as the only external evidence of infestation. Consequently, concealed larvae are often overlooked when inspections of the crop are made. They feed on the fertilized ovary (developing seed capsule) and stamens (pollen bearing organs).

Nourishment from a single flower is inadequate for full development, and larvae are forced to migrate in search of further food sources. They often move from flower to flower and in this manner an entire group of flowers on a stalk can be destroyed. When feeding in exposed situations, larvae web adjacent plant materials to form a shelter.

Bean pod borer moth (drawing by W. Manley).



- *Fruiting plants.*—Seed pods may be directly penetrated by older larvae, which then eat the seeds. Complete development within a single pod is possible, if the pod contains sufficient nutriment. Moist excreta clustered around the mouth of the entrance tunnel is often a sign that a larva is feeding inside.

Larvae are reported to pass through five growth stages (called instars) in 8 to 13 days at 25 to 29°C. Each growth stage is marked by a shedding of the complete skin. The soft-bodied larvae may reach 2·5 cm in length, and are usually cream, green or light yellow in colour, depending on the types of food eaten.

Pupa

At maturity, larvae move off the plant and pupate in the debris and soil at the base of the plant. Adult pod borer moths emerge from the pupal cocoon several days later, and after completion of mating and dispersal, recommence the life cycle.

Identification

Some confusion over the field identification of pod borer larvae exists as grubs of two species of moth (known scientifically as *Heliothis armigera* and *Heliothis punctigera*) also feed on legume shoots, flowers and seed pods. As larvae of the two Heliothis are virtually identical in external appearance, no attempt is made to separate them in the key provided in Table 1.

TABLE 1

SEPARATION OF HELIOTHIS AND POD BORER LARVAE

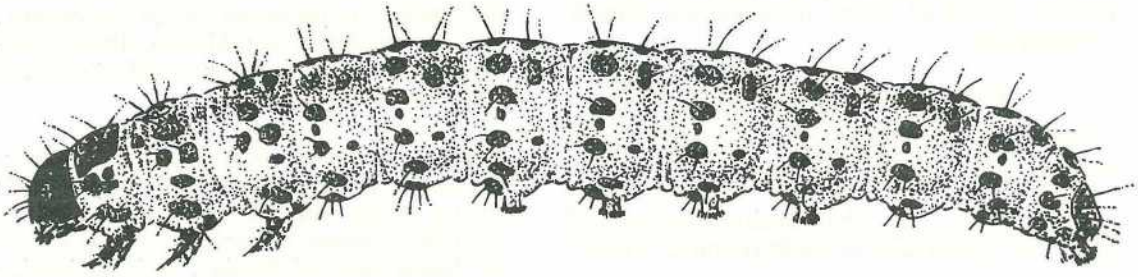
HELIOTHIS	POD BORER
1. Larvae grow to 3·5 cm	Larvae grow to 2·5 cm
2. Larger larvae robust, with trunk colour predominantly green, brown, pink or yellow and suffused with variable markings and longitudinal stripes	Larger larvae often slightly thickened in mid-body, with trunk colour uniform cream, yellow or green with no longitudinal markings or stripes
3. No longitudinal series of angular brown plates along top and sides of trunk	Longitudinal series of angular plates along top (arranged in groups of four on the upper part of each abdominal segment) and sides of trunk. Sometimes faded and difficult to see
4. Head capsules of large larvae mottled brown ..	Head capsules of large larvae uniform brown
5. Do not web parts of plants together, often found in exposed situations, e.g., on leaves	Often web parts of plant to form a feeding shelter, not often found in exposed situations

Damage

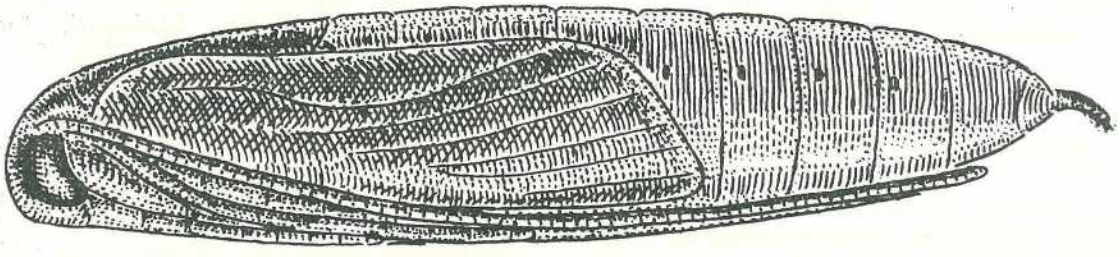
Bean pod borer is a significant pest in the warmer northern parts of its range, but is seldom a limiting factor in peanut, navy bean and soybean production in south-east Queensland.

Few problems occur while crops are in the vegetative phase, as plants can usually withstand, and often compensate for, reasonable leaf and stem loss. However, serious losses may result from infestations between the onset of flowering and the start of pod ripening. A general rule is that pod borer causes most severe injury during flowering and early pod formation. At this stage, larvae can influence the total amount of seed set by destroying the developing ovaries and injuring young pods, which subsequently abort.

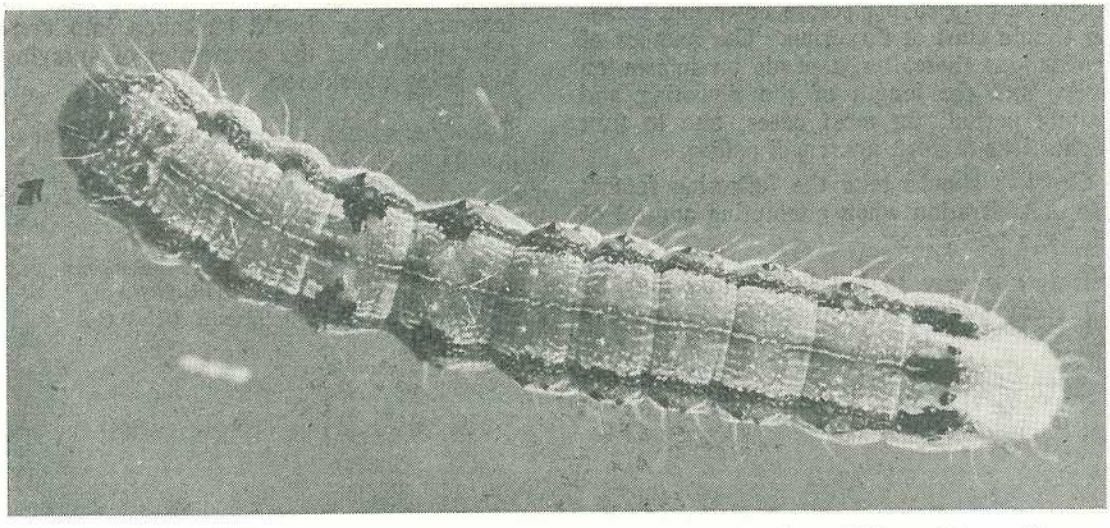
Plants with semi-mature and mature pods appear to be better able to withstand damage and feeding merely results in the reduction in the quantity and quality of the seed produced in infested pods. To some extent, the vulnerability of a crop is also related to the total number of flowers and weight of seed produced. Plant species which produce few flowers and few seeds may be less tolerant of pod borer attack.



Bean pod borer larva (drawing by W. Manley). Note the rows of angular plates running longitudinally along the top and sides of the trunk.



Bean pod borer pupa (drawing by W. Manley).



Top view of a Heliothis *larva showing longitudinal stripes suffused with variable markings. There are no rows of angular plates running along the top and sides of the trunk. Arrow points to head of the larva.*

In addition, unsightly damage can lower market values of crops intended for human consumption.

Seasonal distribution

Bean pod borer appears to be more active in the late summer-autumn period, which co-incides with the initiation of flowering in many legumes. A characteristic feature of pod borer outbreaks is their sporadic nature.

Control

A rule of thumb is that there are two commercial situations where spraying for pod borer control can be justified. These are:

- Where a legume crop is being grown for human consumption, and
- Where legumes are cultivated for pasture seed production.

Insecticide applications to mixed pastures, or green manure crops are usually uneconomic.

Methomyl, a carbamate insecticide with a short residual life, is recommended for control of the pod borer. Methomyl sold commercially as 'Lannate L' and containing 225 g/l of active constituent should be applied at 1·5 to 2·0 l/ha when insecticide control is warranted. The withholding period required following use of the spray is one day. As advantage will rarely be gained by spraying before flowering, spraying should start at flowering. The number of applications thereafter depends on infestation levels, and the length of the flowering and fruiting period. In most cases, one to four applications a week apart will suffice.

Growers should take the following factors into consideration when attempting control of the bean pod borer:—

- It is not easy to kill larvae that may be present inside flowers or seedpods and cover problems are magnified in those crops where the flowers are protected by the leaf canopy. In some instances, e.g. Siratro, flowers protrude above the leaves and this facilitates spraying operations.

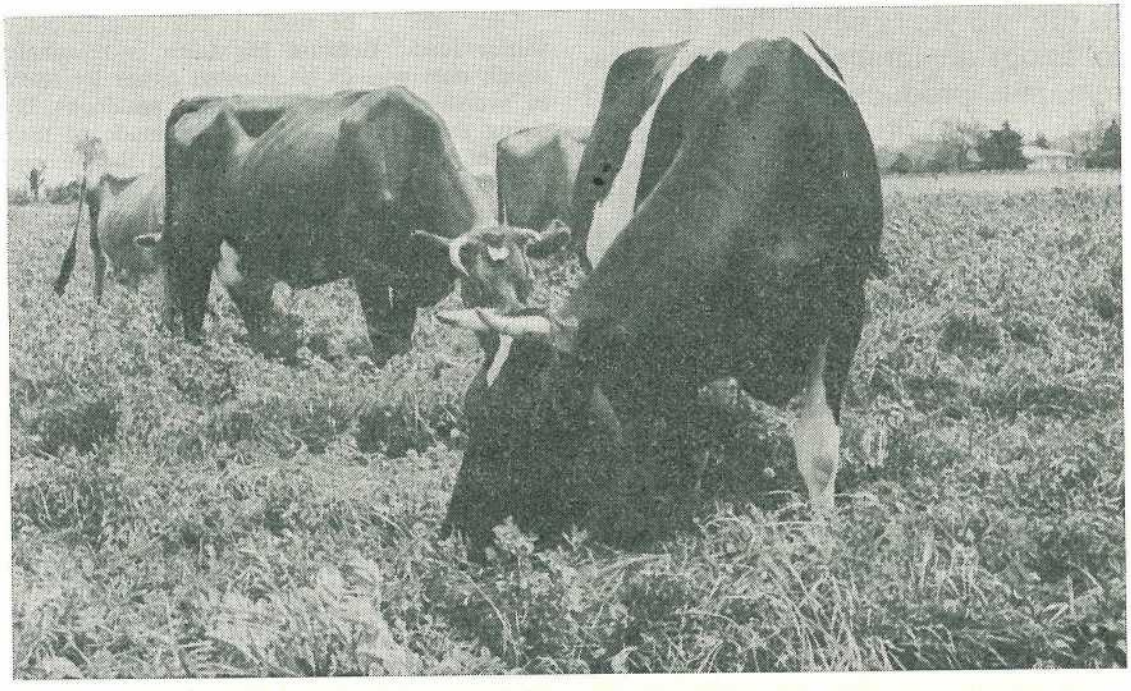
- Timing can influence the success of spraying, as some legumes have limited periods during which the flowers are open. For example, cowpea flowers are closed during the hotter parts of the day. It is imperative that insecticide treatment occur when petals are expanded during the cooler conditions of early morning. Such treatment ensures that insecticide reaches the larval feeding sites. Contact between spray and pest is particularly important when short term insecticides are used. Methomyl, for example, loses a substantial portion of its insecticidal activity quite rapidly.

- When inspecting crops for pod borer, growers should open numbers of flowers and pods, so that percentage infestation can be accurately assessed. Twice weekly inspections ensure that younger larvae will be detected.

- Methomyl, as well as controlling pod borer, also kills the larvae of a number of other moth species (such as Heliothis), and the green vegetable bug, which also attacks legumes. This should be taken into consideration when the economics of spraying are being considered.

Scientific names of pests discussed are:

Bean pod borer	*Maruca testulalis* (Geyer)
Corn earworm, tobacco budworm, tomato grub, cotton bollworm	*Heliothis armigera* (Hubner)
Native budworm	*Heliothis punctigera* Wallengren
Green vegetable bug ..	*Nezara viridula* (L.)



High production—low cost feeding system

by R. HARTWIG, D. BRICE and R. WALKER, Dairy Field Services Branch and G. LAMBERT, Agriculture Branch.

Kalbar dairy farmers Wilf and Gwen Goetsch have doubled their milk production over a two year period and reduced production costs by good planning and management of farm feed supplies.

IN the two years since they decided to adopt an intensive feeding system, milk production has increased from 132,860 litres (29,225 gallons) in 1973 to 269,378 litres (59,256 gallons) in 1975.

Production costs (fixed and variable costs) have been maintained at a comparatively low level and were reduced from 5·79 c/litre (26·32 c/gal.) in 1974 to 5·52 c/litre (25·09 c/gal.) in 1975.

Previously the property had been operated as a mixed farming enterprise, with dairying, pigs and cash crops as the main source of income.

The area of the property is 32 ha, comprising 24 ha alluvial creek flats and 8 ha of brigalow scrub soil, all of which can be irrigated.

Dry stock have been agisted on a 28 ha scrub soil paddock.

The alluvial clay flats are typical of the Kalbar area. They are deep, rich and reasonably well drained.

Phosphate and potash levels are high, but nitrogen levels vary according to crop history and the time of the year.

The brigalow scrub hill soils are also typical of scrub soils in the region. They are dark grey clay loams, about 1 metre deep, well drained and highly fertile.

In early 1974 the Goetschs had as their main objective, the increase of profit from milk production. They hoped to do this by improving the quality and increasing the quantity of home grown fodder and by increasing the herd size.

Planning

The most serious problem they faced was the shortage of high quality feed particularly during the autumn-winter period. In planning their feed programme they decided on a number of strategies.

Lucerne, already their major feed source during spring, summer and early autumn, would continue to form the basis of the feeding programme.

Oats was to be used as the autumn-early winter feed. Because the farm is relatively small, oats was to be planted either by itself or oversown into failing lucerne paddocks. By doing this, good use would be made of that area of lucerne during winter and the lucerne would be re-vitalized and perhaps last another season if needed.

Ryegrass was to be oversown into an old paspalum pasture as well as into low density lucerne paddocks.

For both oats and ryegrass plantings, regular, sensible use of irrigation and nitrogen fertilizer was planned. This increased the quantity of feed produced as well as greatly improving its quality.

They decided to plant the 3·5 ha used for growing soybeans to fodder crops for the cows.

They emphasised that an important aspect in planning a feed programme was to know the capability and limitations of each paddock on the farm, knowing what crops and pastures will grow best in each paddock and the quantity and quality of feed likely to be produced.

Cropping programme–1975

Lucerne

An area of 11 ha of lucerne was the main fodder crop on the farm and was grown on the better drained soils. It provided high quality feed for most of the year at low cost. Surplus growth in the spring and summer was made into hay for feeding during the autumn and winter. Approximately 3,000 bales of hay were fed during the latter period.

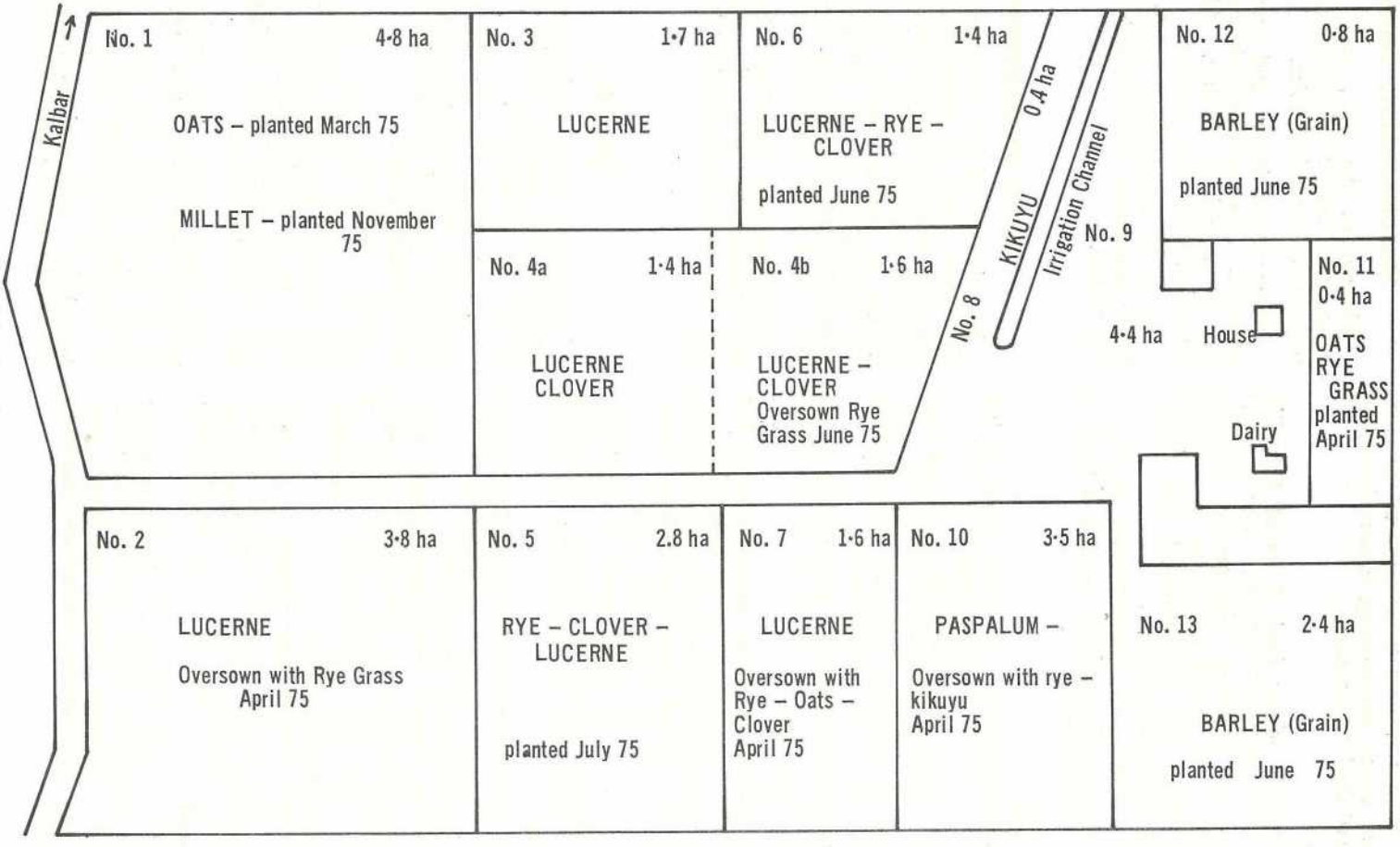
Lucerne was planted in April–May–June. Cover crops of either oats or rye were planted with the lucerne. This gave quick feed and reduced the risk of bloat for the first few months. The cover crops did not interfere with the development of the lucerne in any way.

Oats (at the rate of 30 kg/ha) or ryegrass (at the rate of 10 to 15 kg/ha) were oversown into lucerne stands which had begun to thin out.

Wilf applied nitrogenous fertilizer (Urea) at the rate of 120 kg/ha on all oversown crops at planting.

Pasture/Cropping Programme – 1975

W.L. & G.J.. Goetsch – Kalbar



A further two or three applications were applied during the growing season depending on herd feed requirements.

Oats

For early winter feed, 5 ha of Camellia oats were planted in March. Wet weather delayed the planting. Nitrogenous fertilizer (Urea) at the rate of 120 kg/ha was applied at planting and approximately 280 kg/ha during the growing season.

First grazing was approximately six weeks after planting followed by grazing at from 4 to 6 weekly intervals.

Rye grass

The inclusion of rye grass made a big difference to the winter production in 1975.

Wilf found that oversowing lucerne and pasture paddocks with rye grass was the best method of obtaining increased winter–spring production on his small property.

The lucerne paddocks were lightly renovated and sown with 10 to 15 kg/ha Tama or Ariki rye grass.

The rhodes–paspalum pasture area of 3·5 ha was planted with 25 to 30 kg/ha H1 and Tama rye grass in April after two rippings, two offset discings and several harrowings. Tama was by far the most vigorous variety.

A total area of approximately 9 ha of pasture was oversown with rye grass. A further 3 ha were planted to a perennial rye/clover pasture.

Wilf has stressed that he achieved maximum results through frequent watering and nitrogen top dressing of the pastures.

The first grazings were approximately 6 to 7 weeks after planting. The crops were then rotationally strip grazed about every 3 weeks. The rye grass provided additional feed until late November.

Nitrogen fertilizer was applied in amounts and at frequencies to suit the feed requirements for the herd. In the spring when surplus feed was being made into hay, less fertilizer was used.

Approximately 330 to 500 kg/ha urea was applied during the year. The lower rate was applied to oversown lucerne and higher rates were used for oversown rhodes and paspalum pastures.

Supplementary feeding

Throughout the year, grain feeding was more or less used as a contentment feed in the bails to make milking easier.

Home grown barley and purchased grain were fed. This was mixed with hammer milled hay to make it go further. About 1 to 2 kg grain per cow/day was fed.

Up to 20 bales of hay per day were also fed to supplement paddock feed in the autumn and winter.

Herd management

The dairy herd was increased from 57 to 82 milkers over the period 1974 to 1975. Approximately 60% of the herd calved during the autumn–winter period and the remaining calving was spread over the rest of the year. This maximised the use of winter feed and provided an adequate supply of milk to maintain a milk quota throughout the year.

Dry cows were transferred from the agistment paddock to the home property in sufficient time to ensure they calved in good condition.

Results

The success of the feed programme can be gauged by the amount of milk produced and the cost of producing it.

Table I shows the quantity of milk produced, the income obtained from milk sales, the costs incurred in producing the milk and the operating profit.

Milk production was increased from 191 000 litres (42 000 gallons) to over 269 000 litres (59 000 gallons) from 1974 to 1975. By comparison, average production of milk supply farms in the region is 132 000 litres (29 000 gallons).

The total variable costs of milk production increased from 3·60 c/litre (16·36 c/gallon) in 1974 to 3·96 c/litre (18·0 c/gallon) in 1975. Each additional litre of milk produced in 1975 therefore cost 3·96 cents (18·0 c/gallon) for a return of approximately 6 cents (27·3 c/gallon)—manufacture milk price.

The average total variable costs of production of 17 other farms in the region for the 1974–1975 financial year was 4·34 c/litre (19·72 c/gallon).

The increase in production on the farm in 1975 combined with static fixed costs resulted in the total cost of production (fixed plus variable costs) being reduced from 5·79 c/litre (26·32 c/gallon) in 1974 to 5·52 c/litre (25·09 c/gallon) in 1975.

The farm operating profit from milk production was increased by 93% from $4 592 in 1974 to $8 887 in 1975.

The Goetschs study their production costs closely. They have found that expenditure on the production of high quality home grown fodder has given the best return. Expenditure on seed, fertilizer, fuel and electricity has therefore been very profitable compared with the high cost of purchasing grain concentrates for supplementary feeding.

MILK PRODUCTION COSTS

	1974		1975	
	Actual	c/litre	Actual	c/litre
Milk Production	190 995 litres (42 014 gallons)		269 378 litres (59 256 gallons)	
Gross Income (Milk Sales)	$15 662	8·20 (37·3 c/gal.)	$23 786	8·83 (40·14 c/gal.)
EXPENDITURE—				
Agistment	$477	0·25	$474	0·18
Purchased Feed	$745	0·39	$1 440	0·53
Fertilizer and Chemicals	$897	0·47	$1 414	0·52
Seeds	$442	0·23	$987	0·37
Contracting, Casual Labour	$182	0·10	$168	0·06
Water Levies	$50	0·03	$63	0·02
Fuel and Oil	$216	0·11	$548	0·20
Electricity	$812	0·43	$1 003	0·37
Animal Health	..	..	$84	0·03
Dairy Requisites	$79	0·04	$158	0·06
Cartage and Levies	$1 203	0·63	$1 878	0·70
Plant—Repairs and Maintenance	$1 766	0·92	$2 468	0·92
TOTAL VARIABLE COSTS	$6 869	3·60 (16·36 c/gal.)	$10 685	3·96 (18·00 c/gal.)
GROSS MARGIN	$8 793	..	$13 101	..
TOTAL FIXED COSTS (including depreciation)	$4 201	2·19 (10·0 c/gal.)	$4 214	1·56 (7·09 c/gal.)
TOTAL COSTS (Variable and Fixed)	$11 070	5·79 (26·32 c/gal.)	$14 899	5·52 (25·09 c/gal.)
OPERATING PROFIT	$4 592	2·41 (10·95 c/gal.)	$8 887	3·31 (15·05 c/gal.)
Estimated Net Income—Soybeans	$900	..	..	..
Estimated Net Income—Off Farm Work	..	..	over $900	..
NUMBER OF COWS	57	..	82	..
AVERAGE MILK PRODUCTION PER COW	3 350 litres (737 gal.)		3 285 litres (722 gal.)	

Variable Costs—Costs that vary with the level of production.

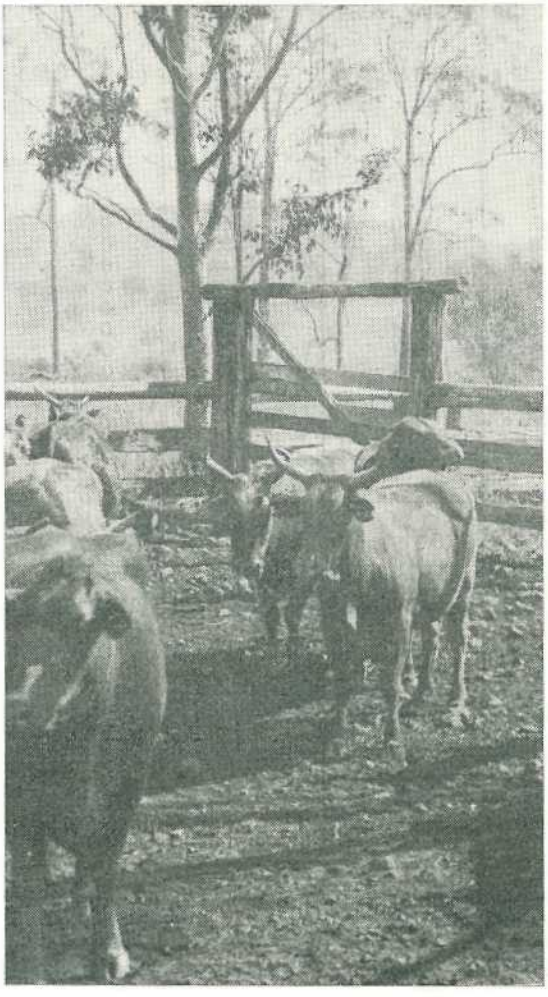
Fixed Costs—These are incurred even if the farm is not producing—They include administrative expenses, insurance, rates and depreciation.

Gross Margin—The margin between total variable costs and gross income.

Dehorning Breeders

how one grazier approached the problem

Brahman cross cows waiting to be dehorned.



WHEN John Little purchased "Fishermans" a 486 hectare cattle property near Gympie, he acquired a Brahman Cross breeding herd which consisted of 80% horned cows.

John was aware of the bruising problem in cattle, however, he did not realize how serious it was until he had completed his first muster and yarding. He saw deep lacerations and puncture wounds on the cows and young calves and when told that bruising costs the beef industry $22 million dollars a year, he decided to try to remedy his problem.

Dehorn or tip?

At first, he intended to tip the top 5 to 6 cm off the horns. This supposedly would reduce the number of puncture wounds and stop any stress that may occur with complete dehorning.

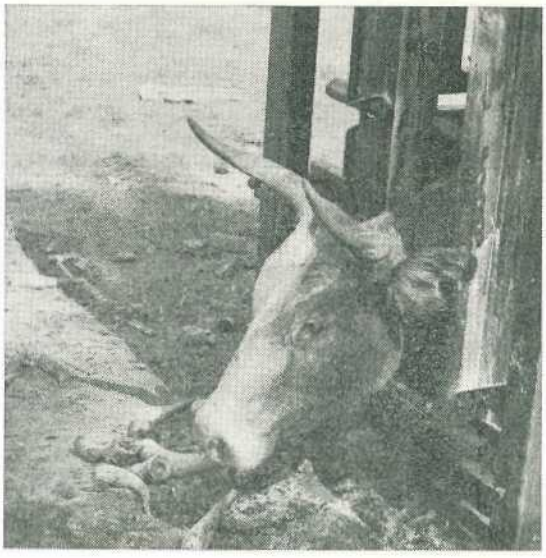
However, when he learned that tipped cattle can cause severe bruising, he decided to dehorn all the breeders, even though some were aged and lactating.

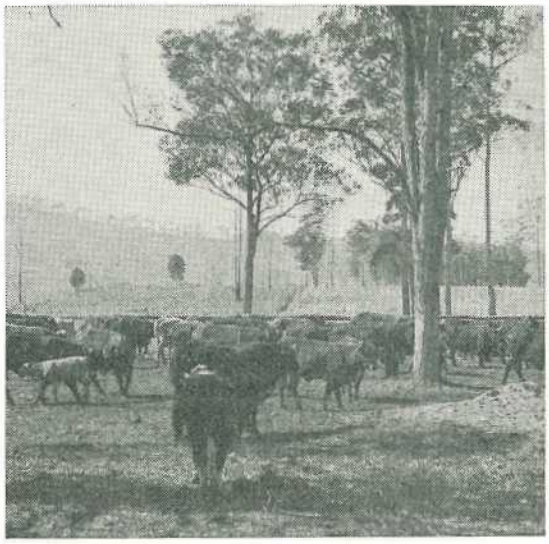
by J. L. KNIGHT,
Beef Cattle Husbandry Branch.

Equipment used

- A head bail at the end of the crush was necessary for effective restraint.
- Nose grips enabled the head to be pulled to one side. This was an advantage with long-horned cows.
- Strong guillotine-type shears. Often 2 men were employed to avoid excess struggling with thick-based horns.
- A bucket of water plus antiseptic. The shears were dipped into the solution after each operation.
- Dehorning powder for wound dressing.

Good restraint is necessary for successful dehorning.





All over—dehorned cows milling quietly in the holding yard.

Time of dehorning

The operation was performed in July. This dry, cold period avoided periods of heavy rain. It was also important to avoid the summer months. This is when blowflies are active and cause losses through wound infection.

John inspected his herd 2 weeks after the operation. He did not incur any deaths as a result of dehorning. If anything, the operation had helped to quieten some of the so-called rogues in the herd. From now on, dehorning will be performed annually on his young calves.

(*For information on dehorning techniques the reference is Queensland Agricultural Journal, February,* 1974 *Vol.* 100 *No.* 2, *p.* 66)

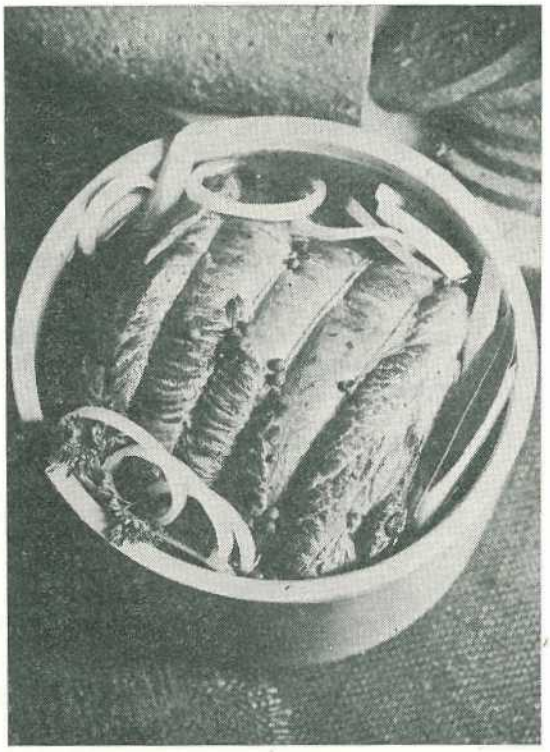
pot luck with chuck

by Mrs. TESS MALLOS,
Food Consultant, Australian Meat Board.

WHEN ordering a forequarter of beef for the freezer, ask the butcher to roll up part of the rib end of the chuck into a pot roast. Even if you don't bulk buy beef, order a chuck pot roast anyway.

Chuck is usually used diced as a stewing meat, but its excellent flavour makes it an ideal meat for a pot roast. If the beef is yearling, this rib section of the chuck can be dry roasted.

Pot roasts are an excellent means of cooking a large piece of meat for a special dinner, or, if for a family meal, any left over can be sliced, well covered with remaining sauce and stored in freezer for another meal. Of course, slices can be used cold for sandwiches or salads. The initial effort can give you more than one meal.



Sauerbraten is a tasty way of serving a rolled roast. It not only makes a satisfying evening meal but any leftovers may be used for cold lunches or snacks.

☆ ☆

Sauerbraten

Here's what you need

1 x 2 kg (4 lb.) chuck pot roast
2 tablespoons butter
1 onion, chopped
2 carrots, quartered
2 tablespoons flour
1½ tablespoons brown sugar

Marinade

1 cup dry red wine
½ cup vinegar
½ cup water
2 teaspoons salt
½ teaspoon whole peppercorns
1 large onion, sliced
1 large carrot, sliced
½ cup chopped celery
4 thin slices lemon
2 bay leaves
4 parsley stalks
¼ teaspoon whole allspice
4 cloves

Here's what you do

Wipe meat with a damp cloth and place in a china or glass mixing bowl. Blend marinade ingredients in a saucepan and bring to boil. Cool and pour over meat. Cover and leave in refrigerator for 3 days, turning meat twice each day.

Lift meat from marinade and dry. Heat butter in a heavy pan and brown meat on all sides. Remove to a plate. Add chopped onion to pan and saute until soft. Stir in flour and cook 2 minutes. Remove lemon slices and parsley stalks from marinade and discard. Pour marinade into pan, stirring until sauce thickens. Add brown sugar and quartered carrots and return meat to pan. Cover and simmer gently for 2½ hours until meat is tender. Remove meat and quartered carrots and keep warm. Strain sauce into a clean pan and press flavouring vegetables through sieve into sauce. Reduce over high heat until about 2 cups sauce remain. Adjust flavour with seasoning and sugar. Return meat and carrots to pan to heat through if necessary. Carve meat into slices and serve with the sauce, carrots, buttered noodles or potato dumplings and steamed red cabbage. *Serves 8.*

☆ ☆

Fruited pot roast

Here's what you need

1 x 2 kg (4 lb.) chuck pot roast
1 tablespoon butter or dripping
1 large onion, chopped
½ cup water
¾ cup apple cider
salt and pepper
½ cup dried apricots
½ cup prunes
500 g (1 lb.) sweet potatoes, peeled and sliced

Here's what you do

Brown meat on all sides in hot dripping or butter. Add chopped onion and cook until lightly browned. Add water, apple cider and salt and pepper to taste. Cover and simmer gently for 1½ hours. Arrange apricots, prunes and sweet potato around meat and simmer for further hour or until meat is tender. If sweet potato cooks too soon, remove to a plate and return to pot towards end of cooking.

Place meat with fruits and sweet potato on serving platter and keep warm. Skim fat from sauce and reduce if necessary. Slice meat and spoon some sauce over it, serving remainder separately. *Serves 8.*

☆ ☆

Spiced pot roast

Here's what you need

1 x 2 kg (4 lb.) chuck pot roast
2 tablespoons butter or oil
1 large onion, sliced
1 clove garlic, crushed
1 cup tomato puree
3 strips orange rind
1 teaspoon sugar
salt and pepper
½ teaspoon nutmeg
5 cm (2 inch) piece cinnamon stick
1 small onion studded with 3 cloves

Here's what you do

Brown meat on all sides in heated butter or oil. Lift out and keep aside. Add onion and garlic to pan and saute gently until onion is soft. Add remaining ingredients and bring to the boil. Reduce heat, return meat to pan, spoon sauce over top and cover tightly. Simmer gently for 2½ hours or until meat is tender, turning once or twice during cooking. Remove meat to platter and keep warm. Remove and discard clove-studded onion and orange rind. Reduce sauce over heat if necessary or thicken with a cornflour and water paste. Slice pot roast and spoon some sauce over slices, serving remainder separately. *Serves 8.*

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Marking of carcasses

UNDER the Department's supervision, a number of stamps are applied to meat carcasses to indicate the class or quality. These inspection marks indicate that it is fit for human consumption.

The ink used for the application of these stamps is made from harmless ingredients and may be one of three colours—red, orange or blue.

Blue ink marks

A stamp, using a blue ink, is applied to beef carcasses that are considered by an inspector to be of good eating quality.

Red ink marks

Inspection stamps using red ink are placed on all carcasses after inspection to indicate that the carcass is fit for human consumption. An additional use of stamps using red ink is for the branding of lamb carcasses. The word 'LAMB' being imprinted on the carcass to clearly indicate to the customer that they are being sold lamb.

Orange ink marks

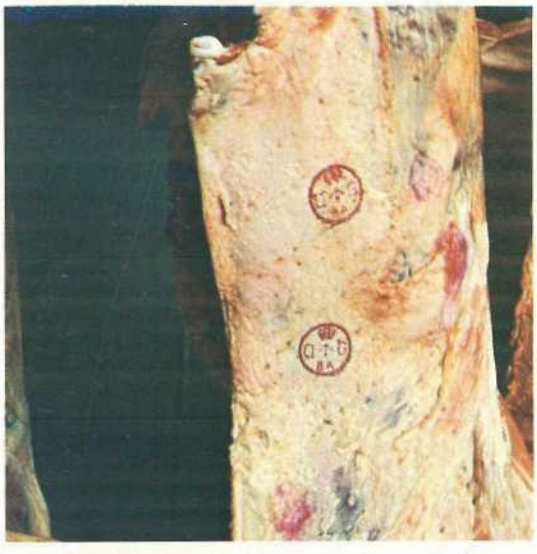
In the case of hoggett, an orange-coloured ink is used to apply the letters 'HGET' to the carcass.

The presence of ink marks on meat may be looked upon by the customer as a measure of protection. Blue ink marks on beef indicate that it is of better quality. Red 'LAMB' or orange 'HGET' stamps show that the customers are being sold what they have asked for. Red inspection marks on meat show that it has been processed under hygienic conditions, is free of disease and fit for human consumption.

Marking of carcasses

A blue ribbon brand is an indication of good eating quality.

A red ribbon brand is used to distinguish lamb from other sheep meats.



A red inspection stamp indicates that the carcass is fit for human consumption.

An orange ribbon brand distinguishes hoggett. This is a sheep carcass that is slightly older than lamb.