farm policy

Vol. 6—No. 2 September, 1966

Published by UNIVERSITY OF WESTERN AUSTRALIA PRESS, NEDLANDS, W.A.

farm policy

JOHN THOMSON
AGRICULTURAL ECONOMICS CENTRE

Farm Policy is a quarterly on economic policies affecting Australian agriculture, compiled by the John Thomson Agricultural Economics Centre at the University of Western Australia's Institute of Agriculture. This Centre was established in 1961 as a problem-solving research unit in agriculture and economics. From time to time the Centre's research findings are reported here.

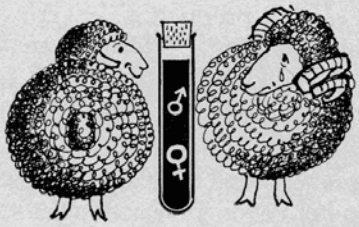
SUBSCRIPTION

$2 per annum, post free. Concession rates for group subscriptions are available to Farm Management Advisory Services, Pasture Improvement Groups, Junior Farmers' Clubs, etc. Enquiries should be made to the Editor, University of Western Australia, Nedlands, Western Australia.

The stud ram has become a sacred cow of the wool industry. Is he necessary? This study shows how a flock can be upgraded without him and suggests that if high-priced stud rams were subject to more scientific and less mystical appraisal, away from hot-house pampering, they would be found lacking. The writer does not spare the professional classers, show judges, shows, and prejudices and superstitions nourished by people having vested interests in them.

PETER WALSH

is a flock owner at Doodlakine, Western Australia. This article was prepared for study conferences in Science in Sheep Breeding. These were organised by the Adult Education Board and zone councils of the Farmers' Union and held at Katanning and Geraldton in 1966.



Genetic improvement without stud rams

DURING the past 20 years a good deal of research and experimentation has been aimed at establishing ways by which the inherent fertility and wool production of the Australian merino may be lifted. The results have fulfilled the predictions of people who initiated the work, and demonstrate that fertility can be maintained or improved and wool production increased by between one per cent and two per cent per annum by the selection of breeders from *within* flocks closed to outside blood. These increases are of genetic origin, are cumulative, and will continue for an indefinite period.

These findings demand a critical re-examination of many widely-held beliefs on selection for breeding and the value, if any, of many practices associated with the production and sale of merino rams. The purpose of this paper is not to prove these contentions, but to outline the challenge they present to the commercial wool-grower, and suggest ways in which it can be met.

It is stressed at the outset that little can be achieved through culling ewes, particularly on a national level. The disastrous drought depletion of Eastern States flocks and the strong demand for additional sheep in the West, due to land and pasture development and better pasture utilisation, demand in the national interest that every female sheep capable of rearing a lamb should be mated. Nation-wide genetic progress can be achieved *only* by the use of superior sires in the nation's commercial flocks. These research findings are of

little more than academic interest and a waste of taxpayers' money until the selection techniques evolved are fully applied in the stud flocks which breed the sires for commercial flocks.

Before these can be accomplished, walls of prejudice—not to mention vested interests and opinions held dogmatically without the support of fact or the refinement of logic—must be broken down. The commercial sheep man who wishes to take advantage of this new knowledge and lift the genetic production level of his flock may do so in two ways:

1. By purchasing rams which are *genetically* superior to the average of his flock.
2. By closing the flock and producing his own rams from a ram-breeding nucleus.

At this point a dilemma, or apparent dilemma, arises.

THE FLOCK-OWNER'S CHOICE

The breeder who chooses the first way is confronted by a baffling question: What sort of rams should he purchase? If he seeks the advice of a stud breeder, he will probably be told, "Purchase rams of the blood line and type you require. Ensure that they come from a uniform flock, because animals bred in a uniform flock will beget uniform progeny." He may even be told not to purchase rams which are vastly superior to his ewes, because the rapid up-grading of a flock is a policy fraught with danger.

One thing he is unlikely to be told, and it is the only thing that really matters, is to ensure that the purchased sires have sufficient genetic superiority to provide a production increase commensurate to their cost. The purchased ram must sire lambs producing either a greater quantity, or more valuable wool than their dams. If it does not, he might just as well select at random from his own ram lambs and pocket the purchase price.

There is a widespread belief that expensive rams should be purchased for good flocks and cheap rams for poorer flocks, or that money is wasted purchasing good rams for poor flocks. In fact, the reverse is the truth as is demonstrated below.

With a poor flock there is an excellent chance of increased production covering the cost of superior sires. This becomes more difficult as a flock improves and is likely, with a good flock and current ram prices, to be impossible.

Stud breeders contend that they must obtain a price to cover production costs and show a reasonable margin of profit. The prevalent system of preparation under which rams are shedded, rugged, clipped, manicured and forced in growth by the artificial feeding of expensive concentrates, probably makes the contention valid.

What does this type of preparation

FLOCK-OWNER A	FLOCK-OWNER B
Poor flock, average cut 8lb. per head	Good flock, average cut 12lb. per head in same environment as A
Both purchase rams with 14lb. genetic production level	
Progeny of this mating will average 8lb. plus 50% of the difference between 8 and 14 Total: 11lb.	Progeny of this mating will average 12lb. plus 50% of the difference between 12 and 14 Total: 13lb.
Improvement: 3lb.	Improvement: 1lb.

achieve? It produces rams of splendid appearance with big bodies carrying heavy fleeces, long stapled, clean, bright and full of character. Its real value, its effect on the quality of lambs sired is exactly nil. Animal characteristics acquired from environment *cannot* be transmitted by heredity. These rams will sire no more, and no better lambs, than if they were reared in the normal flock manner. They often sire none at their first mating because the shock of transition from their hot-house environment to the hard world of reality temporarily impairs fertility.

These practices achieve nothing of value, but impose upon the industry a substantial and unnecessarily inflated cost. An industry eternally complaining of escalating costs of production which it avows are beyond its control, could well take a long hard look at its passive acceptance of this substantial cost component. The stud breeder who indulges in all these extravagant and futile treatments—and then uses the cost and effort incurred in fleece measurement as an excuse for his non-acceptance of the practice—cannot expect to be taken seriously.

Should sires be selected as 2-tooths or 4-tooths? Delaying selection until 2½ years may, or may not, increase accuracy, but wastes one of the most virile and fertile years of the animal's life. Mating 2-tooths reduces the generation interval on the ram side from three to two years, thereby speeding up the rate of progress. If no progress is being made, no systematic selection is warranted. A random selection of home-bred stags will maintain the status quo. A vital question now arises: what progress, overall, is being made?

The average Australian greasy wool cut has increased by about 1 lb. per head in the past 30 years. Legume-based pastures, top dressing, control of parasites and the effective control of rabbits probably account for most of this improvement. Genetically, the nation's flocks might well be stagnant. The thought is disturbing, and doubly so to breeders who purchase sires at high prices believing they will lift their flock's production.

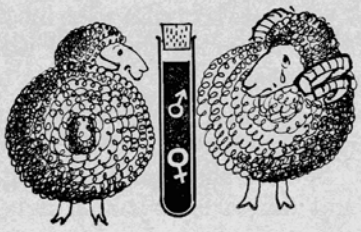
We have already seen that a genetic increase in the national wool clip can be achieved only by breeding and mating superior sires and that a flock owner may either breed these himself or purchase them from a ram-breeding stud. If he purchases, he should first establish that the stud's average production is genetically superior to his own. He should buy production measured 2-tooths free from economic fault which *must* be above the average of the stud's ram drop, and he should not pay high prices unless convinced that the rams are vastly superior to his flock average.

BUYING FROM A CLOSED STUD

If he intends to continue purchasing from the same stud he should make certain that the ewe selection criteria employed within the stud place due emphasis on the weight of greasy wool cut, ignore all factors which have no economic significance, and use sires bred within the stud selected on the same basis . . . in other words, a closed stud. A stud which imports sires is acceptable only if the imports are subjected to a difficult, expensive and time-consuming progeny test. The introduction of an untested top sire can result in a substantial production decline and nullify years of careful and wise selection. This is dramatically illustrated by data from Trangie, New South Wales.

The points I wish to emphasize from these data are:

1. Although spectacular production increases are possible with imported sires, spectacular decreases are just as likely unless the imported sires have been production tested. It is probable that catastrophes similar to that which befell the Trangie stud in 1960 and 1961 are repeated in Western Australian flocks and studs using sires of



THE TRADITIONAL APPROACH

unknown and untested quality. The very expensive rams purchased at show sales are not exempt from this danger. The grand appearance and bulky fleece produced by an artificial diet provides no assurance of genetic wool-producing ability.

2. Had the stud been closed at its peak in 1959, production could have been maintained at or above that level, but 400 gns. was paid for rams which reduced the wool clip by 12 per cent. This is an expensive way to move backwards.

There are two major faults in the traditional approach to breeding. First, the practice of determining fleece weight by visual guess, instead of scale readings. This practice, though obviously foolish, is probably less damaging than the second major fault—the insistence on examining all the external features which the studmaster believes or imagines to be associated with production, instead of measuring production itself.

The logic that these faults will, if genuinely related to production, be detected by the scales, still escapes most stud breeders. It is this attitude of mind which produces cliches like "the horned ewe is a light cutter", "the bare-headed ram is a light cutter", and culls rams for "flaky" horns, "mean" nostrils and "weak" backs. For far too long breeding progress has been stultified by a system which evaluates animal characteristics in inverse ratio to their economic importance.

The whole approach to merino breeding is enveloped in an aura of mystery and complexity unrelated to the knowledge and skill required. This position is sorely aggravated by the influence of breed societies, agricultural societies, show judges and professional classers both inside and outside stock firms. The jargon used by these people contains such fatuous and nebulous references as "even toplines", "good underlines", "well set horns", "attractive faces", "a breedy muzzle", "a bold eye". This mumbo-jumbo and gobbledygook is about as relevant to important factors in animal selection as is the pattern of a goat's entrails to a forecast of events.

Instructions distributed by classers and breed societies advise first an examination of a ram's general appearance, its feet, its head, its horns, its belly and so on. Somewhere near the end they recommend an appraisal of the fleece which, of course, is guessed. In an economic analysis the only factors of real importance in a merino are the value of the wool it can produce and ability to regenerate.

Expressed in its simplest terms, successful merino breeding requires nothing more than the accurate selection of breeding stock for factors of known economic merit and genetic transmissibility. Predictably, professional classers and show judges express hostility to a proposal such as this.

We have explored the problems confronting a flock owner who decides to continue purchasing his rams from outside sources. If an owner decides to breed his own he requires a ram-breeding nucleus flock and a breeding plan, the precise form of which may be varied. He must adhere to the basic principle of selection for superior production. A suggested breeding plan is outlined as follows:

RAMS

Providing the flock's genetic production level is fairly high, leave a complete drop of ram lambs entire and select from these, at 18 months of age, not less than five on the basis of commercial fleece value (clean weight x price).

Or, purchase five rams with superior production records from a stud breeder. It may be wise to spread the risk and purchase these from several studs.

Five or more rams

EWES

Select from ewe hoggets and fertile flock ewes a number equal to about 10% of the total number of ewes mated annually, but not less than 100. The same percentage should be drawn from each mob, and selection criteria confined to greasy fleece weight* with, if desired, a margin up to 10% above or below the minimum weight for very strong or very fine fleeces.

* Subject only to the economic faults listed under *Important Points* overleaf.

100 or more ewes

MATED

RAM PROGENY

All ram lambs left entire and kept paddocked together for fleece measurement at 18 months.

EWE PROGENY

After weaning, ewe lambs are paddocked with all other ewe lambs bred on property in preparation for fleece weighing at 18 months.

NEXT STEP

All ram fleeces weighed at 2-tooth shearing. Top half tested for yield and count and graded in accordance with commercial fleece value. The highest five (or more) are mated to nucleus ewes for one year only. They may later be used as flock rams. Other flock rams are obtained from those below top five.

Five or more rams

All ewe hoggets on property are fleece weighed at 18 months, and the 10% recording highest weight are selected for nucleus replacements whether they were born in the nucleus or not.

100 or more ewes

MATED

IMPORTANT POINTS

1. Fertility. No animal showing a fault (e.g., extreme face cover or skin fold) known to be associated with infertility should enter the nucleus. If identification is possible for multiple births, special consideration should be given to these animals as nucleus material.

2. No animal with coloured wool should enter the nucleus.

3. It is essential that all sheep being measured for selection be paddocked together throughout the woolgrowing period.

4. A breeder should aim at a standard of nutrition for all young sheep sufficiently high to ensure sexual maturity at 18 months, but the hot-house conditions so prevalent in registered studs should be carefully avoided.

5. The more ewes in the nucleus the higher the genetic standard of top rams due to the broader base of selection. This will apply up to, and possibly beyond, the point where more than five rams are required to serve adequately the nucleus ewes.

6. The major financial return from merino sheep in Australia is provided by the fleece they grow. Fleece value is controlled by two factors, weight and price per pound. A common factor valid for assessing the merit of all rams can be obtained by multiplying the two. Clean fleece weight can be determined accurately and simply. Price per pound is more difficult, but is controlled almost entirely by the count, or number of crimps per inch. Many breeding plans reject animals with a wool count below 58s, irrespective of fleece weight. The basis of this rejection seems to be ignorance rather than economic fact. Figures supplied by the Australian Wool Board suggest that count, especially below 60s, may be less important than generally supposed. Australian average price 1960 to 1964 inclusive, clean basis in cents per pound:

70s	64s	60s	58s	56s	50s
103.6	96.6	89.2	82.7	80.1	75.1

7. With this type of plan some inbreeding will occur, but provided no less than five rams are used this is unlikely to be serious. Most studs are slightly inbred anyway. However, at intervals of about five years it may be advisable to exchange a top ram for a top ram from another breeder working on similar lines, either as a 4-tooth or 2-tooth. The introduced sire must be mated as a member of the group of 2-tooths normally used. Such a step would remove any possibility of a dangerous degree of inbreeding and will also increase the flock's genetic diversity, thereby lifting the possible production limit.

GENETIC INCREASES ASSURED

A breeding plan of the type outlined will assure genetic increases in wool returns of up to two per cent per annum. I am advocating a rapid extension of ram breeding on these lines by Western Australian flock owners. This conclusion is derived from the following facts and observations:

1. Considerable savings can be achieved by eliminating ram purchases.

2. Experiments conducted in recent years at the Wongan Hills Research Station by the Department of Agriculture, demonstrated that 2½ per cent of young rams are required for summer matings, and indicated up to four per cent may be advisable. Should this indication be confirmed it, in conjunction with the five per cent annual increase in total sheep numbers, will double the State's ram requirements in the next few years.

Apart from strengthening the importance of point 1, this means that the established sources of ram supply would be unable to meet the demand without a serious decline in average quality.

3. Western Australian stud breeders are not adopting new techniques at an acceptable pace. In fact, very few have adopted them at all. They still introduce untested top sires from other studs and other States often at ridiculous prices and, I suspect, select sires of their own breeding on a basis far removed from economic commonsense. The Department of Agriculture seems satisfied by the high ratio of rams tested to rams sold. This fact by itself is meaningless. If we view the State's sheep as a collective flock of eight million ewes joined to 200,000 rams, the average level of the progeny will be the same no matter what mating combination or groups of combinations are used within the total. Collectively, fleece testing becomes meaningful only when it is used to select the best rams and the best ewes for joining ram breeding flocks to produce *the next generation of sires.* It is evident that such is not the case when so many top sires are introduced and presumably mated without any meaningful production record. A rapid expansion of private ram breeding will exert the most effective pressure on stud breeders both to select sires on a rational basis and to discontinue the futile and extravagant frills associated with ram production and sale. This would mean better and cheaper rams for those flock owners who still wish to continue purchasing.

Before we can accept the conclusion that private ram breeding is a feasible and worthwhile proposition, it is necessary to jettison the prejudices and superstitions nourished by people having vested interests in them. Chief among these is the widespread idea that stud animals possess some magic qualities not possessed by ordinary animals, and that the genetic production level of studs is much higher than flocks. If this were true, we would expect a rapid rise in average flock production, since most flocks use stud rams supposedly possessing the alleged superiority. Our 30-year record of static wool production refutes this belief.

Whereas it is probably true that the average of registered animals is higher than the average of all animals, it is certainly true that individual production varies enormously in all flocks, and that the best individuals from ordinary flocks are superior to the average of all studs. Subsidiary and complementary to the first belief (magic qualities and vast superiority) is the idea that sheep imported from other States must be better than local sheep. This contention is supported by stories, possibly quite true, concerning large flocks of stud ewes rearing lambs and averaging more than 20 lb. of wool per head. The reason for this is not in tremendous genetic superiority, but in environment and, specifically, nutrition.

Everyone knows that nutrition affects wool production, but the extent to which this factor controls production is not fully appreciated. It was demonstrated by the results of trials conducted in 1947 and 1948 at the Wongan Hills Research Station. During the spring period August-October wethers on volunteer pasture produced 1.21 ounces of wool per day, equivalent to 27.5 lb. per year. The same animals from February to April produced 0.33 ounces per day, equivalent to 7.5 lb. per year. Another trial at Muresk in 1962 provided similar results.

LIVESTOCK SHOWS

In the light of current knowledge, the present livestock shows are revealed as a barrier to progress if not a powerful force

for reaction in animal breeding, and will continue to be for as long as they are taken seriously. Even if the standards were rationalised it is difficult, if not impossible, to see them fulfilling a useful technical or economic function.

Agricultural shows bring together, for judging on one day a year, an assortment of animals reared and prepared in varying environments. Even if judging were oriented towards the points which matter, instead of those which do not, environmental factor would still invalidate any important conclusion.

One form of stock competition which could be useful is at present conducted by the Department of Agriculture for the poultry industry. A test on comparable lines to the egg laying trial would provide ram buyers with a reliable method of comparing the production levels of various studs. Such testing is physically possible. Last year the Government made available to agricultural societies $2-for-$1 subsidies for building construction to house and display livestock, thereby assisting them to continue throttling breed improvement.

Not being a member of the Government, I would not know why this decision was made. It may have been because shows are a lot of fun and a great social event in the country. If so, the action may be dubious and not completely indefensible. It seems, however, that the decision was backed by a contention that shows make a useful economic contribution to animal breeding. Viewed in this light, it must appear either as an act of almost incredible stupidity or a cynical attempt to secure support from pressure groups with bribes from the public purse.

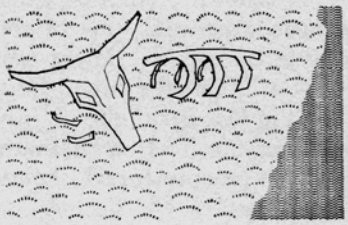
Most of the public research on sheep breeding conducted in Australia has been concentrated on merino sheep. It is fortunate that ability to measure production from both parents, plus the high heritability of desired characteristics makes the technique of mass selection effective and easy. Breed improvement with other domestic animals may be more difficult, but the fundamental principle, selection by production measurement, should be applied to all. Animals bred for their carcase (pigs, mutton, sheep, beef cattle, etc.) should be selected on a basis of fertility in conjunction with rate of weight gain. Besides these, the shape of the body is of little consequence and body markings, head shapes, eye colour, hair texture —upon which so much stud selection is currently based—are of no consequence at all.

CONCLUSION

Scientific research has charted the path by which we may achieve substantial production increases from our merino flocks. This path is not difficult to follow and like many breakthroughs in science and engineering, appears in retrospect to have accomplished by no more than the application of commonsense. If all Australian sheep men follow this path they will add at least $10 million to the national wool cheque. The increase will be cumulative: $10 million this year, $20.1 million next year, and so on. If the major studs lead the way, it will be easier for all, but the individual flock owner can, if he chooses, "go it alone".

Financially, drought-affected graziers in this area have had several good seasons behind them, enabling most to borrow where necessary. Efficient transport to get livestock away to relatively good markets, and an awareness of drought feeding methods have been other factors tending to help them through, so they have suffered less than they had in less severe droughts of the past. However, strong pressure is expected on lending sources for some time to come.

In December 1965 the Rural Liaison Service of the Reserve Bank of Australia carried out a survey of the physical and financial effects of drought in northern New South Wales. This article is a summary extracted from the published report, together with some comments made at the end of July 1966.



Drought effects in northern N.S.W.

A SAMPLE survey was made in December, 1965, to determine facts about the effect of drought on producers' finances. The sample of 227 enterprises was sufficiently large and representative to give a clear picture of the effect of drought on producers in the seven Pastures Protection Districts from which the sample was drawn. The seven districts selected were Glen Innes, Armidale, Warialda, Narrabri, Moree, Walgett and Brewarrina.

These districts are in the Northern Tablelands, North-West Slopes and North-West Plains areas of New South Wales. They comprise about one-tenth of the area of the State and produce roughly one-sixth of the State's wool and wheat. Over the four years prior to the drought sheep and cattle numbers had increased by about one-sixth and wheat acreages by over 40 per cent.

A comparison with other areas of New South Wales indicates that these seven districts were among the most severely drought-affected parts of the State. Their cumulative deficiency of rainfall over the 13 months prior to December, 1965 ranged from 50 per cent to 69 per cent below normal for this period. Some relief rain has fallen in most areas since the survey was made, but for the six-month period December-June, rainfall has been about 50 per cent below average.

The survey confirmed the seriousness of the drought. Survey producers reported that wool production in normal years was

19,472 bales, whereas estimated production for 1965-66 is 13,466 bales—a reduction of 31 per cent. The greatest reduction occurred in the more western districts. Many also reported a reduction in wool quality. Reduction in average cuts per head as well as reduced numbers contributed to the fall in wool production.

Wheat production in 1965-66 was negligible compared with the record harvest the previous year. The total yield was only 35,100 bushels whereas the 1964-65 harvest was 1,131,600 bushels and in 1963-64 it was 867,000 bushels. Although 19,600 acres were planted in 1965 (37,300 the previous year) the average yield from this area was only 1.8 bushels, as a large portion of the land sown was not harvested.

RECORD ACREAGE SOWN

The rain which fell in the wheat-growing districts in June has been sufficient to enable a record acreage of wheat to be sown. This wheat germinated but due to lack of subsoil moisture the position at the end of July was becoming critical.

Of the 227 producers in the sample 209 had hand-fed livestock during 1965. In addition 40 per cent of the producers had used conserved stocks. Total abnormal expenditure on feeding during 1965 for the 227 producers including value of stocks used was $1.2m — an average of almost $5,000 per property or $1.31 per sheep equivalent.

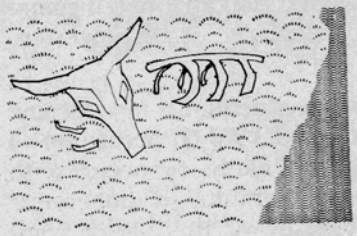
Abnormal deaths of sheep during 1965 amounted to 16.3 per cent of the number on hand at 30th June, 1964 and abnormal deaths of cattle 12.5 per cent. The least affected districts were in the Tablelands. In addition reduced natural increase (65,000 lambs in 1965 compared with 208,000 in a normal year) and forced sales contributed to the reduction in sheep numbers which at December, 1965 compared with June, 1964 had fallen by 21 per cent and cattle numbers by 27.3 per cent. (These percentage reductions probably understate the effect of drought as stock numbers could normally be expected to be higher in December than they are in June.) The reduction in breeding stock was severe—the number of ewes was down by one-sixth.

In general, producers had endeavoured to retain their ewes but most lost more ewes by death than other sheep. In the case of cattle, statistics for these districts show that cows and heifer slaughterings increased during 1964-65 at a greater rate than non-breeding cattle.

Preliminary livestock estimates by the Commonwealth Statistician indicate that sheep numbers in New South Wales fell by 16.3 per cent from 72.4 million to 62.6 million between 31st March, 1965 and 31st March, 1966. Livestock numbers have declined appreciably since the time of the survey mainly due to sales. There are now very few cattle left in the area. Drying winds during the last fortnight of July have had an adverse effect and many owners have now recommenced hand-feeding.

Many producers commented that they would breed rather than buy to re-establish their flocks and herds and mentioned various expedients such as reducing culling rates whereby reproduction rates could be increased. If producers do, in fact, depend on breeding rather than buying to increase their livestock numbers they would save on the capital cost but generally would suffer lower incomes, through reduced livestock sales and wool production, until their numbers are back to what they would regard as normal. In many cases this might take some years. It is probable, however, that many of them will also buy stock as well as breed, provided the season looks promising and prices of stock are not excessive.

In the Tablelands areas, with the return of favourable conditions and the recovery



PROCEDURES ADOPTED

of pastures, the build-up in sheep numbers could resume its pre-drought rate of about 10 per cent per annum. Sheep numbers in the Tablelands were actually higher at December, 1965 than in 1963. In the Moree, Narrabri and Warialda districts, where sheep numbers have been static in recent years, it appears that the re-building of stock numbers may be much slower and many graziers will probably concentrate on growing larger acreages of wheat to recoup their drought losses. In the two western districts it may also take some time to rebuild stock numbers as losses of breeding stock have been quite heavy.

DROUGHT MITIGATION

The procedures adopted by livestock producers were:

1. Reduce stock numbers by	
(i) abnormal sales ..	22 per cent
(ii) not mating	23 per cent
2. Increase supply of feed by	
(i) using additional land, agistment etc.	32 per cent
(ii) hand feeding	91 per cent
3. Do nothing	3 per cent

Most producers pursued more than one of the above procedures. In the case of crop producers there was virtually nothing they could do to avoid losses in production. Those who did not sow their wheat crops (about half the wheat growers), however, avoided some expenditure.

Any programme producers pursued was very much a gamble and at the time of the survey it was too early to make a satisfactory assessment of the success attending various programmes. The results, however, do indicate that hand feeding had generally proven to be successful. Most had fed and intended to continue feeding if the drought did not break. The general availability of feed at the onset of the drought—especially wheat at reasonable prices—was a particularly favourable circumstance which contrasts with most previous drought situations.

Despite considerable improvement in water supplies in past years, more than one-fifth of the enterprises suffered losses due to inadequate watering facilities.

The average assets of the sample enterprise amounted to $160,000 and average liabilities to $21,900. Over one-tenth of the assets could be regarded as reserves being other than land, stock and plant. About 40 per cent of the liabilities were to trading banks. Generally family companies, family partnerships and stock partnerships appeared to be in a stronger financial position than sole proprietors and better able to withstand losses from drought.

There was some variation in the ratio of assets to liabilities between the seven districts and between the main enterprise types, but it is difficult to point up any very marked differences between groups in their overall financial position. All districts showed a fairly high cash income in

1963-64 and 1964-65 in relation to liabilities, particularly in the wheat districts; in the latter, recovery during normal seasons could be more rapid than in some other areas.

The averages for the various groups indicate that producers had taken advantage of recent good seasons to build up reserves and the majority should have little difficulty in financing recovery. The exceptions may be producers who paid very high prices for properties in recent years and those who have suffered heavy livestock losses.

EFFECTS ON INCOME

The average net cash income (before tax and excluding living costs, depreciation and developmental expenditure) of the survey enterprises was estimated as follows:—

1963–64	$14,366
1964–65	$10,436
1965–66 forecast if drought ended Dec. 1965	$ 970 (loss)
1965–66 forecast if drought continued to June, 1966	$ 3,122 (loss)

The drought had some impact on 1964-65 incomes, mainly because of additional outlays on fodder although additional livestock sales helped to keep incomes up. The producers' forecasts of their expected incomes in 1965-66 under two sets of assumptions show the very severe effect of the drought.

Had the first assumption proved correct, 122 producers of the 224 making a forecast expected to operate at a profit in 1965-66, but if the drought continued to June, 1966 only 87 of the 201 producers making a forecast expected to operate profitably. If the drought continued in 1966 cash operating expenses would rise and net incomes fall sharply particularly in the western areas.

The biggest reductions in income between 1963-64 and 1965-66 according to enterprise type are likely to occur with the wheat-sheep operators—a not unexpected result because of the almost complete failure of the wheat crop compared with their record production in 1963-64. The sheep (wool) enterprise will also suffer heavily because of increased fodder costs.

Although forced sales of stock have, to some extent, offset the reduction in income of livestock producers, their incomes can be expected to remain low during the post-drought period of recovery in stock numbers with smaller wool clips and livestock sales. The expected reductions in income are correlated generally with net worth and the bulk of any fluctuations in rural income in the region would therefore emanate from larger enterprises.

The survey showed that of the 227 producers, 97 had sought loans in 1965 for drought purposes and 81 of them had been completely successful and nine partly successful with two rejections and five still under consideration. Most of the 11 who were not completely successful in 1965 in obtaining their drought requirements appeared to be in a weaker financial position and it is concluded that few who were apparently credit-worthy had failed to obtain their drought finance requirements from commercial lenders. Loans obtained for drought purposes by sample enterprises from banks represented 25 per cent of their total loans outstanding to banks. The comparable figure for pastoral finance companies was 43 per cent.

Most of those who sought loans for non-drought purposes had also been completely successful (62 of 77 applicants) and some of the remainder partly successful. Loans granted for non-drought purposes during 1965 by banks, and pastoral com-

panies accounted for 20 per cent and six per cent respectively of all loans owed by sample enterprises to these lenders.

About one-quarter of the 147 enterprises which had overdraft accounts were in excess of the limits approved by their banks (average excess $2,867). Of the 97 applicants who sought loans for drought purposes during 1965, 84 intended to apply again in the following six months.

On the assumption that the drought had broken in December, 1965 the following points about intended borrowing emerge:

1. One hundred and thirty-nine producers stated intentions to borrow during the next six months. Not all would be likely to be able to present acceptable propositions.
2. The effective demand expected to be made on banks for new and increased limits was at least 18 per cent of limits existing at the date of survey. On the assumption that these would be 90 per cent drawn, gross drawings over the six months, (including drawings against limits previously established but unused) from trading banks of sample producers would be at least 31 per cent of outstanding debt to these banks at survey date. For pastoral finance companies the effective demand was expected to be at least 33 per cent of producers' debts to them (some of this demand could spill over to other lenders if it proved beyond the capacity of pastoral finance companies); there were also some who would be seeking loans from other lenders including the Commonwealth Development Bank.
3. Assuming that 44 of the 139 producers intending to borrow would be unlikely to obtain all their borrowing requirements from commercial lenders, many of these could be expected to seek loans under the State drought relief scheme which was announced at the time of the survey.
4. While the purposes for which funds were to be sought could not be clearly defined it appears that the major portion (72 per cent) would be required principally for carry-on requirements which includes smaller amounts for restocking and development; intended borrowing for restocking probably would represent about 25 per cent of funds required from all lenders.
5. The average size of intended borrowing was $12,200 for the sheep (wool) enterprises and $7,600 for wheat/sheep enterprises—the two most common enterprise types.
6. The number of loans to be sought from banks were three times greater than those to be sought from pastoral companies and slightly less than two and a half times greater in amount.
7. As might be expected the larger enterprises in terms of net worth, on average, were seeking larger loans but intended borrowings per $1,000 of net worth declined with increasing net worth.
8. Forty-four of the 139 who foreshadowed borrowing would increase total applications by about 30 per cent if they thought loans were readily available from banks and pastoral companies. However, based on the apparent ability of producers to service their debts, 20 of these 44 would be unlikely to be able to present acceptable borrowing propositions and some of the others, regarded as apparently creditworthy at the time of survey, could become marginal.

BORROWINGS PLANNED

Producers' answers on intended borrowing over the next six months on the assumption that the drought continued till June, 1966 have been analysed in a similar fashion to the above. While their answers

to this series of questions were more speculative than those obtained on the assumption that the drought had broken in December when good rains fell, a few additional points did appear:

1. The total number seeking loans would be much the same (141 on the assumption that drought continued compared with 139 on the assumption that drought ended).

2. Total effective demand on banks would be also much the same but the effective demand on pastoral companies would be much less ($40,000 compared with $208,000). It seems that demand on pastoral finance companies will be greatest when the drought ends.

3. Most of the demand under this assumption would be for carry-on and fodder.

4. The average size of loan sought by sheep (wool) producers would be about one-third lower and that sought by wheat/sheep producers a little higher ($8,070 and $8,182 respectively).

5. Producers would be less willing, on the assumption that the drought continued, to increase their intended borrowings if they knew loans were readily available on ordinary commercial terms than they would be on the assumption that the drought had ended.

The survey revealed that the sample contained a hard core of non-borrowers. Of the 227 producers 63 had not sought finance in 1965 nor intended to seek finance in the six months after interview; 48 had so managed their affairs as to have substantial bank deposits while the remaining 15 included those who already felt fully committed, those who preferred to sell rather than incur debt and a few who thought their chances of obtaining a loan were too poor to warrant a formal application.

CONCLUSION

While rainfall during the year was close to the lowest on record in many areas, graziers probably suffered less in this than in some previous droughts. Important reasons for this are better facilities for rapid transport of livestock, the sounder financial position of producers after a number of years of good seasons and relatively high prices, better understanding of drought feeding methods, the general use of wheat as a fodder, and the existence of a relatively good market for lean meat, particularly beef.

Because most producers were in a sound financial position at the onset of the drought they were able to withstand the loss of income and capital and the additional costs involved in feeding livestock. Where ready cash was not available to meet the additional costs incurred, producers were mostly able to borrow from banks and pastoral companies to meet their commitments.

It seems that all, or almost all, producers who sought to borrow and who could be regarded as sound lending risks, had been able to obtain loans from commercial lenders for drought purposes. Although all relevant facts were not known to interviewers, in most cases where borrowers' proposals were not met it was doubtful if they were reasonably sound risks for the amount sought.

Regarding the immediate future, substantial demands for borrowing can be expected and this increased demand seems likely to continue well after the drought has ended. Since it will take most producers a year or so to regain a normal income position, few of the intending borrowers are likely to be able to afford substantial reductions in limits during the next two years. Numerous requests can also be expected for deferment of agreed reductions in existing limits.

Many producers said they expected

stock prices to go too high for them to wish to purchase very many; their intention was to breed up the required numbers. Altogether, the stated demand for funds for restocking was lower than might have been expected, except perhaps in the far western districts.

A number of intending borrowers—about 18 per cent of all producers in the survey plus several not intending to borrow—have been assessed as unlikely to be able to present acceptable propositions to borrow as much as they would like for carry-on and restocking. These people may obtain assistance from special Government loans.

The results of this survey cannot be extrapolated to other drought-affected areas of New South Wales and Queensland in any formal way. However, certain subjective judgments are possible, particularly for New South Wales where we have made an analysis of the rainfall deficiencies in each district.

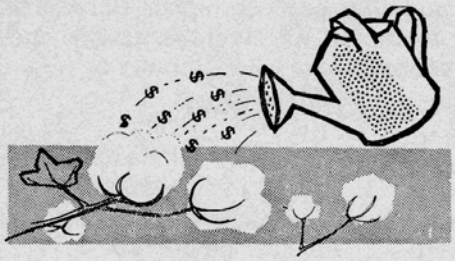
The proportionate reduction in stock numbers would probably be at least as high in the far north-western districts of New South Wales and in western Queensland as in the Brewarrina District. However, particularly in Queensland, the proportion of stock deaths could have been considerably higher because of the greater distances over which stock would have had to be moved to find agistment or a market.

Per capita borrowing for drought purposes and intended borrowing in the post-drought period would probably be higher in the far north-western districts of New South Wales (e.g. Bourke and Wanaaring) than the survey average and at least as high as in the Brewarrina District. In the western Queensland districts, which were similarly drought affected, per capita borrowings and anticipated borrowings would probably be even higher since properties there are, on average, larger and carry more stock.

The cotton bounty scheme, which originated to avert failure of Queensland's dry-farming industry, has by design or fluke done the job of getting the irrigated cotton industry started. Now the fledgling industry faces a testing time, with greatly reduced support per lb. of lint cotton. Warning that the bounty should not be adapted to a guaranteed-price scheme, the author maintains the shake-out is as it should be; the cotton bounty might well become a model for other subsidies.

G. D. OLIVER

is officer in charge, Rural Economics and Marketing Section, W.A. Department of Agriculture. This article is from a talk to the W.A. branch of the Australian Agricultural Economics Society.



Subsidies for new agricultural industries

THERE is little scope in Australia for major new agricultural industries. Crops already with us which may be worth stimulating in some regions are rice, safflower, grain sorghum, linseed, and soya beans. On the livestock side, the lot feeding of beef cattle may become a desirable industry as our major cities increase their already considerable populations. But the title need not be taken too literally; the Government may wish to give a new direction to an old-established industry—a new direction which is seen to be desirable because of changes in demand, but a direction which traditional industries would not take of their own accord.

For example, world demand may be towards certain classes of wool and cotton, particular types of meat animals, and certain improved grain varieties. Selective government assistance at an early stage would aim to bring about the necessary structural changes, or stimulate those changes already taking place though too sluggishly, to maximise long-run returns to farmers and to the nation.

In the past few years we have seen the cotton growing industry emerge from relative obscurity (its position for over half a century) to a place of importance in our economy. The irrigated cotton industry is virtually brand-new and owes its spectacular rise in no small measure to the Commonwealth Bounty scheme. This scheme is worth examination not only because it has been an outstanding suc-

cess in developing a cotton industry (too successful some might say), but also because it has some interesting features not previously incorporated into agricultural support schemes in Australia.

The present cotton bounty scheme came into force in January, 1964, and will run for five years until December, 1968. The Act allows for maximum assistance of $20 million over the five years or $4 million in any one year and applies only to raw cotton consumed in Australia. The scheme allows for a variable subsidy-per-lb. of lint produced above a certain minimum grade and is paid to Spinners for distribution to growers. The *Raw Cotton Bounty Act 1963* makes no provision for Government acquisition of the cotton crop or for a stabilisation fund. There is no provision for restriction of the area of cotton planted or for equalisation between home and export sales.

Attempts to establish a cotton growing industry in Australia date back to the early days of settlement in New South Wales. The State of Queensland, in particular, has always looked on cotton as a possible important commercial crop, and from as early as 1860 has offered financial incentives to cotton growers. The Commonwealth Government first became financially involved in the early 1920s when it joined the Queensland Government in a guarantee to growers of 4½ cents per lb. for seed cotton of good quality. As a result of this and other assistance, the cotton area increased from 72 acres in 1919 to 40,000 acres in 1925.

In 1926, the joint-government plan was replaced by a Commonwealth Government Bounty scheme; in 1935, because production exceeded consumption by Australian Spinners, the Bounty Act was amended to include a protective tariff on imported cotton goods. As a direct result of this scheme, there was a marked increase between 1935 and 1940 in consumption by Australian Spinners.

The cotton-growing industry, however, was unable to keep pace with demand. The world cotton price was depressed in 1939, although this is only part of the reason for the failure of the Queensland industry to expand under Bounty assistance and tariff protection. It was simply not possible to develop a profitable industry in that State under dry-farming techniques. Yields varied enormously from year to year and, for the most part, cotton quality was shocking.

Commonwealth Government assistance to the cotton-growing industry since World War II is usually taken as dating from the 1951-58 Bounty Act, which guaranteed growers first 8 cents then 11.5 cents per lb. for seed cotton above a certain minimum standard. Until 1959, the guarantee was renewed annually; since that date the Bounty has been extended for five-year periods.

PRESENT BOUNTY SCHEME

The present Bounty Scheme, which came into force in January, 1964, provides for assistance of up to $4 million a year over five years. Lint must be of a certain minimum standard to receive the Bounty and there is a limit to the amount of support for each pound of lint. Further, because an important objective of the Act is to encourage the production of knitting and weaving grades of cotton, the Bounty payable per lb. of lint increases with quality.

The bounty on cotton has, as a primary aim, the development of an industry to replace imports of raw cotton without penalty to the Australian spinning industry. It is essential, therefore, the Commonwealth ensures that raw cotton produced in Australia is used. Spinners are encouraged to comply by the simple expedient of allowing them a duty-free concession (by law) on imported raw cotton.

If lint produced in Australia were unsold, by-law entry would be disallowed and the full duty invoked. The present duty on imported raw cotton is $0.012 per lb.

The cotton Bounty scheme encourages production in Australia by providing that all who produce above a certain minimum standard—viz., strict good ordinary, "of a good and merchantable quality" according to the Raw Cotton Bounty Act, No. 86 of 1963—receives a price higher than the world price. The bounty also provides an incentive for production of high grade, long staple cotton, by a variable bounty scale. The 1963 Act, for example, provides for a top bounty of $0.152 for Good Middling (White) of $1\frac{1}{8}$ in. staple length compared with $0.103 for Low Middling (Spotted) of $\frac{7}{8}$ in. staple at the other end of the scale. The reference point for the bounty is the grade Middling (White) of 1 in. staple length which at present carries a rate of $0.134 per lb. (raw cotton). The rates for the other grades can be varied each year.

The variable bounty rate system, allowing as it does for annual revision, was an innovation with the 1963 Act. In a five-year scheme it is doubtful whether it has an advantage over one flat rate because growers, in such a short time, can do little to regulate quality and staple length. These factors are a function of the varieties grown and the Australian industry is not yet in the happy position of having a choice of varieties in different areas which will yield equally well. Over a longer period, however, the variable rate system, efficiently administered, could exert an important influence on the type of cotton produced.

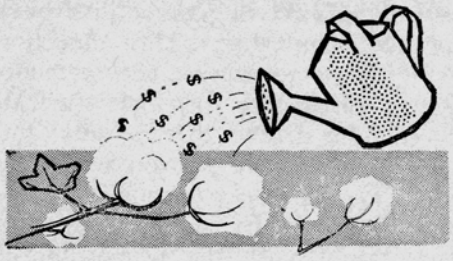
An important change in the 1964 Scheme, from a Western Australian viewpoint at least, is that freight on transport of lint from ginneries in a particular region to spinning mills is met by the growers concerned. Previously a far distant location such as the Ord River Valley had no effect on growers' returns because all were paid a fixed price of 11.5 cents at the ginnery. While this places our industry at a freight disadvantage as compared with other Australian areas it is a reasonable provision and consistent with most other industry freight arrangements. The old system would have amounted to a hidden subsidy for the Ord Scheme. Further, what we have lost on the swings we hope to make up on the roundabouts. Any quality advantage which the Ord may have over other areas will be credited to growers under the present Bounty whereas this was not so with the scheme prior to 1964.

The cotton Bounty scheme is superior to some other forms of assistance to primary producers (for example, the wheat stabilisation scheme) because it provides for an automatic and direct reduction in subsidy per pound of lint as production is increased. The amount of bounty paid to individual growers is not related to cost of production in any way. This was not the case with the bounty before this one under which growers received a fixed subsidy per pound regardless of the total Australian production.

NO GUARANTEED PRICE

The departure from a guaranteed price is a radical and important change in the bounty scheme. This feature of the scheme has received little or no attention but is of utmost importance for the future of cotton growing in Australia.

The price received by growers for cotton contains two basic elements: first, growers receive the world price for different grades and are subject to all its fluctuations from day to day, season to season and year to year. Last year and the year before, Ord growers would have received an average of about 27.5 cents per lb. of lint before



SUBSTANTIAL PROFITS MADE

deduction of ginning and marketing expenses, if they had been forced to rely entirely on the world price. Second, the bounty is added to the world price. During the past two years this added one-third, or 14 cents, to the total average lint price received by Ord farmers. The subsidy in the past two years, amounting to one-third of the gross price, has enabled farmers at both the Ord and Namoi Rivers to make substantial profits.

While I have previously claimed that one important aim of the 1963 bounty scheme was to get cotton growing off the ground with a good stiff dose of prosperity I have since had second thoughts on this point. I now think those who devised the scheme had no conception of the progress which irrigated cotton growing would make in Australia in the last two or three years. Almost certainly the formula (level of support and the variable bounty scale) was based on the dismal experience of cotton growing in Queensland and its level of unit costs based on poor average yields.

Had there been even the smallest inkling of the individual farm profits which have been achieved in some regions since 1963, it is almost certain the Commonwealth would have been less generous with its support. By design or fluke, who knows or cares, the fact remains the Commonwealth enacted a scheme which gave the right boost to get an infant irrigated industry off the ground. And further, again I think it was penury rather than foresight, the bounty scheme contains built in stabilisers to curb the wrong kind of expansion. The total amount of Bounty available each year ($4 million) is sufficient only to cover 30 million lb. of lint at the maximum rates per lb.

In 1965, Australia produced 22 million lb. of lint and consequently growers qualified for the maximum annual subsidy. This season production could reach 50 million lb. The necessity to spread the bounty over all production could reduce the average bounty by 5 cents; this is a reduction in the bounty of about one-third on 1965. The present lint requirement of Australian Spinners is 65,000,000 lb. When this level of production is reached, the bounty will be further cut to less than half the maximum rate per lb. of lint.

The immediate outlook for growers, then, is greatly reduced support per lb. of lint produced. This will be a testing time for the cotton growing industry in Australia and only those areas well suited to production will survive. This is how it should be. Over all, the Bounty system which encourages the production of quality cotton and ensures that expansion must be accompanied by unit cost reductions is a good one. In this context the fillip given to growers' incomes by the bounty in the last two years at both the Namoi and Ord Rivers does not seem unreasonable for it has allowed the development of a cotton industry based on broad acres, efficient use of machinery, and high production per man.

Governments throughout the world will continue to assist rural industries through tariffs, bounties and subsidies of various kinds. Secondary industries, too, receive

considerable support mainly through tariffs which, in turn, raise primary producers' costs. A critical discussion of primary industry subsidy schemes usually ends in a squabble about equity, with farmer representatives claiming their support is more than justified by the support given to manufacturing industries. This dichotomy is unfortunate and clouds the real issues. The various government measures, whether applied to primary or secondary industries, should be looked at as separate entities and an evaluation made in terms of the social and economic contribution to the Australian nation. We must look for improvement right across the board. Government support in one area of our national life, whether justifiable or not, is no justification for an inefficient support policy in another area of our national life. At the moment our concern is with rural industry subsidy schemes and it is important to look at the strengths and weaknesses of existing schemes so that they can be improved and better new schemes formulated.

GUARANTEED PRICE SCHEMES

Economists are in general agreement that Treasury guaranteed price schemes based on a cost of production formula, (for example, the wheat and dried fruits schemes) are undesirable because costs tend to get out of line with those in other parts of the world. This is not an objection to government-sponsored schemes which provide for relief to farmers during restricted periods of sharp price reductions or unfavourable seasons. With a guaranteed price scheme based on cost of production there is a built-in probability that necessary structural changes (size of farms, areas cropped by one man) will take place more slowly than otherwise and factors of production will be used less efficiently. This is because farmers need to feel the hot breath of overseas competition and be persuaded by it to use their wits and ingenuity to improve the competitive position of their industry. This objection applies in a lesser degree to arrangements for higher prices for products (wheat, butter, canning fruits, dried fruits and eggs) in Australia than overseas. The shielding from overseas competition obtained in this way by different primary industries varies with the proportion of exports and the amount of protection afforded. The Australian butter industry is a particularly bad case of over-protection.

The cotton Bounty scheme could well serve as a model for government assistance to agriculture because it combines a clearly defined objective, the development of an efficient cotton-growing industry, with a built-in mechanism for reducing protection as the industry expands. On the other hand it cannot be described as a brilliant or novel conception. A fixed annual amount of subsidy is spread over many units of production in the same way as the dairy industry subsidy and the initial level of support is related to the average cost of production as with the wheat stabilisation scheme. The 1963 arrangements for cotton were essentially an adaptation of earlier Bounty schemes with changes to correct weaknesses—for example, payment at the spinning mill instead of the ginnery; bounty payments on the basis of lint rather than seed cotton; a graduated Bounty scale and a total bounty limit.

CONCLUSION

In conclusion I wish to make these points:

1. In setting out to foster what was virtually a new cotton-growing industry the Commonwealth Government turned its back on the old Queensland industry because the bounty scheme in its present form is quite unsuitable to main-

tain cotton-growing based on dry farming techniques. Further, I believe this was the correct policy both for Australia and the growers concerned because opportunities for adjustment are available.

2. You may well ask: What is the logical conclusion of the Cotton Bounty Act? When its object of establishing an efficient cotton-growing industry is achieved it should be abolished. I am not prepared to say that its objective will be achieved by 1968.

There will be powerful forces at work to perpetuate the scheme and re-organise it into some form of guaranteed price scheme. I am opposed in principle to this type of permanent arrangement not only for cotton but also for wheat, dairying and other industries because they must eventually lead to stultification of initiative and enterprise. Australian agriculture in its many phases has the potential to stand up to international competition. While it is petted and propped it will be less likely to carry out necessary structural changes demanded by a changing world.

EDUCATION FOR

A REPORT, *Manpower Training for Agriculture in Western Australia*, has recently been published by the University Press for the John Thomson Agricultural Economics Centre and the Australian Institute of Agricultural Science. The report is an operational one, designed to present the major issues to farmers and administrators and it outlines courses for action which need to be taken *now*.

Some of the major points made in the report are presented here. These merely indicate its nature and interested persons should read the report in full. It is priced at $1 and is available from the University Press Board, University of Western Australia.

I IMBALANCE IN TRAINING AVAILABLE

1. There is gross numerical imbalance between the needs and the annual output of persons trained for managerial and non-managerial positions in farming.
2. Training is restricted to persons in the wrong age groups and with inappropriate pre-entry qualifications.
3. There is gross qualitative imbalance in courses of training; manual and technical subjects are over-emphasised, management is barely treated.
4. The Martin Committee did not identify the foregoing situation. Its proposals for agriculture, if applied in Western Australia, are likely to aggravate rather than to remedy these imbalances.
5. The foregoing imbalances have occurred inevitably. Western Australia does not have an administrative or political balancing mechanism.
   Institutional needs for technicians are presented by professional administrators. Farmers' needs for training are presented by amateurs. This is one strand in the story, "How Farmers Lost the Agricultural Colleges".

II FARMERS SUBORDINATE TO SCIENTISTS

1. Another strand in the same story is that agricultural scientists, extension officers and technicians want increased numbers of themselves and of each other. They have successfully enlisted farmer support to this end.
2. Management training specifically for future and present farmers could be a superior substitute for employment by the State of more extension officers.
3. Farmers do not appear to be aware of the distinction between using advisory and scientific services subordinately on the one hand, and using them independently on the other. There are two hypothetical extremes:
   (a) A mass of inadequately educated, managerially subordinate farmers kept in a high state of efficiency by an army of professional, technical and managerial advisers.
   (b) A mass of well educated, managerially autonomous farmers helped to maintain a high state of efficiency by a task force of professional, technical and managerial extension advisers.

III PRESENT TRAINING IS POOR VALUE FOR MONEY

1. Neither the Government nor the people of Western Australia are getting value for their money spent at the agricultural wings of the district high schools

and at Muresk Agricultural College. Training at these institutions is not in line with needs.

2. The average net cost to government per Muresk diploma graduate is almost $3,000. By changing the course, the cost per student could be halved. Thus, for the same total outlay by the Government, the number of students could be doubled.

IV MAJOR NEED IS MANAGEMENT TRAINING

1. The Martin Committee proposals are likely to put Muresk Agricultural College into the orbit of the Western Australian Institute of Technology, or into that Institute's type of training. In this event, Muresk will train technicians for service institutions, not managers for the State's agriculture, which is the major need.
2. It would be disastrous for both sets of needs if Muresk were to try to cater for both.
3. Muresk could leave technician training —which is largely laboratory-type training—to the Institute of Technology.
4. Muresk and the facilities of the agricultural wings of the district high schools could be organised to train managers of farms.

V MEANING OF FARM MANAGEMENT

1. Farm management is not widely understood. Widespread misconceptions are:
   (a) That sheep flock management is sheep farm management.
   (b) That planning the layout of a farm is farm planning or farm management.
   (c) That technical know-how is separate from or more important than management.
   (d) That manual skill is separate from or more important than management.
   (e) That management is something a farmer might become interested in once he has got everything else right.
   (f) That management is concerned only with cash and finance.
   (g) That management ignores biological principles.
2. Farm management is the integration of the physical and financial resources of a farm with the inputs and techniques of production, in such a manner as will achieve desired income objectives. It is the decision-making and action-taking involved in the integration and and co-ordination of farm resources, inputs, techniques and skills within a marketing situation.

VI NEED FOR AN ADVISORY BOARD ON AGRICULTURAL TRAINING

1. Extremely high returns, both social and individual, are possible from redressing the serious neglect of education for management of Western Australia's farms.
2. The formation of an Advisory Board on Agricultural Training appears to be the first step in any systematic process attempting to realize this potential.

There is a big gap in efficiency between the average farmer and the top 10 per cent or so of farmers. This gap should be reduced by appropriate policies in agricultural education, research and extension. Education must be better tailored to needs; research should be more oriented to the farmer than to the soils, plants and animals he uses; and extension policy should recognize the potential role of farm management consultants and of farm management service centres or laboratories.

Dr. JOHN L. DILLON

is Professor of Farm Management at the University of New England. This article is based on an address to the convention on maximum use of Australia's rural resources, sponsored by the Federal Rural Committee of the Liberal Party at Wagga Wagga, June 24, 1966.

EDUCATION, RESEARCH, EXTENSION AND . . .

The efficiency gap in agriculture

NO one has yet made a proper assessment of the gap between what is and what's possible in Australian agriculture. Judged on the performance of better farmers—say the top 10 per cent—it seems sure, however, that from both his own and the national point of view, our average farmer, through no fault of his own, is at best only doing half the job he might be doing. Half the job, moreover, measured not in terms of what some backroom scientist might see as technically feasible, but in terms of what a not insignificant number of farmers are already doing.

In postulating an efficiency gap of the order of 50 per cent, I know full well that the average farmer is up against all sorts of limitations. Certainly, he doesn't have the managerial skill and financial resources to enable an overnight doubling of his efficiency through reorganization of his production programme. But that's no excuse for closing our eyes to the existence of the efficiency gap.

The crucial question is: What strategies might be followed to close the gap? In terms of alternatives available to the farmer? In terms of policy instruments available to the Government? Indeed, can we jump the gap—or do we have to run to stay still? In particular, what are the implications for education, research and extension? Here I can do no more than provocatively raise the problem for further discussion. In trying to do so, I will em-

phasize those implications which I feel are important but have not generally been given as much attention as they should.

These days, education is "in". In terms of the efficiency gap, the more education the better because education is aimed at man and he is the main actor in the farm sector. As C. R. Wharton of the Agricultural Development Council, New York, has put it: "Education pushes back cultural prohibitions. It reduces the restrictions of traditionalism and facilitates innovation. It broadens a person's ideas of the possible. It increases the geographic and occupational mobility of people. It makes it easier for a person to think through the problems which he faces and not merely accept them as unchangeable givens."

Efficiency-wise, we need to think and plan in terms of three particular areas of education influencing agriculture:

1. The education of rural youth who are needed for agriculture *per se*, be it a question of mechanics or managers or something in between. Regardless of its level, this education ought to be in terms of principles, not rote memory of the parts of the harness. Like it or not, the future will see a smaller workforce in agriculture. It ought to be of increasing quality. Currently it seems that about 98 per cent of those entering farming do so without any special full-time vocational education.
2. The education of the 80 to 90 per cent of rural youth who will not be needed in agriculture. They must receive education aimed at facilitating their transfer out of agriculture if we are to avoid surplus rural manpower, too-small farms and rural slums.
3. The education of those who serve agriculture directly, be it via the public purse or business. In particular, there is probably no more important unpublicized deterrent to efficient agriculture than the general incompetence in farm management economics that farmers have to face in their accountants and bank managers. The exceptions stand out like beacons. Another point to watch is to be careful that we don't squander our scarce supplies of educated manpower—the District Agronomist who spends most of his time certifying seed potatoes doesn't need a four-year degree. Most importantly, we need specific tertiary education facilities for career work in extension. While most of our universities offer training for agricultural research careers, only two universities have any real programme for extension training.

As well as these three areas of education, I'd like to stress the education of farm leaders and policy-makers. But short of drafting them for night school, it's hard to see how the job might be done!

Of course, in neither the public nor the private sense is education costless. To get it, we have to forego something else. To make reasoned policy decisions on education, therefore, we need information on its costs and returns. Suffice to note that the factual information—let alone research—on Australian rural education is pitiably small.

THE RESEARCH GAP

The implications of the current efficiency gap for agricultural research are easily stated. Bluntly: C.S.I.R.O. gets far too large a share of available funds (and brains); overall, too much support is blindly given to research aimed at the production of new technology; too little support is given to applied research aimed at making new technology operational; and far, far too little support is given to economic and behavioural science research aimed at the efficiency of farm business decisions.

Too often our research is posed in terms of "Under what conditions will it work?" rather than "Under what conditions will it

pay?". In particular, we need a tremendous increase in co-operative applied research between physical and economic scientists. Also, we need budget planning to lessen the size disparity between economic research services (for example the B.A.E.) and technical research services (for example C.S.I.R.O.). Why should C.S.I.R.O. be able to offer a career research salary scale to its physical researchers but not the B.A.E. to its economics researchers?

To justify such conclusions, first, it is clear that we cannot and should not do away with the efficiency gap completely. We need a steady supply of new technology—not least to sustain and improve our competitive position in international trade. To have immediate adoption of such new technology can be no more than a Utopian dream. So some flow of new technology is essential and, *ipso facto*, an efficiency gap of some size is here to stay. Note though that, over time, this gap will relate to a changing bundle of new technologies as creation and implementation proceeds.

TWO TYPES OF RESEARCH

Second, relative to the efficiency gap we can distinguish two types of research. On the one hand there is the C.S.I.R.O.-type of research typically aimed at developing new production technology. Such research can make no contribution to decreasing the gap. Of itself, such research can only enhance the gap. Indeed, by producing results faster than the extension system and the average farmer can digest them, such research is a *cause* of the gap. In contrast, we can distinguish research aimed not at generating new technology, but aimed at understanding and overcoming the barriers that retard the average farmer from performing as well as he might in the face of an already-given technological array. Such research can only reduce the efficiency gap.

Given these two avenuse of research, we have a choice as to what mix of gap-increasing and gap-decreasing research we might select. This choice will then control the size of the efficiency gap in just the same way as our use of the Hot and Cold taps controls the shower water. Alternatively stated, relative to our limited research resources, what size efficiency gap between actual and possible performance do we want? Having chosen the gap, what does it imply about the distribution of our research (and other) resources?

Obviously the choice of the best-sized efficiency gap to have and its feasibility is a problem for economic and sociological research. It must depend on the costs and benefits involved and farmer attitudes. Lacking such detailed research information, I can only conjecture on what might be best. But I am convinced that the present gap is too large. One of perhaps half the size is all we need. On the one hand, the technological carrot would still be there for the efficiency leaders; and on the other we would gain from not having to wait so long for new technology to be adopted.

Most importantly, we would not be expending funds blindly on an oversized stockpile of new technology. In short, we would be working our manufacture and inventory of new technology more efficiently. Instead of producing new technology indiscriminately and overstocking the technological warehouse with a fast inflow and an unguided dribble of outflow, we would be keeping a more rationally-chosen stock of technology in reserve and at the same time be paying more attention to balance the inflow and outflow of the warehouse.

My main point on the research side, therefore, is that we need a far better balance between, on the one hand, research aimed at the soil, plants and animals which the farmer uses and, on the other, research aimed at understanding

FOUR TYPES OF EXTENSION

and appreciating the farmer himself, and the business and social environment in which he has to operate. After all, the farmer—not the soil, plants or animals—is the prime factor in our agriculture. Why should he be ignored?

Perhaps I can make my point with two simple examples. We all know the vast amount of grazing and pasture research that has been carried out in Australia over the past two decades. But, despite this tremendous volume of research, we still have no adequate picture of the relations between wool production, stocking rate and superphosphate such that anything but the broadest of recommendations can be made to a farmer as to what combination of stocking rate and super would be most economic in his circumstances.

Likewise, what would a Martian think to be told that although the costs of marketing wool from producer to mill are equivalent to about 20 per cent of the producer's production cost, only something less than a half of one per cent of wool research expenditure has gone to research into the economics of wool marketing. No wonder the recent reserve price debate was conducted against a background of virtual economic ignorance.

Overall, our research policy seems to have been overweighted towards such 1000-to-1 longshots as we might find in the sheep's third stomach. Scant attention has been paid to the surer but less exciting bet of making sure that standard things are done properly. It is interesting that the Commonwealth has paid some account to this situation recently with the promise of an annual extension grant of $5,400,000. While this grant was initially aimed for extension, it now appears that much of it will go for "regional research" on the basis that extension is no good without having something to extend! It is hard to argue against such logic.

In terms of best use of our rural resources, extension has to get four types of knowledge across to farmers:

1. Knowledge about new inputs.
2. Knowledge about new techniques of production.
3. Knowledge about how to economize in production and marketing.
4. Knowledge about how to get out of agriculture.

The first two are the technical aspects of farming. The third is the economic aspect of management, and is by far the most difficult task that confronts the farmer. It involves not routine tradesman-like skills that once learnt are in his kitbag of skills forever, but the decision-making function of evaluating and choosing between alternative strategies. To be efficient in an economic sense, the farmer has to use logical processes of thinking through problems himself as alternative choices continuously arise under a bewildering array of situations.

As Wharton puts it: "The task of sound economic decision-making is a difficult one which rests on each farmer's skill at *individualizing* information to meet his unique needs . . . The individualization process is complex and difficult . . . [It] is where extension education has been deficient . . . The skill and competence

required for 'individualization' is not one capable of simple transmission or diffusion but one which rests upon self-discovery, practice and personal experience . . . Providing the farmer with new inputs or new techniques may result in adoption but they need not result in efficient (economic) utilization of resources. And it is the degree of economic efficiency in the utilization of resources which leads to sustained growth towards a modern, prosperous and progressive agriculture."

To date, our Government-sponsored extension has largely concentrated on the dissemination of knowledge about new inputs and new techniques of production. Knowledge about economizing (like knowledge about how to get out of agriculture) has not received it fair due. Here I want to argue that it should receive its due. And that because of the individual attention that it demands, I would conjecture that it might best receive it due via the services of non-Governmental Farm Management Consultants operating in the commercial arena. Concomitantly, as was argued in the March 1963 issue of FARM POLICY, these consultants should be backed up by farm management service centres or laboratories in exactly the same way as State technical extension workers are backed up by experiment stations and laboratories.

CHANGES ARE REVOLUTIONARY

Already such developments are well under way. Indeed the pace of these developments and their impact on farmers to date indicates they constitute a revolutionary change in the extension cum farm management side of our agriculture. Beginning with a single entrepreneur in 1955 and rising to about 50 in 1963, there are now some 130 commercial farm management consultants operating in Australia. This compares with the total of some 1,300 Governmental extension and advisory officers (measured in full-time equivalents). Thus the commercial consultants represent about 10 per cent of all extension workers and are providing farm management advice to about 2.5 per cent of our total farm population. These consultant-advised farms must be having a substantial effect on rural production, especially—if as one would expect—there is a sizeable turnover of a consultant's clients.

So far as whether or not commercial consultants are doing a good job, I think the market has already given us the answer. In the space of a few years, 5,000-odd farmers would not begin—and continue—to pay $200 to $400 per year for advice that was not worthwhile.

POLICY IMPLICATIONS

What are the policy implications of this commercial revolution in extension? I think the important ones are these:

1. The rapid and continuing expansion of commercial consulting, together with what little statistical evidence is available, seems to indicate that the gains from such services exceed their cost to the farmer. On the same grounds that we subsidize superphosphate and give tax concessions for developmental expenditure, the nation would likely benefit handsomely from governmental support given to the training and establishment of commercial consultants.
2. Similar benefits would likely accrue from the provision of support for farm management service centres or laboratories to serve as back-up facilities for commercial consultants.
3. If provision is not made for the training of additional agricultural scientists, the complementary services(new inputs and technology) of governmental research and extension agencies will be seriously hindered by a loss of staff to the commercial consulting arena.
4. Over the long run, the extension field of farm management advice might be

largely left to commercial consultants. They are the only ones who can properly do the job on the individual whole-farm basis that it demands. History shows that because of budget restraints, governmental extension services cannot do this job on any significant scale. Nor would the taxpayer tolerate it.

5. Substantial rethinking and research is called for on all aspects of extension. For one thing, current Government policy appears to ignore the revolutionary development that has occurred with the initiation of private practice in consulting. As one consultant recently put it: "The one bond which unites farmers, public servants, financiers, businessmen and trade unionists, is their concern with the techniques of making money. It is unfortunate that extension authorities have not really recognized this healthy symptom of manhood in their protegees." Just as importantly, along with such rethinking must go adequate research into the economics of extension. For example, would conjectures (1), (2), (3) and (4) above stand up under proper research scrutiny?

AVENUES FOR RESEARCH

For informed decisions on the policy questions that I have raised (and all the others I have not raised), we need facts and figures on the gains and costs of alternative courses of action in the fields of agricultural education, research and extension. Such research can be done and should be done. As yet virtually nothing has been done in Australia. Overseas, quite a few studies have been carried out, especially in the U.S. and Japan. As an example let me cite the broad results of one U.S. study. It estimated the net profit per *extra* dollar invested in various agricultural inputs to be as follows for U.S. agriculture in 1959:

Input	Profit per extra dollar
Land and buildings	$0.7*
Machinery	0.2
Labour	0.2
Feed and seed	0.2
Fertilizer	1.7
Education	0.3
Research and extension	9.0

(*Capitalized value)

Broad as the categories are that these particular figures cover, analogous figures for Australia would give us a much firmer base for policy decisions.

SUMMARY

1. The average Australian farmer is at best only something like half as efficient as he might be.
2. To meet this efficiency gap in terms of education, we need better planned and organized education in terms of rural youth needed for agriculture, rural youth not needed for agriculture, and in terms of those who serve agriculture.
3. On the research side we have had too little research aimed at removing barriers to the proper implementation of currently available technology.
4. Extension-wise, recent years have seen a revolutionary development of farm management consulting on a commercial basis. It could pay handsomely to support this development via training and back-up service facilities.
5. We need a good rethink on all aspects of extension and the relative weights to be attached to extension, economic research and technological research. For too long we have concentrated too much on soils, plants and animals and too little on their boss—the farmer.
6. We need research into the costs and benefits of alternative policies of agricultural education, research and extension.