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20th LINCOLN COLLEGE
FARMERS' CONFERENCE
1970
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PROGRAMME
1970

NEW ZEALAND FARMING IN THE 70's AND THE COMMON MARKET
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The Hon. D. J. Carter, Minister of Agriculture.

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AN AMALGAMATION CASE HISTORY
Mr B. Henderson, Farmer, Methven.

TAXATION AND THE GROWTH OF THE FARM BUSINESS
Mr G. H. McEwen, Public Accountant, Masterton.

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Professor Kevin O'Connor, Professor of Range Management, Lincoln College.
Within the next two months, formal negotiations on Britain’s application for membership of the European Economic Community (E.E.C.) are expected to begin. Three other countries—Denmark, Norway and Eire—will also be seeking membership.

It is, of course, on the assumption that Britain’s application will be successful that I have been asked tonight to discuss the possible implications this step might have for New Zealand farming during the 1970’s.

Because of the complex and difficult political and economic issues facing the negotiators on both sides, we cannot rule out the possibility that Britain’s third attempt to join the EEC may end in failure. But this possibility is extremely remote. Indeed, all the signs point strongly to Britain’s bid being successful this time.

Agricultural and food issues will play a crucial role in the negotiations not only because the future prosperity of British farming will be at stake, but also because of the effects which the EEC’s Common Agricultural Policy (CAP) will have on Britain’s cost of living and balance of payments.

It is these effects and the likely force of their impact on access and demand for New Zealand’s meat and dairy products on the United Kingdom (UK) market that are the chief sources of our worry and concern over the prospect of Britain entering the EEC and why we have asked for “adequate safeguards” for our “vital interests” to be negotiated.

It will be helpful at this stage to explain how the Community’s common agricultural policy works and to review its progress since it was implemented in July, 1962, by the six member countries—France, West Germany, Italy, the Netherlands, Belgium and Luxembourg.

Common policies have now been adopted for all the main farm commodities produced in the Community. A few products of minor or more local interest within the Community are not supported by a full-blown CAP, but by levies, quotas or deficiency payments. Of particular interest, from New Zealand’s point of view, is the fact that sheep meats have not yet been covered by a CAP.

Under a common agricultural policy, a commodity is covered by a comprehensive, and very often complex, mechanism of price support, the three basic elements of which are support prices, variable levies and export subsidies.

SUPPORT PRICES are invariably well above world prices. EEC grain prices, for example, are about 85 per cent higher; the butter price is three times higher and sugar prices are four times as high.

VARIABLE LEVIES protect the domestic producer and block lower-priced imports from non-member countries. The levy equals the difference between a minimum import price (usually pitched slightly higher than the EEC support price), and the lowest available c.i.f. price for the same commodity on the world market; for example,
Argentine beef or New Zealand butter. In effect, the imported product is thus deliberately made more expensive to the EEC consumer than the domestic product.

The money received from levies on imports from non-member, or "third" countries, is paid into the European Agricultural Guidance and Guarantee Fund (more commonly known by its French initials FEOGA). This is the common farm fund and it is used to pay the costs of price support and for the export subsidies to get rid of the Community's surplus production on world markets. The receipts from levies, however, have only covered about half of FEOGA expenditure and the deficit has to be made up by direct contributions from the Treasuries of the six member countries according to an agreed scale.

EXPORT SUBSIDIES (or "restitutions," as they are called), are lavish and open-ended. The cost of export subsidies to enable surplus high-cost farm products of the EEC to compete, or be dumped, on world markets, is currently running at about $1000 million a year. Export subsidies are paid not only on basic agricultural commodities such as wheat, sugar, butter and so on, but also on scores of processed foods containing them. Very often the export subsidies are actually higher than the world prices for certain commodities; the export subsidy on butter, for instance, is almost five times the world price.

One other significant aspect of the CAP is that, except for sugar, there are no production controls on any commodity.

As most New Zealand farmers are now well aware, the hot-house environment created by the CAP plus, it must be conceded, a good measure of improved technology, has resulted in the Community's farmers producing vast surpluses of food and feeding stuffs. Butter output is now running at a surplus of 200,000 tons a year, there are four million tons of surplus sugar and six million tons of unwanted wheat and other grains.

As farm output has increased so, too, has the cost of financing it. In 1960, farm price support cost the Six about $416 million; last year the bill soared to more than $2200 million and the EEC Commission estimates that the cost this year could be $2600 million.

To this must be added the Community's expenditure on structural reform—at present limited to $285 million a year. This money is paid out as grants for land improvements and for marketing schemes.

But this is not the end of it because each of the Six member countries has its own budget for its own price support schemes and structural reform programmes (Green Plans) for its farmers.

The main items in which the EEC has not yet reached self-sufficiency are feed grains (79%); vegetable oils and fats (42%); beef (89%); and sheep meats (84%).

From all that I have said in this necessarily brief and incomplete review of the operation of the CAP you would be right in concluding that it has put the Community's agriculture in a very difficult position. Certainly the lot of the EEC peasant farmer has not been improved in spite of the high prices he has received; the sole beneficiaries have been the big landowners and farmers who have made
fortunes from the scale of their operations and from thus being able to afford to apply modern technology, mechanisation and so on.

To round off this depressing tale, mention needs to be made of the two body blows given to the EEC's hallowed principles of uniform marketing and pricing arrangements for agriculture resulting from the devaluation of the French franc last August and the revaluation of the West German Deutschmark last October.

Under the CAP, most farm prices are not pegged to the national currencies of the Six, but to what is known as a "unit of account," which is equivalent to one United States dollar. Thus a parity change in one or more national currencies automatically changes support prices, affecting incentives to produce, farm output, farm incomes, consumer prices, competitiveness of exports and the balance of prices among member countries.

Therefore, following devaluation of the franc, French farmers should theoretically have been better off because their dollars would buy more of the national currency. On the other hand, revaluation should have left the West German farmer worse off because his dollar would have bought less of his own currency.

But, in both instances, the governments of the two countries refused to allow these price changes to take place. The French Government wanted to prevent inflation caused by dearer food to its consumers, while the German Government could not face the political risk of reducing its farmers' prices. In both cases, special and temporary measures were devised by the Six to enable France and West Germany to counteract these effects. Thus, in effect, the Community no longer has a unified pricing policy for its farmers, but three separate ones—one for France, one for West Germany and one applying to the other four member countries.

Now, with their CAP in complete disarray and with the rumblings of discontent at the soaring cost of financing it growing louder, the politicians of the Six are realising that they cannot put off making urgently-needed reforms much longer.

Cutting farm support prices to increase domestic consumption and to restrain production has been ruled out as being politically unacceptable. Moreover, price cuts would make the lot of the peasant farmer even worse than it is now. And those peasants and their families forced to quit would do so in a desperate financial plight and in a bitter mood.

The controversy surrounding the future of the CAP has centred on what is known as the Mansholt Plan submitted by the EEC Commission 18 months ago. This plan proposed a set of economic and social measures intended to bring about major structural changes by encouraging the mass migration of peasant farmers off the land so that farms could be made into larger, more economically viable units.

The plan sought to reduce the Community's peasant farming population of 10 million by half over a 10-year period; to put about seven per cent (12 million acres) of farmland out of crop production and to slaughter three million dairy cows because they are producing milk and butterfat which nobody in Western Europe or the world wants, or at least can pay for at economic prices. To prise these five million surplus people off the land, the Mansholt Plan offered
generous pensions, re-settlement grants, trade training, educational grants for children and so on. The cost of the plan was estimated at $2500 million a year, in addition to the current cost of price support and export subsidies of a similar figure.

Included in the proposals were reductions in the prices of certain products such as butter, sugar and cereals to discourage their continued over-production and to achieve better balance between supply and demand.

The agricultural ministers of the Six have met time and again during the past 18 months to discuss the Mansholt Plan, and modified versions of it, but to no avail. Some minor aspects of the plan, slaughter premiums for dairy cows, for example, have been adopted, but little if any progress has been made toward agreement on the basics of the plan. This is not difficult to understand because the CAP was the child of political compromise and has been nurtured by political considerations and expediency, rather than rational economic and social considerations, ever since. Now, when the chips are down and there is common agreement that the CAP has to be changed, in true Community fashion, each of the Six is seeking the political solution which suits his country best. Such is the depressing picture of the Community as now organised.

From New Zealand's point of view, the Mansholt proposals offer no guarantee of eventually solving the problem of surplus milk production in the EEC because the amalgamation of many small peasant holdings into larger, more efficiently-managed farms is bound to result in even bigger milk outputs and even bigger milk surpluses. That is, in the absence of any measures to limit milk production by quotas or other forms of restraint.

EFFECTS FOR BRITAIN:

Time does not permit more than a very brief comment on the possible effects for Britain from membership of an enlarged EEC.

The main burden to Britain, it has always been known, would lie in adopting the present CAP of the Six. This is because, as the biggest importer of food in an enlarged Community, Britain would have to spend more foreign exchange to pay for dearer food imports from Community sources and also for paying over to the common farm fund (FEOGA), in Brussels, the proceeds of levies on any food imports from non-member countries. Tied up with this, of course, is the important question of increased costs of food to the British consumer.

The volume of food imports, and thus their cost to Britain's balance of payments, will, however, be influenced in two ways:

First, by the extent to which British farmers respond to the incentive of higher EEC farm prices; and, second, by higher domestic food prices causing a drop in consumption or a shift to cheaper substitutes, such as from butter to margarine.

On the first point, British farmers would respond by producing more cereals, beef and possibly sheep meats, in spite of higher feed grain costs, but that dairy, pig and poultry farmers would face higher feed costs (their major input) without compensatory increases in their returns. To offset the higher costs of concentrates, British livestock
producers would be spurred into making fuller and more efficient use of grassland.

On the question of higher food prices, the British Government's recent White Paper, "Britain and the European Communities," estimates a possible rise of 18 to 26 per cent, resulting in a 4 to 5 per cent increase in the cost-of-living index. This rise would, of course, be spread over the transition period Britain would be given to bring its policies and prices into line with those of the EEC.

However one juggles with figures, official or otherwise, it seems clear that Britain's acceptance of the Community's common agricultural policy as it now stands will add greatly to its balance of payments and to its cost of living. Apart from the foreign exchange needed to pay for dearer food imports and for paying over import levy income to FEOGA, Britain will also be called on to pay its percentage share of financing the CAP by direct contributions to FEOGA. The size of this contribution will depend largely on what decisions the present Community of Six take on the Mansholt Plan and other market reforms to halt the rising cost of price support and export subsidies. If the EEC does nothing, Britain's direct contribution to the common farm fund could be substantial.

Britain's negotiators will therefore hope to secure changes in financing the CAP which would make the cost of joining the EEC less burdensome to its balance of payments.

In these efforts the British will be in a much stronger bargaining position than on her two previous attempts at negotiating with the Six.

This is because Britain, as a member of the Community, would provide just what the EEC most desperately needs—an instant market big enough to absorb practically all of its surpluses of butter and other dairy products, grains and sugar. At the same time, it would greatly relieve the Six of the burden of contributing huge sums each year to FEOGA to pay for buying up and storing increasing surpluses. And it would also enable the Six to postpone taking major decisions on the politically-explosive proposals for the structural reform of their peasant-scale farming system.

For obtaining these very considerable benefits, the Six might, in turn, be persuaded to adopt a more realistic approach to sharing the cost of financing the CAP for an enlarged Community of 10 on a more equitable basis.

It is possible to visualise such special considerations being negotiated in the same spirit of compromise that enabled the Six to waive the strict application of the rules of the CAP when first France and then West Germany got into trouble over parity changes in their respective currencies. Moreover, in spite of the French being the "stickiest" over allowing Britain into the EEC, it is inconceivable that France will be able to ignore the obvious appeal of the huge British food market as a less costly and politically more acceptable solution to most of the Community's current farming problems.

**IMPLICATIONS FOR N.Z.**

If Britain joins the EEC under the present rules of the Community's agricultural policy, we have to face up to seeing the loss of our Commonwealth preferential tariffs and rights of free entry for
all our main primary products, except wool. New Zealand would then be treated as a “third” country, so far as the enlarged EEC is concerned, and would therefore be subject to the Community’s import levies and other forms of protection for its agriculture at the frontier.

DAIRY TRADE:

In this situation, the whole pattern of supply and demand for dairy products on the UK market as we know it today would change dramatically. The butter quota system, under which New Zealand has a guaranteed market in Britain of 176,000 tons a year, would go and EEC suppliers would have an open access.

If you take the EEC’s surplus butter production, now running at 200,000 tons or more a year, add to it the exports available from Denmark, Eire and Norway, and allow for some increase in British production, you end up with enough butter from within the enlarged Community to more than satisfy Britain’s needs and with the possibility of a surplus left over to be dumped elsewhere.

This estimate allows for a substantial drop in butter production in Britain because, instead of paying £300 a ton for New Zealand butter, Britain would have to pay the EEC minimum import price of $694 a ton for it. Retail prices of butter would more than double, causing a massive switch to lower-priced margarine. One estimate puts the drop in Britain’s butter imports at approximately 100,000 tons and for a corresponding increase in margarine consumption. Other estimates put the drop in butter consumption at double this quantity.

For cheese the implications for New Zealand are similar. Britain already produces about 50 per cent of the 250,000 tons of cheese consumed a year and there will be enough existing and potential cheddar-manufacturing capacity in an enlarged EEC to meet the whole of Britain’s requirements.

All this leads to the inescapable conclusion that, with Britain firmly inside the EEC, New Zealand dairy products would be excluded entirely from Western Europe.

It is in the certainty of this total loss of our butter and cheese markets in the UK that New Zealand has been, and is, working so assiduously to impress on Britain and the Six that we must be given special safeguards. Our official stance is that we expect nothing less than permanent arrangements to protect our butter trade in the UK.

I have no doubt that official British assurances that their negotiators will do their utmost on New Zealand’s behalf have been made in good faith and that this is their intention. But we would be seriously over-estimating the skill of Britain’s negotiators, or their room for manoeuvre within the prescribed rules of the Community’s agricultural policy, in expecting them to perform the miracle of obtaining permanent access for our butter and cheese to the UK when it enters the EEC.

New Zealand is going to have to accept much less than it is asking for and I’m sure that the Government and the dairy industry realize it only too well.

About the only safeguard we can reasonably hope to get for butter will be limited to the duration of the transition period leading up to Britain becoming a fully-fledged member of the EEC. And the type of special arrangement we might expect to get could be the
gradual phasing out of New Zealand butter supplies to the UK market during the transition period. This arrangement would mean New Zealand shipping progressively less butter to the UK year by year, but receiving compensatory price increases as quantities declined.

From the EEC's point of view, this arrangement would enable New Zealand to maintain, or even increase, its total earnings of overseas exchange from butter during the transitional period, thus providing some financial assistance towards the cost of readjusting our dairy farms and factories to the changed situation in the supply and demand for butter.

If this arrangement, or something like it, is what we are offered, then New Zealand should pray for Britain to obtain as long a transition period as possible. Mercifully for us, Britain will seek the longest transitional period possible in which to adopt the Community's agricultural policy and in which to phase out her own system of price guarantees, deficiency payments and production grants for agriculture. Britain will also want as much time as possible so as to avoid too rapid a rise in consumer food prices and in her balance of payments for dearer food imports.

There has been plenty of guesswork on the transitional period Britain might be given, but the feeling is that a maximum of five years and a minimum of three, is a reasonable expectation.

So, given 18 months to two years for negotiations to be completed, and a further year for the draft conditions for membership to be ratified by the Parliaments of the Six, Britain and the other three applicant countries, it could be sometime about 1977 or 1978 when a five-year transitional period might end. So, to all practical intents and purposes, 1978 could well mark New Zealand's virtual exclusion from the free world's largest butter market.

LAMB:

In contrast to the depressing outlook for New Zealand's butter and cheese if Britain joins the EEC, the prospects for our lamb look very much brighter.

The main reason for this optimism is that lamb is about the only temperate zone food least likely to tread on sensitive farming corns in the EEC.

Unlike dairying, sheepfarming is of very minor importance in the Community, either in terms of production or consumption. France, with 10 million of the EEC's 19 million sheep, is the only lamb producer and consumer of any significance.

There are no surpluses of sheep meats. The EEC produces a total of about 200,000 tons of lamb and mutton a year and imports 31,000 tons, two-thirds of which go to France.

The Six are therefore likely to take a calmer and more charitable attitude on the issue of continued access for New Zealand lamb to the British market than they will in the case of butter.

The relative unimportance of sheepfarming in the Community is one of the reasons why the EEC has not yet adopted a common agricultural policy for sheep meats, although, under the terms of the Rome Treaty, it should have already done so. The other reason is that the EEC has a binding in the GATT, limiting its external tariff
on sheep meats to 20 per cent. Neither the Community nor any of its members can therefore apply levies or any other charges against non-member countries’ lamb which would have the effect of increasing the margin of protection above 20 per cent. To do so would break the GATT binding and the EEC would then have to offer some form of compensation to New Zealand as a signatory to the agreement.

In the absence of a CAP for sheep meats, member countries of the EEC have maintained their own individual forms of protection against outside imports, supplemented in each case by the external tariff of 20 per cent.

This somewhat laissez-faire attitude of the EEC towards sheep meats will obviously have to be changed to some form of Community policy once Britain enters. Britain would then be the Community’s biggest sheep producer and consumer of sheep meats. It would also have access for its lamb to the profitable French markets no longer inhibited by a tariff and import licensing.

But, in drawing up a CAP for sheep meats, and, in particular, covering imports from non-member countries, the Six would be bound to take note of the present GATT binding on sheep meats. The existence of this binding does give New Zealand a bargaining weapon which, I suggest, should be used to the full to persuade the Six that their small-scale and lagging sheep industry can exist without the need for a full-scale CAP complete with all the protectionist trappings usually applied to the Community’s main farm commodities.

The two things in particular that we don’t want to see in any EEC policy for sheep meats are global quotas or variable levies on imports from third countries. The first would seriously restrict our access to the British market, while the second would impose a heavy burden on Britain’s balance of payments in paying over import levies on lamb to the common farm fund (FEOGA).

To avoid the latter, Britain might well favour the Community adopting not a CAP, but a price support system based on deficiency payments to EEC producers to bridge the gap between market realizations and a guaranteed minimum price.

This is the present British system and could be acceptable to the Six because the EEC already operates deficiency payments for hard wheat and oil seeds—products in which, like lamb, the Community is either far from being self-sufficient or which concern only a minority of its farmers.

Any predictions on the possible terms of entry we might secure for our lamb to the UK market if Britain joins the EEC can therefore only be speculative at this stage. But we can be certain on at least one point: New Zealand lamb will not be given unrestricted access to Britain (or, to the rest of the Community), with only a 20 per cent tariff on it.

With only a 20 per cent tariff against it, New Zealand lamb would still be by far the cheapest meat in Britain and cause a marked shift in demand away from the more preferred, but higher-priced, beef, veal and pork. Furthermore, as higher prices will result in Britons eating less meat, relatively cheaper New Zealand lamb would end up holding more than its rightful share of a smaller market.

Thus the effects of both these factors on consumer demand would harm the interests of British and European meat and poultry pro-
ducers who would rightly insist on the price of lamb being raised to maintain its proper relationship with those of other meats.

A 20 per cent tariff on imported lamb would be most unlikely to achieve this and could well call for a tariff of 40 or even 50 per cent. This, I feel, is of much less concern to New Zealand providing that we can preserve unrestricted access to the British market and reasonable access to the rest of the enlarged Community as well. With a bit of goodwill from the EEC in return for our not kicking up too much of a fuss over butter, I feel reasonably confident that New Zealand can achieve this for its lamb which, unlike butter, has definite growth prospects in an enlarged EEC.

IMPLICATIONS FOR N.Z. FARMING:

In tackling this, the most difficult part of my brief tonight, I am all too conscious of plunging headlong into a jungle of uncertainties—uncertainties about the outcome of the negotiations on British entry; uncertainties about future world production and marketing policies and in trends for temperate zone farm products; and about the economic and political decisions governments may take, and so on—any of which could affect the future of New Zealand farming.

However, on the assumptions underlying what I have said I believe is likely to happen if Britain joins the EEC, especially on the loss of our UK market for butter and cheese, there is no doubt in my mind that the New Zealand dairy industry will be the country's No. 1 economic problem during this decade. Some would say it is already.

Comparable outlets for all the butter and cheese displaced from the UK market don't exist at present, nor, in the case of butter, are they ever likely to. But the picture isn't one of unrelieved gloom, as some people would try to persuade us. In the breathing space between now and the late 1970's, we do, as least, have the chance to intensify our efforts in exploring and developing closer trading links with a wide range of countries not tied to a protectionist bloc like the EEC.

And, with the ending of Commonwealth preferences following Britain's entry to Europe, New Zealand should have greater flexibility to negotiate agreements aimed at encouraging a greater flow of two-way trade with those non-Commonwealth countries against whose exports we now apply discriminatory tariffs.

During the latter part of this decade we should, too, see a greater realisation of our expectancies of selling increasing quantities of milk products to such potentially worthwhile markets as India, Pakistan, Latin America, South-east Asia and especially Japan. Even if I may be accused of wishful thinking, I believe that, with the prospect of the supply and demand for dairy products being brought roughly into balance in an enlarged EEC by the end of the 1970's, New Zealand will then be in the pre-eminent position of being able to exploit, virtually unchallenged, the potential markets of the regions mentioned. In this connection perhaps the most effective safeguard for our dairy industry we could obtain from the pending British-EEC negotiations would be an undertaking that an enlarged EEC would withdraw completely from the markets of Asia and the Pacific, in return for our withdrawal from markets in their neck of the woods.

However, I must emphasize that my predictions of a brighter future for our dairy industry are timed to eventuate about, or after, the turn of this decade. This is because I feel sure that the next 10
years are going to mean hard times for dairying while New Zealand and other countries grapple with the problems of over-production in their domestic dairy industries and in world trade in dairy products, especially in butter and butterfat.

During this period, too, the New Zealand dairy industry will have to improve its efficiency still further—on the farms and in the factories—by getting rid of its "lame ducks" who, specifically, are those farmers who, for various reasons, are unable on current costs and prices to provide a decent standard of living for themselves and their families.

Instead of asking the Government for blanket subsidies, or whatever the current euphemism is for a hand-out, the dairy industry's leaders would be doing more to ensure the future strength and viability of dairying by pressing for a restructuring, or readjustment, programme to tackle the problem of low-income producers. It is noteworthy that it was the Australian dairy industry, not the Federal Government, which first suggested the need for a marginal dairy farm reconstruction scheme in Australia.

It will be said that the Government already provides the machinery for the amalgamation of small, uneconomic farms through the Marginal Lands Board, SAC and so on. So it does, but only in a half-hearted and fragmented way. What we need is an all-embracing scheme which would positively encourage low-income farmers to come forward voluntarily to offer their farms for amalgamation, facilitate the upgrading of low-income farms where this is feasible and, by generous financial and other welfare measures, assist the re-settlement of farmers and their families quitting the land. I emphasise the latter form of aid because we are dealing with a problem which is just as much social as economic.

On the production and marketing side the main problem facing the dairy industry will be in disposing of all its butterfat. But for the drought this season, we would probably have seen a significant carry-over of unsold butter. It is not being realistic to talk about how good the market prospects are for casein and milk powder. These non-fat products simply don't exist as profitable commodities unless there is first a market earning substantial returns for the fat fraction in milk. We may well sell more whole milk in the form of cheese, but, like wool and synthetics, butter oil prices are disciplined by cheaper and more efficiently-produced vegetable oils against which there is also no undercurrent of consumer prejudice on health grounds as there is with animal fat.

Provided that the basic butterfat price to producers is based on market realizations and is not kept artificially high by subsidies or Reserve Bank credit and provided also that export beef prices remain about their present level, I would expect some of the butterfat problem to be ameliorated by a continuation of the present trend to expand beef production on dairy farms. In the price situation I have assumed, I can see no valid reason for paying a beef incentive to dairy farmers since the market would provide the required incentive.

The only other alternative for dealing with a persistent over-production of butterfat would be for some form of production restraint such as quotas, preferably quotas that were transferable, or
saleable, by one producer to another. This would mean, of course, that a farmer selling his milk quota would have to go out of dairying altogether.

This may all sound an unduly pessimistic outlook for dairying during the 1970's, but I can see no likelihood of anybody pulling a big enough rabbit out of the hat to insulate the New Zealand dairy industry from the depressing effects of a world glut of butterfat, or for the need to strengthen the competitive efficiency of our best dairy farmers while hastening the exit from dairying of those who just cannot compete at current, or even possibly lower, prices.

There isn't much I can add to what I have already said about how I believe our lamb will fare on the UK market if Britain joins the EEC. I feel confident that a solution, satisfactory to the EEC, Britain and New Zealand will be negotiated and that we will end up with much the same access we already enjoy, but against a high tariff.

Lower British consumption of lamb, and the possibility of increased supplies of British and Irish lamb, could mean a certain loss of sales for us in the UK. But we should be reasonably confident of being able to offset this, and more, by the highly encouraging growth prospects for lamb in North America, Japan and the Mediterranean countries during this decade.

The New Zealand beef industry has benefited for some years now from a strong export demand from the United States. The present United States import legislation links the total import quota to changes in US domestic beef production which is forecast to rise moderately in the 1970's.

Imports by Western European countries, with perhaps the exception of the UK, may also rise further, as should those by Japan, provided her import quotas are expanded. Some of the Communist bloc countries, such as Russia, have purchased quite large quantities of beef recently, but whether this was a symptom of domestic beef production lagging behind demand or whether it was just another of those sporadic purchases we have had in the past, remains to be seen.

Overall, the world demand for beef should continue to be strong, although, if present import controls continue in the US market, greater quantities of New Zealand beef might have to be sent to other, less profitable markets.

Summed up, meat production looks our best bet for the immediate and long-term future and farmers should therefore have every confidence in breeding more sheep and cattle.
OPENING ADDRESS

Hon. D. J. Carter, Minister of Agriculture.

In opening this conference today, I was wondering just what I could have to say that would be of interest, and yet apart from the subjects which are to be covered by so many able speakers at your conference. I studied your programme and decided that some of the remarks which I made in opening the Federated Farmers' Conference in Auckland yesterday could be of significance here. In fact, to be quite truthful, I prepared these notes in the hope that they might serve a dual purpose. In my remarks I have raised some of the questions which require some thinking for the future, and which in my sphere of operations are just as important as those of efficiency and potential of farming which you are discussing at your conference. There is little doubt in my mind that we are in a period of readjustment throughout the world, where values are changing through the pressures coming from a restlessness that is common in most countries. Our particular sphere is in New Zealand and to be a little more precise, the farming sector in New Zealand.

The primary producers of this country have traditionally produced the major proportion of our export income and this is unlikely to alter in the foreseeable future, despite the substantial and successful efforts of our manufacturers. There are few, if any, countries so dependent on primary production. The actions of other countries in an endeavour to maintain the stability of differing sectors of their own economies, mainly the farming sectors, have had a serious effect on the prices we receive from overseas for our produce. Despite the best efforts of Government and the producer boards, the maintenance of our share of what we regard as our traditional markets has been difficult to maintain. Through the General Agreement on Tariffs and Trade (G.A.T.T.) we have been endeavouring to remove some of the worst effects that subsidised produce is having on our returns. In addition to all of this our dependence on a rather limited number of markets, or perhaps the extent to which we were diversifying to alternative markets, has been for the past decade in particular, and still is, a matter for serious study and action. This is now a matter for greater concern with the renewed application from Britain to enter the Common Market.

Almost world-wide inflation is having both beneficial and detrimental effects on our farming economy. Beneficial to the extent that with more money available in many countries, the prices paid for our produce can be higher. Detrimental to the extent that wages and prices are rising against the farming economy and the rise in the prices received is in many instances limited by political action in other countries. Add to this the effect on our wool prices of synthetic fibres or the long-term effect of margarine on the consumption of butter—this of course aided by political action which keeps butter prices high. It is interesting to note, though, that inflation is catching up with the margarine producers and in some countries the margin between margarine and butter is narrowing significantly. Synthetic meat is being produced and while it offers little threat at present, it could be a factor in the future with very high prices being charged for meat.
On the credit side we have an expanding population with an increasing standard of living, and a country that so far has been the most efficient producer of primary produce in the world. This has been possible because our producers have taken full advantage of all the natural assets of soil and climate and developed a method or methods of production which are difficult for others to surpass. Another important factor is that by comparison in particular with some who could be serious competitors, we have always had a stable political climate.

The question now to be answered is, "Where do we go from here?" May I say here that I have complete confidence in the farming industry for the future. In saying this I must qualify it by saying that this does not mean that farming in its various sectors as it is practised at present is necessarily the pattern for the future. But despite the possible actions by other countries—and it is evident now that other countries are not prepared to continue supporting their farmers as they have been doing—it is impossible to believe that a country which is the most efficient producer of primary produce in the world will fall by the wayside.

That brings us to the measures that will be necessary for our farming industry to be a viable one in the foreseeable future. We are not entitled to carry on in the same way and trust that markets will be available on the basis that whatever we produce can be sold at economic prices. Nor is it feasible over a long term in New Zealand for Government assistance to be given to the farming industry. Other countries with substantial industrial content in their income have done this and are now reaping the results—which have not been for their overall benefit. Here again I had better qualify the statement clearly by saying that in my opinion there is a case for short term assistance in a period of readjustment, such as we have at present. The effects of long term assistance are to lessen the attention that will be given to economic indications which would otherwise reveal a necessity for change. This is particularly so if this assistance is on a sectional rather than a national basis.

We in New Zealand are at the present time particularly sensitive to economic atmosphere in the farming industry—probably because of pressures on the industry caused by rising costs, at a time when at least some of our sectors have been faced with falling prices in the last few years. This situation caused some action in the Budget of last year which gave some further assistance to the farming sector. One of the measures instituted at that time was a payment of $10 per head on beef raised from the dairy herd. In the present situation, with the drop in production caused by the drought, the greater sales in Britain and a better surplus position in Europe, this measure does not appear so vital. I am not suggesting that the disastrous drought which caused such a setback to the industry as a whole, as well as to many individual farmers, was welcome as a factor which helped in the solution of one of our marketing problems. The price which farmers had to pay as a result of the drought was far too great to be viewed in this light. I mention this because of earlier remarks I made on this subject being misinterpreted by some. I would suggest, however, that if these things had not come about the scheme could have been vital as a diversification from dairying at the present time.
I would suggest that we must continue to evaluate our means of diversification in the farming industry in every likely field. While the prices we receive stay at even the present level, this beef diversification may not be as attractive as dairying, but there is always a possibility that some sector may require to change. The dairy beef scheme will be carried on next year and with the valuable assistance from beef committees and others we will then have a fair evaluation of the potentialities of this in our overall farming industry. Earlier in my talk to you I suggested that our success in New Zealand was based on our ability to make the most of our natural advantages of soil and climate. This has been done and we produce vast quantities of grass which by various processes we turn into food. Our research has been, and will continue to be, directed towards increasing the efficiency of this operation, but more recently a further complication has become more important; that is the increasing protection given to farmers in many countries by refusing entry to competing produce. It is probably this factor which causes the greatest frustration to farmers who feel so powerless to have much say. Producer boards and Government have been, and will be co-operating in taking such measures as are possible to overcome these difficulties. The recent agreement on the minimum price for milk powder and the grant of credit to Peru are the type of exercise which is being carried out to assist.

How can we, as farmers, prepare for any likely effects coming from Britain's entry into the E.E.C.? I often ponder on this, and the only answer I can find is for us to be as efficient as possible—and the increases in production in the last few years testify to the success of our efforts in that direction. Secondly, we must be capable of diversifying over a wide range of products—both traditional and the new ones which are being constantly developed to meet changing demands. Thirdly, and I would suggest from my own experience that this is being done, see that those who are in key positions are fully aware of all facets of the situation for which they have responsibility, whether they be farmer, statutory board, or government representatives.

Perhaps at this stage I could raise another subject which is of interest to me and which we should probably be looking at as soon as possible. That is, what I would call (for want of a better expression) the form of our farming community. New Zealand farming owes its undoubted success largely to the system of family owned and operated farms with most of the administrative ability being supplied by the farmer owner. Present economic conditions are causing a trend towards larger farms and it is difficult to forecast just how far this trend will go. Already, it is difficult for young men to find the capital to buy the large farm, necessary under today's conditions to provide a reasonable return to the farmer and his family. Already farming companies are being formed with the purpose of attracting other capital to farming, and trying to get some greater benefit from farming on a larger scale.

Because of the system under which we have developed, the extent of managerial and administrative skills employed (apart from the farm owner) is probably less than in many other countries. Labour on farms for many reasons is scarce and is supplied to a great extent
by young men who expect to own their own farms. Working on someone else's farm does not always supply the necessary training for all phases of running a farm. If the likelihood of owning one's own farm becomes less remote, and farms in any case are larger, then under present conditions the labour situation could rapidly deteriorate. I would suggest that the farming community might well be looking to see if a change in emphasis might not be necessary at the present time. It could be visualised that as time progresses we develop in our farming community a system whereby farming managerial skills be developed for those people who will run the larger farms without necessarily expecting to own one. This would imply that there would be courses available, even up to University standard, in the art and method of running a farm (probably of medium to large size) economically and efficiently. This does happen in other countries—it may not be necessary here, but in my opinion the likely necessity should be evaluated.

Another allied subject worthy of study could well be the way of life and the quality of life in our farming areas under today's conditions, and the likely conditions in the future. With particular reference to farm labour it is not sufficient to say that we are short of labour, or that the standard of labour offering is not high, without studying the reason for this and taking some necessary action to remedy any shortcomings that may appear and are capable of solution. To us, as successful farmers, ours is a challenging, fascinating and absorbing occupation, with seldom a dull moment. In our endeavours to be more efficient and to make some money in the process, there is seldom enough time to do those things we want to do. But the community life in the farming areas is disappearing; young people having less to attract them can hardly wait to get to town. With a diminishing population—unless all participate—there is too small a group. In addition, the provision of facilities in the area requires the support of the landowners as the more interested parties in the long term, and also as those with the ability to commit finance. We have many valuable conferences such as the one that is being held here, but our continuing progress is to some extent limited by the supply and quality of labour. The standard of wages, while important, is only one factor. Education for young people, social atmosphere, standing in the community, prospects for advancements, opportunity to participate in activities and contribute to the community life, services which are available; these are all factors which I believe we must study if we are to compete for labour, in a country in which other sectors offering so much, and where in a larger community there is so much to choose from. This suggestion is also along the lines that we must always be ahead of the game whatever happens.

In speaking to you today it has been my purpose to bring to you a few of the thoughts that cross the mind of a farmer and erstwhile farmers' advocate who is now, through force of circumstances, Minister of Agriculture.
ADJUSTING FARMS TO ECONOMIC CHANGE

J. D. Stewart, Professor of Farm Management and Rural Valuation, Lincoln College.

INTRODUCTION

It is my job to try to set the stage for today's proceedings. We are concerning ourselves with the question of adjusting our farming policies and our farm management to the changed economic environment of the 1960s and to the expectations of continuing change in the 1970s. To this end we have invited a number of farmers and professional men to address the Conference on topics related to adjustment on farms and in the farming industry. These are men who, in our view, can make a valuable contribution to the consideration of current economic and management problems in the industry.

RECENT ECONOMIC CHANGES

The economic change with which we are concerned is the change in the relationship of prices received by farmers to the prices they pay to operate their farms; that is, the farmer's terms of trade. Tables 1 and 2 set out one calculation of changes in farming terms of trade during the 1960s.

Table 1. Terms of Trade of New Zealand Sheep Farmers 1959-69.

<table>
<thead>
<tr>
<th>Years</th>
<th>Prices Received</th>
<th>Prices Paid</th>
<th>Terms of Trade</th>
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<tbody>
<tr>
<td>1959-61</td>
<td>100.0</td>
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<tr>
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<tr>
<td>1967-68</td>
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<tr>
<td>1968-69</td>
<td>111.0</td>
<td>120.6</td>
<td>92.0</td>
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Prices Received: Govt. Statistician's Index of Export Prices for Meat, Wool and By-products.

Table 2. Terms of Trade of New Zealand Dairy Farmers 1959-69.

<table>
<thead>
<tr>
<th>Years</th>
<th>Prices Received</th>
<th>Prices Paid</th>
<th>Terms of Trade</th>
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<tr>
<td>1959-61</td>
<td>100.0</td>
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<td>1968-69</td>
<td>109.2</td>
<td>120.2</td>
<td>90.8</td>
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Prices Received: Implicit price index in Gross Farm Income of Dairy Farming Sector (Revised for publication.)
Prices Paid: N.Z. Dairy Board Index of Prices Paid by Dairy Farmers 1949-68.

The position in 1969-70 will probably have worsened somewhat despite good meat prices, since there has been a further sharp increase in farm costs. For the sheep industry the Meat and Wool Boards' Economic Service's index of sheep farm costs just published indicates an increase of 3 per cent.

The Economic Service's analysis of annual movements in prices paid by sheep farmers from 1962 to 1970 is given in Table 3.

Table 3. Annual Movements in Prices Paid by Sheep Farmers. (All Classes) 1962 to 1970.

<table>
<thead>
<tr>
<th>Year to Year</th>
<th>Percentage Change</th>
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<tr>
<td>1962 to 1963</td>
<td>0.8</td>
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<tr>
<td>1963 to 1964</td>
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<tr>
<td>1964 to 1965</td>
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<td>1967 to 1968</td>
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<tr>
<td>1968 to 1969</td>
<td>3.1</td>
</tr>
<tr>
<td>1969 to 1970</td>
<td>3.0</td>
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</table>

Cumulative: 20.9%


The significance of these data is that the average farmer would have had to increase his productivity by an amount equivalent to the decline in his terms of trade, plus some allowance for the increase in his cost of living, if he wished to maintain his same real income. That is, he would have had to increase the standard of technical efficiency of the farm by that amount. I shall return to the matter of technical efficiency shortly, but first I wish to refer briefly to the income situation on farms at present.

PRESENT INCOME SITUATION

While our statistics on farm incomes are not sufficiently up to date or comprehensive in nature to allow valid generalizations about farmers' incomes, it is clear that the recession in wool prices, the pressures on dairy prices, the continuing increase in costs, and the recent widespread drought has put severe income stress on many farms. This applies particularly to two categories, small farms, and farms which have a high debt servicing commitment in relation to productive units. There should be particular concern about the farmer, who, in response to the urgings of the Agricultural Development Conference and the National Development Conference, borrowed for development, and before the development programme was able to generate significant stock increases, was caught in the cost-price
squeeze of the late 1960s. The farmer on small specialized units, with little room for adjustment is obviously also under income stress.

Nevertheless, I doubt very much that we have an "income problem" in the farming industry in the sense that this term is usually used. Even when we look at our affluent neighbours across the Tasman we find that 30,000 Australian farmers, or about 15 per cent of the total, are earning an average of less than $1,000 a year from their farms. This is a situation which, of course, we must avoid, because we do not have the industrial base to bolster up a structurally sick agriculture. But while I cannot speak with authority on the dairy industry where, I am informed, an income problem is emerging, it is my experience that reasonably efficient farmers on units which are not too small, and with a reasonable debt load, are earning real incomes which compare with those of people of comparable status in the community outside agriculture.

The important thing to me is that we pay attention to these three criteria, namely, managerial efficiency, economic size of units, and viable debt loads.

Farmers may wish to argue that it is not sufficient to consider interest on only the debt component of the total farm capital in establishing income. They will point out that they are entitled to interest on their equity capital. I am quite prepared to accept this argument provided that at the same time they will include the increment in their net worth over time, as an addition to income.

Having said this, let me hasten to add that I do not regard the income situation in farming as satisfactory from the point of view of needed growth and adjustments in the farm sector of the economy. There is clear indication in the stock figures of a major slow down in the rate of expansion. Indeed, in Canterbury this year, there is unlikely to be any increase at all, and the figures on dry stock indicate that there will not be enough hoggets for significant increases in sheep numbers next year. Reinvestment is the major sufferer when farm revenue declines, and this applies particularly to the retention of stock. Continued buoyancy in meat prices and a favourable season or two could get stock numbers on the move again, but the propensity to expand has declined considerably in the last two years. It has been further affected by unfavourable seasons in many areas. It is this loss of confidence by farmers which I find most disturbing. A return to the expansion rates of the mid-sixties is now going to require something much more tangible than exhortation. It is going to require realistic price and income policies designed to renew the confidence of farmers in expansion and adjustment.

POSSIBLE FUTURE DEVELOPMENT

I now wish to establish, as tidily as I can, the types of adjustment which are available within the farming industry, and to which we are paying our attention at this Conference. They may be roughly classified as follows:—

- Intensification
- Product Substitution
- Amalgamation
- Integration
- Finance and Ownership.
Intensification

The 1960s saw the most rapid phase in the intensification of the use of farm resources in New Zealand's farming history. This applied particularly to labour productivity and land productivity. Net output per unit of labour, calculated by the Agricultural Economics Research Unit, was over 80 per cent greater in the 1960s than in the 1940s. While the net output per unit of capital had declined somewhat, due to the high level of investment in the early 1960s, the gross output per unit of all inputs on the basis of 100 in the 1930s, 102 in the 1940s, 105 in the 1950s, rose to 121 in the 1960s.

This period of rapid farm development resulted from a number of things, including important technical and managerial advances, e.g. the stocking rate revolution, exhortation by the Government, and readily available funds for development from both on-farm and off-farm sources. It is useful however to think of two principal influences which can be called the investment effect, and the income effect. The favourable revenue and stable costs situation in the early part of the decade encouraged reinvestment, and then as the terms of trade declined in the middle period this investment was exploited following the normal technical time lag, by rapid stock increases, as farmers responded to the need to maintain incomes.

The questions now being asked about farm development by farmers are:

How much further is it possible to intensify without running into technical and managerial barriers and into diminishing financial returns?

Does it pay to develop at present product prices and farming costs?

Is it prudent to borrow to develop in existing circumstances?

If not, where are the funds for development to come from in view of the low financial liquidity of farming at present?

I do not think it is wise to generalise too widely about these questions, even though they could be regarded as the most important set of economic questions being asked in New Zealand at present. However, one thing is clear; this is that development which has heavy emphasis on stock can still be made to pay, in many cases quite handsomely. Programmes which have emphasis on structural investments, building, machinery, weed clearance, access, yards, etc., do not look very profitable. The key variable is the total cost of the development programme per ewe equivalent increase achieved. Recent examples I have seen range from as low as $14 per ewe equivalent to $65. In the first case all the emphasis was placed on putting more stock on a hill country block in order to generate more feed. In the second case emphasis was placed on expensive structural improvements and on improving stock performance. It is crucial to the success of a development programme to get the stock numbers up early, and to allow the required structural improvements to follow when additional revenue is being generated.

Policies designed to re-stimulate farmers to undertake this kind of development should therefore focus on the most strategic inputs. These are fertiliser and stock. We have the fertiliser transport assistance, but if a good economic case can be made for any form of
subsidization in farming then a substantial cost-subsidy on fertiliser, aimed at stabilising its price, would qualify.

Stock retention or purchase represents the most important item of cost in most development programmes, and low liquidity affects farmers’ decisions on stock increases very sensitively. We have the zero standard value system as an incentive, but I doubt that it has a significant effect on farmers’ decisions. I know that a good deal of attention has been given to the possibility of other types of incentive for stock retention and increase, and that it is not an easy problem. If we accept that the major restraint is liquidity then it would appear that the most effective incentive could be a widely publicised and administratively simple stock loans system, with adequate finance being made available through the State Advances Corporation, which is well equipped, although perhaps not adequately staffed to expand its work in this area.

Product Substitution

There is plenty of evidence that New Zealand farmers respond to changes in price ratios, wherever produce substitution is technically possible. An example from the dairy industry is the substitution of Friesians for Jerseys. About one-half of all cows in the dairy industry are artificially mated. In 1965 about one-fifth of these were inseminated with Friesian semen, by 1969 the proportion had risen to one-half. In the sheep industry two significant types of substitution are occurring. One is the substitution of beef, particularly at the expanding margin. Beef production on a bone-in weight basis increased by 40 per cent in the four years 1964-65 to 1968-69, while the overall increase in ewe equivalents was 20 per cent for the same period.

The second trend relates to changes in sheep flock management, with increasing emphasis on ewe fertility. This is being achieved by cross-breeding, by use of new breeds based on cross-breeding, and within pure bred flocks by flock improvement schemes. Although this is not a very spectacular type of product substitution it is nevertheless a significant response by farmers to their judgment of the future outlook for lamb and wool.

Whether we are considering these kinds of adjustments, or the more obvious substitution of cash crops for livestock where this is technically feasible and financially worth while, the important lesson is the need for management flexibility. I do not mean that farmers should be blown about like a leaf by the winds of economic change, but I do mean that they need to keep well informed about the technical possibilities of adjustment and innovation in a rapidly changing technical and economic environment.

Policy measures, where they are confidently based on market outlooks, can be used to accelerate change. For example, the beef rearing subsidy on dairy farms has apparently had some influence on the large increase in dairy-beef calves reared in 1969-70. It is, however, critically important to the continuing economic health of farming, that price support policies which do not conform to the realities of the market situation are not operated.
Amalgamation

Statistics on changes in the size pattern of farms during the 1960s are not available, but it is clear that there has, in recent years, been a sharp increase in the number of property amalgamations. Preliminary results from research on the Malvern County by Pipe at Lincoln College indicate that about 60 per cent of farm transactions in the last three years have involved some form of amalgamation. This figure is confirmed by reports from land salesmen. The motives for amalgamation may vary—we will have comments on these from later speakers. There is no convincing evidence that, beyond certain minimum sizes, where a complement of labour, machinery and buildings is fully utilized, genuine economies of size exist in farming. But it is evident that the major motive of amalgamators is to increase the economic viability of the unit, as a response to the decline in farming terms of trade. Economic viability is usually increased with amalgamations which are prudently financed, because of enlarged turnover in relation to required managerial returns by the farmer.

Some direct encouragement to property amalgamation, particularly of farms which are considered sub-economic units, is being given by the State Advances Corporation. Mr King will be discussing the criteria which are used with such cases.

We have been politically and socially opposed to farm amalgamation in New Zealand, and still have legislation on the statute books which is designed to counteract aggregation. This legislation, while it is now interpreted fairly liberally, is not relevant to current economic conditions in the farming industry, and should be repealed. There are no sound economic arguments for preventing farmers, who have the managerial capacity, and the capital, from farming larger units.

Integration

We should obviously be looking for any opportunity to improve efficiency by specialization of function. For example, it appears that the dairy beef enterprise may be most efficient where the breeding, rearing and fattening processes are carried out by separate people, who could desirably have contractual arrangements with each other, with prices determined on a live-weight basis related to current schedule.

The term integration is usually applied to the arrangements made in, say, the poultry industry where feed compounding or processing firms provide credit and other services to growers, who contract their production to the firm. Other producers might specialise in the production of breeding stock, and others in the supply of chicks. It is doubtful that this degree of specialisation of function is practicable in other areas of farm production in New Zealand, but there is merit in the principle.

There could be more co-operation by farmers in the use of high cost machinery. A group of North Canterbury farmers is successfully operating a form of machinery syndicate. Machines involved include a baler, header, tractors, roller-drill. Each farmer purchases and owns individual items, and has the full rights and responsibilities of ownership. He agrees to hire the equipment to his co-members at rates which are periodically reviewed in relation to costs and deprecia-
tion. This appears to be a successful way of minimizing machinery costs, which have been very subject to cost inflation.

Farmers are an independent race, but they may find, if the family farm is to remain the viable basis of the industry, that they will have to seek ways of obtaining some of the benefits inherent in large scale organization. Flock development groups are a good example of the pooling of resources to obtain the benefits of large scale.

Finance and Ownership

It is popularly imagined that in the future, because of economic and technical change the family farm will diminish in importance, even disappear, and be replaced by company financed and managed farms. I have heard it argued that this is happening in the United States, and will inevitably follow in other developed countries. In fact, the most recent research on this topic from the United States reveals that despite the technological revolution of American agriculture, the continuing decline in the number of farms, and increase in the size of farms, the proportion which are family farms has remained stable. In 1965 95.9 per cent of farms were sole proprietorships; 3.6 per cent were partnerships, and the remaining 0.5 per cent corporations. The figure for family units was similar in 1949.

In my view the family unit will remain the dominant ownership system in New Zealand farming. The biological nature of farming, and the nature of the management process in farming ensures this. Competitive efficiency, i.e. least cost production, is attained at smaller scale than in industry. The separation of the managerial and ownership-financing functions, at least in my experience, often leads to disappointing results.

The major problem for the family-farm structure at present in New Zealand, is the high capital requirement for entry. This is where the company structure has obvious advantages—the equity capital can be contributed from a wide base, and does not have to be repaid. There is not yet any evidence that farming companies are likely to be attractive to the urban investor, although current experience may give us a clearer view of this in the near future.

Land values have increased by two-thirds since 1960 and have doubled since 1955-56. This is the major factor in the financing difficulties of the industry. It is obviously necessary to the vitality of farming that there be regular turnover of ownership with young farmers able to acquire ownership with viable debt loads. The increasing difficulty which young, qualified farmers of limited means are having in acquiring farms could be the major soft spot in the industry in the future.

The paradox to the outside observer is the widening gap between farming terms of trade and land values. This is illustrated in Table 4.
Table 4. Farming Terms of Trade and Land Values.

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<thead>
<tr>
<th>Terms of Trade</th>
<th>Land Values</th>
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<tbody>
<tr>
<td></td>
<td>Sheep</td>
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<tr>
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<td>1967-68</td>
<td>82.9</td>
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<td>1968-69</td>
<td>92.0</td>
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There are a number of factors affecting land values other than the farming terms of trade. If, for example, we take into account changes in productivity over the period we may find that the relationship between the productive value and market prices of farms will not have altered greatly. But however farmers may argue to the contrary, land values are determined by the prices they themselves are prepared to pay for farms. More than I can recall having done before, I question the prices which have been paid for farms in recent months, at least in Canterbury. I doubt whether many purchasers are taking a very hard look at earning capacity, and I feel that they are often more influenced in their attitude to price by the amount of vendor finance being left on the farm, than they are by an objective view of the price.

However, given that the capital requirements for an economically viable farm unit are as high as they are, and accepting that it should not be impossible for young men, qualified in terms of experience, education, and with evidence of saved capital, to enter farming, then it appears that we may have to take a fresh look at the institutional basis of our farm financing. I have only two ill-developed thoughts on this matter. The first, which is not entirely mine, is that there could be an examination of the possibility of commercial lending organizations participating in the equity capital of farms. This might allow them, or encourage them, to extend their lending margins significantly, and virtually become partners in the financing of farmers, rather than remote mortgagees. The second is that the rural section of the State Advances Corporation be separated off from the urban section. I have little complaint about the contribution and the effectiveness of the State Advances Corporation in recent years in the farm sector. But the needs of the farming industry now and in the future are vastly different in concept from the needs of urban housing. I see the possibility of an independent rural lending corporation, with an imaginative and flexible lending policy, geared to the real needs of the industry and adaptable to changed needs. It would be fully staffed with well qualified officers, with time to advise as well as appraise. This corporation would play an important part in maintaining a viable and expanding agriculture in New Zealand.

28
THE FARM OF THE FUTURE

R. A. Candy, farmer, Ngarua, Waitoa.

Over the last 20 years we have seen many changes in a number of sectors of agriculture and very few in others. The geneticist has been responsible for the production of substantially improved strains of cereals, both from a quality and a yield point of view. We have also benefited greatly from the application of his work to the dairy industry, when, during this period, commercial A.I. was born. As the result of the brilliant work of a number of our own scientists we have been able to expand the utilisation of our leading sires to a greater extent than anywhere else in the world. However, up to now, the work of this branch of science has played little or no part in the improved efficiency of our meat (beef, mutton and lamb) industry, or of our wool industry. I believe that in the next 20 years we will see great development in this sphere.

We, as farmers, have the direct responsibility of operating our properties in a sound husbandlike way, always with the basic purpose of achieving higher yields per acre of meat, wool, dairy produce, and crops of all descriptions. We will do this provided these higher yields mean a greater net return per acre and per dollar invested in the enterprise, plus one thing more which I think is our greatest responsibility of all; namely, that at the end of our stewardship in the operation of our properties, we leave them to those who follow us “a little better than we found them.” If we can do that we will not have lived in vain.

There is no doubt that in the last decade the relative economic position of the farmer as a member of the community has worsened considerably, and this despite improved productivity per head—I think unmatched in practically any other industry. If we are to avoid any further deterioration in our position, the “farm of the future” must depend still more on scientists than it has done in the past. We will have to get closer than ever to their thinking and co-operate still more by offering more of our facilities of land and stock to enable wide-ranging experimental work to be done.

In the dairy industry there has been a tremendous increase in the cows handled per unit of labour over the last decade. In fact, between 1964 and 1968 it increased by 28 per cent. I do not think that this will continue at the same rate in the 1970s.

The advent of the maxi shed unit and herds of 400 to 700 cows, came to us in the 1960s. So far I think it is fair to say that there is some doubt as to their overall profitability. Per cow returns have been disappointing in most cases, and labour problems have not been easy. As one who has been dependent on labour for almost 50 years, it has been my experience that one's labour problems pretty well doubled for each extra man above two employed on a dairy farm. Two employed men get on quite well together, but as soon as you add another there always seems to be the odd man out in the team. Dairying, with the very close association of staff in the milking shed both morning and night, together with a lot of group work, feeding out and getting in cows and calves etc., makes some people sick of
the sight of each other where there is no personal affinity, and this is what I think tends to happen on these very big units.

I believe the ideal dairying unit under today’s conditions is one that will economically stand three labour units—the boss and two men; one in which two can handle the milking reasonably satisfactorily so that one can be completely free every week-end, except perhaps for a month at the peak of calving. Also one in which, for personal reasons, any member, boss or worker, who desires to be clear of having to return for milking at specific times, knows that he will be able to do so. The worst feature of dairy-farming is the single unit proposition that requires the operator to drag himself to the cowshed under adverse circumstances “come hell or high water.”

To my mind the outlook for the commercial sale of butterfat in continuing increased quantities at economic prices is very grave. We have built up the most efficient dairy industry in the world; one that through this century has met the requirements of the United Kingdom for a very large percentage of its butter, cheese and casein, and to a lesser extent its skim milk powder. Our Dairy Board has also, since the last war, greatly expanded our sales of dairy products to other markets. But they are still very minor compared with those exports to the U.K., particularly the fat products of butter, cheese and whole milk powder. For our own protection we had to ask for quota restrictions to be put on butter imports to the U.K. and to also have voluntary restrictions accepted by all importers of cheese. These figures, to my mind, represent the maximum quantities we can reasonably expect to sell in that great market in the foreseeable future, even if Britain does not go into the E.E.C.

It was made very plain to me by the British farmers when I was over there just this time last year, that they expect and will fight for the right of providing the extra quantities required by their continuing increased population, and if we were in their shoes we would do the same. If Britain should be accepted into the E.E.C. then the outlook is grimmer than ever. Therefore it is crystal clear to my mind that the expanding capacity to produce food for live-stock which is going on all the time on our dairy-farms should be used to produce commodities other than fats. Let us be sure that we fill our quotas to the U.K. and maintain or expand our sales to other markets at economic prices if at all possible. This is at present almost impossible because of the intrusion into them of the E.E.C. surpluses at “give-away” prices.

The most natural alternative from the dairy-farmer’s point of view is for him to think in terms of beef. I believe it is a great pity that shortly after some of us started producing beef from this source, somebody promptly labelled it “dairy beef,” and for the last two or three years it has become a term used by many as something “beyond the pale”. Let us make no mistake about it, there is no real difference between the additional beef which has originated from a dairy-farm and that from the traditional sources. Probably a higher percentage of it reaches the consumer at a younger age than that from the beef breeds, but this only because these cattle, on the whole, have access to better pastures.
I feel quite sure that in the years which lie ahead we will have
a still further intensification in the dairy industries' change to the
heavier breeds. In the ten years from 1959 to 1969 the demand for
Friesian semen at our A.B. Centres has increased from 12 per cent to
45 per cent, while that for the Jersey breed has fallen from 80 per
cent to 49 per cent. I am convinced that this trend will continue.
Coincident with this we will have a continuing decline in our boyby
calf industry. While these young animals this last season have earned
an all time high per pound, the fact remains that with overall beef
prices as they are, we cannot afford as a nation to slaughter them at
a few days of age.

The dairy-farmer will have several options to take according to
his circumstances. If he does not wish to rear the calves himself, he
will be able to sell them to others who will be pleased to do so. Some
will rear them by the old conventional system of new milk and skim
milk, others with various milk replacers. A great number will buy
them to rear on "nurse" cows that will be multiple suckled. This
will apply on both actual dairy-farms and also on beef properties,
where there will be carried an increased number of foster mothers of
all breeds. These mothers will be animals that are used because of
the milk which they produce for the calves that suckle them. The
whole object of this procedure will be to achieve the maximum weight
gain possible per day. These calves will be weaned at various stages
according to the circumstances in each case, but the weaning is likely
to be earlier on dairy-farms than on sheep-farms.

Many dairy-farmers will then dispose of these animals at this
stage to beef raisers, who will carry them on to the fattening stage.
Others may find that by this system, if they milk a few cows less,
they will be able to operate with one less labour unit, and may there­
fore themselves carry on with these weaners and bring them to satis­
factory killing weights.

It is an accepted scientific fact that an animal's ability to convert
grass to meat becomes less efficient as each month of age passes by.
It is not so long ago that few beef animals were marketed before
about 2 years 8 months or 2 years 9 months of age. Today most beef
producers whose stock are fed on good pastures (the equivalent of
dairy pastures) now market their animals one year earlier, certainly
not on average at the same weights, but weights that reflect a much
more efficient conversion of food to meat than previously.

Now today there are some who, by keeping good food in front of
their stock for a still longer period of the year, are able to market
at 15 to 16 months of age. If this can be achieved by more, as I am
sure it will in the coming decade, it will provide from both the farm­
ers' and the freezing works' point of view a still greater improvement
in efficiency.

On the farm side, farmers would buy good weaners at say about
240 lbs and approximately three months of age, then sell them 12
months later at about 800 lbs live weight. The animals could quite
well be marketed over some two months, and thus work in very satis­
factorily, from the point of feed availability, with the following line
of weaners that would be taken over about this time. From the
freezing company's point of view it would be providing stock for
killing at a time when very little beef is available, and would, in
effect, mean an overall increased capacity for the works.

When I was in the United Kingdom last year attempting to assess
our beef prospects overseas, I had the good fortune to have contact
with several leading men in the trade, who informed me that if we
could supply beef of under two years of age, which, because of age
could be guaranteed tender, they were confident that it would yield
a premium in line with the Yugoslav beef. At present little Yugoslav
beef is coming onto the U.K. market because of advantageous trade
treaties the Yugoslavs have with Italy. This is borne out by the fact
that today the schedule for Y.A.Q. beef, either steer or heifer, of over
400 lbs weight is the same per 100 lbs as that for prime ox up to
620 lbs.

If this type of operation can become general, then under the pres­
ent relative values for milk at 32 cents per lb fat, and beef at 24 cents
per lb, the net return for beef per acre will likely equal, if not exceed,
that for butterfat. In addition it would be far ahead of what is pos­
sible from fat lamb production in those areas where summer growth
is reasonable. I know very well that special circumstances prevail in
parts of the South Island where peak spring growth is followed by
very low summer growth, thus making it particularly suitable for fat
lamb production, and less so for beef. I therefore feel that a very
great improvement in efficiency of beef production will take place
on the farms of the future, with the dairy-farms of the country being
the nursery from which ultimately well over an extra one million
animals will be provided for beef purposes. This will lead to an
increase of 130,000 tons in our beef exports (assuming a 65 per cent
meat yield with an average hook weight of 450 lbs), and will greatly
improve the economic outlook for many of our farmers caught in the
cost price squeeze. It will also contribute, at today’s values, approxi­
mately $140 million additional overseas exchange. This is almost
double the total export income from beef for 1967-68—the last figure
I have available.

Quite apart from this, the improved economic returns from beef
over the last four years have led to a spectacular advance in the
breeding of beef cattle. During this period beef breeding cows have
increased by approximately one-third to almost 1½ million, after being
practically static for the previous four years. This has been accom­
panied by a much slower growth in sheep numbers. This, of course,
reflects farmers’ reaction to the changed pattern in returns from
cattle and sheep that has taken place over this period.

The whole field of the genetic improvement in our beef industry
is one in which at present we have almost a complete lack of know­
ledge of strains of stock that we know are capable of greatly improved
weight gains for a standard food intake. The information being
gained by Dr Lang, Mr Hight, and co-workers at the Whatawhata
Hill Country Research Station is a promising start in this direction.
I trust that in the next decade we will be able to build a sound base
following on this work, so that we can isolate those strains which will
do just that. Then, by A.I., we should see that they are propagated to
the maximum extent possible.
We also need co-operation between the farmer and the scientist to enable us to gather information on the milking ability of individual cows in the traditional beef breeds in our country. I am sure from our experience that there is as great a diversity among these cows as there is among the dairy cows, and, let us make no mistake about it, the major cause of variation between the weights of our traditional beef weaners is the extent to which mum has provided the nutriment to enable growth to be made.

As a humble North Islander I was amazed at the weights being achieved for his weaners by a member of your Committee a few years back. I had the great privilege of seeing his cows and calves running together some 18 months ago, and I was no longer surprised as those Poley cows had just as good udders as many of our Friesian cattle.

In the years that lie ahead the percentage of our beef that will be produced on what we might call our hard country or our newly developed areas (where these cattle do a great job in the control of undesirable species) will get less and less. More and more of our beef will be produced on what will have become high grade, well-topdressed areas, which will not be able to afford the luxury of running traditional beef cows that rear one calf only. The inputs required will be too great for the end product received. I therefore see a change coming in the overall structure of our cattle industry, in which we will not have a dairy industry completely divorced from our beef industry as it has been up until the last year or two. The signs of change are here now, but they will be greatly augmented over the next decade.

As I said earlier, little has been done up to date in our great sheep industry to provide much more efficient basic stock. There have, however, been encouraging signs in the last few years where advanced thinkers in the industry have banded themselves together; to the extent that, with the benefit of greater numbers of progeny, reliable fertility information of different animals has been assessed.

The necessity for this is readily apparent when we look at our lambing percentages over the last decade, where the average is less than 100 per cent, and if anything, is worse at the end of it than it was at the beginning. I must hasten to admit that yours in the South Island has been better than this, but no real improvement has taken place over this period. It appears likely that we will soon have importations of the Finnish Landrace and other breeds whose lambing percentages are very high, and this should help considerably in this direction. The Drysdale breed, whose wool sells at a premium for carpet manufacture, leases its rams out to a number of farmers, so that it can assess their worth and then concentrate on the best for the characters they are looking for. Much more genetic work of this nature, I am sure, will be done in the years that lie ahead, but will only be achieved by the utmost co-operation between the scientist and the farmer.

Labour, I am afraid, will continue to become more expensive as time goes on, and farmers will be searching for every means possible to reduce their dependence on it. This is going to mean that more and more sheep will have to be handled per unit of labour. Already
the Perendale has received popular support in many areas because of its comparative freedom from trouble at lambing time. A number of farmers are today leaving these ewes to lamb themselves, with, they believe, financial benefit to the farmer. My partner, Mr Martin McAdam, also believes, as many others do, that the Romney-Border Leicester cross has great advantages in this connection, as well as in fertility, over our straight Romney sheep.

It may well be a good investment for us to mark and dispose of, after weaning, all ewes that have had lambing problems. I am sure that the sheep-farmer of the future will have to spend progressively less time on this chore than he has up to the present. This factor of labour cost will also play a significant part in the farm of the future, in the proportions of beef and sheep being carried on many properties. There is no doubt that, over the last three years, the great change in the relative values of beef, on the one side, and lamb and wool on the other, has altered very materially the attitude of many farmers towards their stocking pattern. This, together with the much smaller labour input required for the handling of cattle, can in many cases lead to still more economies.

I am satisfied that the farm of the future will be one that will be producing more food per acre than what we are doing today. This may be achieved by more prolific strains of grasses and clovers, or by the use of new species. As our population continues to expand, more of our land will be required for such things as cereals, vegetables, fruit, and wine production. Export potentials will build up from a number of these. I think that our farms as units will tend to increase in area, but I do not think that the company type of farm will expand very much.

There is one thing certain, though, and it is this—that in the years that lie ahead the only thing that will be constant for the farms of the future will be "change."
FINANCE FOR AMALGAMATION

H. J. King, Supervising Appraiser, State Advances Corporation, Christchurch.

INTRODUCTION

In discussing this topic of finance for amalgamation I will deal with the two components land and money under separate headings. These two words lands and money are of such historical and social importance in New Zealand that I consider it worthwhile to spend a little time discussing them as a prelude to amalgamation and finance.

Because original colonisation was largely designed and based on land acquisition with the welfare of land holders uppermost in the minds of administrators, it is not surprising that they tended to be regarded as the more affluent section of the community. Land policies of successive governments have been orientated towards land settlement as an effective means of utilising and capitalising on our idle resources. The purchase of large blocks of land by the Crown for subdivision, the enactment of laws to prevent undue aggregation of land and the undeniable prosperity enjoyed by the farming community since the second world war have all tended to reinforce thinking of the non-farming sector that land represents wealth. Therefore everyone with land is rich and that the extent of the richness is directly proportional to the land held. The farmer has by and large been the envy of others. His vote has been politically significant. He has a place of eminence in the community.

On the other hand the farmer has provided the basic raw materials and exports which have taken this country to where it is today. Farmers can be proud of the part they have played and will continue to play in the development of New Zealand. You must admit that to accomplish this you have been given a very fair share (and rightly so) of the available resources of education—finance, technology, labour, etc.

So successful has this past effort been that phrases such as "farmers are the backbone of New Zealand," or "we ride to prosperity on the sheep's back," are all too well known. However, the cold winds of economic change are blowing.

You will be aware from your returns that New Zealand can neither ignore nor isolate herself from world economic trends. To meet world competition we must not only make such structural changes in agriculture as are necessary but also recognise that forestry, tourism, manufacturing, etc., must be allocated the resources to enable them to make the contribution to the economy which they claim they can achieve (I trust without protection).

This period of readjustment will not be painless. The social and economic implications of a change from almost total dependence on agriculture to a more broadly based economy are such that there is a grave danger of decisions being taken which are based more on emotions such as fear, hate, prejudice, suspicion and political expediency rather than considered judgment based on all the relevant facts.

With all sections of the community clamouring for a share of the too slowly expanding national cake there is an urgent need to assem-
ble and disseminate information on the relative positions of the various sectors and the inter-dependence of those sectors on one another.

Farming has met world competition in the past by ready acceptance of change and implementation of technical advances; I see no alternative to that course in the immediate future.

Farms will gradually increase in size and efficiency. Utilisation of resources in agriculture must be as efficient as those employed elsewhere. Farmers who are physically, financially or mentally incapable of obtaining a sufficient return from their resources employed in agriculture will have to sell out, but this is nothing new nor is it necessarily bad.

In fact I would suggest that with the current demand for labour in other industries it might be an opportune time for those on small properties not making satisfactory progress to consider a change. After all, we live in a country with freedom of choice of vocation and employer, freedom to make decision on how, where and when we invest our resources but these freedoms also carry the responsibility of our actions and the making of such adjustments as are necessary from time to time.

AMALGAMATION:

Amalgamation of land holdings has been going on throughout history. There will be many farmers in this hall who are now farming what was not so long ago two or even three units. The reduction in the number of farmers and increased productivity are two aspects of economic progress. There is so much attention being paid to amalgamation and uneconomic units that there is a danger of the emotions I referred to earlier clouding the issue.

Some see this as a panacea for all ills of the farming industry. The man whose operations are now unprofitable thinks that buying his neighbour's farm automatically solves his problems. Some see this structural change of such urgency that they advocate wholesale reorganisation of land holdings by a national organisation.

I do not subscribe to this contention. Amalgamation and absorption of uneconomic, inefficient units is a process of evolution and any attempt to organise a revolutionary change is undesirable, unwanted and impractical. We do require orderly movement in farm structure which will assist in maintaining a viable economy. The speed of transition will be determined by the profitability (in all its forms of measurement) of the farmers resources employed in any given farm unit in relation to the alternative opportunities available to him for his effort and capital.

If the speed of change is so rapid that it produces results such as unemployment, etc., which are unacceptable to the community or so slow that necessary increases in productivity are impaired then some control is necessary. However, these can only cushion the effect of change on any section of the community for a limited period.

Purposeful amalgamation of uneconomic, inefficient areas of land is good, particularly if placed in the hands of those who have the skills and resources to obtain maximum productivity. All amalgamation is not necessarily a good thing.
AGGREGATION OR AMALGAMATION:

One could argue all day about the definition of amalgamation and aggregation and where one begins and the other finishes, but like beauty it is in the eyes of the beholder. Also, the definition varies according to the aims and objectives involved. Suffice to say here that community opinion of what constitutes a reasonable area of land for any man to possess has been dictated in the past by

(a) The profitability and desirability of farming.
(b) Evidence of large holdings not being farmed to capacity.
(c) Attempts to provide maximum employment on the land because of lack of suitable alternatives at the time.
(d) A demand for apparently unlimited quantities of agricultural products at satisfactory prices.
(e) A man had some sort of right to expect to be able to own a farm.

So true have these views been that a philosophy of “one man one farm” has gained wide acceptance.

However, circumstances have changed so rapidly that population, profitability and productivity make it impossible to continue such policies indefinitely.

No longer has everyone associated with the land some divine right to farm ownership. Because of the tendency towards larger units and the requirements for greater skills and capital to maintain productivity it will become more difficult for a man to obtain a farm of his own.

This will not happen overnight. I have been told that I am the champion of the small farmer and this would be correct provided he is satisfied with the reward he receives for the resources employed. Also, and more important, is the fact that New Zealand farming is comprised of a lot of small units. Sixty-five per cent of the sheep units in this country have been 500 and 2000 sheep so that I am concerned with 65 per cent of the sheep farmers at least. No matter what we do about amalgamation some farms will be larger than others and those on the lower end of the scale will be “small.”

The “family” unit—and in this respect I do not think of the old, one man farm, where the wife and children do the work, but rather a grouping of family land—I see emerging very strongly in the seventies. The established members will use their capital resources to support amalgamations and bring in younger members with energy and technical skills to maintain the necessary productivity. Initially these will be rather loose collections of holdings rather than a tight company with unidentifiable interests. The strong historical and emotional desire to be identified with the land and maintain a certain degree of independence will lead to land ownership being in individual hands but being farming collectively.

WHAT IS AN ECONOMIC UNIT?

This question is always asked but becomes increasingly difficult to answer specifically. Theoretically of course, it means the minimum area of land that provides sufficient revenue to meet all outgoings plus return on capital. However, this is complicated by the price people are prepared to pay for the non-monetary advantages of farm-
ing, taxation, prospect of capital gain and as a hedge against inflation.

There are many farmers on so-called uneconomic units who because of low indebtedness and modest demands for living, etc., are very happy. Others, who are over-committed financially, have high personal requirements or who have scant regard for the other advantages of a farming life, are disappointed.

Perhaps it can be reduced to the area required to maintain maximum productivity, service commitments and provide the owner with a total reward in keeping with community standards.

The point I wish to make is that the profitability of a unit is largely determined by the inputs and expectations of the owner.

WHY AMALGAMATE?

The primary reason as far as the farmer is concerned is to enable him to have more cash left in his pocket at the end of the season. In addition of course he wishes to forestall the cost price squeeze, employ labour, improve work ability, provide for members of his family and perhaps invest against inflation and taxation.

From the national point of view we should aim at reducing the number of inefficient marginal units in order to avoid the problems of other countries and also, importantly, have agriculture balanced to switch to alternative forms of production required by our overseas markets and take advantage of any upturn in revenue prices.

Not only must the farmer keep ahead of increasing farm costs but his personal living costs are taking an increasing share of the profits.

In general, whether the amalgamation be one of an adjoining owner purchasing a few acres or a corporate company acquiring a number of properties the intent is to create an improved financial situation.

WHAT CAN YOU AFFORD?

When a farmer has decided what he would like to do in the way of amalgamation he then has to decide what he can afford to do. This will depend on

(a) The level of indebtedness, efficiency and profitability of the existing unit.
(b) The cost of additional land, stock and plant being purchased.
(c) The level of indebtedness, profitability and productivity of the combined units.

The important point to remember here is that the cash surplus on an annual basis, should be such as to meet all commitments of interest and principal repayments, farm expenses and personal requirements. No matter what the future holds for capital gain (I will refer to that later) the whole operation must not only be serviced now but leave some room for increasing costs and market fluctuation. Year in and year out you simply can not spend more than you earn.

ECONOMY OF SIZE:

There has been a lot of talk about economy of size. This means that as we get bigger the cost of a unit of output is less. It does not always
follow that the purchase of additional land puts more money in your pocket. Perhaps a more profitable way to increase output would be to set up the stocking rate on the existing unit, topdressing or fencing. Cashwise, additional land is likely to be most profitable to those who are now farming and will continue to farm at a high level of productivity on the expanded holding. It has been my observation that production per stock unit tends to fall with increasing size if the standard of management is not of a high order. Hence to gain these economies of scale, such as they are, you must have commensurate levels of ability and capital.

Remember also that when a marginal farmer with limited resources embarks on a programme of expansion which proves unprofitable he runs the risk of accumulating losses which eat into his original equity. Also on the small unit with low debt he had the ability to determine his own destiny by outside work, contracting, etc., or simply because he was prepared to accept the low return on his own capital. On the enlarged unit, however, he can become committed to full time agriculture with no time to work off and no money to service commitments.

Farmers who are already incurring substantial losses are unlikely to solve their problems by borrowing 100 per cent for additional land.

FINANCING:

Most financial institutions would say that once a farmer has debt levels in excess of 50 per cent of assets he is liable to be in financial difficulty. Another rule of thumb figure is that debt servicing per stock unit should not exceed $1-$1.50. While every case must be treated on its merits, and it is appreciated that there can be wide deviations from these figures, they are guides borne of experience. Put another way they are an over simplification of the earning capacity.

Financiers expect borrowers to meet whatever arrangements have been made in respect to loans. A sense of trust and respect is usually built up between the farmer and the lender over a period of years. You all know about it but I must emphasise this aspect again because no lender has unlimited resources and assuming all other conditions have been met the reliable creditworthy customer is likely to be given preference over the unreliable one.

Most loans for amalgamation will be by way of mortgage of land. The amount that can be borrowed is usually between 50 per cent and 66 2/3 per cent of value of the security, usually on first mortgage, though a number of organisations will accept subsequent security.

Many people think that this margin of security is simply to protect the hide of the lender. This is only partly correct and again reflects the average ability of farmers to meet all outgoings with sufficient margin for periods of adversity. No lender likes to have clients who are unable to service their total indebtedness because this means that either family or property are suffering. Some contribution indicates good faith, providence and purpose in the borrower.
Considering the present prices of land in relation to the current and future profitability of farming, everyone is looking at earning capacity. Not only lenders but farmer purchasers should look closely at this aspect. In fact, this should be your main consideration in a decision on what price you can afford to pay rather than what your neighbour is prepared to pay.

**SOURCES OF FINANCE:**

Practically all existing organisations and avenues of farm finance lend either directly or indirectly for amalgamation. Funds are not unlimited, and while creditworthy, competent borrowers with a sound proposition may not always get all their requirements on the terms they desire, it is still usually available somewhere. The following is a list of some of the sources:

- Private mortgages—vendor—solicitor—family.
- Life insurance companies.
- State Advances Corporation.
- Marginal Lands Board.
- Trustee Savings Banks.
- Trading Banks.
- Trustee Companies.
- Public Trust.
- Stock and Station Agencies (Seasonal).

In addition, accumulated cash and gifts play quite a part in the financing of amalgamations.

Interest rates from State Advances Corporation and Marginal Lands Board are five and one-half per cent for first mortgage and six per cent for subsequent mortgages. Other rates are generally approximately one per cent higher.

I will comment in some detail on State Advances Corporation policy because I am familiar with it. At the same time, I must point out that other organisations are playing a substantial role in this field, and the Marginal Lands Board is always prepared to entertain applications where assistance is not available from other sources.

**STATE ADVANCES CORPORATION EXTENT OF LENDING:**

The following table illustrates the extent of demand and the part being played by the Corporation in amalgamation financing:

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<th>Amount $(m)</th>
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<td>275</td>
<td>1.519</td>
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<tr>
<td>1968</td>
<td>207</td>
<td>2.082</td>
</tr>
<tr>
<td>1969</td>
<td>425</td>
<td>6.148</td>
</tr>
<tr>
<td>1970</td>
<td>851</td>
<td>16.321</td>
</tr>
</tbody>
</table>

Even though the total lending to farmers for all purposes exceeded $40,000,000 for the year ending 31 March 1970, the demand exceeded $70,000,000. It will be evident that not only were loans declined because of lack of profitability but bearing in mind the overall funds available, a number of otherwise sound propositions had to be declined also. All sources of finance available in the country must be utilised and those in stronger financial positions have been able to arrange finance elsewhere.
Ability to service indebtedness is of paramount importance. Margins of security can be flexible provided ability, profitability and potential are sound.

Because of the limited funds and the need to utilise these in the best interests of the community as well as the individual the Corporation must give consideration to the following factors in addition to security and earning capacity.

(a) The amalgamation should be purposeful and not simply aggregation.

(b) Establish that there is reasonable need for the additional land.

(c) Consider the desirability of absorbing an uneconomic area of land.

(d) Consider the present use of the land.

(e) Ascertain the scope for development.

(f) Consider the effect of the amalgamation in retaining capable young farmers on the land—those actually working on the land—say 18 or older.

(g) We must have some regard for the purchase limits of $40,000 for sheep units and $25,000 for dairy limits. To exceed these limits the proposition would have to have particular merit.

(h) Price being paid for the land. The Corporation does not set itself up as a price fixing authority in any shape or form. We do not wish to interfere with normal business arrangements but along with other factors the price is considered.

(i) The ability of the applicant to gain maximum productivity.

Where amalgamations are achieving the dual purpose of eliminating an uneconomic area and retaining a capable son the additional land can be purchased in the son’s name if so desired and enlarged holdings farmed in partnership, etc.

Again to conserve funds and particularly where large sums are sought the farmer should investigate the possibility of an increase in existing mortgages to provide part of the cost. Normally a first mortgage over either the existing property or the land being acquired is taken but the Corporation’s security requirements are reasonably flexible in this regard.

Within the limits of funds available and governed by the profitability of the transactions the Corporation is encouraging the amalgamation of uneconomic areas as an evolutionary process.

LAND PRICES:

Farmers should take care that the price they pay for land is realistic for their particular use and resources. Further, that the
borrowing to be undertaken can be serviced under their standard of input and expectations. Where large amalgamations are contemplated the land should be close to its productive value because the “way of life” factors lose their influence. I don’t want to argue about past rises in land or present levels but in relation to present productivity they look high enough.

Those who are gambling on future rises of the order of those obtained in the past decade could be disillusioned. We must now farm for an annual return rather than “lifetime return.” I suggest this levelling out for the following reasons:

(a) The cost/price situation.

(b) The volume of capital required.

(c) The increasing volume of capital required for stock and plant as the necessary productivity is achieved.

(d) Greater education of the farming community and an awareness of alternative opportunity for investment.

I am not advocating controls or restrictions—just think—know what you are buying—it’s your choice—your responsibility. Know whether you are buying a freehold or leasehold farm and the implications of it.

SUMMARY:

We must have faith in agriculture, not blind, “head in the sand” faith but informed reasoned faith. Let us use our advantages of education, initiative and background to keep ahead of our competitors. With decisions based on facts, honesty, national pride and tolerance we can make the most of our opportunities.

Amalgamation is only one way to improve productivity. Most of the gains will be coming from the existing units where I believe there is still plenty of scope.

I trust that your financiers will do their part but they can only provide an opportunity and not a guarantee of success.
A CASE HISTORY OF AMALGAMATION

G. B. Henderson, farmer, Methven.

The object of this paper is not to indicate that amalgamation necessarily means more efficient use of resources, but to show that it is one means by which disposable cash surplus on a small intensively farmed unit can be increased.

The small, one-man farm is at present under the greatest economic stress that it has been confronted with in the last forty years. This pressure is likely to be intensified in the seventies, so that unless the small farmer makes a serious attempt to expand his boundaries he may be better to opt out of farming completely. I will endeavour to show you that the course of action I chose to overcome this problem—amalgamation—was the correct one in my circumstances.

My original farm of 272 acres at Lyndhurst, on medium light soils, was, I felt, at the point where further intensification and expansion of output was going to be difficult even though I had irrigation. We were near the limit of present technology, and although pigs were considered, they were discounted because of the price uncertainty associated with them.

I have been growing approximately 100 acres of crop under irrigation and taking 50 acres of small seeds each year. This consisted of 48 acres of wheat, yielding 75 bushels; 13 acres of barley, yielding 100 bushels; 13 acres of linseed, yielding 32 cwt; 26 acres of peas, yielding 60 bushels; 34 acres of white clover, yielding two bags and 14 acres of ryegrass, yielding 50 bushels. Spring carrying capacity was 13 ewe equivalents on the available grazing area and approximately 800 lambs were bought in and fattened in addition to all my own lambs from the 1100 ewes. The average cash surplus for drawings, tax and capital items generated over recent years from the above programme has, after interest payments, been approximately $12,000. Gross output has been around $95 per acre.

The question was, where do I go from here? With three sons all interested in farming and growing up fast, and myself growing older, I felt it was necessary to do something about the problem urgently. Lost time meant a loss of energy and initiative. With increasing costs and falling profits the real problem of providing three farms for my sons looked even more difficult if left to some future point in time.

There appeared to be five alternative ways of overcoming this problem.

(a) To continue on the farm as at present and re-invest further on the farm.
   At my present level of production I felt it would be difficult to make the progress required.

(b) To continue on the present farm and invest what surplus there was off the farm.
   In the long run this would be to the detriment of my farm and as I had no experience in other areas of investment I discarded this idea.
(c) To sell out, invest the money in urban real estate or shares, and take a job in town.
But this would show a lower return than the course of action I chose.

(d) To sell the existing farm and buy another larger unit.
I felt I couldn't do this until my sons came home from school in four years' time. I would have to buy an irrigation farm, preferably in the same district, as this is the farming system I know. In anything else I would be like a fish out of water. It would probably be an undeveloped property and this might be difficult to find. With costs rising and falling prices, profits might be quite small by the time I had this new property in full production. Even synthetic meat might be a threat to our livelihood. By waiting four years before acting I would in effect lost $40,000 in income when compared with the final alternative.

(e) Expansion.
For expansion (or aggregation) to be a success, the additional property must be of a suitable size, situated within a reasonable distance of my existing property, and be in either a high rainfall area or have irrigation. It must have reasonable fertility and, of course, be priced right in relation to the stage of development. Aggregation also meant a saving of commission on the selling of the existing farm of approximately $2,000, and also meant that action could be taken at once to overcome the problem.

This was the course of action I adopted. A property became available which had all the desirable features I was looking for and had the distinct advantage that it adjoined my existing property. The size is important and the new property in association with my existing property will make eventually, two good economic units.

The new property comprises 362 acres of medium soil, Lismore stony silt loam with approximately six to seven inches topsoil over six to seven inches of free draining sub-soil and thus is ideally suited for irrigation. Rainfall is approximately 32 inches per year. At purchase, 240 acres of the property were border-dyked, the balance being wild flooded. Pastures were excellent and since no cash cropping had been carried out for over 20 years the fertility was very good. Thus it should be possible to obtain high levels of production immediately on this property. I do not see any major capital expenditure arising on the property over the next 20 years as all buildings and improvements are in good repair. The property is well set out for irrigation with headraces and fences sited so that automation of irrigation should not be difficult.

Over the years I have concentrated on developing a management system which makes full use of irrigation. Irrigation enables me to spring sow all cash crops and this has, in addition to allowing two crops per year, altered the demand for labour quite markedly. My sons are keen to do jobs around the farm after school, at the weekends and in the holidays, and this I find not only maintains a healthy family relationship but enables me to operate 634 acres under irrigation without a married couple which I feel most significant in these days of labour shortage. Instead, I will have two Diploma students
for six months in this first year and one after that, thus saving me approximately $6000 in wages over four years—money which doesn't go out of the family. Against this, however, my wife has two additional men to cook for, but she accepts this cheerfully, and for this I am most grateful. Without her valuable support here, and in other directions, our programme of expansion would not have been possible.

As the property runs the whole length of my boundary, with the road running from one house to the other, access is excellent and there is no time lost in shifting stock and plant from one property to the second. With the new property so handy there is a spreading of overheads in that the existing range of machinery is sufficient to handle the extra area, a saving of some $12,000 worth of plant which would be necessary had another property been purchased elsewhere. Most farmers, I feel, are over-capitalized with machinery and have the capacity to work farms twice their size. I have always tried to keep expenditure on these often less productive items to a minimum.

The new property was a Government leasehold with 16 years to run and thus there were several additional problems which had to be faced up to compared with the purchase of a freehold property. I had to weigh up whether the goodwill plus the unimproved value would exceed the true market value. Also, should I have freeholded the property at the outset, or left it for the 16 years, thus reaping the benefits of the lower rental over the intervening period. I sought outside advice on this and was assured that the unimproved value rising over that period would offset any advantage gained by the cheaper rental. Naturally, I aim to freehold the property and as a result of the advice received, will be freeholding the property in a year or two, keeping a watchful eye on land sales around me in the meantime.

Financing the property was one of the least of my worries as when I started farming on my own, some 15 years ago, I then decided to set aside a certain sum of money each year for this very purpose. With the help of irrigation, which gave me a high and stable income each year, I was able to set aside this sum and double it at times, even though taxation has always been a burden. Although the purchase of more land meant greater debt I felt it was better in the long run to be paying interest rather than taxation.

A paddock trust was formed, a few years ago, to ease the taxation burden, but more importantly to provide my sons with money which they might use for the future purchase of land. I intended to form a trust to farm the new block, but being leasehold the Commissioner of Crown Lands was not particularly happy about this, so the idea was given up and I am now farming the property in my own name and will continue this at least until I freehold the property. I financed the property with money borrowed from the children's paddock trust, a State Advances loan of $30,000 at five per cent for 25 years, and from my own savings over the last 15 years.

Where the applicant has their approval, the State Advances Corporation is prepared to treat the purchase of an adjoining property as development. This I feel is of tremendous value in assisting a farmer to plan for the future in an attempt to overcome the small farm problem.
I intend to farm the new 634-acre property under the same system as the original farm, building up to 2700-3000 ewes and replacements with 200 acres in cereal crop and 100-130 acres of grass and clover for seed production. In addition I will be buying in some 1000-1500 store lambs for fattening each year. With irrigation enabling me to spring sow my crops I have a greater area of the farm available over a longer period for the grazing of stock. It also spreads the demand for labour as mentioned earlier. No sheep will go out for grazing nor will any hay or grass and seed straw be sold as I believe this is fertility going out the gate. Fat lamb sires will be used in ensuring that maximum lambs leave the property as early as possible enabling me to shut up for grass seed and white clover. I will be concentrating on two crops as much as possible with the help of water. For example, my own lambs fattened, followed by the area being shut up for white clover, or my own lambs fattened followed by the area being ploughed for linseed in November.

The estimated cash surplus from the larger property is approximately $22,000 or nearly double that achieved on the smaller property. Gross output per acre has fallen slightly from $96 per acre to $82 per acre and expenses have more than doubled for, although labour charges are proportionally lower, interest charges are slightly higher.

<table>
<thead>
<tr>
<th>BUDGET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INCOME</strong></td>
</tr>
<tr>
<td>Sheep</td>
</tr>
<tr>
<td>Wool</td>
</tr>
<tr>
<td>Grain</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td><strong>EXPENDITURE</strong></td>
</tr>
<tr>
<td>Total Expenses</td>
</tr>
<tr>
<td>[ \text{\textbf{\textit{`CASH SURPLUS}}} ] [ \begin{align*} \text{Before} &amp; \quad 12,000 \ \text{After} &amp; \quad 22,000 \end{align*} ]</td>
</tr>
</tbody>
</table>

If you are not increasing production you are going backwards. I also think if you are young and your property is reasonably well developed and you are not putting a certain sum away each year this is also going backwards, especially if your farm is on the small side and, of course, if you have sons interested in farming. To achieve this accumulation of surplus capital each year, I find it is of vital importance to get your accountant to produce a mini budget a month before balance date. Where the balance date is June then the construction of a mini budget in April or May, when everything is sold or can be estimated, will indicate to you exactly what your cash surplus is, if any. What you have then got to decide is how this money should be spent. A reasonable surplus will, of course, attract a large taxation bill. Should you spend some of this surplus on stock
or other tax deductible capital development items, or that new tractor you have been waiting for? These are vital questions which you should answer early and plan your expenditure accordingly each year. I have practised this in the past and at this stage, having reached what I feel is almost maximum production on my own block, am now in a stronger position to expand and to amalgamate the adjoining property. This will enable me to forge ahead at a faster rate and in a few years time perhaps even purchase another block for another son if need be.

I have been trying to say that amalgamation does not come overnight unless you have inherited money or won a ticket in Tatts. It normally takes years of planning and saving, but it is possible even where your original unit is relatively small.

In conclusion I would say there are two important factors that are going to influence agricultural production in the late seventies and early eighties. They are irrigation on the Canterbury Plains and the amalgamation of farm properties into bigger units, this latter only being possible with some careful forward planning.
TAXATION AND THE GROWTH OF THE FARM BUSINESS

G. H. McEwen, Accountant, Masterton.

I intend to take you through a case study in which a young dairy farmer purchases his father's farm and livestock. I will cover the purchase and the progress of the son during his first eleven years; I will draw attention to taxation incentives used in this period and will set out the farmer's liability for income tax at the end of 1969 and will give a summary of his death duty position. To assist this, I have prepared, with the assistance of my staff, and the Inland Revenue Department, the following tables:

"A" General Statistics.
"C" Summary of Tax Concessions Used.
"D" Calculation of untaxed increments to 1969.
"E" Calculation of Death Duties on present estate.
"F" Schedule of Farm Working Expenses.

Mr A. Seed, leased his father's farm from 1956 to 1958. During these two years he found that he was not making any progress financially because all his money was being sunk into improvements to the property. On 3rd of November 1958, father decided to sell the farm, livestock, and plant, to his son. At this point the cows were valued at sixty dollars per head, but the standard value was twenty-eight dollars—a difference of thirty-two dollars per head. If the father had sold to his son at market value, he would have been taxed on the difference between the two values, which was in fact $3232. To avoid this, it was decided to use the provisions of Section 100 of the Land and Income Tax Act of 1954 which provides that a father may sell his livestock to a son at his existing standard value subject to the consent of the Commissioner of Inland Revenue. The Commissioner has power to ask for a higher standard value in cases where the parent's values are unduly low. In this case, consent was granted but the father had to pay Gift Duty on the $3232, less the exemption which was one thousand dollars at that time. Details of the transaction were:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>127 acres of land with two dwellings and cowshed</td>
<td>$25,974</td>
</tr>
<tr>
<td>situated near Lake Wairarapa—at 1959 Govt. value</td>
<td></td>
</tr>
<tr>
<td>Milking plant</td>
<td>$346</td>
</tr>
<tr>
<td>86 cows at standard value $28 each</td>
<td>$2,408</td>
</tr>
<tr>
<td>20 yearlings at $16 each</td>
<td>$320</td>
</tr>
<tr>
<td>1 bull</td>
<td>$24</td>
</tr>
<tr>
<td></td>
<td>$29,072</td>
</tr>
</tbody>
</table>

Settled by:

Bank First Mortgage on land                     $7,000
Second Mortgage to father                        $21,672
Cash contribution                                $400

$29,072 $29,072
From the start every effort was made to increase production by increasing fertiliser and carrying out extensive drainage. Remodelling of the cow shed was completed in the winter of 1961, giving a ten-a-side herringbone shed with circular yard. Accurate figures for production and other items are not available for the earlier years but Table “A” gives a complete summary of operations for the period 1st July 1962 to 30th June 1969.

Production in the 1962-63 season was 32,346 lbs of butterfat or 254 pounds per acre. By 1965 this had increased to 35,701 pounds giving 281 pounds per acre. At this stage, our farmer realised that he was reaching the peak of production on the present property and started to search for additional land. Fifty-nine acres of bare land in an undeveloped state came up for auction. My client and I spent many anxious hours working out partial budgets to test the profitability of expansion and to find a maximum figure at which the purchase was worthwhile. We finally fixed a figure of $220 per acre and purchased at $222. As he had already demonstrated his ability to repay existing debt to the Bank, he was able to obtain a fresh advance to cover the whole of the price of the new additional land.

I do not wish to spend too much time on the farming and production side of the story, for I am here to talk about taxation, and growth. Reference to the main Statistical Table “A” will show that production rose rapidly over the years, reaching a peak of 55,792 pounds in 1969. Both the 1968 and 1969 years had very hot and dry autumns which resulted in a fall-off in the production per cow.

Table “B” sets out the cash flow statement for each year and at the right hand sets out the totals of the items for the seven year period. If you cast quickly along the lines you will see how the revenue has increased steadily to reach a peak in 1968. Expenses have shown a steady rise with a steep jump in 1966 when, with the purchase of additional land and stock, a permanent man was engaged and installed in the house which up to this point had been let. If you refer to the foot of the table you will see that there have been years of surpluses and deficits, but over the period there has been an overall cash surplus of $2880. There is, however, a contingent liability for tax on income equalisation deposits of $3800 which have not been taxed and could absorb up to $1800 or $1900 of cash when withdrawn.

At the right hand side of this table, I have calculated the percentage which each of the major totals bears to the gross revenue from farming.

The important figures are:

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage of Gross Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm expenses and stock purchases</td>
<td>58.64%</td>
</tr>
<tr>
<td>Revenue surplus from farming</td>
<td>41.36%</td>
</tr>
<tr>
<td>Personal expenditure</td>
<td>12.42%</td>
</tr>
<tr>
<td>Life insurance</td>
<td>3.37%</td>
</tr>
<tr>
<td>Tax</td>
<td>7.85%</td>
</tr>
<tr>
<td>Mortgage repayments</td>
<td>9.49%</td>
</tr>
<tr>
<td>Plant and car replacements</td>
<td>3.75%</td>
</tr>
<tr>
<td>Surplus overall</td>
<td>2.25%</td>
</tr>
</tbody>
</table>

49
It is interesting to see how the available revenue has been used. Expressed as a percentage of the gross farm revenue, the following comparisons are interesting:

- Absorbed by taxation: 8%
- Personal drawings: 13%
- Savings:
  - Life insurance: 3%
  - Debt repayment: 10%

This shows a well balanced use of the available funds, and I must comment for a moment on this point which is so important.

Every farmer has to decide his priorities for spending money. Money spent on the farm will, in the main, be deductible for tax purposes. On the other hand, personal drawings and debt repayment are wholly non-deductible; while expenditure on capital items such as plant and buildings qualify for depreciation only. For this reason it is most important to strike a wise balance between these main categories of expenditure. The farming operations should produce a surplus and once this is set, the base for taxation is known, and amounts available for other purposes can be calculated. This is well illustrated at the foot of the cash flow statement. Look at line “C” REVENUE SURPLUS FROM FARMING. Take the first year and you will see that the surplus from farming was $4920. When this figure has been adjusted for increases or decreases in livestock, and depreciation has been deducted, the tax for the year may be calculated and in this year it amounts to $730. You will see that including tax, the farmer has made the following commitments from his revenue surplus:

- Personal drawings: $1870
- Life insurance: $130
- Taxation: $730
- Dairy shares: $70
- Plant Replacement: $290
- Mortgage repayments: $1600

- Total: $4690
- Leaving surplus: $230

- Total available: $4920

If this man had spent another $800 on personal expenses, he would have had to reduce deductible farm expenditure by this amount in order to balance his budget—unless he had persuaded his banker to reduce his debt repayment. $800 less spent on the farm would have increased his tax by at least the amount of the original surplus of $230. It is absolutely essential for progress to achieve a proper balance amongst the conflicting claimants for money—farm running expenses, personal drawings, taxation, plant replacement and debt repayment.
THE USE OF TAX INCENTIVES:

Incentives for farmers to increase production have been in force for many years and their existence is extended from time to time and their nature is changed. Some provisions have been in force for so long that people have forgotten that they are in fact, concessions. This extract from the 1969 Budget (page 19) will serve to remind you that many of the provisions which you enjoy are reviewed each year—I quote:

"Farm development expenditure. Existing legislation provides for the deductibility of certain development expenditure on farms to expire on 31st March 1970. This incentive will be extended for one further year to 31st March 1971."

In table "C" you will see that our man has used:—

1. Development work—including drains and tracks, capital fertiliser on new land, water supply and fencing.
2. Special depreciation on new plant.
5. Standard values (in 1965 and 1966 when cattle numbers increased, the write down from market value to standard value gave reductions in assessable income of $1100 and $1600).

The tax savings resulting from these concessions have been a prime factor in the healthy cash position. The figures at the foot of the table set out savings achieved—a total of $4863 over the seven years.

Some of these savings are of a short term or temporary nature, for example income equalisation. On the other hand, the write down to standard values is a long term saving which may come to charge at some later date.

In addition to these concessions, the maximum of life insurance has been used with the express purpose of providing a fund for paying out $11,000 which will be due to the farmer's brother when their mother dies.

UNTAXED INCREMENTS:

Through the use of standard values, there is usually an untaxed increment present in any livestock farmer's affairs. This is represented by the difference between the market value of the livestock, and its book value, and is set out in table "D." In this case, the difference was $13264 at 30th June 1969. $3232 of this was handed on to our farmer when his father sold to him at standard values in 1958.

So long as our man lives he does not need to face up to this problem. He can in the fullness of time, subject to the consent of the Commissioner of Inland Revenue, pass the problem on to his family by selling to his family, either at standard value or an increased value approved by the Commissioner. He must, however, pay gift duty on the difference between market and standard value. The first $4000 of gift attracts no duty.
There is also provision under Section 103 of the Land and Income Tax Act for taxation relief on this untaxed increment where the farmer sells all or a substantial part of his livestock. There are many ways of meeting the problem and, properly handled by competent people well versed in tax matters it can be reduced to a manageable size.

The other untaxed increment in this case is the Income Equalisation money deposited in 1967 and 1969 totalling $3800. In any year, a farmer may deposit up to 25 per cent of his net farming income into Income Equalisation. There it may stay for five years. In our case we have made these deposits in good years when it was obvious that falling prices would yield lower incomes in later years. Furthermore, in the area concerned, the district is prone to hot summers and very dry autumns. Such a season has just been experienced and the $1800 deposit made in 1967 has now been withdrawn in the 1969-70 year when butterfat production has dropped by 6000 pounds. Thus, we have provided the farmer with a reserve for use in a bad year and have saved some tax on the amount by withdrawing it and having it taxed in a year of lower income.

DEATH DUTIES:

Table “E” lists the assets and liabilities of our farmer and shows the death duties which could become due under differing circumstances. It is obvious that there is sufficient money to meet duties and pay off the mortgage if the farmer is survived by a widow.

However, if his wife dies first, life insurance will pay the duties but will not provide sufficient to repay the mortgage.

GENERAL COMMENTS:

1. Annual Taxes—

The effect of annual taxes has not been a deterrent to this farmer’s increases in production. Substantial concessions, both short and long term, have been gained as outlined in table “C.” There is a certain amount of accumulated potential taxation on the livestock increases and the Income Equalisation deposits as shown in table “D.” These do not present insuperable problems at this stage.

He has sufficient cash reserves to meet all the tax on the $3800 equalisation, even if it were all withdrawn in the same year. It will, however, be kept in reserve and brought out either in a year of low income or it will be brought out and spent on some definite development project.

Annual taxes have been high enough, but they have been paid, and progress has been rapid.

When the additional land was purchased in 1965, thought was given to formation of a trust to hold the land. At the time this did not seem warranted but in retrospect it would seem that this should have been done both to reduce estate duty and as a means of spreading income tax.
2. Death Duties—

These figures show just how rapidly an estate can accumulate without a farmer being aware of it. In 1958 he had assets of approximately $7000, now his net assets are about $80,000. The growth may be traced as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases in value of land</td>
<td>$20,000</td>
</tr>
<tr>
<td>Increases in value of livestock</td>
<td>$10,000</td>
</tr>
<tr>
<td>Debt repayment</td>
<td>$11,600</td>
</tr>
<tr>
<td>Life insurance</td>
<td>$23,100</td>
</tr>
<tr>
<td>Plant, cash, etc.</td>
<td>$8,300</td>
</tr>
<tr>
<td><strong>TOTAL INCREASES IN ESTATE</strong></td>
<td><strong>$73,000</strong></td>
</tr>
</tbody>
</table>

This draws attention to the major problem which death duties impose on owners of farm land.

While it is most gratifying to have the capital gain which arises from the holding and farming of land, it would seem that there is always a pressing need for a review of duties.

In my view, the recent changes in the Law on Taxation of Trusts has been unnecessarily harsh in its effects on planning and management of the affairs of farmers.

3. The Farmer himself—

I have chosen this case-study because it is a success story. He took over his father's farm in 1958 at Government valuation, and purchased the stock at standard value—in all, these gifts amounted to $3232.

Since then he has progressed surely and purposefully in every year.

He has succeeded for the following reasons:

1. He is a progressive thinker and a hard worker.
2. He has obtained the maximum revenue surplus from farming consistent with the highest level of maintenance of land, buildings, livestock and plant.
3. His attitude to taxation is enlightened. He set himself to increase his production and income, but was not deterred by increased taxation.
   In his own words he has said to me, "If I've made the money, I can afford to pay the tax."
4. He has spread his spending wisely over:
   - Farm expenses
   - Personal living
   - Debt repayment
   - Life insurance, and
   - Capital expenditure.
5. He has made wise use of tax concessions and incentives.
   To sum it all up, I would say the success of this farmer is due to his determination and wise planning.
### TABLE “A”

#### GENERAL STATISTICS

<table>
<thead>
<tr>
<th>Year</th>
<th>Area Farmed (Acres)</th>
<th>Dairy Supply in lbs Butterfat</th>
<th>Butterfat per acre</th>
<th>Stock wintered at start of season</th>
<th>Cows in Milk, 15th January</th>
<th>Butterfat per cow</th>
<th>Debt Servicing: Interest</th>
<th>Debt Servicing: Principal</th>
<th>Debt Servicing: Total</th>
<th>Per cow</th>
<th>Per acre</th>
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## CASH FLOW STATEMENT

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<td><strong>REVENUE FROM FARMING:</strong></td>
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<td>$</td>
<td>$</td>
<td>$</td>
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<td>$</td>
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<tr>
<td>Dairy Proceeds</td>
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<td>18650</td>
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<td>Cull cows</td>
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<td>1020</td>
<td>850</td>
<td>1990</td>
<td>2040</td>
<td>1170</td>
<td>1990</td>
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<td>Cull bulls</td>
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<td>70</td>
<td>140</td>
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<td>Yearling heifers</td>
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<td>Bobby calves</td>
<td>360</td>
<td>320</td>
<td>300</td>
<td>300</td>
<td>580</td>
<td>630</td>
<td>1030</td>
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<tr>
<td>Sundries (mainly house rent)</td>
<td>260</td>
<td>230</td>
<td>150</td>
<td>50</td>
<td>120</td>
<td>60</td>
<td>90</td>
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<td><strong>TOTAL REVENUE FROM FARMING (A)</strong></td>
<td>11290</td>
<td>11960</td>
<td>13860</td>
<td>19370</td>
<td>21380</td>
<td>22540</td>
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<td><strong>REVENUE EXPENDITURE:</strong></td>
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<td>Farming expenses</td>
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<tr>
<td>Cattle purchases</td>
<td>670</td>
<td>780</td>
<td>4060</td>
<td>2520</td>
<td>130</td>
<td>350</td>
<td>260</td>
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<tr>
<td><strong>TOTAL REVENUE EXPENDITURE: (B)</strong></td>
<td>6370</td>
<td>6570</td>
<td>10700</td>
<td>13820</td>
<td>10920</td>
<td>11570</td>
<td>12830</td>
<td>71780</td>
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<td><strong>REVENUE SURPLUS FROM FARMING (C) = A - B =</strong></td>
<td>$4920</td>
<td>$5390</td>
<td>$2980</td>
<td>$6850</td>
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## OTHER PAYMENTS:

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<tr>
<td>Drawings</td>
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<td>15210</td>
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<td>Life Insurance</td>
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<td>650</td>
<td>710</td>
<td>670</td>
<td>700</td>
<td>760</td>
<td>4110</td>
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<td>Taxation</td>
<td>730</td>
<td>650</td>
<td>760</td>
<td>1620</td>
<td>1600</td>
<td>2060</td>
<td>1190</td>
<td>9610</td>
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<tr>
<td>House additions</td>
<td>70</td>
<td>20</td>
<td>20</td>
<td>100</td>
<td>160</td>
<td>10</td>
<td>380</td>
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<tr>
<td>Dairy Shares</td>
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<td></td>
<td></td>
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<tr>
<td>Plant and car replacement</td>
<td>290</td>
<td>300</td>
<td>1940</td>
<td>310</td>
<td>1500</td>
<td>50</td>
<td>4590</td>
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<td>Land purchase less borrowing</td>
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<tr>
<td><strong>TOTAL OUTGO (D)</strong></td>
<td>$4690</td>
<td>$6140</td>
<td>$5670</td>
<td>$6550</td>
<td>$7800</td>
<td>$10600</td>
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<td>$47750</td>
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**SURPLUS** = C - D

**DEFICIT** = (G - D)

$230 $2660 $2880 $370 $2360

$750 $2690 $2690 $300 $2880 $2880

$750 $2960 $2960 $300

**OVERALL NET SURPLUS** 2.35%
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<tr>
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</thead>
<tbody>
<tr>
<td>(1) Development Work—</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Drains and tracks</td>
<td>400</td>
<td>300</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
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<tr>
<td>Fertiliser (Capital applications)</td>
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<td></td>
<td></td>
<td>800</td>
<td></td>
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<tr>
<td>Water supply</td>
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<td>250</td>
<td>100</td>
<td>800</td>
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<tr>
<td>Fencing</td>
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<td></td>
<td>100</td>
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<tr>
<td>(2) Special depreciation</td>
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<td>40</td>
<td>162</td>
<td>143</td>
<td>33</td>
<td></td>
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<tr>
<td>(3) Increased fertiliser incentive</td>
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<td></td>
<td></td>
<td>88</td>
<td>162</td>
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<td></td>
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<tr>
<td>(4) Income equalisation</td>
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<td></td>
<td></td>
<td>1800</td>
<td></td>
<td>2000</td>
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<tr>
<td>(5) Adjustment to Standard Value of increased stock</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>1100</td>
<td>1600</td>
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**TOTAL OF TAX CONCESSIONS** | 400 | 388 | 1462 | 2440 | 2312 | 243 | 2833 | 10078 |

**INCOME ACTUALLY TAXED WITH CONCESSIONS**

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>4252</td>
<td>4569</td>
<td>4959</td>
<td>7274</td>
<td>7216</td>
<td>9942</td>
<td>6374</td>
<td>44586</td>
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**INCOME WITHOUT CONCESSIONS**

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<tbody>
<tr>
<td>4652</td>
<td>4957</td>
<td>6421</td>
<td>9714</td>
<td>9528</td>
<td>10185</td>
<td>9207</td>
<td>54664</td>
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**TAX ON THIS INCOME**

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</thead>
<tbody>
<tr>
<td>850</td>
<td>813</td>
<td>1291</td>
<td>2941</td>
<td>2820</td>
<td>3224</td>
<td>2537</td>
<td>14476</td>
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**TAX ACTUALLY PAID**

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<tbody>
<tr>
<td>708</td>
<td>682</td>
<td>750</td>
<td>1625</td>
<td>1597</td>
<td>3063</td>
<td>1188</td>
<td>9613</td>
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**SAVING**

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<tbody>
<tr>
<td>$142</td>
<td>$131</td>
<td>$541</td>
<td>$1316</td>
<td>$1223</td>
<td>$161</td>
<td>$1349</td>
<td>$4863</td>
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TABLE "D"
CALCULATION OF UNTAXED INCREMENTS UP TO 30th JUNE 1969

<table>
<thead>
<tr>
<th>Market Value</th>
<th>Standard Value</th>
<th>Untaxed Increment</th>
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<tr>
<td>Stock at 30th June 1969 was:</td>
<td></td>
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<tr>
<td>211 cows</td>
<td>$90</td>
<td>$18990</td>
</tr>
<tr>
<td>58 heifers</td>
<td>$45</td>
<td>2610</td>
</tr>
<tr>
<td>3 bulls</td>
<td>400</td>
<td>56</td>
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<tr>
<td></td>
<td></td>
<td>$22000</td>
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(b) INCOME EQUALISATION:
Total Deposits to date: $3800

TOTAL UNTAXED INCREMENT: $17064

TABLE "E"
DEATH DUTY CALCULATION

<table>
<thead>
<tr>
<th>ASSETS:</th>
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<tbody>
<tr>
<td>Land at Estimated Revised Government Value</td>
<td>$57,000</td>
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<tr>
<td>Livestock</td>
<td>22,000</td>
</tr>
<tr>
<td>Shares</td>
<td>900</td>
</tr>
<tr>
<td>Plant and Vehicles</td>
<td>3,000</td>
</tr>
<tr>
<td>Bank and Sundry Debts Due</td>
<td>4,000</td>
</tr>
<tr>
<td>Life Insurances at present maturity value</td>
<td>23,100</td>
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<table>
<thead>
<tr>
<th>TOTAL ASSETS</th>
<th>$110,000</th>
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<tbody>
<tr>
<td>LIABILITIES:</td>
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<tr>
<td>Mortgages and Loans</td>
<td>$29,000</td>
</tr>
<tr>
<td>Creditors</td>
<td>1,000</td>
</tr>
<tr>
<td>TOTAL LIABILITIES</td>
<td>30,000</td>
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</table>

NET ESTATE: $80,000

Assuming Will gives full life interest to Widow, and remainder equally to seven children:

DEATH DUTY would be—Gross Duty: $17,600
Less, Widow Exemption: $8,800
Infants' Exemption: 1,540

NET DUTY IF WIDOW SURVIVES: $7,260

If Wife dies first position would be:—
—Gross Duty: $17,600
Less, Infants' Exemption: 1,540

NET DUTY IF NO WIDOW: $16,060

(Note: No account has been taken of possible income tax. This could reduce duty if stock were written up for Income Tax purposes at date of death.)
## SCHEDULE FOR FARM WORKING EXCHANGES

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<th>1964</th>
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<td><strong>FARM WORKING EXPENSES:</strong></td>
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<td>12</td>
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<tr>
<td>Animal Health</td>
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<td>225</td>
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<td>Breeding Expenses</td>
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<td>188</td>
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<tr>
<td>Cultivating Contracts</td>
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<tr>
<td>Dairy Shed Expenses</td>
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<tr>
<td>Electricity</td>
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<td>166</td>
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<tr>
<td>Feed and Grazing</td>
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<td>101</td>
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<tr>
<td>Hay Making and Contracts</td>
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<td>32</td>
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<tr>
<td>Silage Making</td>
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<tr>
<td>Freight</td>
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<td>75</td>
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<tr>
<td>Manure, Lime and Topdressing</td>
<td>970</td>
<td>977</td>
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<tr>
<td>Seeds</td>
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<td>Weed and Pest Control</td>
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<td><strong>REPAIRS AND MAINTENANCE:</strong></td>
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<td>House Employee</td>
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<td>Drains, Tracks, etc.</td>
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<td>Fences, Gates and Yards</td>
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<td>333</td>
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<tr>
<td>Plant and Machinery</td>
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<td>191</td>
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<tr>
<td>Tools and Hardware</td>
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<td>44</td>
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<tr>
<td>Water Supply</td>
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<tr>
<td><strong>VEHICLE EXPENSES:</strong></td>
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<tr>
<td>Fuel, Oil, Grease</td>
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<tr>
<td>Car Expenses (¾)</td>
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<td>Tractor Expenses</td>
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<td>26</td>
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<td><strong>ADMINISTRATION:</strong></td>
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<td>Legal Expenses—Deductible</td>
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<td>Telephones, Mailbox Fees, and Bank Charges</td>
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<td>49</td>
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<tr>
<td>Interest</td>
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<tr>
<td><strong>TOTAL CASH EXPENSES:</strong></td>
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<td>$5790</td>
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**BASIS FOR PERCENTAGES:**

58
<table>
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<tr>
<td>$145</td>
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<td>2228</td>
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<td>$787</td>
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<td>252</td>
<td>278</td>
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<td>214</td>
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<td>2126</td>
<td>2318</td>
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| $6644  | $10500 | $10788 | $11222 | $12369 | $63004 | 100.00% | 51.81 |
RUNNING A LARGE-SCALE FARM

J. D. McDougall, Farmer, Wairarapa.

For years this "way of life" philosophy has been hung round the sheep farmer's neck like an albatross.

Certainly it's a good life, a good balance of physical and mental work and all the challenges of management and decision-making. But unless it can be accepted that an integral part of this mythical "way of life" must be to adopt a business-like approach to the task and to maximise profit, the farmer will, in these changing times, soon be out of business.

What then for the way of life? In any endeavour one should first clearly establish one's aim. As a farmer mine is to invest my capital and surplus income so as to obtain maximum after tax returns.

The national necessity for accelerated farm development has created a favourable tax climate for New Zealand farmers who are prepared to, and can afford to improve their land and productivity. Because of this, I believe that even at today's prices, large scale private farming offers growth and investment opportunities equal to most alternatives. However, as in any business, success or failure depends on management.

In this paper I will discuss the problems, which are few, and the advantages, which are many, facing the larger farming enterprise and then a few of my own ideas and methods.

Problems:

Now the first problem with any business is to run it at peak efficiency. How many of us who run farms have the right mental attitude, ability and particularly training? Let's face it, most of us hold down our jobs because we own the farm we run. Our prime duty should be management, and time is the enemy. Nobody has enough of it but obviously one must allow sufficient time to fulfill the functions of management which are: Planning, Organising, Leading, Integrating, Controlling and Evaluating. "Police" is a handy reminder. In my book one should not have to work half the night to do this, one should put a realistic value on one's time and avoid where possible doing anything that others can do as well, better or cheaper. I like the idea of a farmer sitting at his desk on a wet day and saying, "O.K., I'm a manager, an executive; my time's worth $10 per hour. Now I'm going to prove that and earn it."

Perhaps one of the lesser known problems of the larger farm is finance. Although debt servicing ability can be high, suitable financing is not easy. A young fellow with not much management experience can avail himself of State Advances Mortgage and development finance, plus a bit of help from the stock firm. He can borrow about 65% of the capital required to buy a marginally economic unit, or even less if he is fortunate enough to draw a Lands and Survey ballot. But as soon as one starts speaking in terms of hundreds instead of tens of thousands the maximum one can borrow would appear to be about 40% of market value, regardless of debt servicing ability. Insurance Companies and Banks, for obvious reasons, have very different security margins from S.A.C. and, like S.A.C., many of them have maximum loan limits which can be rather inflexible. This is only my personal experience and it could well be that I am considered a poor credit risk.
Our present Land Aggregation Laws present another small but irritating problem to the large scale farmer. They are about as effective as prohibition was in America. Prohibition only added to the cost of buying and drinking booze and these Land Aggregation Laws only add to the cost of buying and running a farm; they don’t stop anyone buying more land. It seems difficult to reconcile Government’s S.A.C. lending policy for amalgamations and these laws. How big is big enough today, tomorrow, or in 20 years? I would challenge the Government to close the loopholes and make the law work or throw it out. The fact that its is a politically “hot potato” is insufficient reason to evade the issue.

Those are the problems then—none of them insurmountable.

What are the advantages of large scale farming? The most important single advantage is the tendency, because of buyer pressure, for land in large financial packages to be considerably cheaper per stock unit, particularly where the property is not readily subdivisible.

The New Zealand Meat and Wool Board’s “Annual Review of the Sheep Industry, 1968/9”, shows an average per acre price paid varying from only $29 for the larger units to $107 for the smaller units. The comparison was made between farms over 500 acres and farms of between 250 and 500 acres. These figures are influenced by land capability and many other factors, but scale undoubtedly influences capital value per stock unit.

Mr P. B. Newal, of the Department of Agriculture, reported in the prospectus of New Zealand Pastoral Holdings, said:

“Valuation:

I consider the price at which these properties are offered to your Company, namely, $43 p.a. for the 5,000 at Waitoru Station and $48 p.a. for the 9,000 acres at Puketiti Station, represent fair value for blocks of this size, and by way of comparison report that smaller farms of a similar standard in the area are good buying at between $70 and $100 per acre.”

There is also a tendency for unproductive capital improvements such as buildings to be top heavy on smaller units. Similarly, economies can often be made through better utilisation of plant and machinery on larger units and because of the bigger mob size available for pasture control, paddocks can be larger and fencing costs per acre can be reduced.

Another advantage of scale is the ability to attract and pay high calibre staff. A normal 1,000 ewe property is obviously going to have difficulty in attracting as manager an experienced Lincoln degree holder whose wages expectation is probably about $4,000 per annum. On a 5,000 ewe property the position is very different. Having attracted this high calibre staff, there are, on larger units, savings to be made through specialisation and man management. These opportunities are all too frequently ignored through lack of appreciation of basic management principles. Parkinson’s Law starts to operate, the work expands to fill the time available. there is no delegation, there are no incentives, the boss is fully occupied keeping

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everyone else working, it's all he's got time for. Nobody else is asked to think for themselves and if they do take any initiative they are either "meddlers" (the boss) or "scabs on the union" (the rest of staff).

On our traditional one-man farm all surpluses are usually required for living expenses and debt servicing, on larger units obviously there are greater surpluses which can be reinvested to increases both capital value and future productivity without attracting taxation. So in effect, one can convert income into capital add infinitum even to the extent of developing one property from the revenues derived from another adjoining or widely separated unit. This is in our national interest—long may it remain so.

These advantages are to a large degree lost to the investor in a public farming company. If profits are ploughed back share value will not rise correspondingly since share prices are dictated primarily by yield. If high cash dividends are declared, tax incentives offered to farmers are lost and an extremely high level of profitability would be necessary to compete on the share market.

Can large scale farming, or any farming come to that, prove a worthwhile investment?

The "return on capital" figures published by the New Zealand Meat and Wool Board's Economic Survey tell the sad story of the 520 farms included in the survey. The group averages for the four-year period 1964-1968 show a range of 2.72% to 6.46% return. The average all group returns during these four years have been 5.39%, 5.33%, 3.73% and 4.08%, with South Island mixed cropping and fattening (Groups 5.S, mainly Canterbury), you will be pleased to hear, topping the score with nearly 51%.

A major influence in keeping farm profits low is the "Blue Chip" effect. Throughout the world land has historically been recognised as the bluest of "Blue Chip" investments with assured capital accretion. This tends to push land values above rational levels. Overseas experience is that even the introduction of "Capital Gains" tax does not alter this trend.

The physical and financial fragmentation of the industry, which will always be with us, is another handicap.

Despite these factors and despite the averages, enterprising individuals always have and always will make their fortunes farming.

It is interesting to note that of the 30 odd large farm enterprises considered worth including in Peter Newton's "Big Country of the North Island" four had been built up during the last forty years by largely self-made men, and these men went through slumps in farm income during this period equal to what we've seen recently. So I believe that if we can throw aside this "way of life" idea and become managers and administrators, by training if need be, we can be adequately rewarded for our investment and labour. I am particularly confident that this can be so for the large-scale farmer—the dice are loaded in his favour.

Having made these generalisations I will now mention briefly some aspects of my management.

It would be true to say that my early visits to Te Awa Research Station gave me the stimulus and confidence to take the plunge into higher stocking rates at Sunnyside.
After the heavy initial topdressing the aim was to utilise all extra grass grown. My assessment of the extra stock required to do this was very arbitrary. So much super equals so many ewes. If it was overdone the stock performance slipped. If my estimate proved too conservative and feed got away I acquired extra stock somehow. Begged, borrowed, or stolen.

I became prepared to accept lower per animal performance during the development period to achieve pasture improvement and higher per acre yield. Our per animal performance figures still leave a lot to be desired but I believe this is mainly a seasonal influence of three drought years in a row.

The aim each year is to use all surplus income for development wherever such development will show the greatest future profit potential. I am prepared at all times to slow down or accelerate any individual programme for the benefit or to the detriment of others if it appears justified. Each enterprise is budgeted and subjected to individual scrutiny wherever possible.

I have three separate five-year budgets, annual budgets and cash flow projections which in the case of Moonmoot and Bowenvale are worked out in conjunction with the managers as well as farm advisers.

I get a monthly feed back from the cash flow statements and each budget is revised as necessary. I regard inter-farm financial adjustments as more important than inter-farm stock movements, which in the case of Sunnyside and Moonmoot are physically practical.

A frequent comment made to me is "how handy 'Moonmoot' must be for finishing of store lambs and cattle". This concept is, I believe, falacious in nearly all cases.

When "Sunnyside" has stock for sale, I want the best price I can get at the time it suits me to sell. When "Moonmoot" needs stock I want the right type of stock at the right price and again at the right time. If these two conflicting interests coincide, O.K., I save the agent's commission but that's all. Both properties can operate on the open market at any time without any detriment to the other if this basic reasoning is accepted.

There are exceptions. For example, this year "Moonmoot" fell short of target in purchasing Dairy Beef Bulls, sufficient numbers were just not available locally. Because of this the "Sunnyside" beef calves were not castrated and at weaning were sold to "Moonmoot" and weaner steers purchased to replace them at "Sunnyside".

Because of its size and quite high stock numbers (17,000), ewe equivalents, "Sunnyside" has been, and still is, being subjected to fairly detailed labour analysis and planning. There is only one house on the farm and the staff travel from town each day. "Sunnyside" is run as three units. Two two-man blocks and one one-man block. This allows us about 3,000 ewe equivalents per labour unit. We have a yearly work plan with different colours representing the different blocks. This is placed where everyone has access to it and takes into account the main seasonal work only. Any study
of labour inputs and efficiency must, as its first step, record what is taking place now.

We have, for nearly two years now, been recording how our time is spent. I feel confident that when we have sufficient detailed information available we will be able to plan more effectively and make more informed decisions regarding the pros and cons of contract labour, works slaughtering of dog tucker and mutton, different management techniques. We will also be able to plan more effectively our expenditure of capital on labour saving devices such as additional motor bikes, yards, lane-ways, tracks, road metalling and many others.

The data is recorded daily as hours spent on the different jobs. On the same printed form a paddock grazing record is kept and monthly stock tallies are entered. As a matter of interest so far the breakdown of our work input has been:

<table>
<thead>
<tr>
<th>Repairs and Maintenance</th>
<th>Stock Health</th>
<th>Shepherding</th>
<th>and Other Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep</td>
<td>Cattle</td>
<td>Sheep</td>
<td>Cattle</td>
</tr>
<tr>
<td>21%</td>
<td>6%</td>
<td>1½%</td>
<td>58%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10½%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

As an aid to marketing I keep graphs of monthly price movements at both our local saleyards. These have shown that time and place of sale appear to influence price as much as the quality of the stock.

At the present moment our sheep to cattle ratio at "Sunnyside" is nearly 30 sheep to each cattle beast. The aim was to get to the optimum stocking rate as fast as possible, and because of the high capital cost of cattle all stock increases were taken up by sheep. It is anticipated that the stocking rate will tend to stabilise for a while now. If this happens we have budgeted during the next five years to build up cattle numbers as fast as finance will allow. Sheep numbers will decline until our stocking rate is equally divided between sheep and cattle — about 2½ ewe equivalents per acre of each. This should mean higher profits, more evenly spread work load, better grazing management and improved sheep performance.

We shear at "Sunnyside" in January for ease of management. This may not be ideal from the sheep's point of view (or the wool's, either), but it gives us up to Christmas to wean, draft, drench and dip our lambs for fly. Grass dictates when these activities take place.

Another advantage is that it decreases the necessity for dagging. The ewes are tightened up if need be, to dry the dags off and we experience little fly strike or casting (why, I don't know, because the lambs can be dynamite if not dipped!).

The shearers dag the majority of ewes while shearing (a lot cheaper than we can) with no detriment to the wool. January shearing also does away with the necessity to tip crutch prior to tupping.

At the two-tooths pre-tupping shearing, all fleeces are weighed and classed individually and the sheep culled accordingly. We have
streamlined this now so that only one extra man is required in the shed to put through over 1,000 per day.

I have found to my cost that only high yielding cash crops are a paying proposition so apart from "Moonmoot" where I believe there is a place for cropping I have become an all grass farmer. I am prepared to meet the market and take losses in bad seasons in order to keep my costs and overheads low.

It may be of interest that at "Moonmoot" this year we planned to crop 175 acres and after a fairly thorough cost analysis sold our tractor and leased out our plant to a contractor. Our budgeted expenditure on contracts for silage harvesting, crop harvesting, cultivation and moleploughing totalled $5,170.

This was a multi-factorial decision and inadequate housing one of the problems, so I won't go any deeper than this. I only mention it because I am speaking in Canterbury where from observation this decision would verge on heresy!

Another rather unusual situation arose at "Bowenvale". The stocking rate rose from just over 1,000 to 3,000 ewes during four years without any permanent labour being employed during the period. It was remarkable how little this appeared to affect the running of this admittedly fairly straightforward property.

I will sum up by saying that despite historical, actual and projected low levels of return from farm investment nationally, I believe large scale private farming can be both profitable and challenging, although high tax paid cash returns are difficult to achieve.

I believe that, on average, we are pretty good daggers of sheep, diggers of holes, and repairers of broken machinery, but we need to give much more thought to the principles and actualities of management and decision-making.
STATE LAND DEVELOPMENT AND THE LAND SETTLEMENT POLICY

J. Fitzharris, Fields Director, Lands and Survey Department.

INTRODUCTION:

There are two things often not realised about the Lands and Survey Department. One is that it is certainly the biggest farmer in this country and, as far as we know, in the world; the other is that it spends much of its time and efforts taking unproductive land that no other farmer will touch and, by planning, land management and good farming practice bringing it into productive land that individual private farmers can take over and farm profitably.

I make these two initial points because, although most people know we have been in the land development business for many years, their knowledge tends to be local and they may have no conception of the sheer size of the Department's activities.

Also, although the Department is generally well accepted in all districts as part of the farming scene—indeed, it often happens that if an area is not progressing as it might, Government is asked to step in to start development blocks both to help the local economy and to show what farming potential is there—it is still not always understood how this development is done.

For instance, the money used for this type of development is not "taxpayers' money" in the ordinary sense of the term. It is loan money, interest-bearing and, of course, eventually repayable. Its source is the National Development Loans account.

It is important to understand this, because the only way this interest can be earned and paid is by efficient farming operations—and this is why we are in this large-scale farming enterprise.

DEPARTMENTAL DEVELOPMENT:

Land development by Lands and Survey began in the early 1930s on unimproved land owned by the Crown, and was then used as a means of providing employment. Work was stepped up considerably during and after World War II to provide farms to rehabilitate ex-servicemen. While graded ex-servicemen still have preference, practically all farms are now available for civilian settlement.

At March 31 1969 we were farming and developing 1.86 million acres. About 1.2 million of these are farmed, some 113,000 acres for the Department of Maori and Island Affairs, 46,600 acres for other departments and 450,000 acres is taken up by the "Molesworth Station."

The three tables set out in this paper show for the period 1960 to 1969 the trends in the number of sheep and run cattle wintered by the Department, the numbers of sheep and cattle sold and the revenue the Department has received from such sales, and the wool produced and the revenue therefrom.
### TABLE 1
**WOOL**

<table>
<thead>
<tr>
<th>Farming Year</th>
<th>Number of Sheep on hand at Beginning of Year Thousands</th>
<th>Wool Produced Thousands lbs</th>
<th>Average Price per lb Cents</th>
<th>Revenue from Wool $ thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1</td>
<td>813.6</td>
<td>8,881.3</td>
<td>29.9</td>
<td>2,657.8</td>
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<tr>
<td>1961-2</td>
<td>942.9</td>
<td>9,690.8</td>
<td>28.6</td>
<td>2,774.6</td>
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<tr>
<td>1962-3</td>
<td>1,017.2</td>
<td>10,465.0</td>
<td>32.7</td>
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<tr>
<td>1963-4</td>
<td>1,054.5</td>
<td>10,748.7</td>
<td>40.8</td>
<td>4,390.0</td>
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<td>1964-5</td>
<td>1,092.3</td>
<td>12,272.6</td>
<td>30.1</td>
<td>3,691.7</td>
</tr>
<tr>
<td>1965-6</td>
<td>1,231.2</td>
<td>13,765.1</td>
<td>30.4</td>
<td>4,189.0</td>
</tr>
<tr>
<td>1966-7</td>
<td>1,404.6</td>
<td>14,730.1</td>
<td>24.9</td>
<td>3,691.9</td>
</tr>
<tr>
<td>1967-8</td>
<td>1,559.8</td>
<td>16,150.1</td>
<td>20.1</td>
<td>3,245.0</td>
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<tr>
<td>1968-9</td>
<td>1,790.3</td>
<td>16,992.9</td>
<td>23.7</td>
<td>4,031.2</td>
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</table>

It will be seen (Table 1) that sheep numbers have increased steadily over this period. Since 1962, when the Department wintered its first million sheep, the number has increased by 797,246—an increase of 78.4 per cent. It is fairly certain the Department will reach the two million mark by the end of this trading year in June, 1970.

It will be noted also that the revenue derived by the Department from Wool was less at $4.03 million in 1968-9 than it was five years earlier in 1963-4, yet in the meantime the Department had increased its flock by 785,834 sheep and had increased its wool clip by 6,244,191 pounds.

An interesting point is that the increase for sheep during the year ended June 30, 1968, was 14.8 per cent, compared with the national increase of less than 4 per cent. Of the country's total increase that year, the Department provided 52 per cent. For the year ended June 30, 1969, the Department had a small increase of 2 per cent in sheep numbers, compared with a decline in the national total.

Table 1 clearly shows our sagging wool economy. It also indicates that the producer cannot rely on this type of wool production alone if he wishes to avoid the road to bankruptcy. The improved markets for meat, particularly beef, are therefore doubly welcome. Indeed the improvements in this area of farm production are very encouraging.

### TABLE 2
**SHEEP**

<table>
<thead>
<tr>
<th>Farming Year</th>
<th>Number of Sheep on Hand at end of year Thousands</th>
<th>Number of Breeding Ewes on Hand at end of year Thousands</th>
<th>Number of Sheep Sold during year Thousands</th>
<th>Revenue from Sheep Sales $ thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1</td>
<td>942.9</td>
<td>570.7</td>
<td>436.8</td>
<td>1,810.0</td>
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<tr>
<td>1961-2</td>
<td>1,017.3</td>
<td>611.0</td>
<td>497.3</td>
<td>1,722.7</td>
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<tr>
<td>1962-3</td>
<td>1,054.5</td>
<td>648.2</td>
<td>576.6</td>
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<tr>
<td>1963-4</td>
<td>1,092.3</td>
<td>692.2</td>
<td>568.3</td>
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<td>1964-5</td>
<td>1,231.2</td>
<td>763.7</td>
<td>474.6</td>
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<td>1965-6</td>
<td>1,404.6</td>
<td>854.4</td>
<td>518.3</td>
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<td>1966-7</td>
<td>1,559.8</td>
<td>974.5</td>
<td>576.7</td>
<td>2,571.0</td>
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<tr>
<td>1967-8</td>
<td>1,790.3</td>
<td>1,130.9</td>
<td>606.4</td>
<td>2,531.7</td>
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<tr>
<td>1968-9</td>
<td>1,814.5</td>
<td>1,267.9</td>
<td>868.3</td>
<td>3,936.3</td>
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67
TABLE 3
RUN CATTLE

<table>
<thead>
<tr>
<th>Farming Year</th>
<th>Number of Run Cattle Thousands</th>
<th>Number of Breeding Cows Thousands</th>
<th>Number of Cattle sold during year Thousands</th>
<th>Revenue from Cattle sales $ Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1</td>
<td>150.5</td>
<td>55.0</td>
<td>31.2</td>
<td>1.9</td>
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<tr>
<td>1961-2</td>
<td>164.3</td>
<td>57.8</td>
<td>39.1</td>
<td>1.9</td>
</tr>
<tr>
<td>1962-3</td>
<td>163.5</td>
<td>55.8</td>
<td>51.3</td>
<td>2.6</td>
</tr>
<tr>
<td>1963-4</td>
<td>166.2</td>
<td>57.2</td>
<td>51.5</td>
<td>2.8</td>
</tr>
<tr>
<td>1964-5</td>
<td>180.3</td>
<td>60.6</td>
<td>41.9</td>
<td>3.1</td>
</tr>
<tr>
<td>1965-6</td>
<td>204.2</td>
<td>68.4</td>
<td>38.5</td>
<td>3.2</td>
</tr>
<tr>
<td>1966-7</td>
<td>218.1</td>
<td>77.2</td>
<td>40.1</td>
<td>3.0</td>
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<tr>
<td>1967-8</td>
<td>243.5</td>
<td>89.7</td>
<td>40.8</td>
<td>3.3</td>
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<tr>
<td>1968-9</td>
<td>234.1</td>
<td>94.3</td>
<td>66.3</td>
<td>5.1</td>
</tr>
</tbody>
</table>

In recent years the Lands and Survey Department has followed a policy of increasing its breeding stock and the success of this policy is clearly shown by Tables 2 and 3.

Table 2 shows how the revenue from sheep sales has increased— with a sharp increase last year—while at the same time the breeding flock has increased from 570,689 in 1961 to 1,267,947 in 1969. A similar, but even more dramatic increase in revenue has been derived from cattle sales, as shown by Table 3, and again, the breeding herd has increased from 55,043 in 1961 to 94,348 in 1969.

The current market value of livestock on hand is just over $29 million. The grassing programme from unimproved or totally reverted land averages about 30-35,000 acres annually.

For the 1968-9 farming year, by way of summary, the Department sold—

- nearly 17 million lbs wool for $4,031,201
- 868,306 sheep for $3,936,300
- 66,317 cattle for $5,137,641
- other produce for $492,225

Total: $13,597,367

I think these figures adequately substantiate my earlier statement that the Lands and Survey Department is the biggest farmer in New Zealand—or as far as stock is concerned, in the world.

AGENCY WORK:

As well as carrying out land development for settlement on our own behalf, we also, as I said earlier, do work for the Department
of Maori and Island Affairs. The Department also farms as agent for the:

Hauraki Gulf Maritime Park Board—this is mostly islands in the Gulf.
Department of Health—land adjacent to mental hospitals.
Ministry of Defence—Air Department.
N.Z. Forest Service—fire-breaks in forests.
N.Z. Electricity Department—stations bought through power development.
N.Z. Post Office—the three radio stations, Awarua, Makara and Himitangi.
N.Z. Tourist Hotel Corporation—Franz Josef farm.
Queen Elizabeth Park Domain Board—Wellington-West Coast.
Waitangi National Trust Board, at Waitangi.
Te Paki Farm Park—to be established in the Far North.

DIVERSIFICATION OF FARMING:

So far, the Department has developed and settled mostly sheep and dairy units, with only a limited number of cropping, irrigation, orchard and market garden units.

The Department is well aware, however, of the need for further diversification, and is undertaking new types of farming on some of its blocks.

In the Bay of Plenty we are trying out maize, sunflower seed and rice for cash crops. The first two look very promising, although the sunflowers had trouble with birds, and harvesting may also present problems. Rice growing has not been very successful.

For some years we have been growing canning crops in Hawke's Bay and Gisborne, and maybe these and other crops could be extended to Canterbury.

Fertility work is also being done with sheep and cattle, in conjunction with Ruakura Research Station and Whata Whata Hill Station. So far, sheep trials are working out very well. From the original flock of 800 ewes we had 2,700 ewes last year, with 140 per cent of lambs dropped and about 127 per cent weaned.

The main purpose of the trials is to increase stock performance and thereby the profitability of our flocks, and to breed some high-fertility rams for our own use.

The large number we handle makes ruthless culling possible, and this year we hope to have a closed high-fertility flock of 5,000 ewes. We are using all high-fertility rams in this work.

The cattle-breeding exercise is also being undertaken with the aim of breeding cattle based on performance, and at Waikiti Farm Settlement, again in conjunction with Ruakura, we are doing an exercise on performance testing. I am fully convinced that it is only by increasing the performance of our animals that we can get the greatest improvement in our profitability.
Another interesting assignment is in the Bay of Plenty. Here we have some land that was schemed for dairying but now, in view of Government's policy to "contain" the dairy industry, we are trying out some of the "dairy" farms as beef cattle units.

We have set up two of these farms as self-contained individual units. On one we are running so-called dairy beef, having bought in calves at a liveweight price which we propose to put on fat after the first winter. We have facilities for weighing, and will follow the progress of the animals right through.

On the adjoining farm, we have taken in Aberdeen Angus calves from one of our blocks. These come in at the same live weight costing and are being weighed in a similar way.

Both these exercises are, of course, just under way, and progress so far has been good. At present we have weight gains of about two pounds a day. As an interesting comparison, we can compare results with some of the settled dairy farms on similar land on this same block.

Although we in the Lands and Survey Department are engaged in normal farming operations, we are also deeply interested in multiple land use. At present, we have in Te Paki Farm Station some 42,000 acres in the Far North. This has been bought for farming and broad recreational use, and here we are going to set up the Te Paki Coastal Farm Park.

This park will combine recreational and farming activities with the preservation of natural, ecological, scenic and historic features. Facilities will be provided for the rapidly-increasing public use, and staff will be made available for supervision and development.

Another interesting development will be at Wairakei. Here, adjoining the Wairakei Hotel, we have been farming land for the Tourist and Publicity Department. It is now proposed to establish a fairly large farm here which will be farmed in perpetuity and made available to the many visitors to the thermal area to see large-scale and typical New Zealand farming in all its phases.

There will, no doubt, be some headaches in both these projects but we will have to make them work. We may get some guidelines from a study we will make of the techniques used in the English National Park system.

Again, and this is especially pertinent to the South Island, we have to look at our policy on the hill and mountain lands in this area. Our first pastoral leases will be expiring in 1980, so we will be looking at these in seven or eight years time, and I can tell you the Land Settlement Board is already looking at the area to determine a future policy.

Pastoral farming has been the traditional use of this land and, I think, will remain so, but the Land Settlement Board will also have to consider:

1. Their use in water harvesting, as the Government has so much at stake in its many hydro-electric schemes, and

2. The recreational use of these hills.
This is an increasingly important aspect, and I am sure we will be dealing with it more and more in the future. Already, many runholders and others are interested in using the hills for other than pastoral purposes.

People holding pastoral leases have, of course, a very firm tenure of their runs, and I know many are wondering under what conditions they will get their next term. This is a matter on which the Land Settlement Board should be able to determine its policy this year.

Concerning this, you will be aware that the Department has sponsored the Chair in Range Management here at Lincoln College. From this we hope we will get men trained to deal with the multiple use of this great resource of hill and mountain land.

**LAND USE COMMITTEES:**

More and more use will be made of the Land Use Committees. In fact, before any new block is bought, or before any development work is started, this committee will report on the best use of the land, such as for farming or agricultural use, forestry, wildlife or conservation.

This is considered most important in our policy of land management—and I can tell you that this year, for instance, we bought a large property which will now be used entirely for afforestation.

Standards fixed for economic units have altered considerably over the years, due to the rise and fall of prices within the farming industry and the changes in the cost of living throughout the country in general.

The aim of subdivision is to provide a unit that will produce enough to keep a man and his family at a reasonable standard of living, with some potential. It is still policy to continue with the traditional "one man, one farm" unit.

This, as required stock numbers grow, is not easy, and I believe that with sheep we will have to develop flocks of all breeds that will not require the same amount of individual attention they need today. This "easy-care" type of sheep is around in all breeds, and we must sort them out and breed from them.

The developed farms are offered, at an upset price determined by current market valuation, for selection by suitably experienced applicants by the well-known ballot system.

As is known, suitability for admission to the ballots is determined by the local Land Settlement Committees, which assess applicants’ farm and stock management ability, financial acumen and whether they have sufficient money to meet the deposit on the farm. Usually, those successful in the ballots take up the land itself on renewable leases, although freehold is available at a higher deposit.

**CONCLUSION:**

One of the most encouraging aspects of the Department’s land development activities is the example its work gives to others. Almost without exception, in almost every district in which the Department has started to develop unimproved or semi-improved land (especially in difficult areas) there has been a quickening of interest among established land owners.

A close watch is kept on the day-by-day activities of the Department and lessons learned—very often, the hard way—are taken home and applied on neighbouring farms.
TECHNICAL POTENTIALITIES OF NEW ZEALAND FARMING


Over the decades our industry has provided the essential base for New Zealand’s “quality of life.” For the country’s benefit that should continue. But, how far that occurs is becoming very apparently dependent on the vigour with which our climate industry reaches out to develop new production technology, and the speed with which it integrates that into its operation.

It is with these thoughts in mind that I would like to place high among the accomplishments from the South, the manner in which you have kept alive the precious flame of flexibility in farming. The short term profitabilities of extreme specialisation can be a dangerously deceptive jade when considering the long-term vigour, health and profitability of an industry as a whole.

This paper is concerned with technical potentialities. It is concerned with principles and where they appear to lead in this New Zealand environment.

In this there is always an underlying assessment of potential economic feasibility. However, direct production costing is not brought in as a basis of guidance. This is on two grounds.

The first is that the answers from production costing are based on margins whose balance can be altered radically as we open up new technological solutions and new market opportunities. Such costing is an essential technique for posing the issues to be met but it must never be taken as saying, you can never jump those hurdles. That is precisely what you employ your research and technology people for.

The second is specifically rejecting the Colin Clarke type of economic policy which says concentrate your development technology on the lines which are most profitable right now. It takes the view that one essential use of that profitability is providing the resources to explore the possibilities of new and often quite different lines of development which can be opened up in times ahead. The industrial organisations which have used that strategy are the ones which have stayed at the top over the generations.

The course of development of our climate industry and the production systems it comes to use will be governed by a combination of sociological, market, and technological factors. The market and sociology aspects merit major attention but let’s not overlook the manner in which technological innovation can put aside difficulties in those spheres. It can allow us to sell at places we could never reach before, and at prices we never imagined could continue to provide a good profit.

Around us is rapid development of urban type industrialised and increasingly affluent societies. With that goes consequential increasing sophistication and variety in their requirements.

Parallel is the rapid development of transport technology from which we can plan toward doing for the Pacific Basin, at least, what
California and the U.S. South-West has been doing for the remainder of North America. That is, providing a wide variety of low-cost products with particular emphasis on meeting out of season markets.

To meet such development, industry will need to adopt greater technology at all levels and more capital flexibility. Along with that will go vertical and horizontal integration. That is, closer linking of production and processing, and with that larger production units.

It will also bring our process and horticultural crop sector to much more even size terms with our animal sector. Within that are included not only peas, strawberries etc., but also industrial processing of crops such as lucerne, and of course forestry. This is a complex and fascinating field I do not propose to take further here.

As these process and horticultural crops develop to more even balance with the animal production their supporting technology and commercial organisation should enhance the strength of the animal sector.

The ruminant animals, the cow and sheep, turn cheap bulk plant product to a relatively high value item acceptable in the market place. I believe this process has a sound future provided it puts itself through an intensification process resembling the change of the poultry industry from open range to its intensive production form.

Given adequately rapid movement this way I see no reason why the ruminant animals production of protein and other products will not be able to compete very nicely for a long time to come with higher plant protein from field crops; and equally with microbial protein from the energy of oil products etc. In the longer run the latter may be the tougher competitors.

The essential underpinning of these comments is the development of much higher yield forage and cereal crops, many of which can produce feed much more closely tailored to the ruminant requirements than is pasture.

You will have heard of the green revolution in the world's human food production which has dramatically increased grain production in many Asian and American countries. It should have equally dramatic opportunity for our animal production sector.

Some general comments on principles of yield physiology in relation to crop development will give the background to the situation as I see it.

LIMITATIONS OF GRAZED PASTURE:

The paddock grazed pasture system relying on white clover as its source of nitrogen is inherently self limiting in terms of the amount of feed which can be put into the mouths of the animals grazing in the paddock. As you push stock numbers higher and go towards fuller utilisation you become more susceptible to trampling damage, to accelerated summer drying out, or to restricting total yield from extended close grazing.

For the plants themselves there are similar limitations. The clover and animal return doesn't make its nitrogen available evenly, or at the time of year when it will be of most use. If pasture is allowed to grow too long to give large leaf area for rapid growth its leaves stop infiltration of light and start dying off as fast as they
grow. If this is repeated much of the clover is smothered out. Also, ryegrass is essentially a summer dormant species which can't make full use of our summer climate potential. Along with this goes seasonal irregularity and unreliability in feed supply.

The more people seek to mitigate these problems by keeping stock off the pasture part of the year and on feeding pads or similar areas, or by growing reserve crops, or by periodical use of fertiliser nitrogen, the more they raise the question of why not go much more completely toward the use of crops adapted to give high yields in the absence of the grazing animal and take the feed to the animal.

FEATURES IN ALTERNATIVE CROPS:

If we think in these terms the key features to be sought from our plants grown for animal feed are for:

1. High yield per acre of energy food; carbohydrate and similar compounds.
2. Low cost of mineral nutrients per pound of feed grown.
3. Low use of water per pound of feed grown; and
4. Good agronomic characteristics for economical sowing, tending and harvesting.

EFFICIENCY OF PHOTOSYNTHESIS:

High yield potential requires proper crop architecture and efficient photosynthesis. On our present understanding a properly structured crop displays long narrow leaves, or many small leaves, up along a stiff stem. The erect leaves allow efficient utilisation of light and the stiff stems allow dense populations of plants to respond to high levels of fertiliser without lodging.

The really high yields of energy come when the crop of this form builds up a large leaf display and then uses an efficient photosynthesis system to fill large quantities of grain or other storage tissue with carbohydrate.

For the photosynthesis system there are in brief two major groups in our crops. There are those with the so-called tropical grass photosynthesis system which have the highest efficiencies but require warm temperatures and sunny conditions, and there are those species with the Calvin System which have a lower peak efficiency but operate better under cooler conditions. The tropical system provides the very fast-growing cereals such as maizes, and the tropical grasses. The latter, Calvin, system is in the small grain cereals and temperate grasses, which show to best advantage during our cooler seasons, winter/spring in the North and spring/summer in the South.

MINERAL USE:

To achieve low cost of mineral and hence fertiliser nutrient per pound of feed growth, the important requirement is to have a crop which either produces as its final yield grain and stem carbohydrate rather than leaf; or symbiotically fixes all its own nitrogen and still gives high yields.
Table 1.
Pounds of TDN (Total Digestible Nutrients) Produced for Each Pound of N, P, and K in the feed.

<table>
<thead>
<tr>
<th>Element</th>
<th>Pounds of TDN</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>66</td>
<td>3.8/1.0</td>
</tr>
<tr>
<td>Ryegrass pasture</td>
<td>17.2</td>
<td>2.6/1.0</td>
</tr>
<tr>
<td>Lucerne hayage</td>
<td>16</td>
<td>3.3/1.0</td>
</tr>
</tbody>
</table>

Table 1 shows a comparison of ryegrass herbage, a maize crop as silage, and lucerne. In so far as mineral elements have to be paid for either as fertiliser bought, or as land bought, it is a reasonable approximation to use commercial fertiliser costings to give a comparison. This suggests ryegrass fodder is 3.6 times as expensive as maize in its costs per 100 pounds of utilisable nutrients. Lucerne is as economical as maize where grown from symbiotic nitrogen fixation but as expensive as ryegrass where fertiliser nitrogen has to be bought in to stimulate yield.

MOISTURE REQUIREMENT

For moisture there are two aspects. The rate at which plants use it, and the depth of soil their roots can draw from. In rate of use of moisture, lucerne is extravagant, but it can balance this by ability to draw from considerable depth in the soil if there is moisture there. Ryegrass has a medium high rate of moisture use combined with an essentially shallow rooting system. That leads to marked sensitivity to periods of no rain, particularly where close grazing in summer allows heating of the soil surface. Sorghum, maize and tropical pasture grasses are generally economical in moisture use and have fairly deep rooting systems thus giving best overall summer effectiveness of moisture use.

Table 2
Moisture Use By Individual Plants of Lucerne, Tama Ryegrass and Sorghum.

<table>
<thead>
<tr>
<th>Moisture Use</th>
<th>(gms per hour per gram dry weight of Leaves)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lucerne</td>
<td>8.22</td>
</tr>
<tr>
<td>Tama ryegrass</td>
<td>4.55</td>
</tr>
<tr>
<td>Sorghum</td>
<td>2.43</td>
</tr>
</tbody>
</table>
Protein has not been mentioned in the above attributes. This is deliberate. There is mounting evidence that we are within sight of being able to largely replace plant protein with simple nitrogen chemicals in the ruminant diet. This allows feed production to be concentrated in high energy yield crops. That is where the large gains in yield ceiling lie.

FERTILISERS:

Integral with the use of high yield forages and horticultural crops is the replacement of clover nitrogen by fertiliser nitrogen. With the large falls in nitrogen prices, and probably more to come, we are entering a stage where this will become a more profitable source of nitrogen provided it is used on crops which can respond efficiently to it. Along with this goes the current development of quick cheap crop establishment techniques, and effective chemical weed and pest control.

GENERAL CHANGES IN FARMING PROCEDURE:

Major changes in procedures for handling our feed and our stock are an integral part of increasing use of high yield forages.

The first issue concerns transferring to use of stored feed both as forage and as grain. Most of the high yield crops are not adapted to daily or even monthly chewing by stock. Their product needs to be harvested once or twice a year and then stored for future use. For cereals this is stored either as the grains or as the whole crop in low moisture silage, or haylage, or dried. Harvesting the grain only gives easier storage and good transportability, but it abandons 30-40 per cent of the feed value in the crop. Harvesting the whole crop gives more total nutrients at the expense of reduced transportability. With properly sealed storage there is small loss of feed value or fall-off in intake provided the moisture content is reduced below 70 per cent and preferably close to 40 per cent. Please don't judge by much of our current silage experience.

Development of economical forms of storage and materials handling in getting materials from paddock to animal’s mouth some months later, is an area with major scope for progress.

The second issue concerns the handling of the stock. The more the feed is brought to the stock the more there will be movement toward larger scale feeding centres to allow efficiency of use of the feed. This is both to cut down wastage and to allow preparation of ration mixes balanced to production requirements.

Along with this must go much greater development of the animal’s reproductive and growth potential.

The cattle beast has been integrated into large-scale intensive handling. There appears to be no technical reason why the same can’t be done for the sheep. Its greater reproductive potential with shorter gestation and easier induction of multiple births may well make it an eventually more profitable animal in these conditions.
Overall these intensive large-scale techniques are those which offer greatest scope for the use in the production operation of highly trained technologists and flexible use of capital. As in other industries that could become the decisive factor.

Having outlined those general principles let us consider the types of crops and types of development in various districts which they suggest. Estimates of potential are made on the same basis for each of the different types of crop.

PERENNIAL RYEGRASS AND THE RYEGRASS-CLOVER ASSOCIATION

First, could it be emphasised that no comment here does in any way put aside recognition of the accomplishment of the men who established the New Zealand form of the ryegrass-clover grazed pasture system. That stands as one of the outstanding achievements of our industry.

The issue under consideration is a separate one. It is, where should we move now 30-35 years after the essential foundations of the ryegrass-clover system were laid.

The ceiling for this as a grazed pasture association is judged to be about 12,000 lbs of dry matter per acre per year in a good season. That is as feed into an animal's mouth. It represents a bit above 600 lbs of butterfat and 10 ewes per acre.

Fertiliser nitrogen supplementation will play an increasing role in getting enhanced growth at critical times. Ryegrass responds to nitrogen fertiliser particularly well and the persistent high tillering and probably slightly creeping rooted forms are the ones being found best adapted in permanent grazing pasture. Nitrogen may raise the ceiling 30-50 per cent and give much more scope for harvesting stored fodder but the more it is pushed the more expensive the operation is liable to become. Also it can be expected to enhance summer dormancy and death risks.

Overall the relative importance of this species group in the industry as a whole will steadily decline with the expected final strongholds being the cooler and wetter areas of the country. That is the areas where its summer dormancy features don't appear strongly and the areas where intensive grazing is needed to contain second growth scrub.

Maize

Of the world's crops maize is outstanding for its high yield potential and its genetic flexibility. It is now widely used as a whole plant silage, as well as feed and process grain. Its requirement for particularly warm summers to give high yields is being steadily reduced and its yield ceiling rapidly raised. For us it is the outstanding crop to give large yields of high quality grain or fodder during the summer in the warmer areas of the country. Yields of 20-25,000 lbs of dry matter of high nutrient content (68 per cent TDN), or the equivalent of 180-200 bushels of grain are now being achieved in the warmer areas of the country in a 4-5 months growing season. Pres-
ent indications are that breeding and improved agronomy will produce a 30-50 per cent increase in its yield ceiling in the next decade and along with that substantially extend its ability to produce high yields in areas with cooler summers.

**Small Grain Cereals**

The next group is the small grain cereals, and for the ruminant particularly, oats and barley and possibly rye corn. These are the cool season complement to the maizes and have at least as great potential for development. This is as we incorporate into them the growth characteristics adapted to give high yield under high fertiliser conditions. Again they can be used, once the grain has filled, either as the whole plant stored as low moisture silage or haylage, or with grain harvested separately from the straw.

The role envisaged for them is as a summer crop for the cooler districts and as a winter-spring crop to complement the summer-autumn crop in the warmer districts. Their yields in these roles should be in the range of 10,000 to 20,000 lbs of dry matter, that is 100 to over 200 bushels of grain. Where combined with summer maize there is opportunity for 30,000 to 40,000 lbs of good quality utilisable dry matter per year.

**Lucerne**

The next is lucerne. The potential for this as a high yield legume has been tantalisingly in front of us for a long time and effective work is being done to realise that potential. However, it is a rather finicky crop, that is for soil conditions, for water, and for grazing handling. Also for the ruminant it is as energy food only medium quality roughage. This is when harvested for maximum yield. Its role as a ruminant protein supplement promises to be of decreasing importance. Against this we have its ability to good yields in otherwise difficult areas of the South Island and the manner in which stock do well on it. There is undoubtedly a considerable future for it but how far this is as sheep and cattle fodder complementary to cereal carbohydrate, and how far as process crops for drying and other uses remains to be seen. The potential appears to be in the range of 20-25,000 lbs of dry matter per annum, that is harvested and not grazed.

**Tropical Pasture Grasses**

Finally there are the tropical pasture grasses for predominant use in direct paddock grazing. In the warmer and drier districts these should have a major role in hilly areas and areas not suited to frequent cropping. Their high efficiency of photosynthesis and high efficiency of water use allow very high yields in the late spring, summer, and autumn. As such they start to efficiently use our summer growth potential on that type of land. The taller forms of white clover may have a major role with them as a feed quality supplement as well as nitrogen source. Aerial application of nitrogenous fertilisers is definitely envisaged as at least a partial source of their nitrogen. The model envisaged is a creeping stem plant with enhanced fodder quality of its leaf and enhanced tolerance of cool conditions.
Such attributes exist among the tropical grasses. Such should provide the land with a cover giving a high yield, self regeneration to heal damaged spots, and an effective anti-erosion binding of the surface. The winter period would be met by summer and winter storage cereals grown on valley bottoms and flats and stored, or by carbohydrate bought in from cropping areas. Grain supplementation to give enhanced summer growth of livestock may also become worth while. Yields planned for should be 20,000 lbs, probably plus, of feed intake by the animal.

Some will note that tetraploid winter ryegrass has been omitted. It was suggested originally as a source of protein to balance the summer carbohydrate. Need for much of that is disappearing. Also it has the problem of a smallish seed giving more difficult seed bed requirements, of high fertiliser nitrogen requirement, and the difficulties of handling in the harvests required during the winter and early spring.

CONCLUSION:

Overall the theme presented is to transfer emphasis from leafage to carbohydrate as the dominant source of feed for the ruminant animals, and then to grow a lot of it.

These thoughts are presented as a general assessment of the implications of the trends in crop physiology and our markets. This is as a contribution to what should be a continuing debate and reassessment of where we move for the next phase of development of our climate industry.

In this it is not sufficient to say we are changing. That change must be fast enough and big enough to keep the industry ahead not only of overseas competition but also the increasing competition for development resources from alternative industries within this country.

In this the key ingredients will remain the same as in times past. These are our mild climate giving for much of the country two crop a year potential, plus easy ways of handling our animals; and along with that our Kiwi ingenuity which continuously finds ways of getting high levels of production at costs well below those our competitors judge possible.
INTENSIVE SHEEP FARMING UNDER CONDITIONS OF ADEQUATE RAINFALL IN WEST OTAGO

M. D. Lawlor, Farmer, Tapanui.

This paper outlines the development of a family farm in West Otago.

This inland area 20 miles north-east from Gore has a reliable 36-inch rainfall evenly spread throughout the year. Frosts restrict grass growth during June, July and August. We expect one or two snowfalls each winter, and a major fall every few years which can last for three or four weeks. The soil is a medium to heavy clay loam, which responds well to drainage. After years of heavy liming in the 1930's and 40's the pH now ranges from 5.8 to 6.3.

The farm area is nearly 500 acres, fenced now into 40 paddocks, all mole and tile drained.

After serving a ten-year apprenticeship working for my father, I took over the operation in 1958. At this stage it was one of the highest producing properties in the area. However, as the property was growing more summer grass than could be eaten, I decided to expand stock numbers as fast as extra winter and spring feed could be grown.

My confidence was enhanced by the offer of liberal accommodation from a stock firm for development and extra stock. So with this support, plus advice on drainage and pasture improvement from the local Farm Advisory officers, I set out to improve my position using all the tax incentives that farmers were given.

We were fortunate that the family lawyer was an expert on farming tax laws. He set up a type of company partnership to own the land, which allows a gradual transfer of shares as a method of owner transfer. I lease the land from this family company at an annual rental, and farm it with a limited company. To achieve large increases without refinancing, demanded that we get quick return on all development expenditure; this dictated that we drain and put on the extra stock in the same year. This policy of stocking right up tight on the heels of development has meant that we have been caught once or twice when hit by a bad season. However, it also meant that we got full utilisation of feed in all the good years.

We used on an average two thousand pounds off the top end of our taxable income each year during the period of ten years to 1968, for development and extra sheep. This expenditure was calculated to be yielding about a 17 per cent return—this was much better at that time.

By 1969 we had doubled stock numbers to 10 sheep per acre. This gives us about 10 stock units per acre, when it is taken over all land, minus wheat area. As we have been growing wheat for three years on a small scale following roots, we use these 35 to 40 acres of wheat stubbles as wintering pads on which we self-feed silage in the winter.
IMPORTANT FACTORS IN DEVELOPMENT:

The incentive was there; I had a big block of shares in the land company to pay for, and liked to travel and live well. As a student of economic trends I realised that prices for our main products might not always be good; this, coupled with increasing costs, caused me to spend on development while we had surplus income.

It was a challenge: by attending farmers’ conferences, listening to research people, and studying how big companies developed, I knew much could be achieved. We set out to maximise grass production, following drainage with subdivision, porina control and rotational grazing.

We made a study of winter feeding methods, to enable us to winter our increasing flock more efficiently. After studying silage making in the North Island and Australia, we helped develop self-feed of silage in the South. This enables us to conserve all our early nitrogen boosted surplus feed while the weather is unreliable in the November-December period. About half our later conserved grass is made into hay in January, when conditions are generally better for drying.

By 1968-69 I realised that the quick gains of early development were over; it was time to take a fresh look at things and decide how best to harness the experience and capital developed over these years. I had a young family but no desire to become a traditional family farmer slogging till my son was old enough to shoulder part of the load. Farming is changing very fast, the golden age of family farming could be over. Anyway, why should farmers farm for youngsters who may not have the desire or ability to follow on in what is an ever increasing complex industry?

Over the years I have been encouraged and stimulated by an ever increasing flow of visitors from many countries, who in one way or another are interested in farming development or conservation. This flow of visitors often meant that I was one or two days a week entertaining and guiding people over the farm and around the province in general. I decided that promoting the interchange of ideas and communication held an interesting and rewarding future. As I held strong views on the development of our environment, it was decided to start a Tour Organisation specialising in this type of rural study tour. This was the start of diversification. For this Rural Convention Tour Company, we employ an organising secretary, and several farmers are available as tour managers for a day or two at a time.

After several years of abortive attempts to set up a co-operative machinery pool, we decided last year to establish a hay and silage contracting service ourselves. My brother had just arrived home from working for farmers in West Australia. I sold him my harvesting plant and he contracted to do my hay and silage. As my nitrogen fertilised crops were earlier than most of the rest of the district this suited him very well. One machine he operated was a fast rotary mower and as most of the hay crops were heavy and tangled this year, many farmers found it better business to hire a machine which could cut these tangled crops at a fast pace than spend good money
repairing or renewing their ageing equipment. Silage has become popular, especially with the expanding cattle business and this contributed to the success of the enterprise. This use of contractors, and the fact that fencing and drainage work on our farm consists now of maintenance only, allows one man with some casual assistance to comfortably handle the management of this farm. While I am personally away from the farm quite a lot, this is counter-balanced by the fact that my father, though officially retired, still retains an active interest in the property, and is fit enough to fill in for me one or two days a week. This depth of management is one of the great strengths of many family farms. I would suggest that any person setting out to expand a farm's stock numbers should first consider what stand-in help he has available in the case of ill-health or accident.

WHERE DOES THE FUTURE LIE?

Recent research by the local D.S.I.R. and the Research Division of the Department of Agriculture indicates that large increases in grass production can be achieved on heavily stocked pastures by the strategic use of bag nitrogen. Increases of over 100 per cent were demonstrated under trial conditions on our property last spring. These results were magnified by simulating a long cattle type rotation.

We have been using a small tonnage of nitrogen over the last few years for hay and silage production, and have had profitable response boosting autumn feed for finishing lambs and flushing ewes.

Our local farm discussion group studied the whole subject of diversification into cattle to better harness this nitrogen potential and spread labour loads; however it posed many problems. Wintering was a major problem. After a tour of some of the top properties in Canterbury and a stimulating two days at Lincoln College last December, we finally developed a plan which is now in operation.

Three farmers of which I am one, formed a grazing and export meat company which is known as “GEMCO.” This registered private company, hired the best agricultural business consultant available. Not only is this specialist a Lincoln graduate with a V.F.M. but he also has a B.Com. We secured a wintering contract for several hundred calves in Central Otago. This contract is on a maintenance plus weight gain basis with incentive written into the contract to reward good feeding and management. This solves the wintering problem. These animals come south to the finishing pastures about the 1st of October, thus enabling the summer grazier to finish lambing first and have nitrogen boosted feed available. This summer fattening is also on a weight gain contract to the company. In this way we harness the seasonal feed peaks and climate advantages of various regions. We plan to expand this enterprise as fast as prudent, as scale of operation is essential to cover overheads and show a good dividend.

Parallel with this development GEMCO has established a specialist cattle handling service, complete with mobile cattle scales, crush and portable yards. This unit is pulled by a solid four-wheel drive vehicle, and is now available to farmers in Otago and Southland. Drenching, tagging, weighing, dehorning and spraying are all done
by experienced stockmen on contract basis. We plan to include A.B. in this service next season. This unit is to be followed by several more up the island as demand warrants expansion. We aim to assist farmers to diversify into cattle by relieving them of the need to raise large amounts of capital for stock and equipment. It also generates more flexibility of cattle movement to seasonal feed surpluses.

Meat marketing is an area which has received much of GEMCO's attention; we have entered into an arrangement with an exporting company, which in turn has assisted with some of our financing. GEMCO has already enabled us to specialise. One director does all the buying aided by the portable weighing equipment. Another director is in control of all grazing contracts, while the third director negotiates marketing. The South Island beef industry is expanding fast and we are convinced that this company can play an increasing part in making it a more profitable venture for all farmers.

With this company structure supplying summer cattle we plan to reduce the sheep numbers to a level that can be comfortably wintered on an all grass slow rotation system, with only limited amounts of conserved grass and oats. The research basis for this system has been demonstrated at D.S.I.R. Station, Gore. We expect this all grass system will allow us to comfortably winter seven ewe equivalents per acre and reduce our present need for large expenditure on conservation. The surplus summer feed will be converted directly into meat through the cattle. This will enable one man to comfortably manage the property, using contract shearers, hay contractors and having the GEMCO cattle service available for all cattle work.

CONCLUSION:

To summarise, I suggest if farmers gain confidence in the knowledge that increasing markets will become available, then this southern area can expand its contribution to the export drive considerably. However very careful planning and budgeting will be necessary.

To keep abreast with changing conditions farmers will have to constantly study and apply management and technical developments. We must encourage marketing capital to participate more in production, thus they then have incentive to ensure the return to the producer is at a profitable level.

I am convinced that farming can have most of the advantages of scale, business organisation and specialisation without losing the good features of the family farm, its way of life and pleasant environment.
INTENSIFICATION ON LIGHT LAND IN CANTERBURY

B. K. Cameron, Farmer, Pendarves.

INTRODUCTION

The problems facing the Canterbury light land farmer are those which face all farmers at the moment. They are the cost/price squeeze, low wool prices, industrial disputes and the inability to pass on extra costs to other sectors of the community. As well as all this the Canterbury light land farmer has two other problems of importance: a low and unreliable rainfall and with the impending ban on D.D.T., the return of the grass grub problem.

During the next twenty minutes I intend to give some answers to these by briefly outlining our history of farming, which has been seven years of rapid and intense development of our 500 acres as a dry land proposition and then to discuss recent irrigation developments.

DRY LAND FARMING

The farm is a mixed sheep and cropping unit on the coastal side of Ashburton in the Pendarves district. The average rainfall is 27 inches and we usually have 40-50 days of drought each year. The soil is a Lismore silt loam about eight inches deep. The farm is being run as a family unit, with my wife and myself in partnership. In our first four years on the property we increased our stocking rate from about 1,400 to about 3,200 ewe equivalents. Over the last three years, including two drought years, we have ranged between 2,800 and 3,200 ewe equivalents. In all years we have had some of the farm in crops—usually wheat.

We began farming with a small equity and were fully committed financially. This meant that we had to develop out of income. Because of increasing costs and doubtful markets we decided that we had to make an all-out effort to become established as quickly as possible.

This led us to adopt several basic principles.

1. High Stocking Rates lead to High Output per acre.

Without a doubt high stocking rate is the most profitable technique that we have used in the past. The more stock that we have put on the more profit we have made. A recent study involving budgets at different stocking rates shows quite clearly that in our environment, with present dry-land technology, and with our management, about 61-7 ewe equivalents is our most profitable dry-land stocking rate.

Some of the main reasons for the payoff from high stocking are these.

(a) Rationing. Our sheep are allowed to eat only as much as they need for efficient production for that time of the year. We control their intake to avoid luxury feeding. For example we strongly
believe in reducing the weight of our ewes by 10 to 15 lb in early pregnancy. This has a number of advantages.

* It reduces maintenance requirements.
* It improves stock thrift.
* It reduces lambing troubles considerably.
* It allows conservation of feed for late pregnancy.
* It largely avoids wool breaks at lambing.

(b) Feed use. With high stocking there is maximum utilisation of available growth. Almost nothing is wasted and unpalatable species and even weeds are eaten.

(c) Soil fertility. There is no doubt that additional stock will generate fertility by speeding up the fertility cycle. The rapid return of dung and urine providing readily available nutrients which stimulate more growth. To me this has been one of the most striking results of our development programme and was most noticeable from about the five ewe equivalent level upwards. High soil fertility has also improved the quality of the feed.

(d) Side Effects. One of the most pleasing results of high stocking has been the number of beneficial side effects. High stocking, by bringing about closer grazing has resulted in:

* Complete elimination of footrot.
* Effective porina control.
* Fewer internal parasites.
* Cleaner sheep and therefore less dagging.
* Better weed control.
* Possible grass-grub control.

Together these have added up to a tremendous saving in time, energy and money.

These side effects, together with the effects of rationing feed use, and soil fertility have made us very satisfied with the results of heavy stocking.

2. Economy of Expenditure.

As the net profit is our prime objective we pay a lot of attention to expenditure control. Inefficiencies or unjustified expenses are not allowed. For example.

* No surplus or redundant machinery is kept.
* Stock handling is minimised.
* Cultivation techniques have been simplified.

A major economy has been to only surface cultivate with a chisel plough and harrows. This has meant fast, cheap, and with high fertility, very satisfactory seedbeds. On average I would cultivate and sow at the rate of 1 ½ hours per acre, and do it with an extremely small and inexpensive plant.

3. Work Simplification.

As far as possible the use of extra labour has been avoided. This has meant streamlining techniques, forward planning of work, reduc-
ing types of sheep and crops, and only doing essential jobs. On occasions we employ casual labour or contractors. The farm has been laid out for easy access. The use of a good utility truck gives me mobility and comfort between jobs. At lambing the utility is invaluable.


Today farming is a business. This aspect is being constantly checked by bookwork and research—adequate records allow us access to past performances and a cash book enables us to keep good financial control. Total or partial budgets are used to examine alternatives and plan ahead.

We have always been prepared to take calculated risks. We have made mistakes but on the whole boldness has paid off. To help overcome the uncertainties of farming under a low rainfall we have built flexibility into our farming system. We have to move fast and positively when this becomes necessary. With this type of system timely action can become critical.

In brief, our dry-land farming system has been based on high per acre production achieved by high stocking and associated with a simplified low cost flexible economy. While this system has proved successful in the past, we have been looking at irrigation as a further development.

IRRIGATION

As I have mentioned earlier our low effective and irregular rainfall imposes growth stress over prolonged periods in almost every year. Unfortunately this coincides with optimum warmth and light conditions. Increasing the moisture at these times can greatly increase annual production. At high stocking rates lack of moisture is the main limiting factor to increasing production further.

With this thought in mind and with the need for a good domestic water supply we have sunk a six-inch bore. Geologically this was a long shot but we did find a good supply at about 200 feet. We have since installed a combined irrigation domestic and stock water supply and began irrigating last December. The irrigation part of the system involves pumping about 12,000 gallons per hour using two 20 H.P. electric pumps, through 6,000 feet of cheap and permanent underground mains into two spraylines each covering about one acre. The system applies about 25 points per hour. The layout has been designed to cover a total of 180 acres. Capital investment is about $12,000 or $65 dollars per acre watered. The plant is designed to apply an effective two or three inches over 12 hours and to operate 24 hours per day, with two shifts per day. We can also apply liquid nitrogen through the system.

Our objective has been to minimise labour and upkeep, hence we have used electricity as a source of power, installed underground mains and kept our spraylines down to three inches in diameter. Application rates have been designed to establish a routine twice a day shift and to do 24 hours per day watering. I can easily shift
spraylines covering two acres in 45 minutes. It has become an easy, acceptable routine.

In deciding how best to use the irrigation we had to consider a number of factors.

* The plant would cover only a third of the farm.
* We have only a limited supply of water (½ cusec). This means that pumping for six months would only allow 9-inch coverage over the 180 acres.
* Pumping water from 200 ft makes this plant expensive to operate. Without labour the cost is approaching one dollar per acre per inch applied. Total costs over six months would be about $1,700.
* Soils are light and not suited for intensive cropping.
* A crop rotation must allow a variety of crops each requiring water at different times of the year.
* It must give an improvement in net profit over our existing system.
* It must not involve me in more total work.

With these factors in mind we evolved the following policy which hinges on partial irrigation.

Firstly, on our 320 acres of dry land we have formulated this policy. As lucerne is the outstanding dry land plant for our environment we intend to put the whole of this portion of the farm in lucerne. As part of a lucerne renewal programme we would eventually adopt a rotation of old lucerne → turnips → wheat → green feed → new lucerne. About half of this area is already in lucerne and the balance will be sown within about two years.

We intend to use the 180 acres irrigated land for cash cropping and sheep support crops. Because we are on a light soil type and because watering for special sheep crops can be equally profitable, cash cropping will be restricted to about 60 acres. This might involve two successive years in cash crops followed by three or four years under grazing management. Cash crops, for example, wheat or linseed, might only need one or two waterings but would give substantial increases in yields and gross margins.

The other 120 irrigated acres will be used for sheep forage crops which complement dry-land lucerne. These include fodder beet and Tama ryegrass for winter feed and lucerne and broad red clover for additional summer fattening. An irrigation rotation might be fodder beet → spring wheat → Tama ryegrass (winter and spring grazing) → late sown linseed (undersown with broad red clover) → broad red clover (oversown Tama) → broad red clover (oversown Tama). There might also be some lucerne on the irrigated area. This rotation has a spread demand for water.

With these crops on the irrigated area and lucerne on the dry land area, September-October lambing is the obvious and desirable solution.
Six results now emerge:

1. The sheep economy is legume based.
2. The system is still low cost.
3. There is complementarity between dry and irrigated areas.
4. There is complementarity between plant species within a paddock.
5. All plants are high producing.
6. The system is highly profitable.

I will now enlarge on these in some detail.

1. A legume based economy has these advantages:

   (a) Excellent wool growth. Professor J. D. Stewart is finding that his Corriedale ewes stocked at seven ewes per acre are clipping 12-13 lb of wool. This is largely due to the high protein content of legumes.

   (b) Legumes can fix their own atmospheric nitrogen and are less likely to suffer from nitrogen deficiency.

   (c) Professor J. W. McLean has shown in his lamb fattening trials that legumes are much superior to grass for animal growth.

   (d) By using the over-sowing technique on our irrigated stands of legumes (broad red clover or lucerne) we can capitalise on the excellent winter growing qualities of Tama ryegrass.

   (e) Lucerne is not susceptible to porina or grass grub attack. Broad red clover will not be down long enough to be seriously affected. With the pending ban on D.D.T. this could be very important.

   (f) We prefer broad red clover to lucerne under irrigation because of its easier, quicker and cheaper establishment, easier management, higher quality and possibly greater production.

2. It is a Low Cost System.

   (a) In total, tractor hours will be reduced.

   (b) We will not have to use D.D.T. alternatives.

   (c) Shifting the irrigation plant will involve me in only 1½ hours per day. It is also possible that lucerne would be able to effectively use a 5-inch application in which case I would only shift the plant once a day.

   (d) Nearly all fodder will be grown and fed in situ. The only conserved fodder will be some hay made in very wet years and kept as a strategic reserve. In winter we will be relying upon fodder beet for quantity and Tama ryegrass for quality.

   (e) Built-in flexibility is not so important because we can predict fairly accurately our feed supplies for any time of the year. Our most critical situation could be a dry October-November when we have maximum feed requirements for ewes and lambs. The answer here would be to early wean lambs onto irrigated legumes.
3. There is complementarity between areas. With September-October lambing and using irrigation to ensure good crops of fodder beet and Tama for winter feed we have the means of capitalising on lucerne’s superiority in the spring, summer and autumn. Together we have the means of sustained high production.

4. There is complementarity between species. The best example is broad red clover oversown with Tama. Here we are matching two plants, one superior in the summer and the other superior in the winter. Together they could produce 14,000 lb of quality dry matter over a period of 12 months. With their growth habits they are not competitors but are complementary to each other. With good utilisation and management this combination could support 12-14 ewe equivalents.

5. The system uses the high producing species. Fodder beet, Tama, lucerne and broad red clover are all amongst our highest producing forage crops.

6. The system is highly profitable. Before proceeding with the scheme we did a study of the economics involved. Our calculations (which have been generally agreed upon by various authorities) suggest that on average and with our intended management we can expect an increase in net profit of at least $3,000 per year. This would come from increased crop yields and from being able to carry two extra ewe equivalents per acre.

This increase in net profit would occur in dry, average and wet years. In a dry year crop yields would be maintained and by using techniques such as early weaning of lambs onto the irrigated area we could fatten all lambs and maintain our ewes at satisfactory weights. We would come out of the year with no drought expenses or ulcers. In a wet year we would also profit because we would have the extra stock on hand to convert the extra fodder that would be grown over the whole farm into cash; more wool and heavier lambs in the same year and more wool and higher lambing percentages in the following season. Also in wet years we would have lower irrigation expenses and would be able to build up a reserve of hay or sell to the lucerne factory.

Now a word of warning. Irrigation will not be profitable if it is only going to be used as a drought insurance. To be economic any technique which increases available stock fodder must be accompanied by extra stock to turn that fodder into animal products and into cash. For every extra 1000 lb of dry matter produced we must put on another ewe.

Nor is it enough to apply water to conventional pastures and to use current dry-land management techniques. The whole situation must be rethought from basic principles.

Conclusion.

We are still in the process of rethinking. Extending our present scheme is obviously one thought. Our present plans will take two years to implement and then we might expand to exploit the potential of the broad red clover and Tama combination under irrigation.
Higher fertility sheep, for example, Border Leicester/Corriedale are definitely a consideration.

With high quality legumes always available we may adopt early weaning as a deliberate policy.

The future of the 60 acres of cropping will depend upon gross margins we get.

I have great faith in the future of Canterbury light land farming especially when the important fundamentals of high stocking, low cost farming, irrigation, a legume based economy, complementarity and high producing species are used.
LABOUR-SAVING DEVICES FOR SPRINKLER IRRIGATION FARMING


While the effectiveness of irrigation is indisputable, there are many instances where the high cost of labour detracts from the overall economic advantage and the highest profit potential of a crop is not realised.

Most of the sprinkler systems in New Zealand are hand moved, portable, lateral types which require a minimum of capital but considerable labour to operate if they are to be used efficiently. Because of the difficulty of obtaining and retaining reliable labour for shifting irrigation pipes, we believe that a mechanically-moved system in some form must be introduced if the equipment is to be used to its full advantage and if it is to be used efficiently.

On the U.S.A. and Australian markets there are a number of mechanically moved sprinkler systems available. We propose to describe the types of equipment that are available, to give you a breakdown of their cost and finally to try and assess their physical and economic practicability for use in New Zealand.

Essentially, buyers overseas have a choice of eight major types of sprinkler systems and many versions of these exist. The main types are handmove, tow lines, side roll, side move with and without trailer lines, centre pivot self-propelled, straight lateral self-propelled, giant sprinklers, and solid set.

Hand Move

You will all be familiar with this system. Light weight aluminium pipes have made this system portable and in a survey of the plants operating in the Ashburton County, the capital cost has averaged $20.32 per acre watered, with a range from $9 to $77. The labour requirement is high and one man can shift about one-quarter mile of lateral pipe in half an hour—this would cover about 1.5 acres. There have been no basic changes in this system during the last 15 years, because of its limitations all other types have evolved from this system.

Tow Line

This system consists of rigidly coupled laterals and is equipped with fixed or swivelling two-wheeled carriages attached to the pipe at intervals of 40 to 60 ft. These wheels hold the pipe a foot above the ground. The lateral is towed by a tractor or truck from one set to the next. If the main line is positioned in the centre of the field the lateral can move from one side of the main line to the other. The other movement is in zig-zags down the paddock. The tractor will hook onto the end away from the main line and pull the lateral at 45 degrees away from the main line. The tractor then comes to the other end and pulls again at 45 degrees towards the main line.
The lateral is connected to the main line by a right angle, or a flexible hose. This system works well in grasses and other close growing crops and the cross over system can be used for row crops if a turning area of 200-250 ft in width is left along the main line. The whole length of area is irrigated.

The cost of a quarter mile of this system would range from $4,000 to $5,000.

Side-Roll Lateral System

The side-roll lateral is stationary during the period of sprinkling. The lateral is used as an axle. Hand-operated bicycle pedals were first used to power the mover mechanism. Today one or two small petrol engine-powered movers are used to move a quarter mile of side-roll laterals. When the water is shut off, the pipe drains, then the whole lateral line rolls to the next set (about 60 ft) and the water is started again after connecting back onto the main line. These mover units require the irrigator to walk considerable distances to start the petrol engines and to further reduce the labour input, equipment has been developed to operate the mover units from the main line end of the side-roll lateral. These end-move devices include a petrol engine-driven shaft, tractor-driven shaft and an electric motor unit driven and controlled from a tractor-powered electric generator. Remote starting and hydraulic controls allow starting the engine and control of the mover unit from the main line end of the lateral.

This unit works well in close-growing crops and low-growing crops. It is best adapted to rectangular fields without obstructions and with fairly uniform topography. The problem of moving the side-roll unit laterally from one position to another is perhaps best solved by use of blocks mounted on a cable at the spacings of the wheels. The lateral wheels are rolled onto the blocks and then the whole unit is pulled into the new position by a tractor.

The cost for a quarter mile of this unit is between $5,000 and $6,000.

Side-Move Tow Combination

This is a development of the side-roll system to enable the sprinkler to be placed above tall crops such as corn and sugar cane. The sprinkler lateral is supported at 50 to 60 ft intervals with a two-wheeled carriage arrangement. The system is moved by a 5-10 H.P. petrol engine through a line shaft by belt, chain-drive, gear mechanism or electric motors. Trailing pipelines varying in diameter from one to two inches are used on some systems. The lateral and trailer lines are moved by the power unit at one time. From one to seven sprinklers are mounted on each trailer line, making the seven sprinkler trailer line system equivalent to eight hand-move quarter-mile laterals. Outrigger stabilizers are used on the trailer lines to increase the stability of the sprinkler riser and improve water distribution. For right angle change in direction wheels are turned parallel with the pipeline and locked and trailer lines are placed on a rack attached to the lateral pipe-line and the whole system moved to another location either under its own power or by tractor. There is one on the
Australian market which is fixed at the centre and can cover 20 to 100 acres in five-acre settings.

Cost of this system to cover 6.67 acres per setting is between $7,000 and $8,000.

Centre Pivot, Self-Propelled

The foregoing efforts at mechanisation are directed primarily towards improved methods of moving equipment from one set position to the next set position, or towards ways and means for giving greater areas of coverage per individual set of the given system. Travelling irrigation machines similar to those used for many years for irrigating small lawn areas have until recently eluded agricultural equipment designers due primarily to the unavailability of ways and means for supplying the large quantities of water required by an agricultural unit. The centre-pivot, self-propelled system is anchored at the centre and water is introduced at this point from a well, irrigation canal or stream. Sprinklers, varying in type, nozzle size, and discharge capacity are spaced at intervals along the lateral with the largest discharge farthest from the pivot point. Towers supporting the laterals are mounted on wheels, crawler tractor tracks, or skids and the motive power may be supplied by water-driven hydraulic cylinders, rotating arm type sprinklers or electric motors. Mean application ranges from 0.69 inches to 2 inches per hour and the system may supply 1 inch to 3½ inches per acre at each rotation.

Continuously moving sprinkler systems have many advantages over similar stationary equipment. Among these are the following:

(a) Larger area coverage due to continuous operation capability.
(b) Wider sprinkler spacing possible with moving systems.
(c) Excellent uniformity achieved even at wider spacings.
(d) Uniformity not affected by wind to as great a degree as non-moving systems.
(e) Labour saving.
(f) Adjustable application with variable travel speed.
(g) Well suited to use for frequent light applications since movement is continuous and automatic.

In addition to the above advantages, we find in the overseas literature some evidence that would indicate that a given soil type can be subjected to a much higher maximum precipitation rate under a moving sprinkler than can be tolerated when non-moving equipment is used. It has been theorised that this is associated with the fact that any given location in the irrigated area is subjected to a variable precipitation rate as the sprinkler travels into and out of the area. The soil surface at any point is subjected to the maximum precipitation rate of the system for only a short time interval approximately half way through the total irrigation period. If the soil has not been sufficiently wetted by that time to have caused the normal declining infiltration rate characteristics of the soil to reach the maximum allowable continuous application rate for the soil quite conceivably, precipitation rates higher than have previously been considered “maximum” would not cause puddling.
The lateral pipeline in most centre pivot, self-propelled systems is rigid pipe, but some have flexible joints at each support which permits satisfactory operation on uneven terrain. All systems have built in safety devices that stop the lateral if a section gets out of alignment. Laterals vary in length from a few hundred feet to 1600 feet. The most common lateral length is 1285 feet, which will irrigate a circular 130-acre area out of a square 160 acre field.

Cost for a 1285 feet lateral system is between $17,000 and $29,000.

The Straight, self-propelled Lateral

A co-operative effort by a rubber company and the sprinkler irrigation industry, has developed a new type of irrigation hose that has allowed for the development of continuously moving sprinklers similar to existing lawn units. A radical departure from previous concepts of hose design, the newly available irrigation hoses are built in continuous long lengths and have physical properties which allow them to be dragged along the ground while full of water. These hoses are extended to full length and connected to the irrigating machine at the beginning of its run. The machine is operated along a path that passes close to the water source outlet to which the inlet end of the hose is attached. As the irrigation machine passes adjacent to the water supply outlet, the hose forms an elongated “U” behind the machine. As the machine proceeds further along its travel path the hose is extended full length in the opposite direction from which it was originally laid out. Utilization of the irrigation hose in this manner allows for a continuous movement for a distance equal to twice the length of hose and with a 660 feet hose a quarter mile of continuous travel for uninterrupted irrigation passes through a square forty-acre paddock.

A quarter mile lateral and 660 feet of hose would cost about $14,000.

Giant Sprinkler System

Numerous arrangements of water distribution by use of giant sprinklers are on the market. The degree of automation ranges from hand-move to self-propelled. They may consist of one or more sprinklers discharging from 100 to 2,000 gallons per minutes over an area of 200-400 feet in diameter. The self-propelled units are of two types. In the first the water is led to the giant sprinkler by an open race. The unit will have a dam and a trailing suction pipe and operation will begin at the top of the field. The races must be spaced at intervals across the field. The other type has a flexible high pressure hose to supply the water to the unit and it winches itself across the paddock. The hoses are mechanically handled by either power driven reels or by dragging in the paddock around capstans to the next setting. This system is limited to soils with a high intake rate and a compaction problem may be experienced. This system also requires the highest operating pressure (in excess of 100 pounds per square inch) of any system described in this paper.

Cost of a self-propelled raingun delivering 500 gallons per minute is between $6,000 and $8,000.
Solid Set System

A dramatic reduction, or in some cases, elimination of irrigation labour has been achieved in high value crops by the use of the solid set system or the permanent sprinkler system. The solid set system has portable pipelines which are moved only to allow for cultivating and harvesting. The permanent system consists of a total coverage network that is buried below the surface of the paddock with only risers and sprinklers extending above ground level. Some systems may be operated in blocks of laterals with all sprinklers on a lateral operating simultaneously. Other systems have sequencing valves under each sprinkler head that allows the operation of one or more sprinklers on each lateral at one time. With this type a momentary interruption of the water pressure shuts off the operating sprinkler head and turns on the next sprinkler on the lateral. A time clock is used to control the momentary pressure interruption by closing an electric valve or shutting off a pump. Thus irrigation can be completely automatic on these systems. Several investigators have also reported benefits other than irrigation that can be derived from the use of these systems. Among these benefits are the following:

(a) Frost protection;
(b) Crop cooling;
(c) Application of  
  1. Fertilisers;
  2. Fungicides;
  3. Insecticides.

The cost of this system is in the range of $300 to $500 per acre and is applicable to small areas of high return products.

Comparison of Mechanically Moved Sprinkler Systems

Each type of system will have advantages and disadvantages but regardless of the type of system used, it should meet certain requirements.

(a) The application rate should not exceed the ability of the soil to absorb water. Run-off water is evidence of too high an application rate.
(b) The amount of water applied during an irrigation should not exceed that which can be held within the root zone of the crop.
(c) The system should be of such a size and capacity that it is able to replenish the soil moisture at a rate equal to the peak rate of water used by the crops irrigated.
(d) Water should be applied as uniformly as practical over the field. The point of lightest application should receive at least 80 per cent as much water as the average for the paddock.
(e) Distribution pipes should be large enough so that there is an economic balance between pipe cost and power cost.
(f) Water must be applied in a way that will not physically damage the crop or soil.

Because of the difficulty of comparison on actual farms and because some of the systems are not available in New Zealand we have made comparisons based on the following:
(a) A peak daily water requirement of 0.12 inches (12 points).
(b) Water is available at the top end of the farm at ground level. Any cost associated with bringing the water to this point is additional.
(c) An average fall across the farm of 3 inches to 6 inches per chain.
(d) Pressure loss along the laterals is limited to 20 per cent of the maximum, this being consistent with good system design.
(e) A yearly water requirement of 12 inches in six irrigations.
(f) A twelve day fortnight.
(g) Labour costs $2 per hour.
(h) Electricity costs 1.2 cents per unit.
(i) Management ability is such that any irrigation system is operated at its optimum level.
(j) Repairs and maintenance on above-ground equipment is at 5 per cent of the capital cost and for the underground parts it is 1 per cent.
(k) Life expectancy of equipment:
    15 years for above ground parts.
    30 years for underground parts.

HAND MOVE SYSTEM

This is a conventional system with portable aluminium lateral with sprinklers every 50 feet. Each lateral shift is 50 feet and the system is designed to irrigate 100 acres in 50 shifts.

CAPITAL COST

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<th>Item</th>
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<tr>
<td>Lateral 1700 ft 4 inch aluminium</td>
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<tr>
<td>Sprinklers (34)</td>
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<td>Main line 1000 ft 8 inch Fibrolite</td>
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</tr>
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<td>1600 ft 6 inch Fibrolite</td>
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<td>17 hydrants</td>
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<td>Pump and motor</td>
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<td>Capital cost per acre</td>
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OPERATIONAL COSTS

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<th>Labour: 40 minutes to shift lateral line, i.e. 20 minutes per acre = 67c per acre. Annual cost—$4.02.</th>
</tr>
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<tbody>
<tr>
<td>Pumping: Electric power 19KW/hour, i.e. 47.5 units per acre per irrigation = 57c per acre per irrigation. Annual cost—$3.42.</td>
</tr>
<tr>
<td>Repairs and Maintenance Equipment above ground</td>
</tr>
<tr>
<td>below ground level</td>
</tr>
<tr>
<td>Annual cost per acre $1.42.</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
FIXED COSTS

Depreciation:
Equipment above ground ... ... ... 144.13
below ground level ... ... ... 112.00

Annual cost per acre $2.56.
Interest at 6\% on $5522 = $331.32.
Annual cost per acre $3.31.

TOW LINE SYSTEM

This example has a pump mounted on a tractor and 1200 feet of lateral sprinkler line mounted on a swivelling two-wheel carriage unit. There is 160 feet of main line and two races with pumping ponds every 320 feet. It is designed to apply 0.86 inches per hour and has 80 feet moves and the sprinklers are spaced at 25 feet intervals on the lateral. To apply two inches of water it would take two hours 20 minutes and there could be seven to eight shifts per day each of 2.2 acres. In the two-week period 200 acres would be commanded.

CAPITAL COST

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral line mounted with sprinklers</td>
<td>4441</td>
</tr>
<tr>
<td>Pump and motor</td>
<td>1722</td>
</tr>
<tr>
<td>Race and pumping ponds</td>
<td>462</td>
</tr>
<tr>
<td>Capital cost per acre</td>
<td>$33.13</td>
</tr>
</tbody>
</table>

OPERATIONAL COST

Labour: One man can shift the lateral in 15 minutes.
Each time the pumps are shifted it takes 45 minutes.
20 shifts at 45 minutes = 900
72 shifts at 15 minutes = 1080

92 shifts = 1980
Each time the pump shifted it takes 45 minutes.
Each shift 21.5 minutes, i.e. 9.9 minutes per acre = 33c per acre per irrigation.
Annual cost per acre $1.98.

Pumping:
40 H.P. tractor at $1.00 per hour
Cost per irrigation = $2.33
Cost per acre per irrigation = $1.06
Annual cost per acre = $6.36.

Sprinkler line ... ... ... ... ... 222.05
Motor and pump 10\% ... ... ... ... ... 172.20
Race ... ... ... ... ... ... ... ... ... ... 4.65

$398.90

Annual cost per acre $1.99.
FIXED COST

Depreciation:
Equipment ... ... ... ... ... 296.07
Tractor and pump (10 years) ... ... ... 172.20
Race ... ... ... ... ... 15.40

Annual cost per acre $2.42.
Interest 6% on $6625 = $397.50.
Annual cost per acre $1.98.

SIDE ROLL LATERAL SYSTEM

This system is designed to irrigate a square 160-acre area with a main line down the centre and a pump at the upper end. With 64 inch diameter wheels each lateral shift would be 66 feet. To irrigate the area with a 20-chain lateral there would be 80 settings. The unit would apply 0.70 inches per hour and each setting would be 2 hours 50 minutes long.

CAPITAL COST

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral line mounted with sprinklers</td>
<td>3397</td>
</tr>
<tr>
<td>Four-wheel drive unit</td>
<td>852</td>
</tr>
<tr>
<td>Main line 1000 ft 8 inch Fibrolite pipe</td>
<td>1500</td>
</tr>
<tr>
<td>1500 ft 6 inch Fibrolite pipe</td>
<td>1350</td>
</tr>
<tr>
<td>40 hydrants</td>
<td>1200</td>
</tr>
<tr>
<td>Pump and motor</td>
<td>1220</td>
</tr>
<tr>
<td>Capital cost per acre</td>
<td>$9519</td>
</tr>
</tbody>
</table>

OPERATIONAL COST

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour: 15 minutes to shift, == 7.5 minutes per acre or 25c per acre per irrigation.</td>
<td></td>
</tr>
<tr>
<td>Annual cost per acre $1.50</td>
<td></td>
</tr>
<tr>
<td>Pumping: Electric power 30KW per hour</td>
<td></td>
</tr>
<tr>
<td>== 42.5 units per acre per irrigation</td>
<td></td>
</tr>
<tr>
<td>== 52c per acre per irrigation.</td>
<td></td>
</tr>
<tr>
<td>Annual cost per acre $3.12</td>
<td></td>
</tr>
<tr>
<td>Repairs and Maintenance</td>
<td></td>
</tr>
<tr>
<td>Equipment above ground</td>
<td>273.45</td>
</tr>
<tr>
<td>below ground level</td>
<td>40.50</td>
</tr>
<tr>
<td>Annual cost per acre $1.96</td>
<td></td>
</tr>
</tbody>
</table>

FIXED COSTS

Depreciation
Equipment above ground ... ... ... 377.93
below ground level ... ... 135.00

Annual cost per acre $3.21
Interest at 6% on $9519 = $571.14
Annual cost per acre $3.76.
SIDE-MOVE TOW COMBINATION

This system is designed to irrigate a square 160-acre area with a main line down the centre and the pump at the upper end. The unit has 33 trailing lines each 200 feet long and spaced at 40 feet intervals along the 20-chain, five-inch lateral. Each 40 foot section of the lateral is mounted on a pair of wheels connected by a chain. The chain passes over the driving pulley which is driven by a line shaft powered by a 10 H.P. engine. The unit will have two ten-hour settings per day of 6.67 acres each and the precipitation rate will be 0.21 inches per hour.

CAPITAL COST

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1290 ft of 5 inch pipe</td>
<td>1290</td>
</tr>
<tr>
<td>198 sprinklers</td>
<td>644</td>
</tr>
<tr>
<td>Hose</td>
<td>1018</td>
</tr>
<tr>
<td>33-wheel unit</td>
<td>3300</td>
</tr>
<tr>
<td>Fittings</td>
<td>1000</td>
</tr>
<tr>
<td>Motor and gearing</td>
<td>600</td>
</tr>
<tr>
<td>Lateral mounted and sprinklers</td>
<td></td>
</tr>
<tr>
<td>Main line 1500 ft of 8 inch Fibrolite pipe</td>
<td>2250</td>
</tr>
<tr>
<td>1000 ft of 6 inch Fibrolite pipe</td>
<td>900</td>
</tr>
<tr>
<td>40 hydrants</td>
<td>1600</td>
</tr>
<tr>
<td>Pump and motor</td>
<td>1320</td>
</tr>
<tr>
<td>Capital cost per acre</td>
<td>$87.01</td>
</tr>
</tbody>
</table>

RUNNING COSTS

Labour: 30 minutes to shift unit i.e. 4.5 minutes per acre.
= 15c per acre per irrigation.
Annual charge per acre $0.90.

Pumping: Electric power 22.3K.W./hour.
= 32 units per acre per irrigation.
= 38c per acre per irrigation.
Annual cost per acre $2.28.

Repairs and Maintenance
Equipment above ground                               | 468.60 |
below ground level                                     | 48.50  |
Annual cost per acre $3.16.

FIXED COST

Depreciation:
Equipment above ground                               | 611.47 |
below ground level                                     | 158.33 |
Annual cost per acre $4.81.
Interest at 6% on $13,922 = $835.32.
Annual cost per acre $5.22.
CENTRE PIVOT SELF-PROPELLED SYSTEM

Water is supplied through a swivel coupling at the centre of the irrigation area to a 1325 foot lateral made up of 875 feet of 6¾ inch diameter pipe and 450 feet of six inch diameter. The pipe is supported at 90 foot intervals by self-propelled towers. Each tower is propelled by a water driven motor and the drive is through a gear reduction to a chain, driving a pair of tyres. The wheels can be turned to move the system endways. The speed of rotation can be varied from one foot per minute to seven feet per minute on the outside tower. By a system of slaved motors and cable controls the alignment of the system is maintained. This system can water a circular area of 140 acres in six days applying two inches of water. The unit could then be shifted to another 140 acres for the next six days. The capital cost of this system on the U.S.A. market would be just over $17,000. For this paper a New Zealand cost of $20,000 has been used.

CAPITAL COST

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost per acre</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1325ft unit</td>
<td></td>
<td>20,000</td>
</tr>
<tr>
<td>80 chain race at $2 per chain</td>
<td></td>
<td>160</td>
</tr>
<tr>
<td>Pump and motor and connection</td>
<td></td>
<td>3,300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23,460</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$83.79</td>
</tr>
</tbody>
</table>

OPERATING COST

Labour: The unit needs the minimum of attention and to irrigate the 140 acre area 1.5 man hours would be required. The unit would take 4 man hours to shift it to the second position. The labour requirement of 280 acres irrigated is 11 hours, i.e. 2.4 minutes per acre = 8c per acre per irrigation. Annual cost per acre $0.48.

Pumping
Electric power 45 K.W. per hour = 46 units per acre per irrigation. = 55c per acre per irrigation. Annual cost per acre $3.30.

Repairs and Maintenance:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost per acre</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td></td>
<td>1175.00</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>1.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1176.60</td>
</tr>
</tbody>
</table>

FIXED COSTS

Depreciation:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost per acre</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td></td>
<td>1500.00</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>5.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1505.33</td>
</tr>
</tbody>
</table>

Annual cost per acre $5.38. Interest at 6% on $23,460 = $1407.60. Annual cost per acre $5.03.
STRAIGHT LATERAL SELF-PROPELLED SYSTEM

This system involves a five-inch, 1320 feet lateral mounted on wheels and the unit moves down the paddock at a constant speed applying two inches of water to 200 acres in two weeks. Water is supplied to the lateral by a flexible hose. This system will have an open race and pumping ponds at 13200 feet intervals.

<table>
<thead>
<tr>
<th>CAPITAL COST</th>
<th>$</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounted lateral and sprinklers</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>660ft of 5 inch hose</td>
<td>4,620</td>
<td></td>
</tr>
<tr>
<td>Pump, motor and connection</td>
<td>3,100</td>
<td></td>
</tr>
<tr>
<td>90 chain of race and 5 pumping ponds</td>
<td>320</td>
<td></td>
</tr>
<tr>
<td>Cost per acre</td>
<td></td>
<td>$18,040</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$90.20</td>
</tr>
</tbody>
</table>

OPERATIONAL COST

Labour: It would take 8 hours to irrigate the 200 acres i.e. 2.4 minutes per acre

= 8c per acre per irrigation

Annual cost per acre $0.48.

Pumping: Electric power 40 K.W. per hour

= 34 units per acre per irrigation

= 40c per acre per irrigation

Annual cost per acre $2.40.

Repairs and Maintenance

| Equipment                                           | 886.00 |
| Race                                                | 3.20   |
|                                                     | 889.20 |

Annual cost per acre $4.45

FIXED COSTS

Depreciation:

| Equipment                                           | 1,181.33 |
| Race                                                | 10.67    |
|                                                     | 1,192.00 |

Annual cost per acre $5.96.

Interest at 6% on $18,040 = $1,082.40

Annual cost per acre $5.41.

BIG GUN SELF-PROPELLED SYSTEM

This system is designed to irrigate 140 acres in the two-week period and has a giant sprinkler mounted on a trailer. A 660 foot, four-inch hose supplies the water to the sprinkler from a pump which is shifted along the race.

<table>
<thead>
<tr>
<th>CAPITAL COST</th>
<th>$</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giant sprinkler mounted on trailer</td>
<td>3,240</td>
<td></td>
</tr>
<tr>
<td>660ft 4 inch hose</td>
<td>3,135</td>
<td></td>
</tr>
<tr>
<td>Pump, motor and connection</td>
<td>2,875</td>
<td></td>
</tr>
<tr>
<td>60 chains of race</td>
<td></td>
<td>9,250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>360</td>
</tr>
<tr>
<td>Cost per acre</td>
<td></td>
<td>$9,610</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$68.64</td>
</tr>
</tbody>
</table>
OPERATIONAL COSTS

Labour: 30 minutes to shift each day i.e. 2.6 minutes per acre
    = 8.7c per acre per irrigation
Annual charge per acre 52c.
Pumping: Electric power 60K.W. per hour.
    = 110 units per acre per irrigation.
    = $1.32 per acre per irrigation
Annual cost per acre $7.92.
Repairs and Maintenance

<p>| Equipment  | 462.50 |</p>
<table>
<thead>
<tr>
<th>Race</th>
<th>3.60</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$466.10</td>
</tr>
</tbody>
</table>

Annual cost per acre $3.33

FIXED COST

Depreciation:

<p>| Equipment  | 616.67 |</p>
<table>
<thead>
<tr>
<th>Race</th>
<th>12.00</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$628.67</td>
</tr>
</tbody>
</table>

Annual cost per acre $4.49.
Interest at 6% on $9610 = $576.60
Annual cost per acre $4.12

PERMANENT SOLID SET SPRINKLER SYSTEM
This system is designed to irrigate a ten acre area. It is fully automated and will operate without any labour or a section of it may be controlled from a control panel.

CAPITAL COST

| Underground pipe installed | 2,264 |
| Sprinklers                | 925   |
| Control unit              | 1,211 |
| Pump and motor            | 204   |
|                          |       |
| Capital cost per acre     | $4,604|

OPERATIONAL COST

Labour: Only required for repairs and maintenance.
Pumping: Electric power 2K.W. per hour.
    = 48K.W. per acre per irrigation
    = 57c per acre per irrigation
Annual cost per acre $3.42

Repairs and Maintenance

| Underground pipe | 22.64 |
| Other            | 117.00|
|                  |       |
| Annual cost per acre | $139.64|

FIXED COSTS

Depreciation:

| Underground pipes | 75.27 |
| Other             | 216.00|
|                   |       |
| Annual cost per acre | $291.27|

Interest at 6% on $4,604 = $276.24
Annual cost per acre $27.62.
<table>
<thead>
<tr>
<th>System</th>
<th>Area Irrigated Acres</th>
<th>Item</th>
<th>Capital Cost</th>
<th>Annual Fixed Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total Cost</td>
<td>Cost/ Acre</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Hand Move</td>
<td>100</td>
<td>Lateral and sprinklers</td>
<td>1,562</td>
<td>15.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Main line</td>
<td>3,360</td>
<td>33.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pump and motor</td>
<td>600</td>
<td>6.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5,522</td>
<td>55.22</td>
</tr>
<tr>
<td>Tow Line</td>
<td>200</td>
<td>Lateral and sprinklers</td>
<td>4,441</td>
<td>22.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Race and pumping ponds</td>
<td>462</td>
<td>2.31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pump and motor</td>
<td>1,722</td>
<td>8.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6,625</td>
<td>33.13</td>
</tr>
<tr>
<td>Side Roll</td>
<td>160</td>
<td>Lateral and sprinklers</td>
<td>3,397</td>
<td>21.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive Unit</td>
<td>852</td>
<td>5.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Main line</td>
<td>4,050</td>
<td>25.31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pump and motor</td>
<td>1,220</td>
<td>7.63</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>9,519</td>
<td>59.49</td>
</tr>
<tr>
<td>Side Move</td>
<td>160</td>
<td>Lateral lines, mover &amp; sprinklers</td>
<td>7,852</td>
<td>49.08</td>
</tr>
<tr>
<td>Tow</td>
<td></td>
<td>Main line</td>
<td>4,750</td>
<td>29.69</td>
</tr>
<tr>
<td>Combination</td>
<td></td>
<td>Pump and motor</td>
<td>1,320</td>
<td>8.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,922</td>
<td>87.01</td>
</tr>
<tr>
<td>System</td>
<td>Area Irrigated Acres</td>
<td>Item</td>
<td>Capital Cost</td>
<td>Annual Fixed Costs</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------</td>
<td>-------------------------------------</td>
<td>--------------</td>
<td>--------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total Cost</td>
<td>Cost/acre</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Centre Pivot</td>
<td>280</td>
<td>Lateral and sprinklers</td>
<td>20,000</td>
<td>71.43</td>
</tr>
<tr>
<td>Self</td>
<td></td>
<td>Race</td>
<td>160</td>
<td>.57</td>
</tr>
<tr>
<td>Propelled</td>
<td></td>
<td>Pump, motor and connection</td>
<td>3,300</td>
<td>11.79</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>23,460</td>
<td>83.79</td>
</tr>
<tr>
<td>Straight</td>
<td>200</td>
<td>Lateral and sprinklers</td>
<td>10,000</td>
<td>50.00</td>
</tr>
<tr>
<td>Lateral</td>
<td></td>
<td>Hose</td>
<td>4,620</td>
<td>23.10</td>
</tr>
<tr>
<td>Self</td>
<td></td>
<td>Race and pumping ponds</td>
<td>320</td>
<td>1.60</td>
</tr>
<tr>
<td>Propelled</td>
<td></td>
<td>Pump, motor and connection</td>
<td>3,100</td>
<td>15.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>18,040</td>
<td>90.20</td>
</tr>
<tr>
<td>Big Gun</td>
<td>140</td>
<td>Sprinkler and trailer</td>
<td>3,240</td>
<td>23.11</td>
</tr>
<tr>
<td>Self</td>
<td></td>
<td>Hose</td>
<td>3,135</td>
<td>22.39</td>
</tr>
<tr>
<td>Propelled</td>
<td></td>
<td>Race and pumping ponds</td>
<td>360</td>
<td>2.57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pump, motor and connection</td>
<td>2,875</td>
<td>20.57</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9,610</td>
<td>68.64</td>
</tr>
<tr>
<td>Permanent</td>
<td>10</td>
<td>Underground pipe</td>
<td>2,264</td>
<td>226.40</td>
</tr>
<tr>
<td>Solid</td>
<td></td>
<td>Sprinklers</td>
<td>925</td>
<td>92.50</td>
</tr>
<tr>
<td>Set</td>
<td></td>
<td>Control unit</td>
<td>1,211</td>
<td>121.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pump and motor</td>
<td>204</td>
<td>20.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4,604</td>
<td>460.40</td>
</tr>
</tbody>
</table>

Note: Deprn. = Depreciation
Interest = Interest Charge
<table>
<thead>
<tr>
<th></th>
<th>Labour</th>
<th>Pumping</th>
<th>Repairs &amp; Maintenance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minutes/</td>
<td>Annual</td>
<td>Cost/Acre / Year</td>
<td>Cost/Acre / Year</td>
</tr>
<tr>
<td></td>
<td>Acre</td>
<td>Cost/Acre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand Move</td>
<td>20.0</td>
<td>4.02</td>
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<td>1.42</td>
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Table 3
SUMMARY OF SYSTEM

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CONCLUSIONS

The trend in sprinkler irrigation systems is towards more mechanization; a substitution of capital for labour.

It is apparent from the paper that mechanization will require a substantial capital investment and that there is a limitation to the area that can be irrigated by these machines. This would mean that intensification of production to include the highest earning produce will be associated with automated mechanized sprinkler systems.

In New Zealand we will see the solid set systems move into the orchards and market garden crops. On the larger scale irrigation projects where sprinkler equipment is to be used there will be a move towards the side-move tow combination system because it has a low labour requirement and a low precipitation rate which should cause less compaction and puddling of the soil surface than other systems which have a much higher precipitation rate.

Having described the systems available to date it does not mean that continuing research will not reduce the capital involved and increase the efficiency in operation of sprinkler irrigation systems.

ACKNOWLEDGEMENT

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B. R. Homersham Ltd.
INTRODUCTION

"Better the devil you know than the one you don’t." This may be sound argument for the marriage counsellor, but has little other application in a progressive society! Man progresses through change and so too, almost imperceptibly, do his animals. It is well to remember that introduction of new breeds is perhaps the oldest known method of livestock improvement. All New Zealand farm animals are strictly "exotic." The original breeds imported were naturally those familiar to the early (British) settlers. Thanks to tradition and later to animal quarantine regulations, subsequent importations have stemmed largely from the same sources. Many of these breeds have adapted admirably to our conditions, have been improved to high levels of productivity and have provided the foundation for such notable new breeds as the Corriedale, Perendale, South Suffolk and Coopworth. It cannot be disputed, however, that the sample was limited. Of equal significance are recent changes in production patterns, in market requirements and in genetic knowledge. Might we not, therefore, profit by introducing other breeds as yet untried—a practice very successfully pursued by our plant breeders? I shall define as “exotic” any recognised breed for which purebred commercial stock are not locally available.

At the outset let me concede the overriding importance of adequate disease control in any importation programme. My concern here is with potential for genetic improvement and I will assume, with a very high degree of confidence, that the quarantine safeguards applied will be completely effective, backed by the latest knowledge and techniques of disease prevention.

Much of the information summarised here was obtained during a brief yet comprehensive visit to Europe last year. I would like to acknowledge the generosity of the French authorities for making this visit possible and also of the Ministry of Agriculture in Germany for excellent organisation of my stay there. During some of these travels I had the pleasure of the company of Professor I. E. Coop, well known to all of you.

USAGE OF NEW BREEDS

Exotic breeds could be used for several purposes:—

1. To replace existing breeds to which they are superior in overall productivity.

2. To cross with local breeds in order to improve or confer specific qualities, followed by interbreeding. This is particularly useful in improving traits, such as fertility or heat tolerance, which show small response to selection within breeds but large genetic differences between breeds.
3. For direct crossing with local breeds in a stratified breeding system to produce superior commercial stock, either for slaughter (e.g. dairy beef) or for breeding (e.g. fat lamb dams).

4. To contribute desired attributes to a “gene pool” from which superior new breeds can be derived, perhaps “custom-built” to specification.

5. In a systematic crossbreeding programme designed to utilise hybrid vigour. This could be effective for traits concerned with reproduction and survival, usually of low heritability, where performance of crosses may surpass that of either parental breed.

6. To establish a new breed for some special production purpose, e.g. carpet-woolled sheep or mohair goats.

It will be evident that for most purposes effective utilisation of imported stock involves some degree of crossing with local breeds. Breed establishment or breed change itself is most rapidly effected by “grading up,” i.e. by continual backcrossing to males of the new breed, a notable New Zealand example being the transition from Shorthorn to present-day Jersey commercial dairy herds.

**CHOICE OF BREEDS**

Exotic breeds will contribute to livestock improvement only if they are superior to local stock in at least some aspects of production or if they show marked hybrid vigour in crosses with local breeds. Overseas experimental or farm production data provide a useful and a necessary indication of the performance potential of different breeds. It must be remembered, however, that farming conditions overseas—particularly in the northern hemisphere—are vastly different from those of New Zealand. Local testing is clearly essential before the role and the potential of any new breed can be fully assessed. For this purpose imported animals, themselves likely to be highly selected, should be compared with the best rather than average local stock. Desirably of course we should first know the relative productive merits of our existing breeds, as a basis for comparison.

The capacity of the Maximum Security Quarantine Station is obviously limited. So too are the experimental facilities needed for adequate evaluation of imported breeds under a range of conditions. Great importance therefore attaches to choice of the very small number of breeds which can be imported and effectively tested. Selection must be based on our improvement needs, in relation to production patterns and market prospects, and on the potential of overseas breeds to meet these needs.

**DAIRY CATTLE AND PIGS**

There is no present indication that any overseas breed can surpass the Jersey in efficient butterfat production or the Friesian in per cow milk yield. Recent studies in several European countries suggest that the North American Friesian or “Holstein,” from which the New Zealand breed largely originates, has higher milk production potential than the European strains or other local breeds. The New Zealand Dairy Board’s herd improvement and AB sire selection pro-
grammes are as efficient as any in the world and can be relied upon to maintain the high genetic quality of our dairy herds.

Significant overseas developments in pig breeding have included extensive breed comparison and crossbreeding studies. These suggest that the Pietrain from Belgium, the Hampshire from U.S.A. and the Lacombe from Canada might have potential for productive improvement of New Zealand stock. The success of the comparatively recent (Swedish) Landrace importation is worthy of note. The relatively small contribution of pig production to the national economy does not, however, justify high priority for importation of pig breeds.

SHEEP

Notable changes have occurred in the New Zealand sheep industry in recent years. On the one hand farm productivity has increased dramatically to the extent, for example, that twin births have become an asset rather than a liability even under many hill-country conditions. On the other, returns from meat have increased relative to those from wool. These changes are clearly relevant to breeding objectives.

The major attributes of economic importance in sheep production are listed in Table 1.

<table>
<thead>
<tr>
<th>TABLE 1.</th>
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<td>Yield</td>
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<td>Wool Quality</td>
<td>Economically Important Attributes</td>
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110
Few will dispute that higher lambing percentage is the key to greater efficiency of sheep production. Improvement is needed also in lamb growth rate and carcass quality, of dam as well as of sire breeds; excessively large mature size of the breeding ewe, with consequent high maintenance food costs, should however be avoided. Although wool has declined in relative importance it is still likely to contribute substantially to overall profitability; both fleece weight and wool quality must continue to receive attention. Milk production in the ewe may demand greater emphasis as the number of multiple births increases, unless satisfactory artificial rearing or early weaning systems can be developed and applied. Early sexual maturity, permitting lambing at one year of age, could have obvious value in increasing efficiency of production. Other important attributes are adaptability to New Zealand grazing conditions, ease of lambing, resistance to disease and longevity. For some specialist forms of production a long breeding season in the ewe may be desirable to permit early, out-of-season or more frequent lambing.

Literally hundreds of different sheep breeds exist throughout the world. I. L. Mason lists 175 in his book “Sheep breeds of the Mediterranean”; France itself boasts 40 recognised breeds! It would be indeed surprising if some were not superior to our local races in certain attributes. I would like to describe briefly just a few which appear to have distinct potential for improving sheep productivity in this country.

Fig. 1 Finnish Landrace (AHC).
Finnish Landrace (Fig. 1)

Of all the white-woolled European breeds this is undoubtedly the most prolific, with a well-documented litter size both in its land of origin—Finland—and in other European countries of three lambs born per mature ewe. Ewe lambs are frequently mated and usually produce twins at one year of age. In common with other high-fertility breeds, milk production appears to be very satisfactory, the rearing of triplet lambs being not unusual. The Finn is precocious and has a long breeding season. While excelling in fertility, however, it has some unsatisfactory features. It is a relatively small sheep, ewes averaging 125 lbs liveweight, with poor early growth rate. Leggy, long-necked, round-rumped and with a short, hairless tail, the Finnish Landrace has poor conformation by traditional standards; nevertheless meat quality is good and overfatness is no problem! The wool is of good colour and quality, in the 54s-60s range, but ewes clip only about 4½ lbs. Although usually housed in the severe northern winters it is reputedly a hardy breed.

Extensive crossbreeding trials in U.K., Ireland, France and Germany have clearly demonstrated the ability of the Finnish Landrace to boost fertility in crosses with other breeds. In Britain for example Finn cross ewes average 50 more lambs per 100 ewes than do Border Leicester crosses. In terms of New Zealand requirements it is likely that a half-bred Finn x Romney would be quite unsuitable as a hill-country breeding ewe, having too high a lambing rate (200 per cent) coupled with poor fleece weight, growth rate and carcass merit. Such a crossbred ewe might, however, prove highly efficient as an export lamb dam under intensive fat lamb farming conditions. On the other hand I believe the most effective use of this prolific breed could lie in development of a quarter-bred animal adapted to both hill country and lowland conditions. An infusion of 25 per cent Finnish “blood” should lift lambing percentage of the Romney by 40 per cent which on present indications would correspond to about 50 years' intensive selection for fertility. Through selection, or by introducing a suitable third breed, a derived quarter-bred Finn sheep could I believe combine the wool and meat production of the Romney with a lambing potential of 170 per cent.

Romanov

The prolificacy of this East European breed approaches that of the Finnish Landrace. Its chief disadvantages are the high proportion of black hair and kemp in the fleece, amounting to up to one quarter of total fibres (the wool fibres are white), and small body size, mature ewes weighing about 110 lbs. The skin is darkly pigmented except for white patches on the head, while the fleece tends to be grey in colour. Although French experiments have clearly shown the value of the Romanov as a crossing breed to increase prolificacy, its fleece colour and Kempiness make it unacceptable for New Zealand use at this stage.

East Friesian Milk Sheep (Fig. 2)

This North German breed, kept almost solely for dairy (cheese) purposes, has the highest milk production of all European sheep. It is noted also for its high fertility, averaging 215 per cent lambs born.
It is of relatively large size (ewes weighing 170 lbs) with good growth rate but poor “meat conformation” with its long legs, rounded rump and short, hairless tail. Ewes produce a heavy fleece (approximately 11 lbs) of cross-bred 48s-50s wool. It is, however, recognised as a highly temperamental animal which demands individual attention and is normally run in very small units (one to four ewes)—it is definitely not a “flock” sheep. Also, mastitis problems have been reported.

The principal value of the East Friesian could be to contribute its high milking potential and fertility in developing an improved export lamb dam (perhaps including some Finnish Landrace “blood” also). Adaptability of the breed and derived crosses to New Zealand conditions would, however, require close investigation.

**Bleu du Maine**

This is the most fertile of all French breeds, twins being normal from adult ewes. It is a large sheep, ewes weighing about 175 lbs, with rapid early growth rate and good meat quality. Ewes are often successfully mated at seven to eight months, and lamb losses are reputedly low. The wool is in the fine crossbred range (50s-54s) with fleece weights averaging nine pounds. Animals have darkly pigmented (blue-black) faces and limbs, presumably reflecting early Wensleydale and Leicester influence. The wool however is of good white colour. Experience in France and in South Africa suggests that this breed is an excellent performer under wet conditions and responds well to good feeding.

The Bleu du Maine could be crossed directly with the New Zealand Romney to improved fertility, growth rate and wool quality without seriously prejudicing fleece weight.
3. White Headed Mutton Ewe (240 lb liveweight) (AHC).

German White Headed Mutton (Fig. 3)

This breed, sometimes erroneously called the Oldenburg, is descended from the British Cotswold. Perhaps the largest of all European sheep—ewes weigh up to 265 lbs and average 190 lbs—it also has the highest wool production, about 12 lbs of crossbred wool in the 44s-50s range. In appearance it is remarkably similar to the Romney. It is, however, a more fertile breed, averaging 180 per cent lambs born although it may be noted that flock sizes are very small, ranging from five to 20 ewes. Ewes frequently lamb successfully at one year of age. Growth rate is good but meat conformation and carcass quality are not highly regarded. The breed is very well suited to the wetter, low-lying areas of North Germany, but has not attained popularity elsewhere in Germany or overseas.

The close resemblance of this breed to the Romney would make it highly acceptable to New Zealand farmers. Crossed with the Romney the White Headed Mutton may be expected to raise lambing percentage and growth rate and at least maintain fleece weight. The comparison of major interest here is with the Border Leicester, but no relevant information is available on either productive performance or adaptability of the two breeds.

Texel (Fig. 4)

This is a most impressive all-purpose sheep. It is characterized by clean limbs, a bold open face, white skin but pigmented nostrils and good muscular development. Originating in Holland its popularity is increasing very rapidly in other European and overseas countries for lamb production, both as a pure and as a crossing breed.
The Texel is characterized by high fertility, with 175 per cent lambs born; by moderately large size, ewes averaging 170 lbs liveweight; by rapid early growth rate and excellent carcass quality; and by a high production of fine crossbred (48s-54s) wool, ewes clipping on average 10 lbs. Milk yield is high and, in fact, ewes of this breed are frequently hand or machine milked (approximately 20 per cent on Texel Island itself). This is a very hardy sheep usually kept outdoors all year round despite severe winter conditions. The principal drawback of the Texel appears to be proneness to difficult lambing—nevertheless ewes wean on average 165 per cent of lambs. Although mating of ewe lambs is sometimes practised, the breed is less early developing and has a shorter breeding season than many other European races.

With its high fertility, good milk and wool production, excellent meat characteristics and its proven hardiness the Texel offers much promise for improving New Zealand sheep production. It has three important potential uses; firstly to improve overall productivity through direct crossing with the Romney, secondly to contribute milking ability and other desirable traits in developing new, more fertile, “breeds” and thirdly as an export lamb sire breed.

Ile de France

This has been described as the “Charolais” of sheep breeds in view of its excellent muscling qualities. In appearance it resembles the Poll Dorset. It is widely used in France and other countries for crossbred lamb meat production but is maintained also in pure-breeding commercial flocks, usually under favourable feeding conditions.
It should be mentioned that a medium weight lamb carcass (30-35 lbs) with minimum fat is preferred in France. Early growth rate is good and ewes average 150 lbs liveweight. Fertility is only moderate, averaging 135 per cent lambs born. It is, however, a better wool producer than any of the British Down breeds, ewes clipping about 9 lbs of wool of 58s-60s quality.

The Ile de France has definite potential for New Zealand as a special purpose export lamb sire breed, with better wool production than most local competitors. It could also form a valuable component from which genetic lines of superior overall productivity might be derived.

**German Mutton Merino (Merinosfleischaf)**

Among fine-woolled sheep, the Mutton Merino is outstanding for its growth rate and meat qualities. It is a large, well-muscled sheep, ewes averaging 160 lbs liveweight and producing 9-10 lb of 60s-64s wool. With a lamb drop of 145 per cent it is a fertile sheep by Merino standards. It is not regarded as a hardy breed, being invariably wintered indoors in Germany; it has nevertheless adapted well to dry conditions in South Africa and South America. A closely related breed is the Merino Precoce in France, reputedly superior for wool but not for meat production.

The Mutton Merino might be useful in improving meat potential and fertility of the New Zealand Merino, while maintaining wool quality. Its suitability for extensive New Zealand grazing, would, however, require testing.

**German Landmerino**

This, the most numerous of the German breeds, is of only partly Merino origin and, in fact, resembles the Corriedale more than our Merino. It is large framed, plain bodied and open faced, very hardy and accustomed to large-scale flock husbandry. It is an excellent meat sheep as well as producing a moderately heavy fleece (9 lbs) of 58s-64s wool. Ewes average 155 lbs liveweight and can be bred throughout the year. Although reputed fertility is not high (130 per cent overall) the best flocks in Bavaria achieve 170 per cent lambs born and 150 per cent weaned.

The Landmerino, well adapted to extensive grazing, could be considered not only as a serious competitor or an improver of the Corriedale, with comparable wool production but better fertility and meat production qualities, but also as a very useful general purpose sheep with relatively fine wool and long breeding season, adaptable to a wide range of conditions.

**British Breeds**

Mention should be made of certain British breeds not already present in New Zealand. Largest of the British mutton breeds, the Oxford Down could have potential to improve growth rate and meat production of present export lamb sire breeds. The North Country Cheviot, reputedly larger and more prolific—but with lower fleece weight—than the Border Cheviot mainly represented in New Zealand,
could assist in developing an improved Perendale. The primary function of the Scottish Blackface would be to promote carpet wool production, as a possible alternative to the Drysdale; the Blackface is an extremely hardy breed yet shows very high fertility (175 per cent lambs born) in favourable conditions. Wide interest has been shown in two new “breeds” recently developed in U.K. from crosses of British and an imported European breed, namely, the Colbred which includes some East Friesian “blood” and the Improver, based on a Finnish Landrace cross. While both have been very successfully developed to meet specific local needs, the component exotic breeds themselves are likely to contribute more to improved productivity of New Zealand stock.

BEEF CATTLE

The increasing economic importance of beef focuses attention on the need to improve production efficiency. Distinction must be made between the two main forms of beef production, from dairy herds on the one hand and from self-maintaining suckling herds on the other.

The most important traits affecting beef cattle productivity are shown in Table 1. For the slaughter animal itself objectives in improvement should be rapid, and therefore efficient, growth to slaughter, coupled with high dressing percentage, “cutability” and carcass quality. Improvement aims for breeding herds include, in addition to growth rate and meat quality, regular breeding, ability to calve at two years of age, ease of calving, nursing ability and milk production, health, longevity and hardiness, and efficient weaner production, i.e. high weight of calf weaned relative to cow size.

The principal contribution of exotic breeds towards more efficient beef production is likely to be in improving growth rate on the one hand, milk production on the other. Although higher growth rate in existing breeds can certainly be achieved by selection on growth performance, outcrossing to a larger, faster-growing, breed undoubtedly accelerate progress. In breeding herds, however, the advantage of more rapid early growth must be carefully weighed against the possible disadvantages of increased mature cow size and maintenance costs, delayed sexual maturity and lack of “finish” in 20-month-old pasture-fed slaughter stock. The ideal dam breed would perhaps be one with rapid early growth but either small mature size or a high incidence of multiple births. Improvement of milk production through selection on calf weaning weight is likely to be very slow. Change to, or crossing with, a breed of higher milk potential could be well worthwhile in this respect, particularly in permitting multiple suckling of fostered dairy-bred calves.

The following overseas breeds, listed in approximate order of growth rate and mature size, merit consideration for improving New Zealand beef production potential.

Chiana (Fig. 5)

This Italian race is reputedly the largest and one of the oldest of all European breeds, mature cows averaging about 1,900 lbs.
Fig. 5 Chiana (3640 lb liveweight) (FAO).

Developed primarily for draught purposes it is extremely robust and muscular, with heavy forequarters, high shoulder, long legs and strong bones. The coat is white or light grey in colour and the points are black. Probably unexcelled for growth rate, the Chiana offers scope for improving this trait in other breeds and seems an obvious choice in our search for high growth rate “genes.” However its late maturity, low milk production and poor “beef conformation” could limit its usefulness in New Zealand.

Maine Anjou

This dual-purpose (milk plus meat) breed is the largest and fastest growing of all French cattle with mature cows weighing about 1,800 lbs. The coat colour is red or roan, usually with some white patches. It is nowadays regarded more as a meat animal, particularly suited to the production of mature beef from steers up to three years of age. Bull selection programmes, with emphasis on early growth rate, coupled with a certain minimum milk yield of dam, are firmly established for this breed, and stock are being exported to several countries. Calving difficulties are reported among purebred cows. Its late maturity and large mature size may make the Maine Anjou breed unsuitable for use in New Zealand breeding herds; on the other hand it could have considerable merit as a specialised crossing sire for beef production from either dairy or Angus herds.

Charolais

The cream-coloured Charolais has won worldwide renown for its high growth rate and exceptional beefing qualities. Developed originally as a triple purpose breed—milk, beef and draught—it is now used primarily for beef. Mature cows weigh on average 1,700 lbs and
calf birth weights range from 85 to 105 lbs. Under intensive feeding conditions the Charolais, pure and in crosses, has proved itself superior to the British and most Continental beef breeds for growth rate, dressing percentage and "cutability." The most serious defects of the breed are undoubtedly the prevalence of difficult calving and high calf mortality up to weaning, in both crossbred and purebred stock. Calving and rearing problems are accentuated in the presence of "double muscling." Other disadvantages are late sexual maturity, frequently poor conception rate, low milk production and large cow size.

The main potential use of the Charolais would appear to be as a sire breed for crossbred beef production. Investigation is needed also of its value in increasing productive efficiency in breeding herds through crossing with present breeds.

Fig. 6. German Simmental (2750 lb liveweight) (AHC).

Simmental (Fig 6)

An outstanding dual-purpose breed, the Simmental is widely spread throughout Central Europe, with distinct branches in the different countries. Broadly similar in colouring to the Hereford, with white head and red and white body, the red is however less deep and sometimes yellowish. It is a hardy breed, well adapted to mountain pastures, excelling in growth rate and muscling quality and only little below the Friesian in milk yield. Mature cows average 1,600 lbs liveweight. The German Simmental (Flechvieh), also known as the Spotted Mountain, is reputedly superior for meat production to the Austrian, Swiss and French strains. Testing and selection schemes for beef improvement as well as for milk production are highly developed for the Flechvieh. The breed has been widely exported, particularly to South America and to South Africa where it has excelled.
for beef production under extensive grazing conditions. European trials indicate that the Flechvieh is far superior to the Charolais in milk production and only little, if at all, inferior for growth rate and carcass quality.

The Simmental, and particularly the Flechvieh, offers high promise as an improver of both meat and milk qualities in our beef breeding herds, with potential also as a dairy-beef crossing sire.

![South Devon (AHC)](image)

**Fig. 7. South Devon (AHC).**

**South Devon (Fig. 7)**

Largest of all British cattle, the South Devon is a dual-purpose breed although separate milk and beef strains are being developed. Animals are of a uniform deep reddish-brown colour. In the U.K. evaluation trials this was the only breed to match the Charolais in beef production performance of dairy crossbred progeny. Extensive recent performance test information confirms the growth rate superiority of the South Devon over other British breeds. It has performed very well in South Africa and is attracting wide interest in U.S.A.

The South Devon has obvious potential to improve both milk production and growth rate in breeding herds through crossing with New Zealand beef breeds. It could contribute also to more efficient crossbred dairy beef production.

**Blond d’Aquitaine**

This French beef breed has excited much recent overseas interest. Growth rate and lean meat yield compare very favourably with the Charolais up to about 18 months of age, but mature size is less, cows averaging 1,550 lbs liveweight. Calving difficulties are reputedly rare.
and the breed is claimed to perform well under rough feeding conditions. Long in the leg and high at withers, animals lack traditional “beef type” but produce a highly acceptable carcass. Coat colour is light yellow-brown or fawn. An efficient and broadly based breed improvement programme includes extensive performance and progeny testing.

Although less glamourised and less publicised than the Charolais, the Blond d’Aquitaine, with its easier calving and greater hardiness may, in fact, be better for improving efficiency of New Zealand beef production from both breeding herds and dairy crosses.

Fig. 8. Limousin (AHC).

Limousin (Fig. 8)

This second most numerous of the French beef breeds, is extremely popular for veal production. It is related to the Blond d’Aquitaine but is earlier maturing and smaller in stature, mature cows averaging 1,400 lbs liveweight. It is light reddish-brown in colour. Calving and rearing difficulties are rare. Compared with the Charolais the Limousin is finer boned and thinner skinned, with meat claimed to be more tender, better marbled but paler in colour; post-weaning growth rate is, however, substantially lower. Unlike most other breeds in France many Limousin herds are grazed outdoors throughout the year and are reputedly hardy. The excellent meat quality, good early growth but moderate mature size of the Limousin suggest its suitability for improving productivity of our breeding herds.
Other Breeds

The dual-purpose Brown Swiss, widely popular in many countries, is one of the hardest of the major European breeds, performing well under adverse feeding and climatic conditions. German records suggest it to be slightly better than the Simmental for milk production but inferior in growth rate. The breed has performed excellently for beef production in South African studies but less well in crosses with the Angus in the Argentine. Its evaluation as a beef improver in New Zealand may be warranted.

In terms of carcass quality the German Yellow (Gelbvieh) is reputedly the best of the German breeds. It is closely similar to the German Simmental in growth rate, mature size and general hardiness, but the latter breed is deemed preferable for New Zealand use because of its higher milk production and larger numbers.

The Normandy, striking with its triple colouring (yellow, dark brown and white), brindled appearance and dark "goggles," is the most numerous of all French breeds and is an excellent dual-purpose producer. Cows average approximately 1,500 lbs liveweight. In growth rate, conformation and meat quality the Normandy is superior to the French Friesian but milk yields are somewhat less. The breed could be regarded as an improved milking Shorthorn but is considered to have less potential for beef improvement in New Zealand than the breeds already discussed.

The Friesian is the most widely spread of all breeds in Western Europe, with distinct strains in different countries. Although bred primarily for milk production, meat is also important and much emphasis has been placed on desired beef conformation. However, the European Black and White appears to be inferior to the North American Friesian in both milk production and growth rate.

The German Red and White (Rotbunte), found mainly in northern and central Germany, has milk production approaching that of the Friesian but is considered superior for meat, in terms of early growth rate, animal conformation and carcass quality. It is a most attractive animal in appearance but does not warrant high priority in a New Zealand importation programme. Of generally similar appearance and performance potential are the Dutch Red and White and the Danish Red breeds.

The British "Red" beef breeds—the Lincoln Red, Sussex and (North) Devon—also deserve mention. Recent British performance test data indicate quite clearly the growth rate superiority of these breeds over the better-known Hereford, Angus and Shorthorn. Some Devon herds do exist in New Zealand and Lincoln Red stock were, in fact, imported at the beginning of the century. These breeds could have a place in improving growth rate in local stock.

Mounting interest has been shown in recent years in the Zebu breeds, notably the grey-coloured Brahman and the red-coated Afrikaner. They are very heat tolerant, appear to have high efficiency of utilisation of certain pastures and exhibit appreciable hybrid vigour for some traits in crosses with European breeds. Their
main potential use in this country could be for inclusion in systematic cross-breeding programmes, but their advantage for this purpose clearly needs testing.

CONCLUSIONS

Establishment of the new Maximum Security Quarantine Station to permit introduction of new breeds offers exciting prospects for livestock improvement. At the same time it presents a challenge to our present breeds and breeders—let us hope this challenge is taken up. It has been claimed that the principal value of recent introductions of exotic breeds (particularly the Charolais and the Finnish Landrace) into Britain has been the stimulus it provoked towards the performance assessment and the genetic improvement of local breeds. New breeds will offer a challenge also to the farmer, since full expression of their potential may well demand improved or modified husbandry systems.

It must be emphasized there can be no advance guarantee that exotic breeds imported to this country will, in fact, be superior to our local stock, already well adapted to our conditions. However, I hope I have convinced you that some overseas breeds do possess superior qualities and could contribute materially to increased efficiency of New Zealand livestock production. Why not take advantage of the successes of breeders in other countries as well as our own?

New breeds should stand or fall on their own merits here and not on reputations, substantiated or otherwise, established elsewhere. Adequate and impartial testing is important to ensure effective utilization of exotic breeds and prevent unwarranted exploitation. Importation and evaluation of new breeds is undoubtedly costly but the potential rewards are indeed great—I would suggest increases of the order of 40 per cent in the national lambing rate and 20 per cent in sheep and beef carcass weights. The question is surely not whether we can afford to import and investigate new breeds but rather whether we can afford not to.

To summarize, I believe exotic breeds offer exciting potential for genetic improvement in fertility and meat production of sheep and in growth rate and milking performance of beef cattle. In terms of breeds most likely to increase efficiency of production I would suggest (pardon the puns!) that for sheep we should start at the Finnish and for beef we should first try Sim-mental arithmetic!
INTRODUCTION:

The basic theme of this 1970 conference is “How to retain profitability of farming in the 70’s.”

If I knew the answer to this question as far as the high-country farmer is concerned I would probably be at home putting it into practice rather than standing here trying to tell you something to which I don’t really know the answer. However, last year I had the pleasure of a visit by a group of pretty intelligent farmers. Their overall comment at the end of the day was that they were very impressed with the future potential of the high country—a view I hold strongly myself—and I subsequently started to ask myself why neither I nor anyone else had reached this potential, and this seemed a good point at which to start when looking to the future.

I by no means wish to imply that little or nothing has been done in the past because in fact a very great deal has been done. In the past ten years or so there has been almost a major revolution in high-country farming, resulting not so much in an increase in stock numbers carried but a very significant increase in animal unit production—in short, better feeding of stock on, in many cases, a reduced area of country, thus reducing the grazing pressure on the more vulnerable country (in many cases the physical retirement of country).

All this has been accomplished without seriously disturbing the traditional and well-proved forms of successful high-country management, though in some cases it has had to be bent to some extent.

Present forms of development, I believe, can only take us so far in realising the full potential of the high country—what has happened so far has been in the nature of evolution. The next step will be one of planned and calculated policy change entailing management, staffing, finance and everything else that goes towards keeping an enterprise alive.

Not many, if any, high-country places are yet ready for this change and this was the point of asking myself the question, “Why are we not really exploiting our potential?”

At this stage it is worth while to have a look at the past to try and find what has hampered development and perhaps what factors will inhibit progress. I have listed three main headings which cover a pretty wide field and we will have a fairly brief look at each in turn. They are:

(a) The physical difficulties of efficient management of development.
(b) Scientific knowledge—what we know and what we don’t.
(c) Finance—money to do what we want to do and what we get back for it.
PHYSICAL DIFFICULTIES:

Returning to the first point—"The physical difficulties of efficient management of development." As this is basically not a high-country audience I am going to risk spending a bit of time on this question as the high country is a fairly large slice of the South Island, as yet comparatively undeveloped, and I believe that it is most important that all sectors of farming have an appreciation, one of the other, in the same way as town and country must understand each other.

Physical environment, time and distance, are three factors very much involved in development of the high country on a run scale.

By physical environment I refer to the fact that the country is mountainous with, in many cases, a sub-alpine climate with its great range of weather extremes. The growing season is comparatively short and decreases with altitude—this is compensated for in part by the fact that extraordinarily rapid growth takes place during the short season so that the problem of spreading the available feed over the twelve months of the year is somewhat more complex than in most other classes of farming. However, I will have a bit more to say on that aspect later.

The first phase of high-country development is comparatively simple and in very broad terms it has in the past consisted of the application of superphosphate and seed on one or more of the more favourable blocks. Provided management is reasonably adequate, a return on the money spent soon becomes apparent through increased stock-unit production without much, if any, disturbance to past management practice. However, you have committed yourself to a programme of development for better or for worse.

How long this first phase lasted or will last depends on a number of circumstances which I don’t intend to discuss, but inevitably one is forced to take another step along the road. If costs have not already eroded the gains made, then a build up of fertility dictates a greater concentration of stock on certain areas. According to management views this is done by an increase of stock numbers or by a greater concentration of existing stock, but still without any serious disturbance to past management practice. It is here that this question of time and distance starts to make its presence felt.

One of the intriguing points of high-country management is that no two places are alike and there is no average high-country run—even neighbouring runs can be, and probably are, entirely different management problems.

As development progresses management becomes more and more exacting in the same way as your own farms require more intensive and precise management as your production increases.

In an effort to illustrate how this question of time and distance affect development in the high country, consider say "Double Hill" station—a moderately-sized run of 37,000 acres—transposed onto the area starting at Lincoln. Think of your own 500 or 1,000 acre developed farm in relation to this area starting at Lincoln, going out beyond Rolleston and finishing up at Belfast and you should get some
idea of how time and distance affect the situation—particularly when most of our country is steep and inaccessible to vehicles.

Areas of land most suitable for development, particularly if conventional methods of cultivation are to be used, are often scattered or in pockets. In the case of “Double Hill,” two areas in a reasonably advanced state of development are about seven miles apart.

Development of these areas is at the stage that demands fairly intensive stock management, which again has to be tied in with the demands of the rest of the country, other areas of which are under development through topdressing. Add to this the fact that ewes and lambs become largely immobile from October to December, and the question of grazing control can have considerable difficulties.

Perhaps I have laboured this point somewhat but I am convinced it is a very important point and one which will become more important as development progresses. Like your own farms, time, labour and finances are not inexhaustible and development has got to pay for itself as far as the individual is concerned.

You may wonder why we bother about a lot of this country. Well, the simple answer is that well-managed sheep do extraordinarily well on it.

SCIENTIFIC KNOWLEDGE:

Now for the second point—“Scientific knowledge, what we know and what we don’t.”

It is here that I will probably be knocked to leg by Prof. O’Connor who after all is going to have the last word—my defence is that I have tried it, he has talked about it.

The road to any major development of the high country was opened up 20 years ago with the advent of aerial topdressing which advanced the improvable areas from the comparatively small and isolated arable areas to theoretically the whole of a run.

This new concept of improvement to native country was regarded with a considerable amount of suspicion by most runholders. However, there were a number who decided to give it a go and I was one of them.

Looking back to the early 'fifties one now realises how little was really known by anybody about what would happen both to the country and management and I am not sure that we are not still in the same relative position.

I had a definite objective in starting aerial topdressing. A few years earlier a large block had been subdivided but the area which appeared to be the best land proved to be almost useless from a grazing point of view. Stock simply would not survive on it, so some financial risk looked justified to try and improve the position.

Any advice as to rates and frequency of application appeared to be nothing more than an intelligent guess ranging from one to two hundredweight every one to five years. Having had some experi-
ence with ordinary pasture topdressing I opted for two hundredweight reduced to one and a half hundredweight applied every second year.

The immediate objective of supplying feed was achieved and during the next few years it turned into a most valuable block but after five or six years its production appeared to become static or even deteriorate a little.

About 1960 I decided to use sulphur super and because of the reports that it had a longer-lasting effect, application was only every third year. Again the pattern rather repeated itself. There was some improvement but about four years ago I began to think all was not well with the stock—in particular lambing percentage appeared to be falling off. However, after taking weather conditions into account, nothing that could be pinpointed. Lambing 1968 gave the real clue that something had gone haywire—cows wintered on the block were found following the ewes and eating fresh born lambs.

Quite an extensive investigation was carried out, including the analysis of both the herbage and blood samples of sheep and cattle. The result reported was a serious phosphate deficiency in stock and herbage.

I am not qualified to comment on this result other than to say that I was pretty surprised at this result on country that has had a total of 11 hundredweight of super. My only theory is that it is probably tied up with the use of sulphur super.

Last winter three hundredweight of straight super was applied—fairly heavy by high-country standards. Also for the last 18 months bone-flour plus super and salt has been supplied as a lick.

The only results that I can quote are that stock are looking well, and lambing was back to the average of the rest of the country and that there is a lot of feed available—which doesn’t prove very much when allowance is made for seasonal factors.

I have dealt fairly fully with this particular case as I know that it is not an isolated one, nor the first that I have experienced.

Up to the present time we have really only used “shotgun methods” and if anything like, what even now looks like, full potential is to be achieved then far more precise scientific data will be required if the thing is going to be done on sound lines. We cannot afford the money to develop by guesswork. To emphasise this point I quote briefly from work done by McFadden dated 1969.

“But further, he has pointed out that between soils mapped at present as being of the same set, but occurring in different regions (e.g. Hurunui and Kakahu soils in mid-Canterbury and South Canterbury), wide variations of practical significance can still occur in their fertiliser requirements. He has also reported wide variations in the phosphorus status of a soil set within the one region. It is evident that in the high country the extrapolation of trial results, not only between similar soils as mapped, but also within the same soil set, should often be viewed with caution. With regard to soils the more detailed mapping of selected
catchment which is now being undertaken, is highly desirable and although this will certainly not simplify the soil pattern, it will help in its interpretation and we hope aid the application of field research to farming practice."

The high country owes a debt of gratitude to what after all has been a comparatively small band of dedicated scientific workers in this field and I believe that they themselves realise that so far they have only scratched the surface.

FINANCE:

Now consider the third point—"Finance." I hope that Mr Crump will give a much broader picture of the financial side of development than I can. All I am going to do is to give a brief picture of the situation as it applies to one particular place over a period of about 20 years.

First let us have a look at production figures. At the start of the period 1949-50 season production was already comparatively high as compared to the average high-country run so there was no sudden, dramatic or initial rise in production through the use of fertiliser or other means. Taking the first five-year period 1949-50 to '53-54 and comparing the last five years 1962-63 to '66-67 there was a 36.4 per cent increase in sheep shorn, a 50.7 per cent increase in pounds of wool produced but only a 20 per cent increase in gross financial return from wool.

Sheep sales show 80.6 per cent increase and a 41.8 per cent gross financial return. This is overall a reasonable increase in production and we will now have a look at the financial result on a per head basis, over the last period starting '63-64 season. The figures contain three average to good years and two of the recent bad ones.

<table>
<thead>
<tr>
<th>Gross returns per head</th>
<th>Expenditure</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Period</td>
<td>$5.31</td>
<td>$2.73</td>
</tr>
<tr>
<td>Second period</td>
<td>$5.28</td>
<td>$3.76</td>
</tr>
</tbody>
</table>

Points to note: Gross returns same.

Expenditure up $1.

Net returns down $1.

This picture will be only too familiar to most farmers—I will have to leave you to draw your own conclusions as to what the net position would have been had no increase in production been achieved but thanks to the 50 per cent increase in wool production and 80 per cent in surplus sheep the total net proceeds have been maintained at slightly better than 75 per cent in the latter period as compared with the first.

At the moment I am not trying to prove a case whether development pays or does not pay but this next set of figures showing costs in relation to net returns over the last few years has certainly made me think hard as to what form future development should take.
<table>
<thead>
<tr>
<th>Year</th>
<th>Expenditure per head</th>
<th>Net return per head</th>
</tr>
</thead>
<tbody>
<tr>
<td>1949-50</td>
<td>$2.22</td>
<td>$1.99</td>
</tr>
<tr>
<td>1964-65</td>
<td>3.58</td>
<td>1.84</td>
</tr>
<tr>
<td>1965-66</td>
<td>3.43</td>
<td>1.95</td>
</tr>
<tr>
<td>1966-67</td>
<td>4.17</td>
<td>0.49</td>
</tr>
<tr>
<td>1967-68</td>
<td>4.14</td>
<td>0.75</td>
</tr>
<tr>
<td>1968-69</td>
<td>4.52</td>
<td>0.61</td>
</tr>
</tbody>
</table>

The above figures show pretty conclusively that something has got to be done to reverse the movement of rising costs and diminishing returns.

Two basic facts which I think we have got to face are that inflation will continue and that prices for our produce will tend to lag behind increasing costs leaving us with no alternative other than seeking ways and means of more efficient production—in other words getting better value for money that we spend. This is never an easy thing to do but such is my confidence in the future of the high country that I believe the most profitable path of development will be the spending of the same amount of money on half the area or if you like twice as much on the same area.

The help of both the scientist and economist will be vital as mistakes will be costly. I have already tried to point out that we don’t really know very much yet, but I believe that there are fairly clear indications that a greater concentration of resources will pay dividends.

Cattle have not been mentioned so far, principally because, until this year, they have played no great financial part in the case under review. However, generally they are becoming more and more a part of development and certainly for the next few years it would look like being good business to increase cattle rather than sheep for the utilisation of extra feed produced.

It is generally accepted now that cattle run in conjunction with sheep gives a higher ewe-equivalent carrying capacity than either sheep or cattle alone so finding the right proportion for any given run is another avenue for reducing unit cost. Winter feeding, which seems inescapable once development starts, is an expensive item through the long high-country winters but I am sure that a real build-up of fertility can materially lengthen the growing season despite the climate.

Ewes and hoggets are expensive to winter both in feed and manpower. Maybe a critical look at the proportion of ewes and hoggets to dry sheep carried could be worth while.

To sum up—physical factors in the high country create some real difficulties in the way of intensive development but will be largely overcome.

Science—a field wide open for more detailed study with its relationship to the environment and management techniques.

Finance—I don’t advocate large scale borrowing for development at this stage but individual requirements will vary greatly. Ultimately it will depend upon the climate set up by Government how far off or fast the potential of this vast area of country is exploited.
HIGH-COUNTRY DEVELOPMENT

D. K. Crump, Farm Advisory Officer (Economics), Dunedin.

INTRODUCTION

Mr Ensor has given us a good insight into practical aspects of high-country farming, and the economic changes that have occurred in the past. I find it difficult to add anything to what he has said about the economic environment of the high country. His figures clearly demonstrate that the net return per sheep is falling. Mr Ensor explained that to combat inflation and lower prices the high-country farmer must increase efficiency. The only way I know of increasing efficiency is through development. The high-country farmer today has only two options. He either accepts a lower return from farming, or he develops.

The following table presents three development case studies:

| TABLE 1
<table>
<thead>
<tr>
<th>Development Case Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Length of programme (years)</td>
</tr>
<tr>
<td>Change in lambing percentage (%)</td>
</tr>
<tr>
<td>Change in wool/sheep shorn (lb)</td>
</tr>
<tr>
<td>Change in—sheep numbers (%)</td>
</tr>
<tr>
<td>—cattle numbers</td>
</tr>
<tr>
<td>Return on capital (%)</td>
</tr>
<tr>
<td>Change in take-home pay (%)</td>
</tr>
</tbody>
</table>

These are actual case studies of farmers who have developed. From table 1 we see that the take-home pay of these farmers has actually increased in the face of falling prices and rising costs. Development of part of the property has increased the efficiency of the whole property.

We can probably also think of cases where development has not been profitable. In the time that remains I would like to look at some of the factors associated with profitable development. Profitable development is associated with the following factors:

(a) Low maintenance and capital costs per ewe equivalent.
(b) Improved utilisation of feed grown.
(c) Planned development with continuous review and appraisal.

LOW MAINTENANCE AND CAPITAL COST PER EWE EQUIVALENT

Successful development always has a high return to capital. The lower the capital and maintenance cost per ewe the greater the return to capital.

To illustrate this rule I will use a high-country example where each additional ewe carried will contribute $4.00 to net profit.

Costs and Returns per Ewe Equivalent (Gross Margin = $4.00)

<table>
<thead>
<tr>
<th>Capital Cost per Ewe</th>
<th>Maintenance Costs</th>
<th>Return on Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>$</td>
<td>%</td>
</tr>
<tr>
<td>4.00</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>6.00</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>10.00</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>10.00</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>130</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
All that I am really saying is that the lower the cost of carrying another ewe equivalent, the greater is the return on capital. In order to achieve this low cost per extra ewe carried through development, the priorities for development should be:

1. Stock.
2. Fencing.
3. Fertiliser and seed.

If development can proceed in this order a high return can be achieved. As far as possible the aim should be to obtain increased production from the existing facilities of land labour and equipment. On many runs this increased production is being achieved with cattle. Because of their complementary role in grazing, cattle are increasing the utilisation of feed grown, without any increase in fixed expenses.

**IMPROVED UTILISATION OF FEED GROWN**

Increased utilisation of the existing feed grown is the cheapest form of development, and has the lowest maintenance and capital cost per ewe. I believe there is scope for more of this kind of development in the high country. The requirements for better utilisation of improved tussock grassland pastures are an increase in the number of animals grazing, more fencing, and a change in the management pattern which usually incorporates some form of feed conservation.

Many runholders have “increased performance of stock” as their development objective. Although excellent per head performances can be obtained in the high country I do not think per head performance is always the most profitable development objective. A more profitable objective may be “increased utilisation of feed grown.” Although we would expect an immediate rise in performance following an increase in feed supply, this does not always seem to be the case. In practice it seems to take some time to lift stock performance to any great extent. Perhaps this is because the lift in performance must start with hoggets and work through the flock. Most developers can not afford to wait more than one to two years for increase in income from increase in stock performance. However, the decision to go for performance, or numbers, really depends on the level of stock performance prior to development.

Mr M. A. Monteath at Invermay Agricultural Research Centre has a trial which demonstrates that the most profitable stocking rate need not have a high per head performance. In this trial the more profitable higher stocking rate had a per head performance which was less than the low stocking rate. This is illustrated in the following table:

**TABLE 2**

<table>
<thead>
<tr>
<th>Stocking rate</th>
<th>Low</th>
<th>Low + 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage lambs weaned</td>
<td>117</td>
<td>105</td>
</tr>
<tr>
<td>Wool shorn/ewe (lb)</td>
<td>11.2</td>
<td>10.2</td>
</tr>
<tr>
<td>Gross margin/acre</td>
<td>$34</td>
<td>$41</td>
</tr>
</tbody>
</table>

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This trial and many others, have indicated that an objective of high performance per animal does not automatically confer high profit per acre. These trials have all been conducted on intensive farming, but surely the same principle applies to extensive farming. The problem of what stocking rate, and what stock performance to aim for, confronts every farmer. In attempting to throw some light on this question I have turned to simple economic principles. These principles indicate that the optimum stocking rate is achieved, when the return from running another ewe, is equal to the cost of running that ewe.

The cost of running another ewe is made of two parts:
1. The direct costs (shearing, animal health etc.).
2. The cost of lower performance per head over the whole flock.

Where utilisation is low the direct cost is the main cost. The high country is traditionally low cost farming and this is one of its greatest strengths. To illustrate the difference in cost of running a sheep between low and high country, I have taken figures out of the Meat and Wool Boards’ Economic Service Sheep Farm Survey.

<table>
<thead>
<tr>
<th>Direct Costs/Sheep</th>
<th>(Excluding F/C of labour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High country</td>
<td>$1.99/sheep</td>
</tr>
<tr>
<td>Intensive fat lamb</td>
<td>$3.05/sheep</td>
</tr>
</tbody>
</table>

This difference in cost implies that the optimum performance per head should be much lower in the high country than the intensive down country. I do not know what the optimum performance is, but think it may be about 80 per cent lambing and eight pounds of wool per ewe. Of course the economic optimum will vary between properties, but I believe that striving for much greater performance per head is false economy. A more profitable development objective would be increased utilisation of feed grown, rather than increased performance per head. I realise that my philosophy is very contentious, but one of my reasons for presenting it is the very low level of utilisation which is so characteristic of the high country in general, and particularly tussock grassland development. My observations lead me to believe that on improved high country the average utilisation of feed grown is 20-30 per cent. This low utilisation indicates the need for improved management and more stock.

Stock numbers are just one factor in the improved utilisation which is characteristic of all successful development. The other factor is the change in management. I believe there is evidence that successful development involves a change from the traditional set stocking of blocks to some system of mob stocking and rotational grazing on sub-divided blocks. This means that the runholder ceases to be an extensive grazier and becomes a paddock manager. Such a change in management is more important than any extra feed which may be grown as a result of fertiliser and seed application.

Mr Ensor has explained how time and distance make this change in management difficult to achieve. I agree, but the Landrover, and bulldozed tracks have greatly reduced both time and distance in the high country. Strategic fences can also assist in stock movement. On some runs two men are now doing the work that once required eight musterers.
I have devoted most of my time to this problem of increased utilisation, because I believe it is the key to successful development. I have not meant to imply that this increased utilisation is easy to achieve, because I know there are many difficulties. Farmers have been grappling with the problem for many years. Over the last decade, on intensive farmland, there has been a revolution in the management and utilisation of pastures. I think the same type of revolution is yet to occur in the high country.

PLANNED DEVELOPMENT WITH CONTINUOUS REVIEW

Complete failure of development occurs where the cost of the programme is more than it is worth. In other words, the cost of inputs, fencing, fertiliser, etc., is greater than the future worth of the output of meat and wool. The result is that both the nation and the farmer are worse off. The situation I'm thinking of is where several thousand dollars have been spent on development and even if prices had stayed the same, net income would not be higher than before development.

It's all very well to say the above development shouldn't have been contemplated, but how are we to know beforehand that development will not be successful. I believe that most development catastrophies could have been avoided with sufficient screening or evaluation of the development plan. Evaluation involves planning ahead and there are many people available to help farmers with this planning—it involves estimating physical responses, stocking rates, stock numbers, costs of inputs and rates of development. During this planning phase attention is focussed on the capital requirement of the various inputs, and because of this some changes in the plan will be made.

Once development has commenced there must be continual appraisal and adjustment to the programme. If the physical results are not occurring as they should be, it may be necessary to "re-think" the programme. When prices change, as they must, it will be necessary to speed up, or slow down, the rate of development. With a system of financial control the unexpected events can be accommodated, and built into the programme.

CONCLUSION:

There's no doubt there are problems in run country development, but there are also runholders who are overcoming these problems. The greatest asset the runholder has is the vast potential for increased production and profitable development. Exploitation of this potential is overcoming the cost-price squeeze, and providing worthwhile returns to the runholder.

Acknowledgements

I wish to record my thanks to M. A. Monteath and G. G. Cossens of the Invermay Agricultural Research Centre for their information and advice.
THE FARMING FUTURE OF THE HIGH COUNTRY

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THE NATURE OF CHANGE IN PASTORAL USE

There are about 300 high-country runs in the South Island which traditionally have derived their income almost solely from wool. There are more than 500 additional properties in both islands which have derived their income by producing wool and surplus stock from the grazing of tussock grasslands on hill country. Together these properties extend over more than 10 million acres. During the last 30 years more than 800 traditional pastoralists have contemplated the possible end of their loved and honoured way of life. While some other men outside the tradition of the misty gorges have clamoured for the death of high-country farming for the sake of conservation, still others fancying themselves shrewder and wiser in their generation have put their trust in euthanasia, hoping to knock out the aged and infirm among the runs. To the consternation of both such enemies, high-country men and women have often sought new satisfactions for their varied ambitions. Reflecting on their problems some have been tempted to put an end to their traditional way of life, by their own hand. Faced with such decisions they might feel like Macbeth contemplating the prospect of murdering Duncan, his loved king and kinsman:

"If it were done, when 'tis done, then 'twere well it were done quickly; if the assassination Could trammel up the consequences, and catch With his surcease success; that but this blow Might be the be-all and the end-all here, But here, upon this bank and shoal of time,— We'd jump the life to come.—But in these cases, We still have judgement here; that we but teach Bloody instructions, which being taught, return To plague th' inventor."

The lesson of the economic analyst, contemplating pastoral run development is clearly:

"If it were done, when 'tis done, then 'twere well It were done quickly."

The lesson of the agronomist contemplating the task of correcting fertiliser deficiencies and improving the composition and vigour of vegetation by the use of grazing, treading, dunging and urinating stock is likewise:

"If it were done, when 'tis done, then 'twere well If it were done quickly."

For us who but teach instructions which being taught return to plague th' inventor, the question is still open; "Should it be done? Should the traditional way of pastoral farming be done away with
in the high country?" I might represent this question as a choice of rebirth rather than one of death. Some might represent it more as a gradual transmigration of souls. A new spirit of life perfuses the same body of land grown old in the maturing of a former spirit that had leapt only to the shrill sound of musterer's whistle and answering huntaway bark. More then ten years ago I made it clear that high-country farmers had, in my opinion, no choice. They had to develop for both ecologic and economic reasons. Ten years ago in a paper to this conference (O'Connor 1960) I demonstrated the opportunity for production increases in the mountain regions and showed that the urgency for development and the factors needed for development varied on different classes of land. I indicated then that the results to be expected from development differed according to the thoroughness of the development and also varied from one kind of land to another. At that time I estimated that there was opportunity to develop the tussock grasslands to carry a four-fold increase in livestock population in the region as a whole. Subsequent research has indicated that this was perhaps an underestimate (O'Connor 1966a, 1968). No grave harm is likely to have ensued from such conservation because, as was demonstrated four years ago for such an area as the Mackenzie Basin (O'Connor 1966b, c) runholders could not easily breed sufficient stock to keep up with the possible rate of topdressing and oversowing.

Such discussions of development potential, its variability and its practicability are valid for the purposes for which they were prepared, in the first case to present to farmers the scope of the opportunity for production; in the second case to present the case for the pastoral and agricultural development of a region in relation to other forms of land use. Some forms of resource use, such as hydro-electric power development, may be competitive for resources, and their superior resource efficiency over pastoral and agricultural development may be more apparent than real. In the present case I can hardly take refuge in merely painting the potential for farming development, I must now teach instructions, which being taught return to plague the inventor. Such instructions can here be only in general principles, they must be few and they must be memorable.

PRINCIPLES OF DESIGN FOR CHANGES IN PASTORAL USE

1. Knowledge of Resources

Know your land with its soils, its plants, its climate. The good traditional pastoralist knows his range well, its particular features for stock management. I ask you to know it also through new lenses. The now countless field studies of fertiliser needs are interpretable not as so many isolated discreet trials for this acre or for that. They are understood best in the following terms. As soils increase in age, or in rainfall, or leaching, they increase in phosphorus needs for establishment of legumes and grasses. Even more, older or more leached soils have greater needs for phosphate to reach an organic equilibrium at which true maintenance rather than secondary development applies. Every kind of slope or terrace or fan needs to be understood in this context.

Just as soils may differ from one another in their nutrient needs so also plants in tussock grasslands may vary in their nutrient con-
tent from one location to another. Marked differences exist in chemical composition among tall tussock species (Connor et al. 1970) and these may be reflected in differences in acceptability, digestibility and nutritive value to livestock (MacRae and O'Connor 1970). Variations in climate from one aspect or altitude to another also affect the quantity and quality of feed that can be used at different times of the year whether this feed is from unimproved vegetation or from oversown swards.

2. Control of Grazing Pressure

Hundreds of thousands of dollars are being spent annually for improvement and erection of fences. With the development of methods of shepherding appropriate to the 21st century these may be somewhat redundant. However, they are essential enough for the 20th century. It is not enough to erect good fences. They must be used. The function of a fence is not only to have stock where they can be gathered, but also to enclose livestock to apply planned grazing pressure, planned in space and in time. Such planned pressure should be generally lighter for untopdressed, semi-arid native grassland than for oversown and topdressed, moist legume-rich grasslands. For probably most land conditions grazing is best if intermittent rather than continuous through a whole season of the year. The most important part of a fence is the gate and it may have least design and least use.

3. Setting objectives and Rates of Change

It would be unwise for me at this stage of the conference, in the face of the numerous recommendations that we have heard for technological change concerning our avenues of production, to recommend to high-country farmers to concentrate on wool production and wool production only.

There is a school of thought which says concentrate development technology on the lines which are most profitable right now. There is another school of thought typified in Dr Mitchell's address which advocates using that profitability for what may seem to be radical departures from existing patterns of resource use. The crux of this conflict of schools of thought is surely in the timing of the transition. This is the area of difficult decision-making. It is here that the lessons to be learned and applied in the high country will be of value to the whole country and to the world at large.

On the human side there is the phenomenon of diffusion of innovations. Rogers (1969) has analysed many of the psychological and sociological features affecting the rate of the two main transitional phases in this phenomenon, awareness-to-trial and trial-to-adoption. As for any other social system I expect that different members of the high-country pastoral community will adopt innovations at different rates. Such differences will not be understood merely by taking account of the physical and financial conditions of individuals. Rather they will be accounted for by understanding how different people perceive the relative advantage, the compatibility, the complexity, the divisibility and the communicability of innovations. No matter what
"bloody instructions" are taught, the speed of adoption of such new ideas depends on the kind of person receiving them. Any advice from me about pace must therefore be strictly personal and cannot be of general value.

On the physical and biological side there are also lessons from the high-country laboratory which will be of value to much of the remainder of the country and to the world at large. I refer in this respect to the phenomenon of the grassland development transition, transition of low production grasslands at often low fertility to high productive land use systems generally involving grasslands and generally of moderate to high fertility.

It is my opinion that new, wider and deeper ideas about grassland development are of more lasting value than are new practices and techniques. If such new ideas can be tested and found to be valid, I believe the economy of this technique or that will soon sort itself out for this condition or that. We cannot indulge long the luxury of obsession with practices such as thorough seedbed preparation, liming to correct acidity, sowing of certified ryegrass varieties without being able to provide ryegrass management and winter feeding of sheep to sustain high body weights, if the process of genuine science produces new ideas which makes such practices redundant.

4. Spreading Risks

Traditional pastoralisation in the high country has been a low cost system of resource use. If changing conditions make for higher costs there is some prudence in spreading risks, even within the farming sector. Some runholders have already considered the diversification outside the farming sector into recreational use. This possibility cannot be considered adequately in this paper. In the search for new farming enterprises which would spread risks, runholders may well ask what kind of opportunities are open to them. Apart from the increase in surplus sheep production and the finishing of these animals, whether lambs or older sheep marketed as fats or their sale in improved store conditions, there are two production enterprises which in varying degree are attractive. Both of them have the advantage that they are adapted to phases of the grassland development transition in different sections of the high country. I refer, of course, in the first place to beef cattle, in the second place to the production of cereals and some other crops.

So far as beef cattle are concerned, the recent study carried out in the Institute reveals that roughly one half of South Island beef cattle are in the hill- and high-country regions. In recent years rates of increase in beef cattle in these classes of country have markedly exceeded rates of increase in total stock carried so that cattle have assumed a growing relative importance to the farm. Over the same period up to 1965-66 the same trend has not been evident in the corresponding North Island hill-country regions where the beef cattle/sheep ratio has remained constant or tended to decline.

So far as cereal production is concerned, I find from the notes of my first talk to high-country farmers in the Mackenzie country that I appraised the Mackenzie basin as being highly suited climatically to a wide range of cereal and other seed production crops. The
fact that we have produced 90 bushels of barley per acre following
the first ploughing of land that had been topdressed and oversown
and grazed for a period of six years, is pleasantly overshadowed by
the fact that runholders in the upper Waitaki have harvested crops
of cereals in excess of 100 bushels per acre on several occasions in
the last few years. Whether these crops of cereals or small seeds are
to be disposed of for sale or used on the run for strategic animal feed­
ing or further pasture development is a management decision that
leads me to my last general lesson.

5. Keeping Order in Variety.

The multiplicity of land classes, the multiplicity of enterprises,
the multiplicity of pathways along which these enterprises may be
developed on land of different classes all cry out for the mind and
hand of the shrewd planner. Under shrewd planmanship this variety
of resources and of enterprise can eventually be turned to greater
economic benefit for the farmer as well as to greater visual benefit for
him, his family, and the traveller. The complexity of high country
situations can give rise to stress and strain in the process of making
a plan work. Without the benefit of planmanship, multiplicity can
yield both unsightly disorder and uneconomic chaos. In such circum­
cstances Macbeth doth murder sleep. It is not enough to have a gen­
eral plan. Distances over which sheep and shepherds must travel,
seasonal difficulties of access, unpredictable behaviour of soils, plants,
animals and men in changing conditions, all contribute to the diffi­
culties of working to development plans in harsh and rugged environ­
ments. It becomes essential to plan for continuous appraisal and
adjustment to the general plan.

REQUIREMENTS FOR RESOURCE MANAGEMENT

The Prime Minister only yesterday pointed out to the Physical
Environment Conference in Wellington that population growth rates
such as that of New Zealand at the present time could not help but
give rise to tremendous social, economic and political pressures. He
pointed out that, “the rising standards of living set by the National
Development Conference are dependent not only upon our making
available the products of our climate and soils to a world in need
of food, shelter and clothing, but also to people in search of rest and
recreation.

“We cannot afford to squander any of our resources,” said Mr
Holyoake, “we must increase our efficiency in farming, manufactur­
ing, marketing and distribution and, at the same time, safeguard the
beauty of our lakes, mountains, rivers, bush and coastline, both for
our own enjoyment and for our visitors.”

Mr Holyoake has suggested that New Zealand has not yet suf­
fered the worst forms of pollution of our resources. In fact our most
serious water pollutant is eroded material. As you know there have
been thousands of acres, especially at high altitudes, which have been
retired from active grazing during the last ten years to decelerate
such erosion. Merely spelling them from grazing will heal few of
them. Active and successful research has been done by New Zea­
land Forest Service, Grasslands Division of D.S.I.R., the Tussock

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Grasslands and Mountain Lands Institute, as well as by officers of Water and Soil Division of Ministry of Work and the Catchment Boards to learn to rehabilitate such eroded and depleted lands.

There are many thousands of damaged acres that are still in pastoral occupation. Healing of all these damaged resources requires money and human effort. All our resource problems in the high country are not going to dissipate merely by closing the gate on them. We have some zones in the mountains especially in high rainfall sectors where effective dedication to wilderness state is probably sufficient to secure their conservation. We have many more acres where man’s culture is needed to restore and preserve our resources. So called unoccupied land may need the same kind of care and attention as “retired land.” Effective occupation of and responsibility for the region as whole is the necessary prerequisite. It is here that the partnership between the pastoral runholder and the nation as a whole as tenant and landlord is so important. To persist and bear fruit this partnership must have technical services of a greatly improved kind, it must have continuing goodwill on both sides as well as from the community at large and from more specialised authorities at local, regional and national level. Above all it must not be merely an economically viable partnership but a productively and economically vital, growing, flowering and fertile relationship—a symbiosis for which the legume and its bacteroid-containing nodules is perhaps the most apt figure.

It is for this reason that I emphasise the importance of resource development in high-country farming. Without healthy, profitable high-country farming I see little real prospect of any transition, any cultural bridge to any other possible pattern of resource use in the future of the high country.

REFERENCES

