LINCOLN COLLEGE FARMERS' CONFERENCE 1973
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Proceedings of the 23rd Lincoln College Farmers' Conference, May 16 to 18, 1973

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Sir Malcolm Burns (right) accepts from D. K. Mackenzie the painting commissioned by the Conference and painted by Austen Deans.

PRESENTATION TO SIR MALCOLM BURNS

During the 1973 Conference a presentation was made to Sir Malcolm Burns, this being the last Conference he attended as College Principal.

The establishment of the Farmers' Conference committee in 1950 and the arrangement of the first Conference in 1951 were due largely to the foresight of Professor E. R. Hudson, then Director of the College. Sir Malcolm, then Dr M. M. Burns, succeeded Professor Hudson a year later and for the past twenty years has taken a wholehearted interest in the Conference and its affairs.

Perhaps his greatest contribution has been in the evening sessions when, in the true spirit of the Conference, farmers met in informal session with discussion ranging over all the farming topics of the day. The scene is well described by L. W. McCaskill, first Secretary of the Conference Committee, who wrote: "Probably the lasting memory will be those evening sessions with everyone relaxed in lounge chairs before the fire; with pipes full steam ahead, with the benign chairmanship of Dr Burns and with members of the College staff
making occasional provocative statements, discussion was free and completely uninhibited.”

A painting commissioned by the Conference and painted by Austen Deans was presented to Sir Malcolm by D. K. MacKenzie of Hinds, Conference Committee Chairman for 1973. He made the presentation on behalf of all farmers who have attended Lincoln Conferences.

The painting featured one of Sir Malcolm’s favourite fishing pools in the Rakaia River.

CONFERENCE ORGANIZING COMMITTEE

The following are the members of the Farmers’ Conference organizing committee as at July 1, 1973.

J. O. Acland, Peel Forest, South Canterbury (Chairman)
S. C. Bowmar, 4 Lewis Street, Gore
Sir Malcolm Burns, Lincoln College
Professor I. E. Coop, Lincoln College
D. H. Crabb, Lincoln College (Secretary)
J. R. Cresswell, “Omaka Downs”, Blenheim
R. S. Emmerson, “Forest Range”, Tarras
P. C. Ensor, “Double Hill”, Methven
P. D. Gordon, P.O. Box 129, Wanaka
R. Johnston, Ashley Gorge, Oxford
A. T. G. McArthur, Lincoln College
G. P. McIntosh, Waikuku, R.D.3, Rangiora
D. K. Mackenzie, Ealing, R.D.3, Ashburton
A. R. McNabb, P.O. Box 25, Karamea
W. N. Maxwell, “Mt Sandford”, Cheviot R.D.
P. G. Morrison, “Hukanui”, Darfield (Vice-Chairman)
J. W. Overton, 183 Halswell Road, Christchurch
B. Russell, Irwell, R.D.3, Christchurch
S. M. Wallace, Haupiri, Nelson Creek, Westland
A. R. Wilson, Ikawai, 7 R.D., Waimate
I have just returned from a very brief but very fruitful overseas visit during which I was able to have discussions with agricultural ministers in the United States, in Britain, in France and in Germany, as well as briefer discussions with other agricultural ministers at the OECD Conference in Paris and with the European Minister for Agriculture, M. Lardinois. I am pleased to be able to report the tremendous prospects that exist for New Zealand agricultural produce in these markets if attention is paid to marketing in its widest sense. Our products must be presented in such a way that the consumers are satisfied as to quality and appearance. We must look to taste and flavour in foodstuffs, and to colour and fashion with woollen goods and carpets. These aspects are of great importance to the consumer who has never more held the whip hand than he does today in the markets in which we propose to expand in the future.

CONSUMERISM

Consumerism in the United States, in Japan and in Europe is assuming greater and greater importance and the effect of that lobby is, in my view, going to overshadow the long and pre-eminent influence of the beef lobby and the dairy lobby in the United States. This is of very great significance to New Zealand. The abandonment by the American administration of the Soil Bank programme, the expansion of American agriculture, and the determination of the Americans now to join us and other agricultural exporting countries in lowering world barriers against agricultural produce are of very great importance to New Zealand. We certainly welcome the United States as an ally in this new role. Of course, this means a mutual lowering of barriers and we must be prepared to play our part, show that we are genuine and that our intentions are bona fide. We should lower trade barriers against the importa-
tion of goods from their countries in response to freer entry of our own.

FARMING POLICY

The major emphasis of the Labour Government, in its consideration of farming, will be on marketing, the establishment of proper and continuous market intelligence, the research and development of new products, and the improvement of existing products from the raw materials of our agriculture and forests. Emphasis will also be given to farm training, land settlement, and farm finance for purchase and development. Policies to implement these general principles will be introduced this year.

In addition, the Labour Government will not be a party to maintaining policies that merely thicken the hide and dull the sensitivity to market demand or the readiness to adapt to proven research findings. Profitability per acre, both for the farmer and for the nation, is of prime importance. This means the optimum use of each acre based on the measured inputs of labour and capital, in real terms not masked by the sometimes crude palliatives and numbing overdoses of input subsidies. Subsidies can be likened to drugs. They are stimulants in small doses but used to excess can debilitate and dull the vitality and sensitivity of good health.

In this context, let me differentiate between the whole and the part, between the industry and the farmer. It is at the industry level that market responsiveness is so important. The farmer cannot respond if he is not made aware. He can only be made aware if Government and the industry transmit this sensitivity to him. The farmer will respond if he has the initiative and the resource and I believe he has. He is entitled to a standard of living and a quality of life comparable to other sectors. He is entitled to improve his position through better productivity and efficiency. He is neither superior nor inferior to other sectors of the community. When his profitability declines to a point where that standard of life is threatened, he is entitled to support. When profitability returns, that support should reduce in accordance with the level and the prospective performance of that profitability.

The land is the basis of 90% of New Zealand’s export income; it is the future source of the raw materials of industry. Its productivity and preservation are the ultimate responsibility of the nation and the government of the nation. Thus those to whom it is entrusted have special responsibilities and undoubtedly require special considerations. But I want to emphasize again that the future of import subsidies must bear relationship to the profitability of farming and the prospects in the future.

I am very much aware of the tremendous role that Lincoln has played in furthering these goals of profitability and productivity, and perhaps to some extent I am a bit like a church-
man surveying his Sunday congregation in that I am speaking to the converted. The people we would want to reach may not be here in the numbers we may wish. However, it is the progressive farmers — those that have ability and resourcefulness; those that are willing to accept the findings of proven research; those that are willing to experiment — who form that most important element of decision-makers and pace-setters in our agriculture.

OVERSEAS MARKETS

The market prospects for our meat overseas have never been better. The world red meat shortage is a continuing one, largely because of increased consumer demand rather than any decline in levels of production. The increasing capability of world consumers to buy is a feature that is world-wide and we have a tremendous opportunity and must take advantage of that opportunity. We must make sure that our processing industries and our agriculture are attuned to the particular demands of specific markets. One of the problems is that we must sell and ought to sell on as wide a variety, geographically speaking, of markets as we possibly can.

The old traditions that stood New Zealand in good stead during the past century must to a large extent be set aside within the next decade. We must shift more and more of our production into new and expanding markets. We must ensure that we become the exporters of quality processed materials for consumer markets not the exporters of bulk products. If we do these things, if we become more sensitive to the demands of the quality market-places of the world, we have a very attractive future as far as the farming industry and therefore the nation are concerned.

PROBLEMS

The problems we face are in a number of categories. In the meat industry, they are basically matters of hygiene and the fact that hygiene requirements of the American market differ considerably from those of the European market. My visit overseas seemed to be at just the right time to emphasize the need for an international standard. This is what we are seeking through the Codex Commission and I think we will make more progress towards it in the very near future. But the difficulties should not be minimized, nor should we try to avoid the fact that the meat processing industry in this country leaves a great deal to be desired; not enough has been done to keep up with modern hygiene and marketing requirements. This is why I have established an enquiry into the meat industry, into every facet from farm production to the selling of meat in the supermarkets and the butcher shops around the world.
In the woollen industry the Wool Marketing Corporation has been launched. When Parliament resumes we will be discussing the second reading of the Wool Marketing Corporation Amendment Bill that will restore the formerly intended powers of acquisition. I know this is a hot issue, but the future for our wool depends on greater stability, the extension of more services to the end-user, and greater promotion right through a vertically integrated woollen industry; we cannot afford the luxuries of having 33,000 sellers, who in the main cease to have an interest in the wool when the echo of the auctioneer's hammer has died away. We need to take a great deal more interest than that in this most valuable product. I believe that the Wool Marketing Commission has a tremendous role to play in ensuring more stable and permanent profitability for the wool producers and a greater use of New Zealand type wools in the world woollen trade and the world fibre market. We will not be turning away from what we know to be our responsibility in this respect.

The dairy industry is facing a period of some uncertainty. The European butter berg has loomed again. Mercifully, the EEC has honoured its undertaking not to frustrate our efforts and has disposed this year of its surplus — 200,000 tons — to the Russians at £143 a ton. Of course, the European consumer, who is paying nearly £800 a ton, does not see the joke, and we would be flying in the face of reality if we thought that the prospects for a worthwhile review, that would guarantee satisfactory amounts to us after this five-year period, was a likely reality. At present Europe's butter consumption is declining because of the high price consumers are paying and their production is increasing because of the high milk price that they are paying to their farmers. In an average year, the butter berg increases 200,000 tons — in a good year it could be 300,000 tons; in a bad year something less. But that is the prospect for the future. Any increase of imports into Europe — and our butter sales to Britain are butter sales to Europe today — is viewed as an embarrassment within the Community. The present off-take of sales in Britain is less than that required to meet the amount that has been agreed we can send at the price of 390 shillings a hundredweight or £390 a ton to the British market.

At the end of the year the British will be faced, or the Common Market will be faced, with buying the difference between what in fact has been sold and what we have been guaranteed. They can only add to their butter berg. I would suggest that this will only add to the unlikelihood of a favourable review from 1975 onwards.

These are the problems that we face. Fortunately, the prospects for the sale of milkfat in other markets are quite good. We have to improve them by promotion, by further efforts in the market-place, by product development and research, by regarding milk as the raw material and its constituent parts as the basis for new products and new combinations of products.
This is virtually what we have to do with every product from our soil. We must have continuing market intelligence. That is, I believe, a job for Government in co-operation with producer boards and with proprietary companies. We must convert that market intelligence through research and development into new products that will be profitable to all who are engaged in their production. So let us stop talking about a division between primary and secondary industry. It is one process from the farm to the supermarket and all engaged must be meaningfully rewarded in the work that they do in producing goods for world markets. This is why the work being done at Lincoln and Massey and at other research establishments in both the North and South Islands is of such great importance. Agriculture in the future must be market-oriented. It must be sensitive to the market-place. It does not have to shape markets — fly-by-night markets — but it must responsibly understand the market prospects and interpret the trends. We as a nation, and you as the producers, must be enabled to develop and to diversify to meet particular market requirements.

**INCOME FREEZE AND IRRIGATION**

Time does not permit dealing with a number of other matters I would like to discuss. However, I do want to mention the income freeze scheme. It is at present hovering around the $68-70 million mark. I would urge those who are thinking, "Well, maybe, maybe not", to "Maybe". Nobody wants a compulsory scheme and I am certain that it can be avoided if those farmers who are able to pledge do so. If you do this, you retain your flexibility, as far as after the first twelve months are concerned, and this is important to everybody. Secondly, of course, you save on taxation and that is a not inconsiderable advantage. The response to date has been pretty satisfactory and I would urge those farmers who have not yet made a firm decision to do whatever they can within reason — and I do emphasize that point — to take part in the scheme. It is in their best interests in every possible respect. One other matter that I could mention very briefly is irrigation, which is perhaps a very timely topic in this area at this time. I am conscious that the Canterbury area has suffered acutely from droughts, and would make it quite clear that, in the event of a compulsory incomes scheme, those people who have been hit by drought would be given every consideration. But as far as irrigation is concerned my Under-secretary, Bruce Barclay, has been engaged with a committee in investigating the ways and means of implementing our policy. His committee has brought down a scheme which would involve an investment of over $100 million in the next 20 years with an annual expenditure of $6-7 million a year. This is a tremendous investment but one we see as a national responsibility to develop our resources. Such an investment will return
a dividend to the country far exceeding the cost involved, and we want to make the most of our opportunities as far as a market-place is concerned. We cannot feed the world but we can feed a significant section of it, particularly that section in the developed countries who demand meat and dairy products and combinations of them. We believe that irrigation is much more than an insurance against drought. It could change the whole economy of an area if large-scale irrigation is introduced. It is our intention this year to implement the policy and the recommendations that have been brought forward by Mr Barclay's committee.
OUTLOOK FOR PRIMARY PRODUCTS

S. F. HARRIS
Deputy Secretary,
Department of Overseas Trade, Canberra, Australia

The world situation for agricultural commodities has clearly changed enormously from that of a year or two ago when it seemed that almost all rural industries (possibly except beef and dairy products) were in real difficulties. This raises the obvious question whether a fundamental change is not occurring in the position of world agriculture; indeed, to many it seems that the first signs are evident of what the doomsday men have been predicting — world food requirements pressing on the world's capacity to produce.

Certainly, a significant feature of the present situation is the widely spread nature of the improved conditions; wool and beef, mutton and lamb are outstandingly good; dairy products have eased somewhat, but are still at reasonable though declining levels; the world situation is very favourable (from an exporter's point of view) for many other agricultural commodities — wheat, coarse grains, sugar and oilseeds; there has been a marked improvement in the markets for processed and to a degree fresh fruits. Clearly this is a major turnaround in the position of world agricultural trade in the short run, despite the entry, finally, of Britain into the EEC, and despite currency upheavals and changes which would normally be expected to have worked against the position of Australia and New Zealand.

MARKET PROSPECTS

But is it a change that will stay in the longer term? To answer this, it is necessary to look at the extent to which the present situation is a result of short-term — or relatively short-term — factors. And short-term factors have been particularly important for a number of commodities: the world grains market has been affected particularly by the bad seasons last year in the U.S.S.R. and to a lesser extent China, as well as in a number of exporting countries; floods in U.S.A. and severe droughts in a number of countries are still im-
important influences; the present improved situation for Australian and New Zealand apples is a result of a significant reduction in British and European crops following poor seasonal conditions.

For the crop products particularly, when the effects of these seasonal influences cease to be important (and this could take a year or two) a reversal of the favourable situation is likely to be experienced. Indeed ups and downs have in the past been a feature of the world markets for these products, and are likely to be so in the future. Dairy product, particularly butterfat, markets are likely to be affected importantly by the policies of the enlarged EEC and associated governmental arrangements.

In the last two years, EEC support prices for milk, butter and skim milk powder were increased, providing a significant further stimulus to dairy production. For 1973-4, support prices for milk have been raised and, consistent with this, the support price for skim milk powder has been raised, but that of butter has been cut. The lower butter price is no doubt aimed at assisting in increasing domestic consumption and saving on export subsidies. It is backed up by a butter consumption subsidy. These measures, and the recent large sale of butter to the U.S.S.R., should tend to ease the surplus butter stock position in the community but may not head off problems on skim milk powder. The recently concluded GATT butter oil agreement should contribute towards greater stability in world trade in butterfat. But its provisions do not extend to butter as such and the potential for oversupply in butterfat is expected to remain over the next few years.

Prospects for cheese are more encouraging. Japanese imports of cheese should continue to grow. Although the Japanese market will be a competitive one, the upward trend in world cheese consumption is likely to provide increased opportunities for trade. Market prospects for milk protein products (skimmed milk powder and casein) are generally more encouraging than those for butterfat. Prices are down on the high levels prevailing early last year but are unlikely to decline to the very unsatisfactory levels of the 1960s, especially with the International Skim Milk Powder Agreement in operation. These are by-products of butter production and consequently, where large volumes are involved, factors which adversely affect butter markets can have a bearing on levels of output of both skim milk powder and casein.

For wool and beef rather different factors are at work. Some are short term: some restocking of wool in Japan, the low level of pigmeat production in U.S.A. Some are longer term: the substantial increase in world economic activity has been of major importance for wool — and has also influenced the meat market; the high level of world economic activity can be expected to continue for some time; any easing in world economic activity, however, whether as a result of "brakes" now being applied — as in U.S.A. and Japan — or
because of the normal cyclical effects will slow the rate of growth in demand.

A further favourable longer-term factor is the greater emphasis on consumer goods in Eastern European countries. This is reflected in wool and meat as well as grain and dairy product purchases. In the case of wool, I do not pretend to know the situation for carpet wool, though I would expect continued high levels of world economic activity to be particularly important.

For apparel wools the likelihood that world wool supplies next year will only slightly exceed this year's level will be an important factor in sustaining the market, as will the continued high levels of economic activity, but there must be concern at the long-term (lagged) effect on demand of the present high prices. Fashion is currently an important influence; it has been partly price induced and fashion in any case tends to be very variable in its impact. The opportunities that high prices provide for increased competition from synthetics must also give some concern. At present trade supplies of synthetics are themselves tight and seem likely to remain so for some time.

Nevertheless, in the longer term, the pressures will tend to be for increased synthetic fibre prices, both because of general inflationary pressures — less easy to offset with economies of scale — and, looking further ahead, pressures on petroleum and coal prices. There are reasons therefore for thinking that the market will remain firm in the coming year, although not at the levels of the current year.

Clearly, over the general commodity field, there are some favourable longer-term factors added to the general growth in world demand for textiles and protein foods that comes from population and income growth around the world. Yet there seems little reason for thinking that there has been a basic change in the position of agriculture. The problems of markets to which Sir John Ormond referred in his talk to this Conference last year will be ever with us.

BEEF

Both in Australia and in New Zealand, beef prices are largely determined by the international market. The importance of recent events in U.S.A. and the EEC (including U.K.) and to a lesser extent in Japan reflect the dependence of the international beef (and to a large degree meat) trade on these three markets. Clearly the main characteristic of the market has been rapidly rising beef and meat prices in association with a world-wide shortage of red meat, particularly beef. World demand has been rising strongly for over a decade with rising standards of living and changes in tastes. As well as these basic long-term factors there are, however, evidently some short-term factors at work. In the last month or so, there have been dramatic upswings in prices in export markets leading to a rapid rise in meat prices in New Zea-
land and Australia. Just why these have occurred is not completely clear. Consumer demand is obviously very strong, reflecting the rapid upturn in economic activity in major market areas.

In these circumstances, small decreases in production can cause major price changes. During 1972, below-average levels of beef production in a number of countries coincided with below-average production of other meats as, for example, pigmeat in U.S.A. and Japan.

Although in U.S.A., beef production has been rising (by some 2% a year) total meat production was down by some 2%; hence the pressure on prices and imports — although imports supply only a small proportion of U.S.A. consumption. Some over-reaction by traders was also evident with stock build-ups in U.S.A. earlier this year.

In the longer term, world demand for beef is likely to continue to grow strongly, reflecting both population and income growth. At present the recovery of economic activity throughout the world with its favourable effects on consumer incomes is influencing consumption in U.S.A. and EEC while changes in tastes are also important in EEC as well as in Japan. Import restraints have been eased or lifted in the EEC and U.S.A. and in Japan; further liberalization of access to the Japanese market can be expected. There is also a significant influence being felt in the centrally planned economies with improvements in consumer diets — reflected in U.S.S.R. imports of meat. Southern Europe is also moving significantly into the meat market as an importer.

On the supply side, there have been increases in herd numbers and production in both Australia and New Zealand in response to the market openings that the increase in demand has thrown up. It has been dramatic in Australia. Cattle numbers increased by a third from 1969 to 1972, compared with an increase of some 5% for the New Zealand herd (though 16% for beef cattle numbers) over the same period. Australian production increased by 25% over those years while, over the same period, the New Zealand industry increased output by over 9%. In the current year, production in Australia is expected to increase by some 25%, with herd numbers still increasing although at a slower rate than in recent years.

If other producers were reacting in the same way as the Australian industry we might need to start worrying. Undoubtedly many countries are trying to increase beef production as rapidly as possible — but there are many constraints, including the biological ones, on rapid growth in beef production: disease problems, particularly in developing countries; the heavy demand on resources that livestock expansion calls for — land both for the cattle and for grain for feeding. In Europe, increased beef production seems to imply increased dairy production, with its disposal problems — in any case, the strong demand for veal there limits the capacity to expand beef production. In none of the major producing and export-
ing countries has there been a major change of the kind which has taken place in Australia.

In the U.S.A., however, cattle numbers have increased by about 8 million in the period, and a further 4 million from 1972 to 1973, providing the potential for a future production upsurge. On the other hand, the last time there was a major "price break" in U.S.A., in about 1963-4, it was mainly for fed beef rather than our manufacturing-type beef. In the EEC, production has increased, but the increase in output has been achieved at the expense of lower numbers. In the U.K., there has been some build-up in herds, and also in Ireland. Japan's potential for increased output, however, is very limited. In Argentina, production has fallen markedly but herd numbers have recovered. Thus Argentina could be a larger force in world trade and in fact its exports picked up considerably in more recent months. But its domestic demand is very strong and, because of foot-and-mouth problems, its supplies are excluded from U.S.A. and Japan.

Thus there are indications of herd build-up in a few other major trading countries besides Australia and New Zealand. When the beef from these larger herds comes on to the market — quite possibly within the next three years — then world prices could ease, particularly if the movements on to the market tended to occur about the same time. Alternatively, a continuing very favourable outlook for beef may encourage a longer period of herd expansion, providing the potential for a greater acceleration of output towards the end of the decade.

The implications of this in the longer term are significant for both our industries. Most of us are familiar with projections by FAO and OECD which show a major beef (and meat) deficit by the end of the present decade. This looks a very favourable prospect for both our industries. Undoubtedly, the long-term trend is favourable, but there are three aspects which tend to get overlooked.

First, these projections understate likely production of world beef (and meat). For example, Australia will produce more beef in the current year than FAO projected for 1980. By 1980, Australia could possibly be producing 2 million tonnes, some 40% more than allowed for in the FAO projections, and exports could be about three times the projected level. A somewhat comparable situation exists for the New Zealand industry with exports in 1980 perhaps reaching some 425 000 tonnes, or some 150 000 tonnes more than the projections allow for.

The enlargement of the EEC, through the higher producer prices for beef that will now apply, will reduce beef consumption in the joining countries and will encourage greater production of meats in those countries. This will narrow any overall gap for beef (and meat) which might otherwise have existed at the end of the decade. It may incidentally — and provided there are no changes in Community support measures for these products — benefit lamb and sheep meat
producers (and exporters) as well as EEC producers of pig and poultry meats because demand will be switched to these meats. The prospects for lamb exports will, however, depend importantly on developments in the North American market, although there may be some growth in smaller markets. Lamb consumption is very low in U.S.A. and there appears to be some scope for further expansion in the market, particularly with the encouragement of the Promotion Coordination Committee. In summary, then, the pressures of demand on beef (and meat) supplies at the end of the decade may not be as acute as the projections have suggested.

Two other factors could be of importance. Continued high prices will encourage the consumption of meats other than beef; production of both pork and poultry are more easily expanded than beef, and emphasis may be given to these meats in production and trade policies.

Third, continued high prices will also give added stimulus to the further development of synthetic meat substitutes. No one can make a complete judgement at this stage of the possible significance of synthetic meats. The main concern would appear to be with vegetable protein extenders; the technology is already readily available; it is already very economic to use such extenders in proportions up to 20 to 25% or more of products such as hamburgers and frankfurters; for many, the product is regarded as being nutritionally improved.

One of the factors limiting their use in the past has been consumer resistance to the inclusion in manufactured meat products of synthetic substitutes. Consumer resistance to continuing high meat prices may be expected to outweigh such reluctance to accept such synthetic extenders. This becomes of particular concern to our two industries because of our dependence upon the manufactured meat market in importing countries; most of Australia's and New Zealand's exports have been in the form of frozen boneless beef for manufacturing purposes.

New Markets

However, there is an important and growing market for chilled table quality beef in Japan. Other markets for table beef exports have included a number of European markets, notably the U.K. and some Middle East countries, and to a lesser extent some of the South-east Asian countries. Although, until recently there has not been sufficient economic incentive in the form of price premiums to warrant any significant growth in chilled beef exports, with the present very high world prices it has been possible to develop the air-freighting of choice cuts in relatively small amounts to overseas markets, such as Sweden, Canada and Denmark.

The basic dependence on markets for manufacturing beef is expected to continue for at least some years, as domestic
beef industries in most of the major world markets are orientated towards production of table beef, leaving them increasingly dependent on imports for supplies of manufacturing quality beef, demand for which is significant. However, in the longer term, the manufacturing sector of the beef market is likely to meet the strongest competition from meat substitutes. In summary, in view of the short-term factors currently at work in the market, some movement back from present prices in the short term must be expected, though it is not clear how soon this will occur.

In the longer term, the market will reflect the effect on supplies of the encouragement being given by government policy measures encouraging meat production, and the encouragement of production of beef and substitutes, natural and synthetic, by high prices and the favourable market projections.

The long-term outlook remains favourable but a significant movement back from present prices looks fairly likely. There seems little reason, however, except for possibly short periods, to expect prices to fall to levels below those which in the relatively recent past we would have considered very favourable.
WOOL MARKETING CORPORATION PLANS

W. WHINERAY

Managing Director, Wool Marketing Corporation, Wellington

It is probably true to say that over the years farmers have been subjected to more written and verbal advice — directives, journals, newsletters, etc. — than any other segment of the community, and yet in wool matters at least there has never been more confusion, uncertainty, and even distrust. The answer to that, surely, is action. As a farmer friend said to me recently: "For goodness sake, let's stop the talk and get on with the job." I agree with him entirely. I do not blame those who have had to rely on talk in the past, but we are now beyond the stage where talk is going to solve any of the industry's difficulties. What farmers want to see — and what I want to give them — are the first firm steps into marketing reform. They are not big steps, but I make no apology for that. The wool business is a very big and complex one, and there is a lot of caution on all sides. We will take short steps to start with and when we have established that the ground is firm beneath our feet, and most people are satisfied, we will lengthen our stride a little.

CORPORATION PLANS

For the most part the Corporation and its plans for the next season will be discussed in this paper. In fulfilling those plans, the Corporation is going to show farmers far more about the realities of modern marketing than they will ever learn from pamphlets and speeches. Even these first steps are unlikely to be greeted with joy by everybody. In fact it is sometimes easier to introduce a big scheme than just a part of it. There is nothing so new about it; it is based on studies and practical experience in marketing that go back to the study group which the Wool Board and the Wool Commission jointly set up in late 1964. The group was charged with looking at the causes of price fluctuations and suggesting methods of containing them within the existing system. It was also called on to report on methods of wool marketing.
The group brought down its report in November 1967. It broadly recommended an appraisal and purchase system in which all wool would be bought by an authority and sold by the authority through the existing channels. During the three years of its existence, the group issued a number of background papers — on such matters as the effect of spreading the flow of types to the market — and these have been the basis of much of the subsequent thinking on the subject.

As the first managing director of the Corporation, I am impressed by the depth and quality of much of the marketing work that has been done. We are not starting from scratch; far from it. Right now, if the need arose, we have the ability to handle the wool clip in an orderly manner within eight days if an emergency situation arose and build it into a sophisticated operation within a few months.

I will pass only briefly over the events since the study group reported in 1967 — the year crossbred prices fell and the Wool Commission intervened in the market. There was also a great deal of currency speculation culminating in the devaluation of sterling and subsequently of the New Zealand dollar. Because market conditions were "tender" and New Zealand held 700 000 bales of stock wool, the appraisal and purchase scheme was not introduced. The Wool Board and the Wool Commission set up a Wool Marketing Committee which went through the recommendations in detail. That committee brought down its own report in November 1968. It recommended immediate work on objective measurement, improved wool flow and other ancillary matters, but, on the larger issue, it deferred action until the bulk of the stockpile had been sold.

That time came in 1970, and the Board appointed the Battelle Institute from Ohio to act as consultants. The Institute reported in July 1971. Its report became the basis of the Board's own marketing plan, which was released to growers in August that year and received general endorsement. It envisaged the eventual acquisition of wool by a grower-controlled authority, but the authority was to win its way there by a judicious use of its powers and its commercial expertise.

So that the recommendation of Battelle could be implemented, the Wool Board, together with the Government, appointed yet another organization with a marvellous long name — the Wool Marketing Corporation Establishment Company. The company came down strongly in favour of a Corporation vested with power of total acquisition. Put bluntly, they argued that the Battelle scheme was impractical and did not match the urgency of the situation. The legislation was drafted on these lines.

The rest is recent history. The bill was referred to a Select Committee and was amended, making the power of acquisition subject to a growers' referendum. When Government changed hands, an amendment bill was introduced in Febru-
ary this year, dropping the referendum and restoring to the Corporation the power to introduce acquisition when it thought fit. This amendment bill has been read the first time and will complete its passage through the House later this year.

The Corporation began life on December 1, taking over the assets and staff of the Wool Commission. Those assets now amount to almost $55 million. The entire stockpile has been sold and the assets are overwhelmingly in Government securities.

The directors were appointed just before Christmas and started active work in January. Five of them, including the chairman, Douglas Bremner, were nominated by the Wool Board — according to the Act. The other three voting members are appointed by the Minister. It is a strong Board with a wide range of experience. In fact "strong" is the right word. Professor Brian Philpott is a familiar figure around this campus, and he is well matched against some of the other figures around the Board table.

One of the first things to which our directors gave their attention was acquisition, because of the fire in the fern and the fears that it could be introduced overnight. Mr Bremner announced that we would be developing programmes and methods of marketing so that acquisition — which he rightly described as a "tool" of marketing — could be used most effectively. He expected those programmes would be sufficiently advanced to allow their implementation by 1975 — but the Corporation could move at an earlier date if it was in the interests of the industry and the country. He added that, when acquisition was introduced, the methods of distribution prevailing at the time would continue.

That brings us up to date, to the time when I made my first appearance on the scene. You have not heard much from the Corporation for the simple reason that we have not yet had much to say. But let there be no mistake, it is in being, charged with obtaining for woolgrowers the best possible returns for New Zealand wool.

Returning briefly to the men who have been primarily entrusted with this task, the directors — they are a blend of commercial and grower interests under the direction of a chairman with outstanding talents in both these fields. I know there is a lot of talk in farming circles about what sort of blend it ought to be. I want to make one or two comments on the matter of specific expertise.

**MARKETING SKILL**

Marketing is one of the modern skills. As in medicine and agriculture and engineering, there is a vast body of knowledge and experience that has been built up. Men put long study into gaining marketing skills, and then they need years of exposure to the heat of the market-place to become truly efficient.
Many farmers these days will appreciate the point I am making. They see all around them examples of modern marketing techniques at work, and very often the marketing skills — rather than the inherent qualities of the product — make the difference between its success and failure.

Many will be aware of the interest which the universities are taking in the marketing field — particularly with a view to training a corps of men to serve our primary products. I know this has long been a cause for Brian Philpott; I am sure it is alive here at Lincoln, and no doubt the Corporation can assist it.

The basis of the Corporation concept is that wool marketing will be handled in a thoroughly professional way by people trained to the job. Those people are subject to a board of directors, which must include men with more than a little practical and theoretical knowledge of commercial marketing. I ask you to respect those men, and the skills and experience they are bringing to the service of your industry.

Some of you may look upon the grower representatives mainly as watch-dogs for your interests. They have much more to contribute than that. Men learn techniques of decision-making and sound judgement in many fields — and farming is a good one for it. Every Board needs such men.

The Corporation has taken over the staff of 40 of the old Wool Commission. I am the only addition so far and there will be no wholesale recruiting. Growers generally view with high regard the work of the Commission over the difficult years in quietly and effectively storing more than 700,000 bales, then selling it in such an orderly manner that the market was not disrupted. The whole operation reflects great credit on my associate, Hugh Peirse, and the Commission staff.

PLANS FOR THE IMMEDIATE FUTURE

I have laid before my directorate a programme leading towards full implementation in 1975. I have also given an indication of what we could achieve at short notice — and, as mentioned, we could operate in as little as eight days if an emergency forced a decision.

There are many avenues for reform and the Corporation already has wide powers; some even suggest the power should be used for major reform in a sudden revolutionary manner. However, my recommendation is for a steady progression through the next two years, introducing reforms and then widening their scope until we are geared to handle the full clip in an efficient manner by 1975 if the directors deem it wise to do so at that time.

There will be changes throughout the period but none of them will be random and each will form part of the full scheme. Some of the first may appear very modest, but they will be developed as the growers and the trade become familiar with the pattern, and there is a gain in confidence.
A steady pace is often the quickest way to cover a long distance. So little has changed in the past 100 years that another few months will not hurt.

These will be our projects for the 1973-4 season:

(1) **Larger lot sizes.** We will be announcing a voluntary system for lot-building in specific categories of wool. It has the blessing of brokers and buyers who have agreed to reduce the showing requirements for lots that have been built to agreed standards.

(2) **Minimum lot sizes.** Compulsory lot-building will be introduced for many categories of skirtings and oddments, as soon as procedural details have been settled.

(3) **Objective testing.** As far as it is able, the Corporation will promote objective testing of wool in lots exceeding 40 bales. We will use our own funds initially, and, where such tests are of commercial value, the buyers have agreed to reimburse us.

(4) **Grab sampling.** The use of grab samples in selected categories of wool, and the consequential savings that lie behind sampling and testing, will be steadily encouraged. Equipment is currently being evaluated by brokers and when perfected buyers will be consulted.

(5) **Economic studies.** We are required under the Act to develop minimum price tables appropriate to the 1973-4 season. We have commissioned independent studies as a supplement to our own econometric model in order to establish our estimates of market prices as logically as possible.

(6) **Marketing.** From time to time, the Corporation will purchase small quantities of wool privately or at auction. The main objective will be to use the wool for controlled market experiments. The purchases will not be large and will not disrupt the flow of wool to normal end uses. Naturally we will not always be able to say what we are about. Incidentally, the economic studies will have a part in this experimental work.

(7) **Transport.** In the tangle of logistics, the greatest immediate benefit seems to lie in the region between brokers' and dealers' stores and the ship's side. Under the powers of the Act, we will be looking at developing close-off dates for documentation, loading, etc. The purpose, of course, is to speed the wool flow and reduce waiting time for men and ships — all of which have a cost.

(8) **Acquisition.** At the request of the Electoral Committee, at the mid-year meeting, we are examining alternatives to the present scheme. We are approaching it with an open mind but you should realize it is no easy task. For nearly
ten years the industry, here and overseas, has been looking for a system that meets the requirements of an efficient marketing scheme without acquisition.

**CARPET WOOL**

Perhaps I should say a word about the visit to New Zealand of the executives of the Karastan Rug Mills in the United States. You will have read of their problems with wool prices. There is no doubt in our minds that their concern is genuine and that the situation for carpet manufacturers is as serious as they say. In purely marketing terms, we cannot in my view afford to lose any large users, especially when they are prepared to negotiate and enter into forward commitments at what are normally very attractive prices. If Karastan and the wool-using carpet manufacturers in the United States gradually move to synthetics, it will mean increased supplies of wool (from other countries as well as our own) to be placed elsewhere. As most people appreciate, the difference between a shortage and a surplus in commodity markets is small but the effect on price is usually far from small.

We are endeavouring to establish what primarily are the types of wool Karastan requires and what is the best price we can negotiate. We will then offer the package to the trade so that a number of firms can participate in fulfilling Karastan's huge requirements. Any wool so offered would be from growers fully prepared to enter into a contract at firm prices. The recent decline in prices will undoubtedly affect the situation as far as Karastan is concerned, but already a number of growers have indicated their interest in the proposition.

It has been a wonderful sale season for wool and prices should continue to be good in the immediate future. The concern for all of us is what is the right thing to ensure we maintain reasonable prosperity in the longer term. It has taken us ten years to get a Marketing Corporation established. For eight of those ten years, prices averaged approximately 63 cents a kilo. We have to do better than that.

The marketing changes which have been proposed, and are embodied in the legislation, are not of the "on-again-off-again" variety, depending on the state of the wool market. As already stated, it will take the best part of two years for the Corporation to be capable of assuming its full responsibilities. It will take longer still before the full benefits are felt throughout the system, with greater stability and increased returns to the grower. Given the normal market cycle, we will probably go through seasons of lower prices before then, so we need to move with all reasonable speed, remembering that undue delay now increases the risk four or five years hence.

I am not concerned with talking "politically" about wool marketing. Some could say, and doubtless will, that I am being political at this moment. I prefer to think I am talking
openly with my shareholders and trying to say something helpful.

My job, with the assistance of my staff, is to prepare and implement a programme of marketing reform which secures the best long-term return to the woolgrowers. That is a challenging task. To succeed, I mean to get the best people I can find when they are required, to pursue the best policies we can devise — as gentle as possible but as tough as necessary. I believe in good communications, and as we go, I shall explain the thinking behind our decisions (unless of course to do so is against your own commercial interest).

So step by step we shall progress. Within a few months, thousands of growers are going to see some changes, and in a few months more they will see more of the marketing pattern develop.

You have to believe in organized marketing because the evidence of its power and success is all around you. From work I completed when I was overseas on the marketing of commodities, I am convinced that the best way to safeguard the future is by becoming strong organized sellers. Historically the terms of trade tend to turn against agricultural producers under a free market system. A great many of the world's commodities — even those sold at auction — are currently sold on a co-operative basis.

I will be closely involved with the wool industry for the next few years. During this time the establishment of the Corporation and its effective operation will be completed. But, in essence, the Corporation staff and my Directors are all servants of the woolgrower. We will create for you a modern marketing organization but to a very large extent the full implementation rests with you and your leaders. It is your industry and that of your sons and daughters who will follow you on to the farms. I hope you will have the vision to look beyond today and even tomorrow.
Jonathan Seagull discovered that boredom and fear and anger are the reasons that a gull’s life is so short, and with these gone from his thought, he lived a long fine life indeed. — Richard Bach.

INTRODUCTION

Stuart Harris has marshalled the formidable resources of the Bureau of Agricultural Economics to present a substantial and perceptive paper on market prospects for beef and it is not proposed here to pursue further the aspect of market prospects but to review and present a few principles which are neither new nor profound, but, hopefully, are timely.

New Zealand has emerged from the culture shock of the EEC but still has to formulate and put into effect national marketing policies that are soundly based and meant for the 1980s and beyond. It must be evident that the British, now safely in the EEC after long and painful tribulation, have New Zealand interest at heart only when it coincides with self-interest.

So it is planned in this paper to say a little about marketing principles, then examine New Zealand’s past marketing performance, and suggest what the future approach should be.

MARKETING PRINCIPLES

A commonly accepted definition is that marketing is concerned with the satisfaction of wants and needs of consumers at a profit. So one does not produce electric mousetraps, however decorative, hygienic and painless they may be, if the consumer is adamant that he prefers the old wood and cheese type. One asks the consumer what he wants and needs, and then gives it to him. Of course an attempt is made to persuade him of the superiority of the new product and one hopes he will buy it eventually, but meantime one satisfies his wishes.

As stated, the satisfaction is at a profit — profit to whom? In the case of meat, to the producer, to the processor, and
to the distributor. So it is a joint effort with producer, processor and distributor working together, not sniping at one another. The more satisfied the consumer is with their joint efforts, the higher the price he is willing to pay; the less satisfied, the lower the price. In fact, the alternative to asking him what he wants is to infer it from the price he pays.

Now the focus is on the consumer, and the aim is to make a profit. How does one go about marketing? Does one shove the product under the consumer's nose, extolling its virtues? Or sit back and wait for consumers to flock forward because of the high quality, wholesome, nourishing and so very superior product? Neither. Marketing strategy consists of four steps: assess the market; organize for marketing; plan a market programme; evaluate past efforts. No matter what one is attempting to market, be it mutton, electric blankets, corsets or caviare, it is necessary to assess, organize, plan and evaluate — in that order.

**Assessment** means collecting information about the market in which the product is to be sold — types of customers, their incomes and buying habits, their likes and dislikes, and so on. Included here are data on prices consumers have been willing to pay in the past.

**Organization** involves structuring the firm or industry to market with maximum effect. In some cases many firms selling the same or slightly different products may be appropriate, in others a single giant firm or marketing authority may be best.

**Planning** revolves around product design and presentation, pricing strategy, distribution, advertising and promotion.

**Evaluation** means seeking independent assessment of performance and accepting criticism; not forming the closed circle so much a part of New Zealand marketing folklore, while only congratulating one another.

The rather delicate question now arises of how New Zealand meat marketing has measured up to these criteria in the past — delicate, because at a meeting a couple of years ago I offered some temperate comments on the subject and have yet to hear the end of it.

On the basis of evidence normally available to a person like myself, I suggest that meat marketing organizations have apparently placed too little emphasis on assessment (finding out what the consumer wants and needs now and in the future), and probably relied too much on the advertising and promotion aspect of planning. I defer comment on organization meantime and can find no evidence of meaningful evaluation. I accept that in the past when the U.K. was our natural and almost sole market, assessment was not such a critical factor. However those days are gone now. I accept that within a large and complex organization such as a Board there are
checks and balances which sometimes require policy changes to be slow and cautious. I also accept that very large expenditures on advertising and promotion can result in changing consumers’ needs and wants. But it is extremely difficult to measure the effect of advertising and promotion. What one wishes to measure is the effect on sales, but the link is tenuous and complicated. So practically all studies settle for measuring the communication effect, that is, the effect of given advertising on buyers’ knowledge, feelings and convictions about the product — but not on whether he actually buys or not. It is just not good enough when such large sums of money are involved. There are techniques for measuring sales effect but they are sophisticated and require skill in application and interpretation.

I hesitate to suggest that secondary industry marketers are showing more initiative and adaptability in “scientific marketing” methods than primary industry. However, a seminar was held at Lincoln last year on “Doing Business in Japan” and some manufacturers showed up very well. Consider Hamilton jet boat units. In discussing market penetration in Japan they said: “Our first reaction was to sail in there promoting our glamour craft for the pleasure industry. After all this product had been sold very successfully throughout other countries in the world. We soon learned we played the wrong card too soon. So a year ago we took a look and listened to various people and their needs, and went home and designed a product that the Japanese said they required.” Feltex contributed another case study in which they emphasized the prime necessity to investigate thoroughly the characteristics of the Japanese carpet market and discussed their procedures for doing so. Another example came from the Tourist Department. Their strategy was to identify the needs and wants of the Japanese traveller and use these in promoting New Zealand.

**ORGANIZATION FOR MARKETING**

Aspects of the present system of marketing meat and whether some other system might be preferable will now be discussed. If attention is confined to meat exporting, it is found that there are 46 meat export works selling overseas on their own account or through agents. Would it be preferable for all or part of the processing and distribution sector to be placed under a single marketing authority?

This sort of query arises in producers’ minds because normally their share of the consumer’s dollar tends to get smaller and smaller as time goes on. For meat this is partly because processing is labour-intensive and affected by rising wages, and partly because consumers are demanding more services such as packaging, quick-freezing and so on. A marketing authority which will raise returns to producers and at the same time reduce price fluctuations is seen as the answer. This happier state of affairs is presumed to be brought
about by the ability of the authority to control supply, expand demand, and reduce marketing costs.

The objective of the marketing system is to satisfy needs and wants of consumers. As far as meat prices are concerned, the present behaviour of consumers away from beef and lamb towards other meats and meat substitutes indicates they think prices are high enough. (This does not mean consumers are not willing to pay higher prices for some meats and associated services.)

**Control of Supply**

Holding back supplies is likely to be tricky when only one of a number of suppliers (as New Zealand is). The same criticism can be made of the New Zealand "strong seller" argument; there are also storage costs. The extra amount eventually obtained by holding back has to be at least larger than the storage and other costs incurred in holding.

If pooling of returns is proposed, this leaves no incentive for the enterprising producer and discourages quality improvement. However, supply management has possibilities. This involves altering the product mix — that is, the proportions, say, of sheep and cattle coming on to the market. A central authority is in the best position to do this by premiums or penalties. Again, an authority may be more soundly based financially to test new or expanding markets.

**Expansion of Demand**

The case for a central authority is strongest here because the functions of market assessment, advertising and promotion can best be administered and evaluated by the agency handling the product.

**Reduction of Marketing Costs**

Theoretically an authority could cut costs by such measures as: removing marketing agents who compete against one another for markets; negotiating large-scale shipping and transport contracts; being able to deal with countries who prefer to negotiate with a national organization. Also an authority may not have high profits as an objective. However, in practice there is little evidence that present meat export firms are making excess profits. If they were, and in the absence of barriers to entry, they would soon attract other competitors into the industry because in the business world profit is the name of the game.

Transforming livestock to meat and marketing it is a complex and risky series of operations, requiring highly skilled and paid personnel with necessary training and experience. An authority would have to pay a very high initial price for such expertise. Why not take advantage of these existing skills by a less than complete takeover?
Individual firms have to make numerous decisions which, if they turn out to be correct, mean profit (but if incorrect mean loss). An authority making wrong decisions on behalf of the whole industry could have a much larger unfavourable effect. Again an authority may have to obtain the large working capital required from Government and thus be subject to political and Treasury control. Finally, under acquisition there may not be sufficient incentive for continually increasing killing and processing efficiency if rates are set at a low efficiency level.

I conclude that it seems wiser to work towards improving the present system rather than replacing it altogether. Probably a medium-term objective could be for a central authority to assume ownership of meat ex works. It could market some meat on a test or development basis but leave the bulk to be marketed through established channels, provided these were seen to remain efficient and enterprising.

**IMPROVEMENTS OF PRESENT SYSTEM**

Many avenues of improvement exist — the Meat Board lamb-marketing shake-up was confrontation at its best. I offer two suggestions only.

**Processor Needs**

Farmers tend to regard the meat works as the principal opportunists and exploiters in the marketing system. However, if the needs of the processor were more carefully considered by the farmer, both could benefit to a substantial degree. Briefly, the meat works will pass back highest net returns per head to the farmer if the farmer ensures consistent supplies of stock which are clean, healthy, of consistent type and delivered when requested.

If I were contemplating setting up a meat works these are the sorts of factors I would look for in the various localities I had under consideration. In fact, in Australia one large meat company has withdrawn its buyers from various districts because of stock and delivery inconsistencies.

**Size and Location of Meat Works**

To break down the price of a roast leg of lamb on someone's dinner table in the U.K., about half goes to the producer, about a fifth to the works, and the rest to shipping and selling charges. So New Zealand costs are the major component.

We have been looking at the ex farm costs we can influence in New Zealand, and briefly this means looking at the efficiency of meat works. This work is being carried out by one of my staff, Rod Brodie. Our objective is to minimize the cost of transporting lambs to the works plus minimizing killing and processing charges and costs to shipside.
There are quite significant economies in killing charges as throughput at works increases. For example, capital costs for a daily throughput of 5000 lamb equivalents is about $1100 per head, compared with $900 per head for a throughput of 15,000 lamb equivalents. The cost curve is U-shaped, which means there is a least cost throughput at which a works should operate. So the best size for a works can be determined. The best location will depend on how far the stock have to be transported from farm to works and from works to port for shipment overseas. The major transport costs are from farm to works. We are still working through this exercise but right now suggest there is a strong case for fewer works, but each larger in size. The day of the very small works has gone.

In fact, to improve the existing system, a good bet for the Meat Board would be to build and run a small works, utilizing the latest equipment and technology. This would not only increase returns to the fortunate farmers who supplied it but give a accurate data on how low killing charges could go. Hence it would also provide a bargaining weapon for the Board in its dealings with the industry.

THE MEAT CONSUMER OF THE FUTURE

An outline can be given of what market research has indicated will be the likely characteristics of the meat consumer of the 1980s. Producers, processors and distributors should adjust accordingly.

The housewife will be out of the house more, maybe have a part-time job, and certainly be less of a slave to the kitchen stove. She will also have a larger housekeeping budget. This implies the following:

(1) Meat must be easier and more convenient to prepare.
(2) There will need to be a greater choice of cuts, more attractively presented.
(3) More precise specification of quality and type, true to label, will be required. Standards will be enforced by consumer organizations and Government.
(4) Value rather than price will be paramount. Value implies lack of waste, such as fat and bone, and a once hot, once cold joint with no leftovers thereafter.
(5) Meat must be capable of being stored longer but ready for immediate use.

If it moves towards satisfying these requirements the meat industry will continue to prosper.

Finally, a comment about substitutes for meat. Production of these substitutes, which are mainly vegetable proteins, is expanding. Meantime, the grits and flours which are used as
fillers in manufacturing quality meat are of more concern than the analogues or ready-to-use forms.

The U.S.A. is at present the main producer, followed by Japan, U.K. and Canada. Annual consumption of meat substitutes in U.S.A. is round 10,000 tons or about 0.5% of red meat consumption. By comparison, imports of all meats by U.S.A. is about 6% of consumption. The U.S. Department of Agriculture estimates that by 1980 substitutes will have captured 20% of the market previously held by manufacturing quality meat. In general, the rate of erosion of New Zealand's meat markets by substitutes will depend on how effectively a move is made towards satisfying changing needs of consumers.

SUMMARY

(1) In marketing, satisfying the capricious, unpredictable consumer is the name of the game.

(2) Successful marketing, whatever the product, involves a logical and orderly strategy of assessment, organization, planning and evaluation.

(3) In the past, New Zealand meat marketing strategy has been weak in market assessment and has tended to over-emphasize advertising and promotion.

(4) The present meat marketing system could be improved by the creation of a central authority to assume ownership of meat ex works.

(5) In the future, consumer needs and wants will have to be more carefully assessed and met for the meat industry to remain prosperous.
DEALING WITH FLUCTUATING FARMING RETURNS

P. S. ALEXANDER

Farm Accountant, Pyne, Gould, Guinness Ltd., Christchurch

Before attempting to explain some of the approaches for dealing with fluctuating farm incomes, a table of five farm products and the fluctuations in the prices paid to farmers for them over a 12-year period, might first be considered (Table 1).

Between 1966-7 and 1971-2 sheep farmers as a whole, even though they have been increasing production, have been faced with a period of static or falling gross incomes but steadily rising costs, so that high taxable net farm profits have not been the order of the day — in many cases the problem has been one of juggling to hold the farm expenses inside the farm income. Under these conditions the accountant is often faced with the situation where a very low profit or loss is shown for taxation purposes. In many cases this state of affairs is accepted by the farmer and his accountant and the accountant may file an income tax return on behalf of his client over this period of years showing losses and losses carried forward or very low profits which of course would mean probably no or very small income tax payments.

In some situations this approach can be a little short-sighted because:

(1) Personal exemptions must be covered — once not covered in any year they are gone for ever.

(2) A large loss in any one year could mean the non-claiming of the personal exemptions in a second or later years.

(3) The farmer is missing out on spreading some of his income at the lower income tax rates, which exist at the lower levels of income.

(4) A farmer with a fluctuating net income will pay over a period more income tax than a farmer whose net income fluctuates less; he will also pay more irregular tax payments.
TABLE 1: AVERAGE PRICES RECEIVED BY FARMERS, 1961-73

<table>
<thead>
<tr>
<th>Year</th>
<th>Wool Sold at Auction* c/kg</th>
<th>30 lb Lamb at Works Early Dec.† $</th>
<th>42 lb Ewe at Works Early Feb.† $</th>
<th>2-th Ewe at N. Canty Ewe Fairs* $</th>
<th>4 &amp; 5 yr Ewes at N. Canty Ewe Fairs* $</th>
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<tr>
<td>1961-2</td>
<td>72.1</td>
<td>3.30</td>
<td>2.10</td>
<td>5.38</td>
<td>3.35</td>
</tr>
<tr>
<td>1962-3</td>
<td>78.7</td>
<td>3.90</td>
<td>2.10</td>
<td>6.90</td>
<td>4.85</td>
</tr>
<tr>
<td>1963-4</td>
<td>101.2</td>
<td>4.50</td>
<td>2.70</td>
<td>7.30</td>
<td>4.78</td>
</tr>
<tr>
<td>1964-5</td>
<td>77.4</td>
<td>5.10</td>
<td>3.76</td>
<td>8.52</td>
<td>6.12</td>
</tr>
<tr>
<td>1965-6</td>
<td>76.5</td>
<td>5.10</td>
<td>3.35</td>
<td>9.88</td>
<td>6.98</td>
</tr>
<tr>
<td>1966-7</td>
<td>64.6</td>
<td>3.98</td>
<td>3.20</td>
<td>7.52</td>
<td>5.55</td>
</tr>
<tr>
<td>1967-8</td>
<td>50.5</td>
<td>4.77</td>
<td>3.53</td>
<td>7.00</td>
<td>5.09</td>
</tr>
<tr>
<td>1968-9</td>
<td>61.9</td>
<td>5.54</td>
<td>3.11</td>
<td>7.36</td>
<td>5.57</td>
</tr>
<tr>
<td>1969-70</td>
<td>56.4</td>
<td>5.91</td>
<td>4.63</td>
<td>7.70</td>
<td>5.91</td>
</tr>
<tr>
<td>1970-1</td>
<td>53.4</td>
<td>5.60</td>
<td>3.84</td>
<td>7.52</td>
<td>6.13</td>
</tr>
<tr>
<td>1971-2</td>
<td>66.5</td>
<td>4.73</td>
<td>3.75</td>
<td>6.61</td>
<td>4.69</td>
</tr>
<tr>
<td>1972-3</td>
<td>145‡</td>
<td>8.46</td>
<td>12.45</td>
<td>17.50</td>
<td>13.00</td>
</tr>
</tbody>
</table>

extreme % variation excluding
1972-3 100 79 120 83 109

extreme % variation including
1972-3 187 246 492 226 288

†A Canterbury freezing company.
‡No official up-to-date figure available — estimate only.

Note:
1. The marked fluctuations in all groups.
2. The figures for 1964-5 are better in all cases than for 1971-2.
3. The effect of the 1972-3 figures on the variation %.
4. The very marked improvement in all five groupings for the 1972-3 season compared with any previous year.
5. The 1971-2 figures are fairly similar to 1961-2 — lack of growth in prices.
6. Increase in costs over period disregarded.
(5) Allowing for personal expenses, taxation payments, plant replacements, rising costs, etc., most farmers would need over a long term a taxable farm profit or minimum "subsistence" income on a "year in, year out" basis of at least $4000 to $6000 — some would need a lot more. In other words, if they are going to "make it" financially, this is a sort of minimum level for a so-called average farmer over a period of years.

Table 2 gives some idea of the effect of fluctuations on taxation payments (for simplicity this table is based on 1973 income tax rates and with personal exemptions of $1000 each year).

**TABLE 2: INCOME TAX PAYMENTS ON FLUCTUATING TAXABLE INCOMES**

<table>
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<td>1096</td>
<td>$5000</td>
<td>915</td>
<td>$15500</td>
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</tr>
</tbody>
</table>

Note:
1. The very small difference in taxes payable between no fluctuations and limited fluctuations — $100 only in all.
2. The $2413 difference between no fluctuations and marked fluctuations.

One of the most disruptive effects on management with the marked fluctuations in net income and consequently income tax payments is that income tax payments from year to year are very irregular. In some years a large terminal tax demand is received, while in the following year possibly a large refund is received. The advance payment of the next year's provisional tax always compounds and complicates the payment or refund due. It is true that in retrospect there are always improvements that could be made to any situation
that was not foreseen at the time and this would particularly apply to farming in a number of ways over the last ten years. It is not suggested that the exercise of trying to keep a farmer's taxable income at an optimum level is possible, easy or even ideal.

DEALING WITH FLUCTUATIONS

What is suggested, is that, if a farmer and his accountant are reasonably confident of the farmer's financial position, his farm and his ability to "make it" financially, they be prepared to "pitch" his net taxable income upward in times of low taxable incomes or loss situations. How far upward will normally depend on a number of factors, such as courage and cash, but it should be somewhere near his minimum long-term "subsistence" income level, which would seem to be around $4000 to $6000.

It should be stressed that, while a "pitching" upward of net income as described is not usually difficult from an accounting point of view, it should be done very carefully for a number of reasons, the most important one usually being that it makes a farmer pay more taxation in the year involved than is absolutely necessary. Although this tax is at the lower rate, it is still vitally important because it is being paid in a year when his cash position is weak. For some years Government has appreciated the basic problem of fluctuating farm incomes and its effect on taxation payments and this is reflected in the very large amount of legislation that has been passed over the last ten years.

The course of action a farmer and his accountant could effect to "pitch" a low taxable income or loss situation to a higher taxable income level could be one or a combination of the following:

(1) Defer the claiming of part or all of any development expenses (including fertilizer).

(2) Increase some livestock standard values.

(3) Defer the claiming of some investment allowances.

(4) Defer the claiming of some special depreciation.

(5) Non-claiming of ordinary plant depreciation.

(6) Non-payment or reduced payment of interest on any "on-demand" family loans.

(7) Withdrawal of part or all of any moneys held in the farm income equalization scheme.

(8) Bringing back as taxable income part or all of any moneys held in the livestock nil standard value reserve scheme.

(9) Various balance date adjustments.
Some of these avenues would have needed preparation some years before to be effective in any one year and others would not be applicable in all cases; some also would be undesirable in some situations. Most of the points mentioned could be incorporated after the end of the financial year. However, if the accountant was brought into the picture some time before the end of the financial year, with the overall financial position known, then other avenues could also be explored which would have the same effect as those mentioned.

Although the handling of a much higher taxable income than normal is more enjoyable to the farmer, his accountant and his advisers, the same principles apply as to timely and intelligent action. Where some time before the end of the financial year it is obvious through instinct, the cash position, or a revised budget, that a much higher than normal taxable farm income has been made for the year, then the accountant should be involved as soon as possible and a discussion take place as to whether trial accounts should be prepared to give a more exact idea of what the final taxable farm profit for the year could be.

Assuming that trial accounts or deeper analysis did confirm a very high taxable income, and also assuming that the farmer and his accountant could spend deductible moneys soundly on the farm, that the cash position was sound, and that they did not wish to pay income tax on the trial account net profit figure indicated, the type of avenues they could explore would be as follows:

(1) Expenditure of moneys on farm development work before the end of the financial year.

(2) Expenditure of moneys on previously deferred farm maintenance work before the end of the year.

(3) Application of losses carried forward from the previous year.

(4) Claiming of investment allowance deferred from the previous year.

(5) Claiming of special depreciation deferred from the previous year.

(6) Application of part or all of any previously deferred development expenses.

(7) Claiming of maximum ordinary and special building depreciation, ordinary and special plant depreciation, and maximum investment allowance.

(8) Claiming of supplementary allowance on buildings.

(9) Making of deposits into the farm income equalization scheme.
(10) Increasing the livestock at nil standard value in the livestock nil standard value reserve scheme.

(11) Reducing the standard values of some livestock groups — a very limited application here.

(12) Various balance date adjustments.

(13) Payment of farm wages to wife for farm work performed (also sometimes father).

(14) Payment of farm wages to children for farm work performed.

(15) Payment of interest on "on-demand" family loans.

(16) Upgrading present livestock by larger than normal sales, and larger than normal purchases.

(17) Retention of stock so that sales are less than normal which would reduce gross profit through standard values.

(18) Build up in stock through higher than normal purchases which would reduce gross profit through standard values.

(19) Change in stock policy — most common here would be a movement in capital stock from sheep to cattle.

(20) Replacement and/or purchase of new and/or second-hand farm plant and vehicles before the end of the financial year.

(21) An alteration in the direction of farm expenditure before the end of the financial year — such as more use of farm contractors, thus allowing more time for livestock work.

(22) Section 103 of the principal Act could be of some assistance depending on the reasons for the much higher than normal income.

A number of these avenues will be unavailable or undesirable for a number of reasons for a number of farmers, and still other avenues will have required initial action some years before to be of any use currently. It is important for farmers and their advisers to try to avoid the situation where important farm management decisions that do not suit the sound running of the farm are being made because they suit the taxation position. Wherever possible the taxation side should be handled in such a manner that it is fitted into the best management of the farm, and not the other way around. The first priority is the most efficient financial operation of the farm unit.
SUMMARY

(1) The accountant must be involved at an early stage.

(2) Farmers who have pressed their accountants to hold their incomes and tax payments down during difficult times may find their accountants cannot assist them greatly in times of much improved prices.

(3) The most satisfactory handling of fluctuating farming returns requires forward thinking, planning and preparation in times of not so good as well as good prices.

(4) Farmers and farm advisers who prepare, follow through, and revise a soundly produced budget can assist in combating some of the fluctuations in income.

(5) Taxation disadvantages are not the only problems of fluctuating returns.

(6) The amount of farming taxation legislation that has been passed which has some bearing when dealing with fluctuating returns is very considerable.

(7) The stage has been reached where an accountant has to specialize in farm accounting to keep abreast of the legislation and provide a complete service for his farm accounting client.

(8) As a farm asset needs the best management that can be provided, so farm financial affairs require an accountant well versed in farm accounting — the farmer and his family cannot afford less.
Management functions are usually described in terms which include planning, organizing, directing and controlling. It is this first function of management — planning — that is the main concern of this paper. Perhaps it might be useful to review just what is meant by planning.

In planning the concern is with the future — with trying to foretell the effects of coming events. A plan made now, however, does not determine future decisions. The only decisions made in a plan are decisions made now. What the planner is trying to do is to decide what will be the consequences in the future of decisions made now. In deciding the future consequences of today's decisions, the planner is acting to assess the risks involved in the decision. Thus an important element in planning involves considerations of risk. The planner tries to establish what might go wrong with his expectations and how best to adjust if things do go wrong.

As a greater knowledge of the facts that influence success or failure is established, the manager is better able to organize his farm to reduce risk. If by planning the manager is able to foresee future events before they occur, he is more likely to be able to take steps to reduce undesirable consequences of the events.

This sounds like something that is good in theory but more difficult to achieve in practice. With the wisdom of hindsight, it is easy to think of cases in the past half dozen years where carefully planned developments, through the vagaries of market and weather, have resulted in a farmer not achieving the results aimed for. In some cases in recent years it may be that some development programmes that have been undertaken even with thorough planning would have been better never started. However, this is not the fault of planning as such. It is rather the failure of the planners to take a sufficiently broad view of the consequences of development, or else that the probability of unforeseen events occurring has been such that the risk involved has been considered justified.
It has been suggested that some farmers do not plan, not because they do not want to work for the future, but because they see no way of guaranteeing the future expectations that have to be assumed for a plan to be worth while. It cannot be disputed that future prices or weather cannot be reliably predicted. However, this does not take away the desirability of future planning. In fact, the very element of risk in farming makes planning more necessary than would be the case if it were an industry where returns were relatively stable. Because it is known that prices for farm products are likely to fluctuate both between and within seasons, and that farming income is markedly affected by weather, any plan for farm development must be flexible. In drawing up a plan, the farm manager must incorporate provisions to adjust to income swings. He must ensure that included in the plans are provisions for frequent reviews to see if subsequent events have changed the validity of the basis on which the plan was established.

When a farm moves from a relatively static state into a dynamic phase of development, the demands on management and the requirements for planning are greatly increased. A farmer in his traditional farming situation may follow traditional patterns from habit. The only variables he will encounter are vagaries of price and weather. Over neither of these has he much influence and planning can assist him to only a limited degree.

Replace this situation with an injection of capital and a development programme, and the manager is faced with a host of new complications — meeting unfamiliar non-recurring expenditure items and facing a series of new decisions over which he does have control and for which planning can have great significance. It is under this development situation that the plan, the budget, and financial control assume greatest importance. It is this situation that farm managers are facing in 1973 — each with a bank full of unaccustomed cash available to spend on farm development. It is in this situation, then, that planning is important.

If one is going to plan, it is first necessary to set some objective, some goal to plan for. It is generally recognized that a farmer’s objective is a matter of personal choice. It is his farm and, in current student terminology, each may do his own thing — provided, of course, his creditors and his wife will let him.

In realizing the necessity for objective setting, a farmer is not different from workers in other occupations. A good salesman plans a target for sales figures for the year and goes out after that target; the good politician plans a majority he wishes to achieve at the next election and goes out after that target he has set himself. The good farm manager also sets his objective and derives a plan to help him achieve that target. Whether his target is maximum net profit, maximum
production per animal, or maximum opportunity to enjoy a leisurely holiday in Hawaii, is his business.

SETTING AN OBJECTIVE

However, the setting of a clear objective to plan towards simplifies management. A clearly defined objective gives a base against which all alternatives may be weighed. If the planned dominant objective is, for example, the production of 100 prime steers for sale each autumn, any other competing demand for resources may be weighed in the light of their effect on this dominant goal. If it is necessary to choose between allocating capital to stock water for the cattle or to buying a jet boat for the family, then having set the objective as producing 100 steers, there are some tangible criteria against which to measure the decision to divert capital.

If there is a plan for development, it will have been established how critical stock water is to the goal of 100 steers fattened. It will be possible to readily decide the effect of capital diversion to fund a jet boat on the stated dominant objective. Whatever the decision, it will be made after having considered its other effects.

There seem to be few farmers with a clearly defined objective for which they are planning. For top efficiency in management, it is essential to have a goal to plan towards. With such a goal, it is possible to drive, not drift. In the words of an ancient philosopher: “Man who shoot arrow without target likely to end up hitting nothing”.

Planning for development involves consideration of all the resources on the farm, and their integration into the most beneficial combination to achieve the development objective. The easiest way to achieve this objective is to express the management plan in some quantitative form like a budget. The process of preparing a budget is planning in every sense of the word, and the budget itself is a resultant plan. Before putting down in the budget an estimate of income and expenditure, it is necessary to have planned overall management for the period.

The budget, when prepared, becomes a stated standard of performance. Thus, preparing a budget, in addition to formalizing a plan, is also, in effect, setting standards. Setting standards is the first step in the control process which it may be remembered is another function of management. A measurement of current performance against the standards, a further step in the control process, is facilitated, because the budget expresses standards of performance in readily measurable terms. Deviations from the budget are easily identified and give early warning of a need for corrective action — the last step in the control process, and the step which leads to flexibility in management decisions.
Thus the preparation of budgets on the farm, when contemplating development, is the opportunity for better planning, improved co-ordination of resources, and a basis for control. The big danger of planning by budget preparation, however, is that unless one is prepared to revise the budget it may lead to inflexibility.

Any ex-servicemen who experienced the ex-servicemen's settlement days of State Advances budgets will remember the inflexibility that often occurred when, because something was not allowed for in the budget expenditure, a desirable transaction had to be foregone. This was an administrative problem with a large bureaucracy but not a problem that should occur with the individual farmer.

Any plan and any budget should be regularly and periodically reviewed, to incorporate changes in income, expenditure or future expectations as they arise. Once a basic plan is prepared and presented in the form of a budget, it is relatively easy to follow the effects of change and to adjust to incorporate these. When adjusting an existing plan, it is possible to adjust in the light of planned future events; without a plan, any adjustments can only be done by intuition, a not very reliable management basis.

Those who have planned their farming programme this year will have been making many adjustments. As wool, meat and crop incomes have risen during the season, farmers will have been comparing the prices against their previously planned income and adjusting accordingly. Because they have planned, the effect of price changes will have been early apparent and they should be among the lucky ones whose orders for fencing, topdressing and new cars will have been placed early and fulfilled. The man who does not plan will not move until the sudden realization of an unaccustomed large credit in his stock firm has jogged him into action, too late to secure many of the purchases he now needs to make.

**MAJOR PITFALLS**

Frequently, one sees a complete failure to appreciate the full integration of resources that occurs on a farm. If, over the past three or four years a farmer has successfully farmed his present stock with an annual topdressing application of, say, 40 tonnes of superphosphate, and this year, to minimize his tax liability, he has doubled his topdressing (from the production figures from the local fertilizer works at Hornby, it is obvious that many farmers have done just this) then for his decision to be soundly based, he must expect to grow a lot more grass. If his present per-animal production is at a satisfactorily level, then, unless he has also planned to increase stock capacity to utilize the extra grass grown, the extra fertilizer will be wasted.

Many farmers are good developers of land. They will seed, manure, cultivate and fence, but rarely do they make adequate
provision for stock increases, to convert the extra fodder grown into a form that can provide income to repay their investment. If extra land is developed, such that it now incurs an annual increased topdressing bill of, say, $100, then to show a reasonable additional return on that outlay of $100 on topdressing, at today's prices, it is necessary to provide for additional capital investment in livestock of almost $200 (see Appendix).

Unless this is done, an economic return will not be received on the cost of fertilizer. How many farmers have budgeted the capital requirement of the extra stock to eat the feed that the extra topdressing they have put on will grow? If they do not expect to grow extra feed, then of course the extra topdressing will probably show no return.

With many farmers, expenditure on such things as topdressing, fencing and draining will be readily made from surplus cash. This expenditure produces more feed. The following year the decision is made to increase stock to cope with the extra feed. But what is lost sight of is that increasing stock, whether by retention of their own bred animals or buying them in, has the same effect—a reduced amount of available cash to spend on other items.

It is this need to provide stock that is most likely to create stress on liquidity. Often after a period of high income years substantial development inputs are made in farming, but with a time lag before stock are increased. If, in that time, prices fall, many farmers either forgo the benefits of early development by not adequately utilizing the extra feed, or else they move into high short-term debt loadings through reduced cash while building up stock. Planned development provides for finance for all resources at the time development is commenced.

I recently visited a farmer who had planned to cultivate and sow down to grass in the one season 200 acres of what had been largely unproductive land. However, he had made no provision for supplying the 1000 extra stock units that the newly developed land would feed. While his finances would have covered the initial developments, the need to find some $10,000 to $15,000 of extra capital for stock would have severely strained him. By sitting down, and planning his development on an integrated basis with his financial and labour resources, we settled on developing not 200 acres but 50 acres in the first year.

The increased profitability of farming in 1973 will without doubt result in a marked upsurge in farm development expenditure. For most effective use of this increased income, the farm manager should first clearly decide his dominant managerial objectives. Having set his target from within these objectives, he should then prepare a detailed development plan to enable him to most readily achieve his goal.
APPENDIX

Proposition

Given land development such that to retain the increased productivity an annual increased topdressing requirement costing $1 is incurred, what capital needs to be invested in livestock to provide an adequate return for this extra annual cost?

Assumptions

(1) No change in productivity of existing stock.
(2) No fixed cost changes.
(3) Capital per stock unit (S.V.) is $15.
(4) Gross margin per stock unit is $10.
(5) Cost of capital is 8%.
(6) Required return on investment is 10%.

Analysis

(1) To show 10% on additional annual investment in topdressing of $1 requires profit of $1.10.
(2) Marginal profit per s.u. added
   \[ = \text{gross margin per s.u. minus cost of capital per s.u.} \]
   \[ = $10 - ($15 \times 0.08) \]
   \[ = $8.80. \]
(3) Extra s.u. needed will be \( \frac{1.10}{8.80} \) s.u.
(4) Extra capital investment in livestock will be \( \frac{1.10}{8.80} \times 15 = $1.86, \)
   \( i.e., \) for every $1 increase in annual topdressing maintenance, an additional $1.86 of capital investment in livestock will be needed.
SUCCESSFUL DEVELOPMENT: A FARMER'S VIEWPOINT

R. W. ARMSTRONG
Farmer, Te Pirita, Canterbury

In August 1961, we said goodbye to our lifetime of farming on Banks Peninsula and settled in Christchurch. Within the month we bought a farm at Te Pirita. A trust was formed and the farm bought in the trust name. The 1278 acres of Lismore stony silt loam lies 4 miles south and 8 miles inland from Dun-sandel, and about 38 miles from Christchurch. The farm was subdivided into two 500-acre blocks of native tussock and six paddocks of subterranean clover pastures. The fences were reasonable, and there was a fairly good water supply. There were 100 acres of scattered gorse. Nodding thistle infested another 200 acres and the remains of a 60-acre wartime aerodrome was non-productive. For buildings there was a one-roomed hut, a two-stand shearing shed, tractor shed and cover for 1200 bales of hay. On the date of possession in 1962, the farm carried 950 stock units; today it carries 5228 stock units (see Table 1).

TABLE 1: INCREASES IN STOCK, 1962-73

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(5 years old)

The late Professor Flay challenged farmers at the 1956 Farmers' Conference when he said that there were thousands of acres waiting to be developed. Our stretch of almost bare
land 3 miles long and two-thirds of a mile wide presented us with an opportunity to prove that his words had not been wasted. (We named the farm “Longview”.) It was decided that, if it was worth while developing the farm, it had to be done quickly. Every acre producing meant greater earning power and a stronger financial position. We were confident of success. Difficulties were taken for granted, but failure was never considered.

Our first aim at “Longview” was to have every workable acre cultivated and producing within three years. We aimed to make all improvements of a high permanent standard. We rejected using budgets because they can become too restrictive, but calculated all development moves carefully and took no undue foreseeable risks.

Banks Peninsula had been kind to us—our farming there was reasonably successful. Our creditability with the stock firms and our bank was sound. We were ready to put our heads down for ten years if necessary to make “Longview” a farm to be proud of and a credit to Canterbury farming.

DEVELOPMENT

Development started immediately and in the autumn of 1962 230 acres were sown to permanent pasture. Three years later, by the autumn of 1965, our target had been reached. Every workable acre had been limed and sown down to permanent pastures, or was in winter feed. Chisel plough cultivation was adopted because of its simplicity; anyone old enough to drive a tractor could do the job—a great asset in busy times. Five workings at intervals from July to December (if possible after a rain) and the ground was ready for drilling.

The seed mixture used was based on Ross Brothers successful pasture establishment—5 lb of perennial ryegrass, 5 lb of H-1 short-rotation ryegrass, 2 lb of cocksfoot, white, red and subterranean clover, with 1 bushel of winter grey oats. It was amazing how very successful this light seeding was on the many hundreds of acres drilled in the earlier years. From 1963 onwards, turnips were grown for wintering and so turnip seed was also included in the permanent pasture mixtures. We gave up swedes after growing them for several years, mainly because fathen was spreading.

After resowing the pastures, our thoughts next turned to lucerne and all that goes with it in general improvements. The first paddock of lucerne was drilled at 8 lb per acre in 1964. Lime and manure requirements had been met but in spite of an excellent strike it struggled for two years. By 1968 we had 220 acres, but were still not sure it was any better than subterranean clover pastures on this country. However, when DDT went out more lucerne became a must. The present area in lucerne is 510 acres compared with 700 acres in pasture and winter feed.
Trees are essential in our farming. Four hundred chains have been planted and fenced along the lines suggested by farm forestry experience. In my opinion, farms without trees are like deserts; all farmers should support and make use of their local farm forestry association.

Most of the twenty miles of new fences are seven wire (5 plain, 2 barbed), two posts, two 4 ft 6 in. stakes, and four battens per chain. Contractors built the first 10 miles but we have erected our own since buying a post driver in 1967. Over 120 gates have been swung—all pipe and mainly 14 ft wide.

Originally all pastures received an annual topdressing of 1 cwt per acre but after recent soil tests the rate has been increased to 2 to 3 cwt over the past three years. All paddocks are limed before sowing down.

Unpredictable droughts make it impossible to estimate winter feed requirements. My idea of requirements of the 5200 stock units under normal conditions would be 60 acres of turnips and Italian ryegrass, 60 acres of turnips and grass, and about 80 acres of rejuvenated pastures, 6000 bales of hay, 4000 of straw. A 30 ton silo of saleable barley or wheat could be a worthwhile reserve.

With the aid of a development loan we built the farm cottage, enlarged the shearing shed to four stands, and constructed covered yards. Four hay barns were built to provide cover for 14,000 bales of hay. As the pastures gathered strength, stocking was increased by the addition of both sheep and cattle. With sheep, progress was slow until 1966 when 2200 ewes, 1200 hoggets, and 180 others were wintered. Two years later we had 3200 ewes, 1150 hoggets and 200 others. Since then as many as 3800 ewes have been carried but we are now turning to more cattle and fewer sheep.

The sheep policy is as follows. On about March 7, 1200 of the older and worst woolled ewes are joined to Southdown-Dorset rams. Three weeks later Corriedale rams are put out with the remaining ewes. The first mob has usually finished lambing before the Corriedales start. The Southdown-Dorset mob are given the best paddocks and are drafted at 8 to 10 weeks at 28 to 32 lb. Two-thirds of the lambs go fat off their mothers, while the rest are weaned, drenched with selenium, and fattened on lucerne. The weaned ewes go on to short rations. The later lambing Corriedales take their turn on the best feed until drafted in early December. Mainly because of droughts, lambing percentages have shrunk from 123 in 1969 to just over 100. Wool weights have shrunk from 4.5 to 4 kg.

Cattle replacements are bred from a herd based on heifers bought from Mt Peel in 1962 and 1963. In recent years, encouraged by substantial weight gains, Friesian bulls have been used. This year calves by a half-Charolais bull, out of our crossbred cows, are quite outstanding. When the season permits we also buy cattle and sell them as fats along with surplus home-grown stock.
In making improvements, we have invested in time and money-saving ideas. The homestead was sited in the middle of the farm to save transport time. Our portable yards, usable for all types of sheep work, become mobile in five minutes, and may be moved to any corner of the farm. The covered yards shelter 1200 sheep, which means few shearing holdups. The farm lane is a real time-saver in stock and tractor work. By grading off the top soil and building up with the shingle from underneath, this lane was metalled for $500.

To make "Longview" habitable for man and beast, power and the telephone had to be brought 4 miles, and a house had to be built. Here we ran into our first problem — finance for the house. Three different lending sources turned down our application for a loan on first mortgage. A second approach, direct to the general manager of an insurance firm, got the desired results — a lesson worth remembering about always going to the top. We became residents of our new home in July 1963. As time permitted, lawns, gardens and a shrubbery were established. Around the homestead, and of recent years in farm shelter too, we planted for beauty as well as protection.

A convenient shingle pit provided the hole for a swimming pool to be built. There are times when it is very necessary to relax and get away from it all. Our retreat became a small seaside shack we built at a beach near Akaroa.

FINANCE

The most important and certainly the most difficult part was finance. Although we had confidence and a sound financial organization there were other important matters to be considered. To develop or die-in-the-attempt would only mean increased death duties. Our decision was to form a trust for the children and lease the farm back from them. From the beginning, the family have played their part in the successful development of their own property.

In establishing creditability on a sound basis an approach was made to a stock firm for a $20 000 overdraft. They agreed subject to having security over the stock and plant. This we would not give them, but to the everlasting credit of the firm our overdraft passed the level asked for on numerous occasions, and no questions were ever asked. This firm, and other stock firms too, have been most helpful. Our bank has been another pillar of support, with liberal overdraft and development loans when difficulties occurred.

I have found confidence in one's own plans of utmost importance. Confidence breeds confidence, especially when backed up with successful results. Before making a request on finance, I found it wise to try to anticipate the queries and have the answer ready. At all times we have stuck by any agreement made to maintain our creditability. In the ten financial years from 1963 to 1972 we had six net losses, total-
ling $25 000, and profits in four years totalling $27 800 — an average net profit of $280. These losses were accepted because they were expected and our development continued.

We faced a few problems on the way. In the spring of 1971 calf losses caused a lot of concern until it was traced to a copper deficiency. Then there were droughts. A net profit of $20 000 in 1969 created the impression that we were about to reap the benefit of our development. However, as our records show, over the past three drought years lambing percentage has dropped from 123 in 1969 to 100, and wool weights from 4½ to 4 kg.

Without taking into consideration lower lamb weights and pasture deterioration, I would estimate the last three drought years have cost us over $32,000 as shown in Table 2.

TABLE 2: COST OF 3 YEARS’ DROUGHT AT TE PIRITA

<table>
<thead>
<tr>
<th></th>
<th>$</th>
<th>%</th>
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<tbody>
<tr>
<td>Bought feed and grazing</td>
<td>18 000</td>
<td>56</td>
</tr>
<tr>
<td>Reduced lambing %</td>
<td>7 560</td>
<td>23</td>
</tr>
<tr>
<td>Lower wool weight</td>
<td>6 750</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>32 310</td>
<td>100</td>
</tr>
</tbody>
</table>

If the average loss is multiplied by the number of farms similarly affected, the sum could be in millions—big losses for the individual farmer but greater still for the Tax Department.

1973 has been the most successful farming year I have known. But for the drought, our hard core development debts would have been completely written off. Thanks to those who had confidence in our confidence, those whose experience we used, and the men who worked with us and shared our progress, our “Longview” story has a happy ending. The costly development work is finished and “Longview” is in a position to reap the benefit of the better years ahead.

What has been described is of the past. What we are all really interested in is the future. With the march of progress I believe the younger generation will double our achievements. Their methods may include new and highly economical irrigation on our country. They will produce amongst other things barley for their own large-scale cattle and sheep feedlots. Feedlot stock could command premium prices for special markets. Killed in the off-season they could keep at least some of the freezing works operating all the year round. As a Canterbury man I sincerely hope the young farmers stay with us. I firmly believe Canterbury farmers are on the brink of the biggest breakthrough in our farming history.
GROWTH INVESTMENT AND INNOVATION

Neil G. Gow
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Internationally, the family farm and its prospects is a continuing political issue. In America the fear is the threat of corporate farming, in Britain the worry is the takeover of the countryside by the businessman, and in Europe it is the problem of the aged and infirm occupying farms. Experts have prophesied doom for the family farm and yet it survives. The same conventional wisdom says farms must get physically bigger, and it is implied that increase in size means control will pass out of the hands of the farmer. The prophets of doom have yet to be proved correct. Technology has foiled them but it has also bred a family farm of today very different from its predecessor of yesterday.

TECHNOLOGY

Technology means the systematic application of scientific or other organized knowledge to practical tasks. Technology generally leads to specification of the tasks involved in farming. This is because new technology means investing more money and developing new skills to ensure its efficient use. Not so long ago the farmer had to grow fodder to feed his horsepower to be able to get on with his real farming activities. Today he turns a tap to refuel his tractor, because technology has organized the feeding of his horsepower for him. Similarly, the dairying of bygone days meant milking cows by hand, on-farm cheese and butter making, with pigs to clean up the by-products. Now, investment in new technology has provided herringbone sheds, tankers for bulk milk collection, and almost fully automated dairy factories with specialists running each part of the production process. As soon as tasks become specialized through technology, a new range of options becomes available to the farmer in selecting the production process suitable to his particular needs. It is this flexibility in recombining the components of a production process that is leading to new organizational and financial structures in
INVESTMENT AND INNOVATION

farming. The net result is that it is increasingly difficult to identify farmers.

Two tremendously important features of technology should not be overlooked. First, the rate of technical progress is increasing. While this means more and more opportunities for new farm investment, it also carries the threat of potentially faster rates of obsolescence. In the pig industry in particular, pressure from ecology groups may cause a complete redesigning of pig facilities. In America I saw the first stage of a complete dismantling of a feedlot capable of accommodating 120,000 steers because of urban reaction to pollution. Because technology is capital intensive, the problem of obsolescence is compounded.

One consequence of the high capital demands of technology will be different growth patterns for different types of production. Arable farming has to be land based, but certain types of animal production may be less demanding of land. A feedlot is capital intensive, as is a grain-based pig enterprise, and because of this these activities will tend to lose their farming image as they become less and less distinguishable from normal commercial businesses. The question to be faced, therefore, is what sort of individual is going to put one of these newer type operations together. Is it to be the urban businessman or the family farmer? In my view it is going to be an entrepreneur, and, regardless of his final identity, it is going to mean the emergence of a new form of agriculture.

ENTREPRENEURSHIP

Entrepreneurship is a terrible piece of jargon to introduce, but it is necessary to the line of argument. It involves making decisions based on judgements, and more importantly it involves taking responsibility for those decisions, particularly the financial responsibility. It is one of the roles of the boss and is distinct from his supervisory and co-ordinating roles.

Entrepreneurship has a strong flavour of vision, flair and judgement. Most farmers possess it, but, while some are stimulated by the demands it makes of them, others are overwhelmed. Those who enjoy the stress of entrepreneurship are today probably operating businesses that bear only a vague similarity to the so-called family farm. They are still referred to as farmers but from a business and legal standpoint they are no longer owner-operators. In reality they are no longer simple farmers but operators of businesses producing a variety of goods and services.

The conventional stereotype of the family farm has already been alluded to as being a self-contained unit — and in some people’s eyes therefore good. A more useful definition of the modern family farm is to see it as a business whose output may not only be conventional farm products but also services. Similarly on the input side it may rent or otherwise control parts of the land, labour and capital that it does not own.
That is, it is no longer relevant whether a farm is self-contained or not. These sorts of farms can be thought of as goods and services firms. The simple ones are typified on the one hand by the farmer who does part-time shearing and on the other by the farmer who contracts out his topdressing, shearing, crutching, dipping and tailing requirements. Strangely enough, those farmers who normally expect to, and do earn significant off-farm income are often at less risk in times of economic stress than some of their larger, more conventional colleagues.

The phrase “family farm” is a bad one in many ways — bad because it is pregnant with emotion and historical association. Therefore it appeals to the politician, both professional and amateur. Generalized talk about the family farm has been used to paper over the complex economic and social problems facing rural areas. While the debate about the future of the family farm has been progressing, significant changes have taken place in society and the true modern meaning of family farm has not really been appreciated. Invariably people’s remedy is to say that the family farm must grow. What is not normally stated explicitly is how the growth should come about. The farmer can grow in one or all of a number of ways. He can increase his farm in physical size, he can increase the use of capital, or he can move outside the farm gate. The course he takes will be determined by his ability, his goals, the current state of government policy, the pressures of society, the current and projected economic situation, and his ability to acquire land, labour and capital. It is not intended to discuss these determinants in detail here, but rather to make some relevant observations.

First, there are in this country any number of farmers with the ability and desire to grow — whether it be by buying more land or by intensifying the use of what they already have. A visitor from Mars might well wonder whether we are serious about promoting efficient growth, since he would undoubtedly be struck by the irony of our existing land aggregation laws existing alongside our financing of amalgamations with State money. We have become adept at getting around those pieces of legislation which have becomes obstacles. I refer, of course, to the substantial increases in partnerships, companies and trusts. To my mind these devices have been at best a means of retaining resources in agriculture, and at worst just a method of minimizing interference. To push this line a little further, I think the term estate planning should be banned and replaced with the term inter-generation transfer of assets. The reason for this is that estate planning is emotive and smacks of solemn-faced lawyers, funeral music, and the acceptance by an individual of his mortality. Inter-generation transfer, on the other hand, has a positive connotation unrelated to death. It relates directly to the growth of a dynamic farm organization.
The possibilities offered by partnerships, companies and trusts in the positive sense of attracting resources into agriculture have only been played with. I am waiting for the day when one of our top farmers puts his reputation on the line and goes public. I believe some of our more aggressive farmers are almost there. Gemco owes its existence to this sort of philosophy — basically it is a positive response to the opportunities afforded by technology and economic forces married to a new system of financing and a new concept of ownership.

Growth and economic viability will become the major objectives of the farmer of the future and the concept of a debt-free balance sheet will probably disappear. The name of the game will be investment and innovation. For the more audacious, it will mean investment in new products, untried technology, and new forms of ownership. For the less audacious, it will mean smaller changes in business structure but a higher rate of adoption of proven technology.

SEPARATION OF OWNERSHIP AND MANAGEMENT

For the enterprising farmer the challenge of the future will be the development of new forms of ownership with a trend towards the separation of ownership and management. This will start from two points. First, new capital will be attracted by the sale of shares, and management will be professional and salaried. The shrewd entrepreneur will then use the increase in equity capital to secure additional and probably more liberal loans. Secondly, owners of land will make it available to farmers in return for a piece of the action. There is no logical reason, but plenty of others, why land owners and farmers need to be the same person or even have the same legal or business identity. The sharemilkers of the dairy industry have operated along these lines for years. Is it too bad a play on words to suggest we will see a lot more share-sheeping?

For the more cautious, co-operation in its various forms offers interesting possibilities. Where co-operation is approached positively and in an environment free from immediate economic stress, it is a viable and useful means of maintaining growth. The history of co-operation in New Zealand has been spotty. Where it has been used on a big scale, and particularly in the dairy industry, it has been successful; where it has been used in a smaller way, not so successful. I saw it working successfully in Britain last year amongst small groups of farmers and from my experience these British farmers value their independence just as much as New Zealand farmers. In fact, a number of them see co-operation as a positive way of ensuring their continued independence. New Zealand farmers tend to think of co-operation as being confined to production situations like group labour schemes and machinery pools but neglect its potential appli-
cation to marketing. This leads to the question of bargaining and the opportunity for farmers to increase their net income by concentrating more of their efforts outside the farm gate.

It should be made quite clear what bargaining power means. It comes in two forms—opponent gain and opponent pain. Opponent gain means that one's opponent recognizes that the bargaining process can make him better off. The success of trading groups in lowering prices to their members is an example of wholesalers' recognizing the advantages to them of bulk sales. Opponent pain derives its power from the group's ability to make their opponents worse off. Regardless of its form, bargaining, to be successful, must show demonstrable benefits. That is, it is necessary to be in a true trading situation and not just playing poker. Clearly group action is likely to be more successful than individual action, but even then certain facts should be clearly recognized. The group must have control over the product and it must have unity of purpose. Moreover, the members of the group must be willing to bear the costs involved. Finally, the opponent must recognize the group's ability and position to bargain. For the individualist, the opportunity for gain outside the farm gate lies in his ability to service the needs and requirements of his consumer, and to extract a return for that service.

I wonder how many farmers "turn off" as soon as their products disappear out the front gate on the back of a truck? It would possibly be fair comment to say that most New Zealand farmers regard marketing as a specialized activity and not as the final stage of production. It has become abundantly clear that consumers in a modern affluent economy are prepared to pay for service. For the more enterprising there are opportunities to cash in on the fads and fashions of consumers. If the product meets market specification, final price may not be all-important. For example, the higher price of margarine is not stopping it from making inroads into the local butter market. Recently I observed in America two intriguing examples of consumer desire for specific products being exploited by quick-thinking entrepreneurs. In one case, a firm was producing a range of furniture exhibiting mechanically applied borer damage. In the other, a firm was producing imitation moss-covered wall panels for interior decoration in response to a tremendous demand for the timber off antiquated, dilapidated, wooden farm barns.

THE FUTURE

This paper has ranged broadly over a very wide field. The points which need emphasis might now be summarized. First, I believe that the farmers of New Zealand face exciting challenges. After being battered by economic pressures, they now have some cash in the till, a renewed sense of confidence, and an increasing rate of technology to help them face the future. Furthermore, they have a proven record as technical innovators and in many cases substantial untapped reserves of managerial
and entrepreneurial skill. Whether they have the institutional environment which will allow them to exploit their potential remains a debatable point. What is true, however, is that the most aggressive and enterprising farmers are already exploiting the current situation to their advantage.

Secondly, history has taught that growth is vital, but to limit the concept of growth to increase in acreage alone may be dangerous. Increases in capital intensity, major changes in business structure, and opportunities outside the farm gate are areas of growth available to the family farm which present challenges, both to the individual farmer and to national policy makers—challenges ripe with opportunities for imaginative decision making.

Thirdly, the concept of the family farm is going to change, and although New Zealand agriculture will probably continue to be dominated by specialist units there should be enough flexibility in the system to allow for the evolution of new types of farming. To attempt to hold the line on the conventional stereotype of family farms will be sterile.

Fourthly, investment and innovation will continue in a variety of forms. These processes will reward those with the imagination and ability to turn ideas into reality, and the entrepreneurial skill to attract the required land, labour and capital and bear the responsibility for their judgements. In spite of, and in some cases because of the obstacles to the growth of large units, some farmers are going to grow rapidly in size. Whether these large operations finish up as highly complex, highly integrated units, or, as one of my colleagues describes them, “a constellation of specialized units” is debatable. Personally, I favour the latter—if only because specialization has served New Zealand well in the past. I would go further and predict that the ability to command, manage and move cash is going to be the number one criterion of success in the future. It should be emphasized, however, that the requirement for farmers to be able to do the job, both technically and practically, is in no way diminished. In fact the ability to achieve higher levels of operational efficiency will be crucial. If my prediction about the ability to acquire, manage and move cash is proved correct, there will be a substantial increase in part-time farming because of the ability of this sort of farming to tap new sources of capital and cash.

Lastly, I think there will be a place for the conventional family farmer, provided he responds positively to the opportunities for retaining his independence, through co-operation and other group activities; provided, also, that he recognizes the opportunities open to him by thinking of himself as not only a producer of goods, but also as a seller of services. The real challenge to the family farmer is simply this—with cash in the till and some breathing space to think, is he going to develop along conventional lines or is he going to put some of his current windfall gains at risk and try something more unconventional?
ADDING VALUE TO FARM PRODUCE

J. Bull
Farmer and Businessman, Hunterville, Rangitikei

There is continuing consideration of ways and means of increasing the value of farm products by profitably converting them wholly or partially to the needs of the buyer before freight costs are incurred on the low value segment of the product.

If it can be done in the locality of the primary production, this processing—which is another name for added value—means greater opportunities of employment and greater prosperity for the servicing people in rural communities in New Zealand. This decentralization is good business from the national viewpoint and offers job and investment opportunity in areas which are pleasant to live in.

Virtually all farm products are bulky, and at some stage are processed by one method or another to something less bulky before sale to the ultimate buyer—the consumer. In many instances the procedures necessary for this processing must take place with a large-scale operation, as in the case of the committed New Zealand Light Leathers plant at Timaru, the largest of its kind in the world. Here, the minimum economic size of the plant is such that it must be very large to achieve real economies of scale in order to be profitable. This is an excellent example of adding value to farm products, as pointed out in the prospectus recently circulated by the company: "Currently the bulk of the annual supply of pelts is exported in a pickled state without processing. It is intended to engage in the first stage of processing to produce crust tanned leather for supply to leather processors and finishers. The processing will add a further increment of value to the product, provide employment and profit within New Zealand, and increase the overseas exchange earnings from this side of the sheep industry. The added value at full production is estimated to be in the region of $5 000 000 per annum."

Though mention could be made of many other industries which are operating successfully, adding value to farm products, one company deserves special mention. This is the
Adding value involves amongst other things the development of marketing techniques—recognizing that the needs of the buyer are the first consideration, and understanding that it is his dollar that is being chased, and knowing that there is always competition in that chase. This might be illustrated by reference to one facet of my own business, potato production and marketing. Here, the need to change marketing methods has been demonstrated by the rapid growth of Auckland supermarket chains which require their potatoes to be available in 6 lb or 10 lb polythene packs. Only three years ago, one chain—the largest in produce—bought their potatoes in sacks from Auckland merchants. This was standard practice, involving commission, a cartage cost and handlings to the supermarket depot. At this depot the supermarket staff pre-packed into 10 lb polythene bags using equipment that required a labour input of about one man-hour per 100 packs. These 10 lb packs were again handled into bins for transport to the supermarkets, and there were several more expensive handlings before the consumer actually touched them. The point is that, only 3 years ago, one of the most progressive supermarket chains in Auckland was using a system that involved nine separate and costly movements from the point where the potatoes were purchased in sacks in Auckland, until the consumer placed the package in his or her shopping trundler in that city.

As a result of study of overseas trends and the recognition by people within my company that an ever-increasing tonnage of potatoes would be sold at retail level in prepackaged form, certain decisions were taken and acted upon. In 1971, a 16-head automatic potato and onion bag hanging, packing, weighing and tying machine—the first of its kind imported—was shipped in from the United States. Since then this machine has been located at Pukekohe, just south of Auckland, and is operated year-round by our company staff. As well as an adequate building, fork-hoists, and loading facilities, we own a substantial number of trundlers each holding ninety 10 lb packs. The plant has a normal capacity of two thousand 10 lb packs per hour and automation is such that only six people
are employed. The potatoes are received in bulk ex rail from the Rangitikei in collapsible 1 ton bins, and packed and stacked into the trundlers at the rate of 10 tons per hour. Our sales organization goes further in that we arrange daily deliveries to supermarkets, cartage our care per our contractor, with invoicing and supermarket contact the responsibility of our nominated merchant who operates on a predetermined commission. This streamlined service does not, unfortunately, result in fat profits for two main reasons — first others have followed our lead and offer the same service, and, secondly, the provision of this one service represents a capital investment of about $60 000.

The services of the plant are offered to growers and merchants in Pukekohe on a year-round basis for the custom packing and distribution of both potatoes and onions. Very importantly, but scarcely recognized, is the fact that the service that we have initiated has halved the transportation and handling costs that were formerly incurred, and were paid for by the consumer. This reduction in handling has meant less damage to the product, and with daily deliveries the product is always fresh. All are real benefits to the consumer, and also, as always, a better quality product is good for an industry.

This one part of the business has been described in detail to demonstrate what is involved in moving beyond the farm gate, and to provide an example of the subject of this paper. On a national basis, adding value — that is, processing in depth, involving producing a more sophisticated and more expensive product — is not necessarily to the advantage of the producing country. Processing at any cost is not a national economic argument, and may merely result in the misallocation of resources.

MEAT

These observations are relevant to meat — which currently represents over $500 000 000 in export income, using existing methods. While there is a possibility of performing in New Zealand some further processing of by-products or of the raw meat itself, there is substantial backing for the opinion that the greater part of export earnings will continue for some time to come from the raw or near-raw product. Some companies involved in New Zealand meat exporting point to the preference of importers for carcass meat, generally because of wholesalers' preference, though several express the view that in some importing countries this preference may be due to cheaper processing ability. This is a real factor when the wage rates paid in New Zealand are compared with the much lower average weekly earnings in other countries — e.g., Korea $NZ9.68, Greece $NZ18.48, Italy $NZ29.04.
Nevertheless, it is generally considered that it is in this field that the best prospects for improving our terms of trade lie, for the simple reason that we obtain more overseas funds for more sophisticated products than for less processed or basic raw materials. In practice, of course, the problem is much more complex. Each successive step in processing requires extra inputs of capital and labour. As the products become more sophisticated, competition becomes keener and countries with high cost structures—such as our own—find it difficult to compete. Processed or semi-processed products may also face higher tariffs or quotas relative to the unprocessed form.

What further processing can be carried out on meat and meat by-products? Meat could be either boned-out or in cuts. The export of packaged retail cuts is a further step from exporting primal cuts. The extreme of processing is either pre-cooked meat, which is big business in Argentina, as this processing allows Argentinian meat into countries that prohibit importation from a source with a foot-and-mouth disease history, or meat associated with other foods, e.g., television dinners. The basic question, however, is inevitably an economic one.

A number of other products are considered worthy of development:

(1) The possibility of establishing a consortium to process tallow into more valuable fatty acid and allied products.

(2) Hides to a tanned stage.

(3) Casings to a point where they may go directly to the end-user. Some traditional buyers still calibrate and select casings in the country of sale rather than in New Zealand. This does not produce the highest export earnings. The rapid development of synthetic edible casings is a serious menace to the natural casings industry.

(4) Lamb caps. Though the full processing of this product would be a most desirable goal, it is most unlikely to be achieved without the full co-operation of processors in the U.S.A. Full co-operation would be essential both on technical and marketing aspects and this co-operation is unlikely to be given without appropriate tax-incentives, etc.

(5) Pharmaceutical glands—e.g., thyroid, adrenal, pancreas, pituitary, ovaries and liver. Comments relating to caps regarding overseas processors, marketing and tax incentives, probably apply equally to gland processing.

(6) Bones. Bone processing is thought possible to the extent of producing gelatine and calcined bone powder. The waste in the present use of a considerable tonnage of bones is serious.
(7) Finally, as a more general observation, there is need for research into the up-grading of a vast quantity of protein material now "lost" to the rendering department in freezing works. The weight of material now going to rendering departments is equivalent to about 50% of the protein in the actual meat products. A less ambitious hope would be for certain fertilizers produced at present to be converted to stock foods before export.

The position regarding further processing of meats would be greatly changed if the export incentive tax now available to manufactured goods (and to some primary products such as seed and logs) were to apply to meat products to which reasonably sophisticated processing has been added.

CONCLUSION

The report and conclusions given by the New Zealand Wool Topmaking Investigating Co. Ltd, and other similar studies of adding value to agricultural products leave me with this very definitive view. Further processing appears to offer greater scope for higher prices, thereby improving the terms of trade. It does not necessarily follow, however, that increased processing would represent an overall economic gain in terms of resource use. Further processing at any cost is not an answer.

It is further complicated by the problems processors face in the need to compete for land, labour, capital and other resources with other users who are operating to a large extent in a protected domestic market. Because of this situation, it is reasonable to suggest the extension of some of the benefits accruing to the protected industry to some areas of the primary sector. Without doubt there is an extremely strong case for the extension of the export incentive tax where appropriate to some processed primary products.
The title of this paper is a little ambiguous. The words "cottage industry" tend to indicate a fragmented industry such as the crofter type cottage industry in Ireland and Scotland. The industry to be described is not one where work is done in the home, although it did start there, but one that is carried on in an old woolshed that my father built some fifty years ago.

**THE FARM**

The farm, "Wilanda Downs", is 50 miles north-west of Invercargill, lying in the foot-hill country of the Takitimu Mountains. Five miles away is the township of Ohai, a coal-mining centre, which has experienced a substantial population decline, following a fall off in coal sales.

The property comprises 4500 acres of sweet silver tussock country, about two-thirds of which is either ploughed or ploughable. The rainfall is evenly distributed with an annual average of 44 in. Over 11,000 sheep, plus 1000 Angus cattle are wintered.

When my father arrived in 1920 the property was carrying 1100 sheep, and very badly at that. The area was infested with rabbits. In one year alone he caught 44,000 and the battle to eradicate them was waged for over ten years, until they were all fenced out by about 1933. No cropping is undertaken other than for winter feed, except an area of blackcurrants, but this project has not really emerged from the experimental stage. Four married men are employed on the property, which I have managed since 1952.

**COTTAGE INDUSTRY**

The farm-based cottage industry was first conceived in 1966. Two of us, the other being one Tom Gilmour who died, sadly, within a year of our starting, felt that more could be
done with sheepskins. Instead of disposing of the characteristic Southland crossbred wool as slip wool at our freezing works, as was the common practice, we believed that more effort should be directed towards tanning the skins, and processing them into sheepskin articles.

We started manufacturing at the beginning of 1967, making a variety of products, ranging from little zip purses to wall-to-wall sheepskin carpets. However, our main production, in fact about 80% of it, now goes into car-seat covers, of which we make eight different models.

**Reasons for Starting**

Many people have often asked me, “What on earth induced you to get involved in that sheepskin business?” There were many reasons. Perhaps not the least of these was the fact that I needed a carpet in the house. To this end, I decided to ask a freezing works to save some skins from a line of ewes I had sent in — characteristic Southland crossbred skins — which were tanned and then I made them up into a carpet. This carpet was duly admired, especially by American fishermen whom my good friend, Tom Gilmour, used to bring in during some of the safari trips which he conducted. Ill health had caused him to give up active farming.

About this time, 1967, there was also a great need for farmers to diversify—a need which is still evident today. As production figures on the farm, which had been climbing over the preceding 15 years, were starting to level off, I was looking for a further challenge. At that time, too, I was buying in large numbers of old and overfat ewes during the summer months, to break in some of the rough blocks, at the same time removing their fat to achieve a better schedule price.

**The Industry**

The thought occurred to us both that we had most of the ingredients to start an industry. Being optimists, with a combination of wild enthusiasm and determination, we were soon involved in an extensive market survey, while our accountant, a very competent adviser, undertook a critical cost analysis. The results appeared satisfactory, so in February 1967, we formed a company with a capital of $2,000.

We certainly lacked manufacturing experience, but were fortunate that the wives of the men working on the farm were keen to show their skills. With them as our work force, and using a small room at the homestead, we commenced operations. Soon the extent of the business required a shift to a cottage on the farm. We stayed in the cottage for a year, then it started to burst at the seams, as sheepskins are very bulky things. By this time a new woolshed had been built, so we then moved into the old one, expecting it to serve us for
another five years. We have now been in the old shed for nearly six years and have actually extended it by 3,500 sq.ft. Likewise, the staff has expanded and we now draw from the nearby town of Ohai as well as from the farm.

It took two years to develop and perfect the car-seat cover which has stood us in such good stead. It is accepted not only throughout New Zealand, but also overseas. Although annoying, it is flattering to see now exact copies of our models being made by others, not only in New Zealand, but also in Australia.

At the beginning of our first year of production, we debated as to whether we should commit ourselves to 400 or 600 skins. By the end of the first year we had actually used more than 3000 skins. By the end of 1973 we will have had over 100,000 tanned sheepskins pass through our little woolshed factory.

At the time of starting, I thought we would be able to use all the skins from the bought-in old fat ewes which were ultimately sent to the freezing works, but after the first year we found this impracticable for two reasons:

1. There is such a wide variation in both wool and pelt types, necessitating the holding of very large stocks to allow proper matching of skins.
2. It became apparent that another source would have to be found to make up the numbers we needed.

We do not tan sheepskins ourselves, nor do we now process skins from sheep off the farm, as we did at the start. All of the tanning is done by contract in Mosgiel, and through this method we are able to obtain, from one of New Zealand's best sheepskin tanners, the quantities and types required. The tanners have in no small way contributed to our progress, through the supply of consistently high quality skins, and to our ability to meet the demand as new markets have developed.

Strict supervision of the manufacturing process and marketing has also contributed and in this capacity we are fortunate in having a very capable person, the wife of the district's police officer, who has managed production and marketing from the outset.

So has developed a viable “cottage industry”:

1. Based on an idea.
2. Backed by enthusiasm and initiative at all levels.
3. Supported by an extensive market survey and careful cost benefit studies.
4. Sited in available buildings on the farm.
5. Working with home-based labour.
6. Utilizing, initially, home-grown products.
7. Producing merchandise for which there is an obvious and expanding market.
Financing

The initial capital of the company was not a very significant amount and having the farm in the background provided still further security for the bank, to cover the increasing amount of stock we were required to carry. This was one factor we had not fully allowed for in the early stages and will perhaps always be one of the most important features of the business. So many companies have failed through insufficient capital.

The level of stock varies quite alarmingly at different times of the year. This is partly due to market fluctuations, but mainly due to the very wide variations in wool and skin types. To make a wall-to-wall carpet of 200 sq.ft, for instance, means stockpiling perhaps 200 or more skins for long periods until we get enough of them to match up. Another factor is the time taken from purchasing the raw skin through to the time it leaves the factory and finally when payment is made for the finished product. This can take up to four or five months. There is a constant need to work out cash flow patterns to ensure financial stability.

Marketing

Marketing is quite a different field from manufacturing and fortunately my partner, Tom Gilmour, was a born salesman.

In mid-1967, and before increasing production to any great extent, we both ventured overseas, travelling through America and Europe to try to establish, to some degree, whether sheepskins or sheepskin products would be attractive to overseas buyers. We were away 2½ months and came home more convinced than ever that there was considerable interest over a wide range of countries provided the price was right. Although this overseas trip stimulated our enthusiasm, events that followed changed the whole concept of our farm-based cottage industry into an industry with much wider implications.

“TWO FROM ONE” PROCESS

When I was in London I was shown by the International Wool Secretariat (IWS) a new process which they were developing. It was called the “two from one” process, on which the IWS had taken out world patent rights. I was so impressed by this new process that I applied for a New Zealand licence and the company was ultimately granted it as sole New Zealand licensee.

Briefly the process involves the use of a fast-moving band knife and a conveyor system. A raw sheepskin is placed with the wool uppermost on a conveyor that leads into a horizontally situated band knife. The band knife then cuts a layer of wool off the pelt, leaving about ½ in. of wool still on the pelt. The cut wool pile is then conveyed away from the skin on to a suitable backing material — canvas or cotton, for example.
The wool, the bonding agent and the canvas are then fused together under heat and pressure. Throughout the process the wool pile does not become disorientated and to all intents and purposes the new wool pile product looks just like an ordinary tanned sheepskin after it has been trimmed around the edges. One has to look at the backing material to determine the difference. The original sheepskin with \( \frac{1}{2} \) in. wool pile still left on it can then be treated in the same way as any tanned sheepskin. Hence the name “two from one”. It is a simple process and the advantages are many over a natural sheepskin. It is much lighter for clothing and can readily be manufactured into a variety of products. It is completely washable and autoclavable for hospital bed rugs and we hope it will be cheaper than its counterpart as a scatter rug.

All this is related to indicate, first, how a farmer can become involved with and perhaps directly benefit from, a research and marketing organization such as the IWS, which he is largely responsible for financing and, secondly, the involvement this caused away from the farm-based cottage industry.

This new process took 18 months to get under way. The band knife had to be ordered from Germany. It was a prototype for the process. A very sophisticated hydraulic press had to be fabricated. The “two from one” factory had to be located in Invercargill because the site needed to be close to the supply of “green” skins.

Financial considerations involved bringing in new shareholders and a very large increase in the capital of the company (now approaching $100,000). While the process had been proved in the laboratory, we faced the problem of adapting the idea to commercial production, which involved overcoming many technical and economic problems.

After four years of trials and tribulations, we now feel that we have been successful in producing a new and exciting product. We have yet to prove the economies of scale and complete a marketing survey both on the home and overseas markets. We have had to spend considerable sums of money over the four years of experimental work and, if it was not for our little farm-based cottage industry at Ohai, we would not have been able to carry on with developing the “two from one” process.

DELEGATION OF FARM MANAGEMENT

The farm-based industry was not very time-consuming after we had established ourselves, but the development of the “two from one” process meant I had to reorganize the running of the farm.

I accordingly delegated all the stock work to one man and in touch with the day-to-day functions and farm policy. Maybe
the scale of the farming operation enabled me to do this more readily than would otherwise have been possible. Perhaps the reliability, but more importantly the stability, of the farm work force has in no small way been brought about by the opportunity afforded the wives to add to the weekly pay packet, as well as the fact that a busy person is often a more contented person.

THE FUTURE

We sell our products only because they can compete on New Zealand and overseas markets, both in respect of quality and of price, as there is no sentiment in business.

We can only employ labour provided the premises are registered as "factories" by the Labour Department, and all the normal requirements of a factory have to be met.

There is no question of using cheap labour in a farm-based industry. All wages paid must equal or exceed Award wages pertaining to such work. Bankers have no sentiment either. Methods of financing the business, and of management control, must be those of any normal enterprise and carefully supervised by competent people. Expansion can only be possible provided these points are satisfied.

To gain the best return from the costly initial inputs of study, investigation and experimentation we have put into this whole operation, especially the "two from one" process, a greater volume of production is necessary. We are planning to achieve this.

CONCLUSION

The position today is, therefore, that the company really conducts two separate types of business. One is the farm-based industry, still conducted in the old but extended woolshed, producing articles from tanned sheepskins, with a substantial New Zealand market and an expanding overseas demand. It still employs the wives of farm employees, but because of expansion, it also employs other womenfolk from the neighbouring township. Although small in stature it is true regional development and is an incentive to families to remain in the rural scene.

The second type is the "two from one" factory, which cannot be classed as farm-based, but as an "extension" of the farm-based industry. It is one which we hope will attract lucrative markets, not only at home, but in many countries abroad where this unique product of our basic sheep industry is in demand.
In the last five to ten years, a rather bewildering variety of new breeds of cattle has become available to the beef industry in New Zealand. Breeds such as the Charolais, Simmental, Limousin, Maine-Anjou, Blonde Aquitaine, Pie-Rouge, South Devon, Sussex, Lincoln Red, Meuse-Rhine-Yssel (MRY), and Chiana are now available in the country either as actual animals or as semen. It is clear that it will be many years before adequate information is available on the relative merits of these breeds and their crosses. Nevertheless, it is vital that an examination be made of the ways in which these breeds can be utilized in improving the productivity of the beef industry. Hence the intention in this article is, first of all, to outline the needs and objectives in improving beef production. Then an assessment will be made of the various ways of using breed and cross differences in meeting the needs of the industry. Finally, consideration will be given to the information presently available on some of the exotic breeds and some suggestions made as to the likely role they could play in New Zealand beef production.

OBJECTIVES IN IMPROVEMENT

It is important to remember that there are two phases in the production cycle of the beef animal in a single-suckling herd. The first phase is that of calf production. In this, it is the traits of the cow which are of most significance—high fertility and regularity of calving, adequate milk production and mothering ability to wean heavy calves. Improvement in these traits will increase the productivity of the cow herd. The second phase is that of growth or weight production. This refers to the post-weaning stage of growth up to the slaughter of the animal for beef. The important traits in the efficiency of this phase of production are growth rate, carcass composition, and the eating qualities of the beef produced.
In considering these two phases, several points need to be stressed:

(1) Efficiency of calf production is relatively much more important than efficiency in the growth phase. This arises because the cow herd, including the calves up to weaning, consumes about twice as much feed as is needed to carry through the calves produced by the herd from weaning to slaughter. So, overall, the traits which contribute to cow efficiency are very much more important than those contributing to the efficiency of the steer.

(2) The functions performed by the cow are very different from those of the steer. Consequently, the traits required in the cow are different from and may be antagonistic to those needed in the steer phase of production. This is shown in Table 1 where the traits required for cows and for steers are listed and their desirability for each phase of production is indicated. The main conflicts arise from the genetic relationships between mature size, rate of growth and rate of maturity. Thus, while small cows have the advantage of lower maintenance requirements, this is offset to some extent by the fact that they have a lower rate of gain and will pass this tendency on to their steer calves which are then at a disadvantage in the second phase of beef production.

(3) It is necessary to note some of the genetic properties of the various cow and steer traits. The two properties of most concern are: (a) the rate at which the trait responds to selection for it, and (b) the extent to which the trait shows hybrid vigour in crosses. The results of work done overseas are summarized in Table 2. It is clear that the more important traits of the breeding cow respond only little to selection but show a substantial amount of hybrid vigour. On the other hand, the steer traits can be changed readily by selection but

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**TABLE 1: TRAITS REQUIRED IN THE COW AND IN THE STEER**

<table>
<thead>
<tr>
<th>Trait</th>
<th>Cow</th>
<th>Steer</th>
</tr>
</thead>
<tbody>
<tr>
<td>High fertility</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Easy calving</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Good milking ability</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Small size</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Good temperament</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>High growth rate</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>High yielding carcass</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Tender, palatable beef</td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>

+ indicates that the trait is desirable.
— is undesirable.
0 neutral or of little importance.
BEEF BREEDS AND CROSSES

TABLE 2: CLASSIFICATION OF TRAITS BASED ON RESPONSE TO SELECTION AND AMOUNT OF HYBRID VIGOUR

<table>
<thead>
<tr>
<th>Traits</th>
<th>Response to Selection</th>
<th>Amount of Hybrid Vigour</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Fertility</td>
<td>Very Slow</td>
<td>Much</td>
</tr>
<tr>
<td>Mothering ability</td>
<td></td>
<td>10% and more</td>
</tr>
<tr>
<td>Calving interval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II Growth rate</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Weaning weight</td>
<td></td>
<td>5-10%</td>
</tr>
<tr>
<td>Overall conformation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk yield</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III Mature weight</td>
<td>Fast</td>
<td>Little</td>
</tr>
<tr>
<td>Tenderness</td>
<td></td>
<td>5%</td>
</tr>
</tbody>
</table>

show only a moderate amount of hybrid vigour. Consequently it is important that every avenue should be explored in order to set up production systems which make maximum use of hybrid vigour, primarily in the cow herd but also secondarily in the growth of the slaughter animal. In effect, crossbreeding may permit the production of a better combination of the cow and steer components of performance than can be obtained within a single breed.

UTILIZATION OF BREED DIFFERENCES

It is now necessary to examine in detail the various methods which are available to use breed differences in efficient beef production.

(1) Breed Replacement

If a particular breed proves to be superior in both its cow and steer traits to any existing breeds and crosses, then the objective would be to replace the less productive breeds by the superior breed. This can be done in two ways:

(1) By grading up (i.e., the continuing use of bulls of the superior breed). This is a commonly used method and is well known in the New Zealand livestock scene. For example, the replacement of the Shorthorn breed by the Jersey in the dairy industry and by the Angus in the beef industry was essentially accomplished by this process.

(2) By doing less culling among individuals of the superior breed and so expanding its numbers to replace the other breeds. This is a slower, less efficient procedure, but has been used in the expansion of the Friesian breed in Britain and Europe (in contrast to the grading up process currently operating in the New Zealand dairy industry at present).
Both these processes will be used in the establishment of the exotic breeds in New Zealand, but whether they will be involved in the commercial industry is more questionable. It could be that the Limousin could be used to grade up the Angus breed and the Simmental to grade up the Hereford. In each case, however, the crucial question would be whether the exotic breed is better in its cow performance than the local breeds. To answer this requires comparisons of purebred or graded-up herds of the breeds involved over a range of conditions, especially on hill country. Hence answers are not likely to be forthcoming in the near future.

(2) Specific Two-breed Crosses

An example of this system would be the Southdown × Romney for export lamb production. It is of limited use in a situation where reproductive rates are low as in cattle. It is only likely to take place where a system of stratification has evolved whereby cull or cast-for-age cows from hill herds are brought on to better country and crossed to bulls of another breed. Only a very little of this type of crossing exists in New Zealand. In using it, one would gain the full amount of hybrid vigour in steer performance traits but no hybrid vigour in cow performance.

(3) Three-way Cross

This system consists in mating a superior sire breed to cows resulting from a cross between two breeds chosen largely for their maternal traits. In words commonly used nowadays, it is the use of the big terminal sire on an F1 cow. The cow, being a first cross between two breeds, will show maximum hybrid vigour for the cow performance traits. The terminal sire is chosen for its high level of performance in the steer traits and usually both sexes from this cross will be slaughtered. Again this will give maximum hybrid vigour for the traits involved in post-weaning growth and production.

This is a system of production which needs examination under New Zealand conditions. The immediate practical difficulty is that it requires about 60 to 65 purebred cattle of breed B to maintain 100 A × B cows for producing slaughter cattle. It is this fact, plus the consideration that the first-cross cow is chosen to be good for maternal traits, which suggests that the dairy industry could play a part in the system. For example, one would consider in this context the production of an Angus × Jersey, or Hereford × Friesian cow by crossing the appropriate sire with surplus Jersey or Friesian cows. Then these first-cross cows would be mated with the big terminal sires such as Charolais or Simmental. It could be that the surplus breeding capacity of the dairy industry would be more efficiently used in producing appropriate first-cross cows than in producing stock for slaughter.
Rotational Crossing

Rotational crossbreeding, or the use in sequence of sires of two or more pure breeds, has the advantage of utilizing a high proportion of the maximum potential hybrid vigour in both cow and steer performance. It has the disadvantage that each breed contributes on average to the same extent as a sire breed and as a dam breed in the cross. Consequently selection needs to be for both the cow and steer performance traits in each breed and thus no breed specialization can take place. The number of breeds used in the rotation is relevant, a two-breed rotation retaining two-thirds of the hybrid vigour effects for both cow and steer traits, a three-breed rotation retaining six-sevenths and a four-breed rotation retaining fourteen-fifteenths of the hybrid vigour effects.

In New Zealand, many breeders have handled the Angus × Hereford cross herd more or less as a two-breed rotation. There is need for more consideration to be given to the three-breed rotation. It is a simple system and, because female replacements are bred within the herd, it fits in well with the typical hill country run herd.

The use of a specialized sire breed on cows produced by a two-breed rotation is a system which combines some of the advantages of the three-way and rotational crossing. Such a system would involve crossing a large terminal sire such as the Charolais or Simmental to an Angus × Hereford rotationally bred surplus cow. In this case all of the hybrid vigour in steer performance traits is utilized as well as a large part of the maternal hybrid vigour.

Synthetic Breeds

In this system, the cross is interbred and established as a new and separate breed. This procedure is well known in sheep in New Zealand. It offers less opportunity than rotational crossing for retaining hybrid vigour in both cow and steer performance. Once interbreeding has started, then the problems of improvement are essentially the same as in any other breed.

Comparisons between Breeds

Experimental comparisons of exotic breeds in New Zealand are limited to Charolais × Jersey and Charolais × Friesian cattle, although some field experience is now becoming available with other crosses. The results of Barton (1968) and of Everitt (1972) are in general agreement as to the performance of the Charolais × Jersey cross steers. They grew rapidly but not significantly better than the Friesian × Jersey cross or as well as the Friesian. Their yield of meat or trimmed cuts percentage was better than the Friesian, Friesian × Jersey and Angus cattle. There was a higher mortality rate,
especially at calving and in the first three months. Hollard (1968) noted that the Charolais × Friesian grew about as well as the Friesian.

A growing amount of information on the comparative beef performance of the exotic breeds is becoming available from trials that are being undertaken, not only in Europe, but also in Canada, Argentina, South West Africa, and South Africa. It is noted that the results of the different trials are often not repeatable because of small numbers or because of insufficient sampling of the breeds involved. However, it is possible to classify the breeds into groups. Group I includes the Charolais, Simmental, Romagna, Chiana and German Yellow. Present results show little difference between these breeds in growth rate, yield of red meat, rate of maturity, leanness and calving difficulties. Group II includes the Limousin, Blonde Aquitaine, Maine-Anjou, MRY, South Devon and British Friesian. These breeds are smaller, slightly slower in growth, still high yielding and lean. Group III includes the Continental Friesians, Devon, Sussex and Danish Red. Finally, the last group includes the remaining British beef breeds — the Hereford, Shorthorn and Angus.

It is noted that there is a clear positive correlation between daily gain and mature weight and a negative correlation between daily gain and fatness — i.e., breeds with a large mature size grow most rapidly and mature most slowly. There is a negative association between daily gain in weight and amount of food needed to achieve this gain. Also, the larger breeds when slaughtered at the same weights tend to have more muscle in the carcass and hence a higher muscle:bone ratio. Proportions of the joints are not very different. The less desirable aspects of large size are greater gestation lengths, heavier calves at birth, more calving difficulties, and more still-births.

It is important to note that some breeds deviate in one or more traits from this general regression on size. Of special note is the Limousin which appears to have a higher muscle: bone ratio (due to more muscle and less bone) than is expected for its size. This is reflected in a larger eye-muscle area. In contrast, the Friesian types appear to have more bone than breeds of comparable size.

On the whole, evidence from work in U.S.A. and Canada confirms the picture outlined above. A very detailed comparison of a number of breeds is being undertaken at the U.S. Meat Animal Research Center at Clay Center, Nebraska (including South Devon, Limousin, Simmental and Charolais). Generally, the Simmental crosses produced from Angus and Hereford cows are similar to Charolais crosses in growth rate, birth weights, calving difficulty and carcass traits. Growth of the Limousin crosses is less than the Charolais or Simmental but above the British beef breeds.
In considering this information, one must remember that it can only be a very general guide. It is necessary to recall that the New Zealand information on the Charolais crosses compared with the Friesian does not altogether line up with British experience and that generally the comparisons which have been made overseas are at comparatively high levels of nutrition. The comparative advantage of the large, late-maturing beast may not necessarily hold under lower levels of feeding.

Nevertheless, this information serves as a base for examining the possibilities in breed exploitation in New Zealand. In the first place, the large terminal sire breeds such as the Charolais, Simmental, Chiana, and perhaps South Devon and Limousin, may be grouped together. In the writer's opinion, obtaining optimum use of these breeds will require the development of a three-way cross system. A crucial point is the production of a cow which will be able to produce calves sired by these large breeds with little trouble at calving. More and more, this seems to require the Jersey to be involved as one of the breeds. This also fits in with the idea of these F₂ cows being produced from the surplus breeding capacity in the dairy industry. The use of the Jersey, however, has a disadvantage in that the male calves born as a by-product of the production of these F₂ cows are comparatively slow in growth rate and may be inclined to yellow fat. This may favour an alternative such as the production of the Hereford × Friesian female rather than the Angus × Jersey. It is probable that the three-way cross system would be a specialized operation carried out on reasonably good country. The fact that this system (used for a long time in Great Britain) is now developing rapidly in many other countries, is a justification for a careful assessment of its use in New Zealand.

There is a further group of breeds which includes the Simmental, Maine-Anjou and Friesians of various sorts where growthiness and high milk production are combined. These breeds could well contribute to a rotational crossing programme along with present breeds. Again this system of breeding, because it supplies its own replacements, merits more consideration than it has yet been given in New Zealand. The Limousin has a good reputation for carcass merit in the sense of the British breeds, although its growth rate is substantially better. Crossing with the Angus to form a synthetic breed could be a possible use of this breed. It could also fit in (perhaps where better marbling is required) as a terminal sire or in a rotation. The Blonde Aquitaine, South Devon and Lincoln Red could also fall into the same sort of pattern.

In conclusion, there would appear to be little doubt that beef production will need to become a very much more specialized industry in New Zealand. In this paper the writer has tried to show the ways in which the breeds can be utilized by crossbreeding systems. The hope is that producers can be
induced to try out these systems and to sort out how best they may operate in different environmental and management situations. However, it is clear that much less reliance will be placed on trying to get all the good traits together in one breed. Rather, crosses will be "tailor-made" for specific purposes.

REFERENCES


Artificial insemination, or artificial breeding, as it is commonly called, has for many years been a major factor in dairy cattle breeding but so far it has been of negligible importance in breeding beef cattle. There are signs that this is changing and therefore now is the time to consider how to use the technique to obtain the sort of improvement in the beef industry that the dairy industry has already obtained through its widespread use.

**BREEDING FOR IMPROVEMENT**

To do this it is first necessary to recall the three steps that must be taken in setting out to breed better cattle:

1. Decide which characteristics are to be improved.
2. Measure or assess the differences between the cattle in these characteristics.
3. Use this information to select the cattle to breed from.

The application of these steps in breeding beef cattle can now be considered.

**Deciding which Characteristics to Improve**

It is an axiom of breeding that the more things one tries to improve the less improvement can be made in any one of them. Therefore, if progress is really going to be made, it is essential to confine selection to as few characteristics as possible, and to ensure that they are characteristics of real commercial importance.

Accordingly, first priority should be placed on those characteristics that influence the return obtained for the final product, the slaughter animal. These will always include growth rate, both before and after weaning, and ideally, depending on the grading and pricing system, some emphasis on carcass...
characteristics such as meat yield. In addition, because breeding animals could be kept for many years and slaughter animals for nearly two years, account should also be taken of factors which make cattle easier to manage, such as good feet and a placid temperament.

But there is no point in making the task of improving these characteristics harder by also considering factors of no value to the commercial producer, such as coat colour. On such questions a leaf might be taken from the book of the Scottish stockman who, when asked what colour he preferred, replied, "The colour of the good ones!"

Measuring the Characteristics to be Improved

It is sometimes said that nothing can take the place of the eye of the breeder. Be that as it may, there is a much more important statement: "Nothing can take the place of the facts."

Fortunately, it is not necessary to guess or assess when setting out to improve most of the important characteristics of cattle because, whether they are characteristics of dairy cattle or beef cattle, they can be measured. A dairy cow's milk can be weighed, the calves reared by our beef cows can be weighed and, after they are weaned, they can continue to be weighed to measure their subsequent growth. There are, in fact, very few aspects of true commercial importance in beef cattle that cannot be measured on the live animal itself or its carcass. It is not necessary to guess.

But in case anyone thinks that to improve the growth rate of beef cattle it is only necessary to find out who has the heaviest bulls and to use these, another most important aspect of measuring must be considered — how to interpret the information.

Most will have seen in the glossy brochures which abound these days some very high weight-for-age figures and liveweight gains, or will have noted that the bulls some breeders bring to the sales are consistently bigger than those of others. But how many have asked the all-important question "How was this achieved?" While weights are facts, it is also a fact that the easiest way of obtaining heavy animals is to make sure that they never want for anything — whether a nurse cow to give them a flying start, or a liberal ration of meal to keep them going. Because of this, it is quite meaningless to compare the weights of animals unless it is certain that they have had the same opportunity. Thus, the really important measurements are not actual weaning weights or subsequent gains but the differences in weight between animals run under the same conditions.

Very little progress will be made unless this all-important fact is kept very much to the fore in thinking on beef improvement.
Using the Information to Select Breeding Cattle

There are two terms which are widely used when discussing the breeding of beef cattle — performance testing and progeny testing. There seems to be a good deal of confusion about their meaning and use, and hence it is important to clarify them. To do this, consider growth rate as an example. The objective is to select bulls likely to sire fast-growing progeny. One way of doing this is to rear bulls together and to keep the fastest growing ones for breeding. That is, the bulls are compared and selected on the basis of their own performance, a performance test. While all the superiority of the selected bulls will not be reflected in their progeny progress can be made by doing this. Alternatively, all the bulls could be used for breeding, and they could be compared on the basis of the performance of their progeny. The bulls have then been progeny tested and, provided there are enough calves by each bull, a more accurate assessment will be obtained of each bull's breeding ability than performance testing will give.

However, while progeny testing is the more accurate way of estimating a bull's breeding ability, this does not necessarily mean that progeny testing should be adopted, as it also has disadvantages. In comparison with performance testing, only a very limited number of bulls can be tested and it is necessary to wait quite a while to get the answer. In fact, because of this and for other reasons, which it is hoped will become more apparent as this paper proceeds, progeny testing is of very doubtful value in beef improvement unless it is combined with the use of artificial breeding. At this stage, therefore, let us assume it has been decided to use performance testing. How is it applied in practice?

PERFORMANCE TESTING

In breeding there are always two parents and therefore two possible animals to select, and the principle of performance testing can be used in both cases.

In the case of the dams, heifers can be selected to go into the breeding herd on the basis of their own growth rate and, when they are in the herd, they can be culled on their mothering ability on the basis of the growth of their subsequent calves. However, there is a catch. As a high proportion of the heifers reared each year must be retained to replace cows that die or are culled, the scope for selection is limited and progress by this means necessarily slow.

On the other hand, relative to cows, very few bulls are needed, so presumably there will be much more scope when selecting the bulls to use. Furthermore, as each bull will have far more influence on the quality of the resulting calf crop than any individual cow can have, more care should be taken when selecting him. Thus, the real key to beef improvement, as with dairy cattle improvement, is the quality of the bulls, and, to make progress, all that is required is to performance test a large number of bulls.

In performance testing bulls it will probably be found that some are very poor bulls, a large number of bulls are close
to average, and some are very good bulls. To make progress, therefore, all that is needed is to use for breeding only the good ones that turn up.

Does it sound too good to be true? It is! Why? Let us do some arithmetic. There are about two million beef cows to be mated each year. At 40 cows per bull, this means about 50,000 bulls need to be used and if, on average, each bull is used for, say, three years, this means that 17,000 new bulls have to be chosen each year. How many are available to choose from?

There are about 1000 registered beef breeding herds in New Zealand and about 30,000 registered cows. Thus, if selection is confined to bulls bred in these herds, there is obviously going to be no selection at all, as every bull reared must be used by somebody. Even if there were sufficient to select from, there is a further complication. Only about one-third of these registered herd owners record their cattle, and some of these adopt practices, such as the use of nurse cows and preferential treatment for certain bulls, which effectively make their records worthless as an aid to beef improvement.

So it is really a vicious circle. Although knowing what to do, under natural mating with purebred bulls there just are not the means to do it; even the unorthodox answer, to use grade bulls, is not much help either as very few of these are recorded. This vicious circle can only be broken by finding a way of mating each bull to many more cows and thus requiring fewer bulls. That is, it is necessary to take advantage of the technique of artificial insemination to "make a little bull go a long way".

Just how far he can go is illustrated by the dairy industry which also has about two million cows to mate each year. Last year, half of them were mated, by natural mating, to 25,000 bulls; the other half were mated by artificial insemination to just 25 bulls. This is a very clear illustration of the great benefit artificial breeding can bring to cattle improvement, through the opportunity to be really selective about the bulls used. Note that the word "opportunity" was used. Artificial breeding is not a panacea for all ills; it is a means of making improvement. If this means is coupled with an effective system of selecting top quality bulls, progress will be made; without such a system it is only another way of marking time or even of going backwards at a faster rate.

**ARTIFICIAL BREEDING IN THE BEEF INDUSTRY**

The widespread use of artificial breeding in the beef industry is obviously more difficult than in the dairy industry, as its successful adoption on most properties requires obvious management changes before and during the breeding season.
That these management changes will be made if the stakes are high enough has already been shown by the large number of people who have used this technique to mate their cows to bulls of the exotic breeds. I believe the stakes are also high enough to make these management changes so as to be able to use the top bulls of the traditional breeds as well. At the very least, such bulls should surely be widely used in bull-breeding herds, so that the quality of these herds is improved and sons of such sires are made available to those commercial producers who are not able to use artificial breeding directly.

Thus, the immediate advantage that artificial breeding can give is the means of making effective selection from the relatively few cattle that are at present recorded. But it need not and should not stop there.

Provided the number of herds and cattle that are recorded is greatly increased, and this must have high priority, the technique can also be used to help to make still faster progress in the future. For example, the progeny of selected bulls, of both traditional and exotic breeds, can be compared on many different farms, and thus a clearer picture of the relative merits of these breeds can be obtained. Because the bulls used will have a large number of progeny on many different farms, those bulls which are really delivering the goods can be identified. They can then be used more heavily and their sons and daughters selected for future use.

By using the same bull at the same time in different stud herds each breeder concerned can be provided with a common reference point that will enable him to compare his cattle with those of other breeders. This technique has been used in the dairy industry to compare artificially bred herds with other herds and thereby an accurate measure of the progress made has been obtained. If the evidence collected shows that it is desirable, the technique can also be used to change rapidly to a different breed without unduly sacrificing the quality of the bulls used.

In a nutshell, artificial breeding, provided it is combined with an effective recording scheme, and realistic objectives, will:

(1) Provide better evidence on the true commercial value of the many different breeds now available.

(2) Provide a more accurate means of locating superior cattle within each breed.

(3) Provide the only effective means of making use of this information to improve the genetic quality of beef cattle, as a whole, at a reasonable rate.

It is important that it should be used for these ends and not just as a novel way of following the latest fashion in the battle of the breeds.
Six years ago at a Lincoln Conference I discussed the performance of Angus cattle in the hill country. Since then we have been trying some different breeds at Mt Peel Station and our experience with these will be considered in this paper. We have an open mind on breeds, provided they can achieve the targets set for them. Other farmers will have different targets which will be achieved better by different breeds.

Our aims are to breed a cow that will (1) get in-calf within three cycles; (2) produce her first calf as a two-year-old and have a long, productive life, weaning a live calf every year with a calf weaning weight at 200 days of 600 lb; be structurally sound and have a good temperament.

In the case of the fattening animal, the aim is to breed a steer that reaches 1,000 lb liveweight in 16 months and produces meat that achieves the best price.

With these objects in mind, we set out in 1968 to introduce the Charolais by way of artificial insemination (AI). It was never envisaged that the Charolais would take over from the Angus as a base cow, but rather that it would be used as a final cross, or, as the Americans say, a terminal sire.

After a period of four years of AI (a total of 2,000 cows in that time) we think that it will always play a part in our beef production programme, but, because of management problems, it seems doubtful whether it will be used extensively in New Zealand.

The biggest disadvantage is that the beef cow has a calf at foot (which does not occur in the dairy industry situation). In addition, a large amount of feed is needed close to the stockyards, and there must be time to observe the cows twice daily and bring those in season into the yards. It is likely, however, that in the near future a drug will be available to induce a uniform cycling period for all the cows; this will of course make AI much simpler.
Rather than extensive use of AI, we feel that a two-tier system may develop where those farmers who have selected their top performance cows will inseminate these with the best semen available (by “best” is meant semen backed by records of performance and progeny testing). This would then make available to the commercial breeder bulls that are only one generation away from top progeny-tested bulls anywhere in the world.

CHAROLAIS

Through AI it has been possible to experiment with different breeds; the first one used was the Charolais. There is no doubt that the Charolais is a fast-growing animal when compared with traditional breeds. Results from the first cross Charolais × Angus indicate that this cross produces about 70 lb more beef in 18 months than the straight-bred Angus steer; if this steer grades G.A.Q. or F.A.Q. it will return the farmer an extra $24 per head. However, to achieve these grade levels it appears that the Charolais × Angus will need to be well fed to 18 months.

**TABLE 1: RETURNS FOR CHAROLAIS × ANGUS AND ANGUS STEERS AT 18 MONTHS**

<table>
<thead>
<tr>
<th>No.</th>
<th>Grading</th>
<th>Price/100 lb</th>
<th>Total Price $</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>Charolais × Angus (average weight 525 lb)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>G.A.Q.</td>
<td>36.25</td>
<td>570.90</td>
</tr>
<tr>
<td>9</td>
<td>F.A.Q.</td>
<td>36.00</td>
<td>1701.00</td>
</tr>
<tr>
<td>12</td>
<td>Y.A.Q.</td>
<td>31.00</td>
<td>1953.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4224.90</td>
</tr>
<tr>
<td>(Average per head, $176)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angus (average weight 475 lb)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>G.A.Q.</td>
<td>36.25</td>
<td>3960.31</td>
</tr>
<tr>
<td>3</td>
<td>F.A.Q.</td>
<td>36.00</td>
<td>513.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4473.31</td>
</tr>
<tr>
<td>(Average per head, $172)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 shows returns for Charolais × Angus and Angus steers run together from birth and killed at 18 months. These steers were not as well fed as in other years and as a result were downgraded for lack of fat. Fast-growing animals reach their mature weight at a later age and therefore lay down fat at a later stage. It is doubtful if the present grading system for beef is really geared to encourage the farmer to produce the greatest amount of red meat beast, yet surely the world wants red meat not fat.
Other interesting growth figures come from Mr McDonald's cattle at Peel Forest. Mr McDonald is a fattener of young cattle. He buys in at the autumn calf sales, feeds the calves well on autumn grass, 2 lb barley, plus a little hay, then on swedes and hay in winter, and grass again in spring. His calves are never short of feed but his farm is stocked at 6 EE per acre.

Table 2 gives growth rates for different breeds of steer calves wintered and fattened on his farm last year. Though the trial was with a limited number of animals only, and thus no conclusions can be drawn, it is interesting to see the large weights achieved in a relatively short time. The steers were in very good demand for the local market.

**TABLE 2: GROWTH RATES OF STEER CALVES, PEEL FOREST**

<table>
<thead>
<tr>
<th>Breed</th>
<th>Weight (lb)</th>
<th>Gain (lb/day)</th>
<th>Date</th>
<th>Sold Weight (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Devon × Shorthorn</td>
<td>701</td>
<td>951</td>
<td>Oct. 24</td>
<td>1.63</td>
</tr>
<tr>
<td>Angus × Friesian</td>
<td>741</td>
<td>978</td>
<td>Oct. 24</td>
<td>1.55</td>
</tr>
<tr>
<td>Charolais × Angus</td>
<td>639</td>
<td>928</td>
<td>Nov. 4</td>
<td>1.88</td>
</tr>
<tr>
<td>Hereford × Ayrshire</td>
<td>738</td>
<td>982</td>
<td>Oct. 24</td>
<td>1.68</td>
</tr>
<tr>
<td>Angus × Hereford</td>
<td>673</td>
<td>912</td>
<td>Nov. 4</td>
<td>1.57</td>
</tr>
</tbody>
</table>

Mr McDonald's aim, like ours, was to reach 1,000 lb live-weight in 16 months; in fact, he is achieving it in 14 months and believes that a crossbred of some kind is required to do this. He is this year carrying out the following breed comparisons: Charolais × Angus, Hereford × Ayrshire, Simmental × Angus, South Devon × Shorthorn, Hereford × Angus.

**SIMMENTAL**

Last year, we mated by AI 200 mature Angus cows to the German Simmental strain and these calved last spring without problems. There were large variations in colour, and, while colour has no effect on growth, it is felt that some buyers may be put off by the variations.

Weaning weights of the Charolais × Angus and Simmental × Angus have been very similar, i.e., about 550 lb at 200 days. Because of the Simmental's milking ability, it is a breed that can be used as a first-cross cow and then mated to a terminal sire.

Calving problems with Charolais and Simmental mated to mature Angus cows have been no greater than we would normally have had with Angus mated to Angus — only one in 200 or 300. Problems have been experienced, however, in mating the Charolais to heifers; in our view, heifers should not be mated to the Charolais or any other large European breed.
LIMOUSIN

In the autumn of 1972, Angus cows were inseminated with Limousin semen. The calves were born in March of this year and by that time the cows were in good condition. There were no calving problems and calf size at birth was only a little larger than that of Angus calves. Although the Limousin does not grow as fast as other large European breeds, it does have a higher yield of red meat and could be very useful as a terminal sire on Hereford × Friesian or some other such cross.

Other breeds will be tried to see where they might fit into our breeding programme. The costs incurred by AI can be more than offset by selling surplus first-cross females to Australia.

IMPROVING THE ANGUS

So far, this discussion has centred around crossbreeding and its advantages but for successful crossbreeding it is necessary to start somewhere with a straight breed.

We feel that the Angus and Hereford breeds have a great future in beef production in New Zealand, provided that breeders do everything possible to improve their performance. Although the traditional breeds do not grow as fast as the European, they do have that trait, which, in a cow, is even more important than growth— the ability, beginning as a two-year-old, to have a live calf at weaning every year, even in a situation of feed shortage. Because of this, and because we have a reasonably large population to work with, we have begun a programme to improve our Angus.

To achieve production aims, we are in the process of sorting out those cows which produce the biggest calf at weaning. These cows then go into an elite herd where birth date of calves is recorded and the calves are weighed at weaning. The idea then is to mate these cows to the top performance or progeny-tested bull.

We also belong to the Canterbury Angus Development Group, a group of eight breeders who came together in 1971 with the sole object of improving the performance of the Angus breed. The group has about 4,000 Angus cows and this coming spring will be recording the birth dates and weaning weights of 800 cows. The group feels that, with selection on performance, there are many unregistered cows that could perform as well or even better than many stud cows, and that these high-performing cows should be providing bulls for the industry. There is still a place for the stud breeders, provided they adopt new regulations that encourage higher performance of their breed.

Beef breeding is at a very exciting stage, and those breeds whose breeders have the right objectives in mind will be the ones that succeed in the long term.
HUSBANDRY METHODS AND IMPROVED BEEF PRODUCTION

A. M. NICOL
Lecturer in Animal Science, Lincoln College

In the past few years great emphasis has been placed on the improvement of beef cattle performance through selection within breeds and the introduction of new breeds. Relatively little cognisance has been given to the old dictum that "breeding is no substitute for feeding". The management of beef cattle is of great significance for two reasons. First, it has been demonstrated quite clearly that the advantage of potentially more productive stock is realized only where the standard of management is high. Figures from M.L.C. (1969) show an advantage in weaning weight to the Friesian × beef cow, compared with the pure beef cow, as Lowlands, +13 kg; Uplands, +10 kg; Highlands, +3 kg. These figures indicate that the higher-producing Friesian cross beef cow shows a large advantage over the pure beef cow only where feed conditions are good. Secondly, the rate of improvement in beef cattle productivity, which can be obtained through selection methods, is very slow owing mainly to the long turnover of the generations. On the other hand, very marked improvement in the performance of beef cattle enterprises can be achieved through management.

BREEDING COW MANAGEMENT

The Criteria of Productivity

The important criteria for efficiency of the breeding cow are calving percentage, the cow death rate and the weight of the calf at weaning. Table 1 illustrates the effect on the economic return per 100 breeding cows of altering these three criteria by one standard deviation. For example, if cow death rate changes by 1%, the owner will lose the value of the cow ($100) and her potential calf ($70) and will have to replace her with an in-calf heifer ($150), which is a total of $320. Therefore a change of 2% in cow death rate will change the return per 100 cows by $640. The only one of these three
TABLE 1: EFFECT OF WEANING %, COW DEATH RATE AND WEANING WEIGHT ON RETURNS PER 100 COWS

<table>
<thead>
<tr>
<th></th>
<th>Value/Unit</th>
<th>Standard Deviation</th>
<th>Relative Economic Value/100 Cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaning %</td>
<td>$70/calf</td>
<td>20%</td>
<td>$1400</td>
</tr>
<tr>
<td>Cow death rate</td>
<td>$100 + $70 + $150</td>
<td>2%</td>
<td>$640</td>
</tr>
<tr>
<td>Weaning weight</td>
<td>36c/kg liveweight</td>
<td>18 kg</td>
<td>$560</td>
</tr>
</tbody>
</table>

TABLE 2: INFLUENCE OF LENGTH OF LIFE AND NUMBER OF CALVES WEANED ON WEIGHT OF CALF WEANED

<table>
<thead>
<tr>
<th>No. Possible Calvings in Herd</th>
<th>No. Calves Weaned</th>
<th>Total Lifetime Output (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>1800</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>1260</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>720</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

criteria which is very responsive to genetic improvement, the weaning weight of the calf, is only half as important in influencing returns per 100 cows as the weaning percentage.

As far as the individual cow is concerned, another approach can be taken and that is to analyse the effect of the number of calves weaned by that cow on her lifetime output and average calf weaning weight. As can be seen in Table 2 a cow which produces seven calves of 180 kg weaning weight in seven calvings will have a lifetime output of 1260 kg calf liveweight. If, however, she produces only six calves out of a possible seven, then each calf will have to weigh 210 kg if she is to produce 1260 kg calf in her lifetime. The important points from Table 2 are that missing production of a calf one year means that a considerable increase in the weaning weight of the remainder of her calves is required to maintain her lifetime performance. The effect is considerably less on the cow which has a long productive life in the herd than for one with a short life.

Factors Affecting Weaning Percentage

It is obvious that a high weaning percentage is of great importance. The factors which control weaning percentage are (1) Reproductive failure through disease; (2) Poor conception rates in cows; (3) High calf mortality from birth to weaning; and (4) Failure of cows to exhibit oestrus.
Disease is normally the first to be incriminated as the reason for poor weaning percentages, but in relatively few cases is this confirmed on veterinary investigation. Disease is not the main cause of reproductive failure in beef cows. Failure of cows to conceive is unlikely to be a big loss of potential calves unless single-sire mating is practised without rotating the bulls around the groups. Recently, however, there has been some evidence to show that cows which gain weight prior to mating are more likely to conceive than those that do not (Table 3, extracted from Moller and Shannon, 1972).

Although it is difficult to confirm in hill country areas without careful observation, high neonatal calf losses may occur. Experimentally it has been shown that weaning percentages may decrease from 95 to 75% as a result of cows being in too poor a condition at calving and producing light calves which have a poor chance of survival. Farmers have also experienced high death rates in calves at the other end of the scale; those that are too large at birth. This is a particular problem of two-year-old heifers which have been too well fed over their entire pregnancy.

The most important reason for the dry cow problem is the failure of cows to cycle during the period that the bulls are out with them. This anoestrus is almost entirely due to poor feeding at critical times. Work at Whatawhata Research Station has shown that the combination of a poor level of feeding prior to calving and up to weaning can have a dramatic effect on the number of cows not in-calf, increasing it from a respectable 6 to 9% up to an unacceptable level of 45% (Hight, 1968).

Even a less dramatic effect, such as increasing the period of time after calving that cows take to return to normal oestrus, can have effects on weaning percentage and spread of calving. For instance, some of the Lincoln work shows that even a relatively short period of poor nutrition of 40 days after calving can increase the time to first service by seven days. Since, to maintain a regular 365-day interval between calving, cows must conceive not more than 80 days after calving, even these small effects can be important.

The recommendations are, then, that the level of nutrition in the last 4 to 6 weeks before calving and almost immediately after calving must be high so that cows are gaining body

---

### TABLE 3: INFLUENCE OF CHANGE IN LIVEWEIGHT PRE-MATING ON NON-RETURN RATE OF COWS

<table>
<thead>
<tr>
<th>Change 3 wk Pre-mating</th>
<th>Non-return Rate (%)</th>
<th>Average Liveweight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 2% gain</td>
<td>64.2</td>
<td>322</td>
</tr>
<tr>
<td>-1.9 to +1.9%</td>
<td>57.3</td>
<td>350</td>
</tr>
<tr>
<td>≥ 2% loss</td>
<td>59.8</td>
<td>360</td>
</tr>
</tbody>
</table>

From Table 1, Moller and Shannon (1972)
weight if high cow performance is to be achieved. However, a considerable weight loss in mid-pregnancy is quite acceptable and will not affect performance.

Management Practices

In the past, with low cow numbers on most properties, cows survived over the winter and early spring on "roughage" or "non-grazed" excess summer growth which was eaten off by the cows as standing hay. Some variation in cow body weight occurred but this was not sufficient to cause either very light calves which have a poorer chance of survival or cows with too low a body weight at mating.

As cow numbers rise, however, this roughage may not last throughout the winter and consequently cow body weight falls to a much greater extent, which in turn may decrease weaning percentages. A number of techniques are available to possibly prevent this happening: (1) Better allocation of standing roughage; (2) Special provision of grass for pre-calving and calving; (3) Better timing of calving; and (4) Supplementary feeding of cows.

When cows are simply set-stocked on blocks during the winter, it is inevitable that they eat the good quality feed first, leaving the poorer quality roughage for late winter, at which time their requirements for pregnancy and approaching lactation are increasing rapidly and they in fact require better feeding. By mob-stocking cows and rotating them around blocks, a better balance of poor to good quality feed can be achieved. Sheep tend to eat out the better feed leaving the cows less.

In areas where winter grass growth occurs, it is possible to save grass for the special purpose of providing this, free of competition from sheep, to the cows before calving. In parts of the North Island hill country good topdressed and oversown blocks are being spelled for 6 to 8 weeks and then set-stocked with cows at 2.5/ha from 3 to 4 weeks before calving. In some cases nitrogen is being applied to assist this winter pasture growth. Good results are being achieved in terms of improved cow performance and reduction in grass staggers.

The top class butterfat supply dairy farmers have altered their calving date quite significantly as their stocking rates have risen. By later calving they have been better able to synchronize the time of peak feed demand of their cows with the flush of spring pasture growth. This technique may well have application in some beef herds. It can be shown that calves have to grow only 0.05 kg per day faster from birth to weaning to make up for being born 14 days later.

In most cases it is completely impractical to supplementary feed beef cows during the winter because of the problems of access to the cows and the availability of such feed. An alternative line of attack is that, instead of thinking about considering the feeding of all cows some of the winter, it may be
possible to feed a few of the cows all of the winter. At Lincoln we have been feeding in-calf cows solely on barley straw for 100 days in mid-pregnancy. They eat 8 to 9 kg per head per day. The loss in weight is within acceptable levels for this stage of pregnancy (8 to 10%). With the advent of cheaper methods of gathering and storing straw, contracts between hill country men and mixed cropping farmers for the wintering of cows may well develop.

It should be remembered that in a group of animals there are some that are less able to withstand stress. This is particularly true of the breeding cow. It is good management, no matter what wintering system is used, to draft off once or twice over the winter the 10% of cows that are well below average and give them preferential treatment. A high lice burden can be the additional cause of cows losing condition rapidly and it is becoming increasingly popular to take lice control measures on cows in early winter.

While these management techniques have been discussed in relation to improving weaning percentage, they are also important in improving the other two criteria of cow productivity. Most cow deaths occur in late winter or at calving and can be reduced by good winter and calving management. Ensuring a good level of cow nutrition prior to and after calving is also automatically improving cow milk production and consequently calf weaning weight.

FINISHING CATTLE MANAGEMENT

The growing of young cattle to suitable slaughter weights is becoming increasingly competitive. Rather than an enterprise where cattle are simply being used to control pasture growth, it has to be one that is profitable and this means management is more important.

Target Performance

The most useful single tool available to the cattle finisher is the forward planning of target growth rates and liveweights. These target figures not only indicate the level of feeding required, but provide a guide as to what type and size of cattle should be purchased for any specific plan. By having such target growth figures, checks on management are possible at any stage of the year.

Buying Policy

All analyses of finishing enterprises show that purchase price has a very significant effect on profitability. Within reason the fewer preconceived ideas a buyer has, the more likely he is to make a good buy. It has been shown that smaller lines and those with mixed breeds are cheaper. More private sales help to reduce costs. Inevitably if one is buying
large numbers of weaners, there are a few small animals in some lines. It is good husbandry to remove these and treat them as a separate mob, or if there are not enough for this, to resell them immediately. Certainly, if they are left to compete with better stock over the winter they will suffer in terms of below average growth rates.

To take this a step further, it is advisable at the yearling stage to compare the liveweight of the smaller cattle with target figures. If they are obviously below standard, they should be sold. If kept, they will still be on hand the following autumn eating valuable feed that would be more efficiently used by the new intake of weaners.

**Feeding and Health**

Obviously, whether or not target growth rates are achieved will depend mainly on how the animals are fed. The food intake of young beef animals is very sensitive to feed quality. For example, it is not possible to achieve winter target gains of about 0.5 kg per day, unless at least two-thirds of the animal's feed requirement is supplied as high-quality feed. In other words, if a 220 kg weaner going into the winter is eating more than 2 kg of hay or straw, it is unlikely to attain the target daily gain.

The good health of these young beef animals is important in achieving production targets. However, since animal health is such a local problem, no firm recommendations can be made. Attention to details, such as dehorning, training and diet change will also pay dividends.

**Compensatory Growth**

There are still a number of beef producers who believe that compensatory growth can be relied on to cover up for poor winter management. There is plenty of convincing New Zealand evidence to show that one spring/summer grazing period is not sufficiently long to recover all the weight sacrificed the previous winter (Joblin, 1968; Scales and Lewis, 1971). On the other hand, a survey in Britain shows no value in excessively high winter gains, unless of course the animal is to be killed in early summer (Table 4 from M.L.C., 1970). This United Kingdom work indicates that steers that gained

**TABLE 4: RELATIONSHIP BETWEEN WINTER, SUMMER AND TOTAL LIVESTOCK GAIN IN STEERS**

<table>
<thead>
<tr>
<th>Daily Liveweight Gain (kg/day)</th>
<th>Total Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>Summer</td>
</tr>
<tr>
<td>0.3</td>
<td>1.0</td>
</tr>
<tr>
<td>0.5</td>
<td>0.9</td>
</tr>
<tr>
<td>0.7</td>
<td>0.55</td>
</tr>
</tbody>
</table>
Selection for Slaughter

An interesting effect on beef output per animal can be achieved simply by changing the method of selecting steers for slaughter. The normal method is to select the “tops” (normally the heaviest animals) and so allow the smaller ones to continue growing. Over the past two seasons we have compared this method with another in which the steers with the “least gain” over 14-day periods were selected as the steers to kill.

The results (Table 5) show a before slaughter increase in liveweight of 0.07 kg per day from November till slaughter in favour of the kill by gain group. Although there is a wider range in carcass weight of this group the average carcass weight was 3.5 kg heavier, which is a useful increase in value per head.

By consideration of at least some of the husbandry techniques discussed considerable improvements in beef production can be achieved. There is no doubt that there are many areas in which further problems will be identified and when answers to these are found further progress can be made.

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BEEF PRODUCTION FOR JAPAN

G. W. Kitson
Research Economist, Lincoln College

Asked to describe the Japanese economy I would say that it is a throbbing, vibrant, amoeba-like monster. It continually threatens to burst its skin and pour out uncontrolled on to the rest of the world. In trying to contain its activity it is necessary to provide a safety valve. This safety valve, the hosepipe of exports, has been converted this year into a vacuum pump of imports which has threatened to drain the rest of the world dry of many commodities—wool, for example. Both the export hosepipe and the import vacuum pump have tended to concentrate in limited product areas.

THE JAPANESE BEEF MARKET IN GENERAL

It is likely that one of the future product areas for imports will be beef. Japanese beef consumption has been constrained by rigidly imposed import restrictions and highly restrictive prices. However, indications are that the bubble constraining consumption is about to burst. Major reasons for this have been, and will continue to be, the growth of spending power of the average Japanese, growth of the consumer movement in Japan, severe internal inflation and growing embarrassment caused by Japan’s massive levels of overseas currency reserves. The constraint on beef consumption is illustrated in Tables 1 and 2.

TABLE 1: BEEF CONSUMPTION IN JAPAN

<table>
<thead>
<tr>
<th>Year</th>
<th>lb/head</th>
<th>% of Total Meat Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>....</td>
<td>3.49</td>
</tr>
<tr>
<td>1967</td>
<td>....</td>
<td>3.59</td>
</tr>
<tr>
<td>1968</td>
<td>....</td>
<td>3.85</td>
</tr>
<tr>
<td>1969</td>
<td>....</td>
<td>5.10</td>
</tr>
<tr>
<td>1970</td>
<td>....</td>
<td>6.07</td>
</tr>
<tr>
<td>1971</td>
<td>....</td>
<td>6.30</td>
</tr>
<tr>
<td>1972 (est.)</td>
<td>....</td>
<td>7.53</td>
</tr>
</tbody>
</table>

89
TABLE 2: INCREASES IN DOMESTIC RETAIL PRICES FOR DIFFERENT MEATS (1960-70)

<table>
<thead>
<tr>
<th>Meat</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>149</td>
</tr>
<tr>
<td>Pork</td>
<td>42</td>
</tr>
<tr>
<td>Poultry</td>
<td>57</td>
</tr>
</tbody>
</table>

Until about 1968 beef consumption per head was rather static and beef lost its position as one of the most favoured types of meat. Restraint on beef consumption was largely because of the much greater price increase for beef compared with other main meat products, pork and poultry. Production of these products was encouraged because they were more amenable to land-intensive types of production and could be more easily produced domestically within Japan, despite a heavy reliance on imported feedstuffs.

Since 1968, however, beef consumption has been growing, largely in response to income increases. With greater spending power, consumers have been better able to afford the meat (beef) which was shown by a recent consumer survey to be the most desired food from a selection of 104 foods.

Despite this, however, beef consumption in Japan is very low by comparison with other developed countries. Beef and veal per capita consumption figures for round 1969-70 for other countries were: United States, 114 lb; New Zealand, 103 lb; Australia, 88 lb; United Kingdom, 47 lb.

FUTURE BEEF CONSUMPTION IN JAPAN

What of Japanese beef consumption in the future? Table 3 shows projections made by various researchers. Some of these projections are clearly too low already. However, at current rates of increase, the FAO higher estimate of 476,000 tons for 1975 seems reasonable. The OECD projection for 1985 also seems too low being equivalent to about 9 to 10 lb per head. On the other hand, the LIPC estimate seems far too high and appears to be based on reaching western country consumption levels of round 70 lb per head per annum.

TABLE 3: BEEF CONSUMPTION PROJECTIONS

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Beef Consumption (’000 tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>Actual</td>
</tr>
<tr>
<td>1972</td>
<td>Estimated</td>
</tr>
<tr>
<td>1975</td>
<td>OECD projection</td>
</tr>
<tr>
<td>FAO (lower estimate)</td>
<td></td>
</tr>
<tr>
<td>FAO (higher estimate)</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>LIPC</td>
</tr>
<tr>
<td>1985</td>
<td>OECD</td>
</tr>
</tbody>
</table>

298  
350  
346  
377  
476  
3900  
557
As an intuitive guess for 1985 consumption levels, I would suggest *per capita* levels of round 25 to 30 lb per head. This would give a total market of the order of 1.4 million tons by that year, about four times or about 1 million tons greater than the current size. Incidentally, the Japanese Ministry of Agriculture and Fisheries (MAF) suggests that total meat consumption will increase about 2.3 times by 1982; thus the share of beef in meat consumption will probably increase.

**SUPPLYING THE FUTURE BEEF MARKET**

What capacity does Japan have to satisfy the Japanese beef market herself? The current situation for beef producers in Japan is difficult. The average cost of producing a Wagyu calf in 1970 was about $NZ400. This cost was made up of concentrate feed, 24%, roughage, 21% and labour about 25%. Feed costs are largely a reflection of the shortage of grazing land. In 1970 the average price of good agricultural land was $3,640 per acre. The high cost of raising calves results in a serious shortage of calves for feeding because the average market price for Wagyu feeders in 1970 was only about $NZ250. Consequently there is increasing interest in importing feeder calves despite very high duties.

The quality of rations is poor, roughage is expensive and feeders face an increasing effluent disposal problem. The result is that although domestic beef production nearly doubled between 1968 and 1971, beef cattle numbers have fallen steadily. Dairy cattle numbers also fell in 1972 compared with 1971.

In the longer term MAF is projecting a level of self-sufficiency in meat production of round 90% for 1982 and has instituted a number of land and feedlot development schemes with this objective in mind. Most of these schemes, however, will probably have a minimal total effect as land is being lost to agriculture at nearly 1% per annum as it is. Of greater significance for domestic production potential will be the outcome of a factional struggle within MAF between the Livestock Bureau and the Forestry Bureau. This struggle involves the use of hilly forested land for grazing. In total this amounts to about 60 million acres much of which could be developed for grazing. However, under the current climate of public opinion with regard to environmental problems I think this is unlikely. Furthermore development costs would make this expensive land.

Intensive feedlot development in Japan will continue to be expensive. One development which may have given a spur to feedloting was the use of feedstuffs protein derived from petrochemicals. This development, even though approved by Japanese health authorities, had a setback when it was rejected by the increasingly vocal consumer movement. Interested companies have now withdrawn production plans for
this product. There remains interest, however, in a milk-based, textured protein beef product. The inability of Japan to produce domestically her future beef requirements seems to have been recognized within Japan also. Recent events confirming this have been:

(1) The announcement by the MAF of a "develop and import" policy for livestock products. (New Zealand incidentally was specifically mentioned as a potential source of livestock products in this announcement.)

(2) The explosion of interest by Japanese companies in beef joint-venture developments. As of December last year there were 12 beef joint ventures of various descriptions for the Japanese market in Australia. On a worldwide basis, plans existed for a further 42 Japanese ventures, including 18 in Australia, with others in Canada, Madagascar, New Zealand and Brazil.

(3) The rapid increase in beef import quotas for Japan. Table 4 shows these changes.

TABLE 4: CHANGES IN JAPANESE BEEF IMPORTS
Years ended March 31st

<table>
<thead>
<tr>
<th>Years ended March 31st</th>
<th>Beef Imported tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>5,300</td>
</tr>
<tr>
<td>1965</td>
<td>11,000</td>
</tr>
<tr>
<td>1968</td>
<td>19,000</td>
</tr>
<tr>
<td>1969</td>
<td>20,700</td>
</tr>
<tr>
<td>1970</td>
<td>22,000</td>
</tr>
<tr>
<td>1971</td>
<td>24,000</td>
</tr>
<tr>
<td>1972</td>
<td>36,000</td>
</tr>
<tr>
<td>1973</td>
<td>71,500</td>
</tr>
<tr>
<td>1973 April-Sept.</td>
<td>70,000</td>
</tr>
</tbody>
</table>

Changes have been especially rapid since 1971 and for the year-ending February 31, 1974 the total will be well over 100,000 tons.

AUSTRALIA AND NEW ZEALAND AS SUPPLIERS

The share of this beef market taken by Australia has been growing consistently. In 1967 it was 72.1%, in 1970 86.6%, and in 1972 round 90%. Over the same period New Zealand's share has fallen from 17.4% in 1967 to less than 10% in 1972. These two countries have provided lower-priced beef, and have lower freight charges than United States and Canada, which provide more expensive meat cuts.

The quantity of New Zealand's beef shipments to Japan has been irregular and reflects New Zealand's falling market share. This is evident in Table 5.
TABLE 5: NEW ZEALAND BEEF EXPORTS TO JAPAN

<table>
<thead>
<tr>
<th>Year</th>
<th>tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961-2</td>
<td>3,147</td>
</tr>
<tr>
<td>1962-3</td>
<td>819</td>
</tr>
<tr>
<td>1963-4</td>
<td>985</td>
</tr>
<tr>
<td>1964-5</td>
<td>2,857</td>
</tr>
<tr>
<td>1965-6</td>
<td>3,454</td>
</tr>
<tr>
<td>1966-7</td>
<td>2,872</td>
</tr>
<tr>
<td>1967-8</td>
<td>1,865</td>
</tr>
<tr>
<td>1969</td>
<td>3,097</td>
</tr>
<tr>
<td>1970</td>
<td>2,408</td>
</tr>
<tr>
<td>1971</td>
<td>3,831</td>
</tr>
<tr>
<td>1972</td>
<td>3,652</td>
</tr>
</tbody>
</table>

The bulk of these exports has been manufacturing beef (63.7% in 1970-1 and 78.9% in 1971-2) and frozen cuts (25.7% and 12.8%, respectively).

This contrasts strongly with shipments from Australia. Australia's success in developing the Japanese beef market is of interest because it provides a guide to New Zealand producers and processors. This success has been associated with a number of factors, the principal of which are: (1) Active promotion both to retailers and consumers; (2) Availability of chilled beef shipment facilities and the associated move into higher quality beef cuts; (3) Development of Japanese beef-raising joint ventures in Australia.

A most important factor in promotion of Australian beef has been the "Designated Store Scheme". Under this scheme imported beef can be sold separately from Japanese beef at retail prices related to the lower c.i.f. prices for Australian beef. This scheme was instituted in 1969 by the All Japan Meat Industry Co-operative Association (AJMICA) and has been added to by the Livestock Industry Promotion Council (LIPC) the sole importers of beef into Japan. There are now more than 1,000 stores, including very large stores, involved in this scheme. The Australian Meat Board has been very active in promoting Australian beef to these stores which in turn have agreed to publicize to consumers, jointly with the Australians, the fact that Australia is the origin of this beef.

A major growth area in Japanese beef consumption has been good-quality beef at moderate prices. The Australians have expanded quickly into this area by selling increasing quantities of choice chilled beef cuts in a cryovac seal. Australian exports to Japan of this kind of beef in fact increased from 4000 tons in 1970-1 to 12,000 tons in 1971-2. It is anticipated that the Japanese market will take 25,000 to 30,000 tons of chilled beef in 1973 and that this will be all first-quality cattle of up to 800 lb dressed weight. Development of this chilled beef market has required chilled container
shipping services. These were instituted from New Zealand only last year.

The quota system for imports of beef into Japan and the development of joint-venture beef raising operations by the Japanese importing companies in Australia have also worked to increase Australia's share of the Japanese beef market. A number of the 24 Japanese companies with licences to import beef are involved in joint-venture operations in Australia. These companies will obviously import beef from their own Australian operations rather than from outside these operations. The impact of their financial commitment in Australia will become more effective in the future as Australia is the country of major interest for currently-planned beef joint ventures.

**TYPES OF BEEF REQUIRED**

There has been growing interest in New Zealand in the prospects for feedlot operations for the Japanese market. My initial reaction to this is to suggest caution, because it is possible that demand for the feedlot product may be more limited than imagined, that feedloting for New Zealand producers requires a substantial premium for this product over the grass-finished product and that this can be assured only by development of appropriate market channels, preferably by some type of contractual arrangement.

There is in fact a prejudice among many Japanese traders against feedlot beef. But the Japanese are no better equipped than we are to resolve the question of comparative beef quality for feedlot systems versus grass finishing. In fact good evidence suggests that, on many occasions, experienced Japanese traders have been unable to distinguish between the two types. The whole question of quality is confused greatly by questions of beef breed, age of the beast, possible combinations of management technique, and processing and cooking techniques.

High-quality beef for the Japanese is synonymous with the high degree of marbling of the meat with fat, as found in traditional *suki yaki* beef and found, but to a lesser extent, in feedlot beef. However, *suki yaki* beef now constitutes only about 6% of total beef marketed in Japan. Modern demand is more for steaks. Here the degree of marbling is less critical. Moreover there is good reason to think that marbling can be achieved without resorting to feedlot management systems. Research into this should be encouraged.

The prejudice of many Japanese towards feedlot beef is understandable. This type of management is most akin to their own *suki yaki*-type beef system. They have been influenced by American preferences for this kind of beef, and because feedloting is land intensive it has been developed more than grass feeding in Japan during recent years. They have had relatively
little exposure to grass-fed beef apart from being told such things as "it smells" and has a bad colour.

Yet despite this prejudice they have been consuming vastly increased quantities of this beef both as Holstein culls from their own dairy herds and as imported beef. Furthermore projections are that middle-grade, plain-tasting beef will continue to dominate the imported beef market. Estimates suggest the following proportions of imports for various types of beef for about 1975: (1) Very good beef, probably feedlot—10 to 15%; (2) Middle-grade, plain-tasting beef—50 to 60%; (3) Low-grade manufacturing beef—30 to 35%.

The view that middle-grade beef will be dominant in future is confirmed by a number of other Japanese trading companies and retail organizations, suggesting, for example, that young people find this kind of beef acceptable. What is significant is that the fastest growing types of retail outlets in Japan, ordinary rather than high-class Japanese supermarkets, have some preference for medium-quality beef. The growth of the manufacturing beef market is also becoming apparent and will in future become increasingly associated with the hamburger boom.

More significant than management practices for the Japanese beef market during recent years has been the chilling of beef. Frozen beef for the Japanese market has a number of defects. One market survey noted the following: (1) The dripping of blood from beef after thawing creates a very bad impression for the Japanese; (2) Frozen beef can quickly become discoloured; (3) Beef frozen immediately after killing is too "immature" to be tender. For this reason the Australians promote their beef as "mature" chilled beef.

The other disadvantage New Zealand has in feedlot beef production is cost of production. Existing beef/barley price ratios are low compared with other countries. The current New Zealand figure is about 6:1. This compares with recent figures of about 8:1 for the EEC, 9:1 for United Kingdom and 12:1 for United States. Australian figures two years ago were about 7:1. The low New Zealand ratio is supported by relatively low pasture production costs in discouraging feedlot management systems.

New Zealand's beef to barley price ratio could be improved by both increases in beef prices and by production of higher-yielding, true feed barleys in New Zealand.

The first alternative requires a premium for grain-finished beef. This is not currently available in New Zealand but it is available for a limited sector of the Japanese market which is prepared to back its prejudice towards feedlot beef by paying a premium for it. The only way to ensure this premium is to enter into some kind of contractual arrangement with the user of the beef, a supermarket or department store, for example. This may or may not involve Japanese capital as a joint-venture deal. A beef-raising joint venture will almost certainly involve one of the 24 Japanese trading companies.
licensed to import beef into Japan. A common system is that employed by the Australian firm, F. J. Walker, and the Japanese importer, C. Itoh. This venture has five feedlot "pens", each of 66 cattle. These pens are contracted to Japanese buyers. Last year they were taken by the Suehiro restaurant chain, Prima Ham Company and, I believe, two supermarket chains. Other marketing arrangements involve direct contracts with Japanese supermarkets or department stores through a licensed Japanese importing company.

Successful feedlot arrangements for the Japanese market are ensured of a premium for their product. The amount of the premium required over grass-finished beef will vary but it is suggested that eight cents per pound would be a minimum. For operations which grow their own barley, care should be taken in calculating costs of feedloting to value the barley at true market rates.

Joint venture arrangements with Japanese companies in beef raising are not confined to feedloting. A number of the Australian Japanese joint ventures are based on pasture-fed beef. As noted earlier, joint ventures have been a significant factor in the success of the Australians in the Japanese market. New Zealand, however, has discouraged the development of this type of venture within New Zealand because of its attitude towards foreign capital, especially where land ownership is involved. This has discouraged potential joint ventures in New Zealand and has caused New Zealand to lose its footing in a rapidly-growing market despite its price competitiveness with Australia in beef production. I think the time has come for us to try to assess realistically what our resistance to foreign capital is costing us. With some foreign capital also come foreign people, foreign ideas and new marketing opportunities.

SUMMARY

(1) In 1961 beef accounted for 35% of all meat consumed in Japan. This percentage fell to about 14% largely because beef became too expensive. With higher incomes, however, consumption is now increasing rapidly.

(2) Beef consumption is still very low and even at an estimated 25 to 30 lb per head per annum for 1985 (N.Z. 103 lb), total consumption will increase 4½ times.

(3) Japanese potential for production increases are limited because of overall cost factors, especially land availability. There is potential for hill country development. Japan is therefore looking abroad more and more for supplies. This will increasingly involve joint-venture operations.

(4) Australia has achieved larger and larger shares of the imported beef market while the New Zealand share has fallen to less than 10%. Australia's success is related to
promotion, ability to provide quality chilled cuts, and joint-venture development in Australia.

(5) Marbled beef is synonymous with quality in Japanese eyes but major growth in beef consumption has been in plainer beef. It is expected that demand for plainer beef will continue to grow as will demand for manufacturing beef and high quality beef.

(6) It is more important to provide good-quality, chilled beef to Japan than embark on wholesale feedlot production. There is a market for feedlot beef, but, because of relative production costs in New Zealand, it is important to secure contractual market outlets before producing feedlot beef in New Zealand.
Although nearly every farm in New Zealand is concerned with grazing stock of one kind or another, comparatively little research has been done in this country on many aspects of grazing and pasture management. There have been a few studies comparing systems of grazing, particularly rotational grazing, set-stocking and breakfeeding, but most of this work has been with dairy cows under North Island conditions. However, some work on these aspects has been carried out at Invermay and there have been a number of farm trials and demonstrations in Otago and Southland concerned with all-grass farming.

With greater emphasis on all-grass and cattle farming it has become apparent that more information is needed on the various aspects of grazing management. For example, what is the optimum height of grazing at different times of the year? Is it better to skim off the top of a sward or should it be grazed closely to clean up all roughage at each grazing? What is the best system of rotational grazing—should stock be shifted daily, every 2 to 3 days, or weekly? How many sheep should be grazed per hectare—500, 1000 or 2000? What is the effect of continuous grazing and also long periods of spelling on pasture production and composition? Is rotational grazing with sheep or cattle any better than set-stocking? What effect has tramping in winter on subsequent production, and what effect has trampling on weeds in the pasture? Are there any different effects from cattle grazing than from sheep?

These are some of the questions for which we are attempting to find answers at Invermay, and an outline of some of the work follows.

**ROTATIONAL GRAZING v. SET-STOCKING**

This question is raised frequently, yet there are very few New Zealand reports in the literature on the topic. With dairy cows, McMeekan showed a slight advantage for rotational
grazing but stressed the need for high-stocking capacity for optimum efficiency of the system. He also quoted Australian work which indicated that, of 15 trials, rotational grazing was superior to set-stocking in two; in a further two, set-stocking was superior to rotational grazing, and the remaining 11 were inconclusive. Although there is little documented evidence, many sheep farmers consider rotational grazing will give greater productivity per acre by allowing a greater number of stock to be carried, but individual animal performance is likely to be superior with set-stocking.

In trials conducted at Invermay for three years with three rates of stocking, 20, 30 and 40 ewes per hectare, and two heights of pasture under the two grazing systems, the results generally followed the expected pattern. Overall there was little difference between the two systems, either in lamb growth or per-acre performance, but set-stocking tended to favour individual lamb performance while rotational grazing favoured per-acre production.

In two further trials comparing set-stocking and rotational grazing with hoggets in early winter, there was no marked difference between the two systems although set-stocking gave slightly better per-animal performance.

Because rotational grazing tends to give higher per-acre productivity and provides opportunity for more flexibility and control, i.e., rationing of feed, it is likely to be preferred where stock carrying capacity is high and where feed is limited as during winter. On the other hand, where good per-animal performance is desired, e.g., for fat lamb production and winter hogget growth, and where labour inputs are important, set-stocking could be preferred.

**Frequency of Rotational Grazing Shifts**

Rotational grazing can cover many systems of shifts from daily to every 3 to 4 weeks. The limited amount of research done on this aspect suggests there is little advantage in very frequent shifts and generally animal performance is better under a longer and slower rotation. This finding has the added advantage that, given a selected rotation time, fewer paddocks are required and thus less capital outlay.

**HEIGHT OF GRAZING**

The height of the sward can affect production greatly. Most farmers have noted that pastures grazed very closely are less productive and recover more slowly than those with a cover of several centimetres of herbage.

This has been well demonstrated on cutting trials. For example Lynch (1954) found cutting at six-weekly intervals gave more than double that of weekly cutting (Table 1).
TABLE 1: RESULTS OF PASTURE CUTTING TRIALS  
(Lynch, 1954)

<table>
<thead>
<tr>
<th>Frequency of Cutting</th>
<th>Yield DM kg/ha</th>
<th>Relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly</td>
<td>9,730</td>
<td>100</td>
</tr>
<tr>
<td>2-weekly</td>
<td>13,500</td>
<td>139</td>
</tr>
<tr>
<td>3-weekly</td>
<td>16,420</td>
<td>169</td>
</tr>
<tr>
<td>6-weekly</td>
<td>22,010</td>
<td>227</td>
</tr>
</tbody>
</table>

In mowing trials at Invermay, Round-Turner found cutting young pastures at 4 to 6 weeks gave up to 40% more production than cutting at 2 to 3 weeks.

Under grazing, at Woodlands, Risk recorded about 20% more dry matter on long pastures than on short pastures, and, at Invermay, in a rates of stocking trial, production ranged from 5000 kg/ha in a 25 sheep per hectare treatment to over 11,000 kg/ha in a 12 sheep per hectare treatment. In a further trial at Invermay, on older pasture, Boswell found pasture grazed at 20 cm gave approximately 30% more production than one grazed at 10 cm. He also found defoliating to a height of 6 cm gave slightly more production than grazing down to 3 cm. Thus it is obvious that grazing method and frequency are likely to have a very marked effect and I am sure these factors are not taken sufficiently into account. A new pasture strain which will increase production by less than 10% is hailed with great enthusiasm, and farmers will readily apply fertilizer to give a 10% response yet fail to manipulate their grazing to obtain a much greater bonus.

ALL-GRASS FARMING

The development of all-grass farming systems has been a major development in Southland during recent years. Most of these systems are based on a slow rotation with the sheep rotating around 20 to 30 paddocks spending 2 to 3 days in each. Stocking intensity varies from about 500 per hectare where the sheep are kept 3 to 4 days per paddock to up to 2000 where they are shifted every 2 days. To obtain the necessary number of paddocks temporary subdivision is frequently used. Hay is normally fed on the second day and in very wet weather animals are normally confined to a pad or sacrifice paddocks and fed hay. This system is most successful with high-fertility pastures and requires a high standard of management. However those successfully adopting the technique have been able to eliminate brassica cropping, reduce hay usage to about half to one bale per ewe per year, increase carrying capacity and thus improve their net income. Further details of the problems and practices adopted were given in three papers presented to the 1972 Grassland Conference at Te Anau and reported in the proceedings.
WINTERING HOGGETS

Hoggets can be successfully wintered on an all-grass system based on rotational grazing or set-stocking. Invermay results have shown that there is little difference in liveweight gains between animals wintered on grass and those grazing swedes. Much will depend on the availability of the feed and the quality of the swede and grass crop (Table 2).

TABLE 2: GROWTH OF HOGGETS ON GRASS AND SWEDES IN WINTER

<table>
<thead>
<tr>
<th></th>
<th>Rotational Grazing kg</th>
<th>Set-stocking Swedes kg</th>
<th>Feed Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st 30 days</td>
<td>3.6</td>
<td>4.1</td>
<td>-0.4</td>
</tr>
<tr>
<td>2nd 30 days</td>
<td>0.0</td>
<td>1.2</td>
<td>3.0</td>
</tr>
<tr>
<td>Total 60 days</td>
<td>3.6</td>
<td>5.3</td>
<td>2.6</td>
</tr>
<tr>
<td>1972</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st 30 days</td>
<td>4.9</td>
<td>6.4</td>
<td>4.7</td>
</tr>
<tr>
<td>2nd 30 days</td>
<td>1.7</td>
<td>1.5</td>
<td>3.1</td>
</tr>
<tr>
<td>Total 60 days</td>
<td>6.6</td>
<td>7.9</td>
<td>7.8</td>
</tr>
</tbody>
</table>

USE OF WINTERING PADS

The use of wintering “pads” has developed along with all-grass farming, particularly in the higher rainfall districts. The pads are constructed from sawdust, woodchips or straw, approximately 0.7 m² being allocated per sheep and 5 m² per cattle beast.

The sheep may be fed on these pads for a few weeks or up to several months but are usually taken off the pads 4 to 6 weeks before lambing. The animals are fed a maintenance or sub-maintenance diet during early pregnancy and this is gradually increased as lambing approaches. Twice-weekly feeding of hay is satisfactory.

With this type of feeding there is always a small proportion of animals that will not accept hay or eat very sparingly; it is wise to remove these and place them on alternative feed. Another practice sometimes adopted is to feed a portion of the flock, usually the top animals, on a pad, and rotationally graze the remainder. Even where an all-grazing system is being used, pads can prove invaluable for short periods during prolonged rain or snow.
CATTLE v. SHEEP GRAZING

With the high prices for beef in recent years there has been an increasing interest in cattle farming and in management systems for efficient beef production. In a trial at Invermay, Monteath (1973) conducted farmlet studies for four years in which several sheep farmlets stocked at various rates were compared with two beef cattle farmlets.

Pasture production and composition data from this study proved of interest as large differences developed between sheep and cattle grazing after the first year. For the first year there was no difference but after that between 22 and 31% more dry matter production was recorded on the sheep pastures than on the cattle paddocks. This difference appeared to be brought about by an increase in production under sheep grazing while production was static under cattle grazing. Sheep pastures were denser than cattle pastures and the ryegrass content of the sheep pastures doubled over the four years while there was little change in the cattle swards.

This result, if it occurs widely, could have very important implications, and C. C. Boswell is looking into it in greater detail at present. The reasons for the difference could be due to several factors: two of these, the opening up of the sward and differences in ryegrass percentage, have already been mentioned. A third possibility is that the difference is due to the different pattern of return of dung and urine with sheep and cattle. With cattle large amounts of nutrients are returned to a relatively small part of the paddock and a smaller percentage of the area receives dung or urine in a year than under sheep grazing. This could well result in a greater deficiency of nutrients, especially nitrogen, under cattle grazing.

CONCLUSION

Only three or four aspects of grazing management have been covered. The effect of spelling and treading at different times of the year, the use of nitrogen, overdrilling and effects of various stocking intensities, for example, have not been discussed. However, if I have demonstrated the importance of pasture management and indicated some of the ways in which farming efficiency can be improved by more attention to this subject, then my efforts will have been well worth while.

ACKNOWLEDGEMENTS

I wish to thank K. H. C. Lewis, N. L. Round-Turner, C. C. Boswell and W. Risk for permission to publish data from their trials.

REFERENCES

The technique of ova transfer in sheep was developed at Cambridge University in the early 1950s and since that time further research has clarified many problems. While the technique has been used extensively for experimental purposes there has been little commercial application. Large numbers of ova resulting from multiple ovulation can be transferred to recipient ewes to increase the number of offspring from selected animals.

**THE TECHNIQUE**

For the success of an ova transfer programme it is necessary to obtain large numbers of ova from donor ewes. Sheep usually shed only one or two ova at each heat period but injection of a ewe with pregnant mare’s serum gonadotrophin (PMS) on the thirteenth day of the oestrous cycle, that is, approximately four days before the next heat, makes it possible to obtain these large numbers of ova. Serum recovered from the blood of pregnant mares between days 30 and 90 of gestation is rich in follicle-stimulating hormone which will stimulate the ovaries of the ewe. The donor ewes are then naturally mated and ova are recovered 2 to 4 days later.

Wool is clipped from the lower abdomen which is then cleaned and sterilized. Following general anaesthesia of the ewe, the uterus and ovaries are exteriorized through a small abdominal incision. The number of corpora lutea or ovulation points on each ovary indicates the number of ovulations. A thin polythene tube is inserted into the Fallopian tube, firmly held by an assistant and directed into a small glass bowl. Each tube is flushed from the uterine end using approximately 3 ml of sterile sheep serum at 37°C. The flushings are then examined under a binocular microscope and ova are located. Cleavage is used as the criterion of fertilization and only fertilized eggs are transferred. Recipient ewes are prepared for transfer as previously outlined. Ova for transfer are sucked up in a small glass pipette with a minimum of fluid.
Photographs taken during an ova transfer feasibility study carried out on the research farm, Lincoln College, involving College staff members and staff from Invermay Agricultural Research Centre (see opposite).
and are gently aspirated into the Fallopian tube of the recipient ewe or placed into the uterus by puncturing the uterine wall. Two- and four-cell ova are transferred to the Fallopian tubes and those of eight cells or more are transferred to the uterus. Between the time of ova recovery the transfer flushings should be maintained at a temperature from 30 to 35°C. As the success rate of uterine transfers is greater, ova are usually recovered 3 to 3½ days after mating when they will be at the eight-cell stage, thus enabling transfers to be made into the uterus. Greatest success rates are achieved following transfers of one or two ova. In a transfer programme it would be prudent to transfer two eight-cell ova to the uterus of each recipient. It is imperative that recipient ewes are at the same stage of the oestrous cycle as are the donors. Consequently ewes which have been observed in heat within ±12 hours of their respective donors are used as recipients.

After the transfers have been completed both donor and recipient ewes should be run with fertile rams. Donor ewes in which all the ova have not been recovered may still have some ova left in the Fallopian tubes or uterus and will not be remated. Those ewes from which all ova were recovered plus the recipients in which transfers have been unsuccessful will return to service.

**ORGANIZATION OF AN OVA TRANSFER PROGRAMME**

In the organization of an ova transfer programme it is convenient to synchronize donor and recipient ewes in order that (1) The precise stage of the oestrous cycle of donor and recipient ewes is known; (2) Ova recoveries and transfers can be made at convenient times; and (3) Recipient ewes can be made available at precisely the same stage of the cycle as donor animals.

Various methods of synchronization are available but the simplest is the use of intravaginal sponges containing a synthetic progestagen. These small sponges are inserted into the anterior vagina using a plastic tube and remain in place for 14 days. Ewes come into heat 2 or 3 days after withdrawal of sponges. A sequence of events can be seen in Table 1. By staggering the start of this programme it is possible to have the required number of donor and recipient ewes available at the appropriate stages of the oestrous cycle at a predetermined time for ova recoveries and transfers to be made.

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**Above:** Flushing ova from Fallopian tubes of a donor ewe. Flushings are directed into a small glass bowl via a thin polythene tube.

**Below:** Introducing fertilized ova into the uterus of a recipient ewe. Prior to transfer the ova have been aged by checking the number of cell divisions under a microscope.
TABLE 1: SEQUENCE OF EVENTS IN AN OVA TRANSFER PROGRAMME

<table>
<thead>
<tr>
<th>Days from Start of Programme</th>
<th>Donors</th>
<th>Recipients</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Insert sponges</td>
<td>Insert sponges</td>
</tr>
<tr>
<td>14</td>
<td>Remove sponges</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Oestrus</td>
<td>Oestrus</td>
</tr>
<tr>
<td>29</td>
<td>Inject PMS</td>
<td>Remove sponges</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Oestrus</td>
<td>Oestrus</td>
</tr>
<tr>
<td>35</td>
<td>Recover ova</td>
<td>Transfer ova</td>
</tr>
</tbody>
</table>

Initially intravaginal sponges are inserted into donor ewes and are withdrawn 14 days later. Following withdrawal of sponges ewes are run with harnessed vasectomized rams and the time of onset of oestrus recorded. At that time sponges should also be inserted into the recipient ewes. PMS is injected 13 days after the detection of oestrus in donor ewes and these animals are run with entire rams following this injection. One day after PMS is injected into donor ewes, intravaginal sponges are withdrawn from the recipients and these ewes are then run with vasectomized rams. As ewes come into heat 1½ to 2½ days after withdrawal of sponges and usually 2½ to 3½ days after injection of PMS on day 13 of the cycle, this schedule of events ensures donors and recipients are at the same stage of the oestrous cycle, a prerequisite for successful transfers. Observations of the onset of oestrus are made at 12-hourly intervals. At the time of ova recoveries and transfers it is essential to have more than one person skilled in carrying out the necessary surgery as following recovery it is imperative that ova be transferred in as little time as possible. Sheep ova will remain viable for only a few hours and, as a general principle, ova should be transferred within one hour of recovery.

POSSIBLE RESULTS OF AN OVA TRANSFER PROGRAMME

It is appropriate to consider the sequence of events and the increase in the number of offspring which may be achieved by using the ova transfer technique. Table 2 outlines a series of success rates for each part of a programme involving 100 donor ewes. The assumptions made are realistic and some tend to be slightly conservative. In March this year Invermay and Lincoln College co-operated in a preliminary look at the commercial application of ova transfer. Some highly-productive ewes from the College Coopworth stud were used. As yet no fertility data are available but values for ovulation rate, ova recovery and fertilization rate were of the same order as the assumptions made in Table 2.

If 100 ewes are treated as outlined in the previous section then a small proportion will not come into heat and be mated.
OVA TRANSPLANTS

TABLE 2: POSSIBLE RESULTS OF AN OVA TRANSFER PROGRAMME INVOLVING 100 DONOR EWES

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>No. of Ova or Lambs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number served</td>
<td>90</td>
</tr>
<tr>
<td>Mean number of ovulations</td>
<td>8</td>
</tr>
<tr>
<td>% ova recovery</td>
<td>75</td>
</tr>
<tr>
<td>% fertilized</td>
<td>80</td>
</tr>
<tr>
<td>% surviving after transfer</td>
<td>60</td>
</tr>
<tr>
<td>Plus lambs from donor ewes remated</td>
<td>100</td>
</tr>
</tbody>
</table>

Provided treatment of ewes commences after the start of the breeding season, the number of ewes not mated should be less than 10%. Treatment with PMS at a dose level of 1500 international units or greater will usually result in a mean ovulation rate of eight or more. The response is highly variable but usually from 4 to 20 ova will be shed after stimulation with the above dose. Recovery of ova from the Fallopian tubes of live ewes is a remarkably successful part of the technique. Recovery rates will be of the order of 75% and may be as high as 90%. Of the total number of ova recovered not all will be fertilized. Provided rams produce high-quality semen and ewes are mated several times, fertilization rates should be 80% and will often be higher.

The proportion of ova surviving after transfer of one or two 8-cell ova to the uterus is variable, but the more recent research information has shown success rates from 50 to 70%. The proportion of ova surviving after single ovum transfers is normally greater than when two ova are transferred. However, if a large number of ova are recovered from a donor ewe, single-ovum transfers would mean twice as many recipient ewes have to be used. The resultant increase in the time taken between recovery and transfer of ova may cause a decrease in viability of ova and consequently the survival rate. Therefore two ova should be transferred. Transfer of more than two ova is not to be recommended. Although the proportion of ewes lambing will be similar, more ewes will suffer partial loss of the total number of transferred ova resulting in a decrease in the survival rate.

Of the 100 donor ewes a proportion will not return to service because one or more ova will not have been recovered and a normal pregnancy will thus result. If those ewes returning to service are remated then most will conceive normally and bear lambs to term. A figure of 100 lambs from the donor ewes remated is not unreasonable and if high-fertility ewes have been used as donors then this figure may be conservative.

From the example given it can be seen that the total number of offspring has been markedly increased. If 150 lambs were born per 100 ewes in the flock then a transfer programme
with the success outlined will more than double this figure. The example considers only one PMS stimulation of ewes during the breeding season when in fact two or more crops of ova may ultimately be possible from donor ewes during the one breeding season.

**PROBLEMS**

The most readily available source of gonadotrophin is PMS which is a protein hormone. It is the nature of higher animals to develop an immune reaction to foreign protein. Following repeated injections of PMS ewes have been shown to have a decreasing ovarian response and there may also be a proportion of ewes which fail to ovulate. This is thought to be because of an antibody response although very recent work at Massey University does not substantiate this view but suggests that temporary exhaustion of ovarian follicles may be involved. This problem may eventually be overcome by the use of sheep anterior pituitary extract which would not result in any antibody response. This is simply extraction of follicle stimulating hormone (FSH) from sheep pituitary glands collected from slaughterhouse material. However at the moment simple and effective methods for extracting FSH from sheep pituitary glands are not commercially available.

There is a great variation in the response of ewes to a constant dose of PMS. This places a restriction on the dose rate of PMS which can be used. At higher dose levels the number of ova shed will be increased but at very high ovulation rates fertilization has often been depressed and also transport of ova in the Fallopian tubes is adversely affected resulting in lower rates of ova recovery.

These problems of a non-predictable response to PMS and also a diminishing response to repeated doses of PMS may be alleviated following future research.

**COSTS AND APPLICATION**

The cost of PMS is at present from $2 to $3 per animal treated with 1500 international units depending on the source of supply. Progestagen-impregnated intravaginal sponges cost at present approximately 60c each. Consequently total costs will be in the region of $3 per ewe and if four recipient ewes per donor are used then a further $2.40 per donor will be incurred. This means a total cost of materials of $5 to $6 per donor ewe.

Insertion of intravaginal sponges, injection of donor ewes and recording of times of oestrus may all be carried out by producers concerned. The recovery and transfer of ova must, however, be carried out by veterinarians or other skilled people. I make no attempts to compute costs of this part of the enterprise but the costs of anaesthetics, microscopes,
surgical equipment plus expertise will considerably raise the cost of the enterprise.

The technique of ova transfer undoubtedly has some application in the New Zealand sheep industry and will almost certainly be used for rapidly increasing numbers once the imported breeds of sheep at present on Somes Island become available for testing. Also, using the technique with the few most productive ewes in performance-recorded flocks will increase the selection differential. By the time a ewe has been shown to be of superior productive merit, and her progeny have also been shown to be high producers, she will usually have a limited reproductive life. At this stage superovulation and egg transfer could result in increased numbers of progeny. If male progeny so produced are mated with 150 or 200 ewes, which is shown to be feasible in my own work at Invermay, then the rate of flock improvement can be accelerated.
Improvement of hill country pastures received a major impetus in the 1950s when high wool and meat prices supplied the capital for large-scale development through aerial over­sowing and topdressing, subdivision and increased stocking. In the past few years, however, low wool and meat prices have resulted in the cash surplus of the hill country farmer declining rapidly, and expenditure on development has suffered consequently. In spite of pessimistic predictions by economists we have seen a miraculous improvement in sheep farming in 1972-3, and it is therefore appropriate to look once more towards further hill country development. In particular it is important that money should be spent wisely so that future income is improved, not just spent without thought in an effort to save a little more from the Minister of Finance. In the past many mistakes have inevitably occurred in development techniques owing to lack of information, but farmer experience, together with the research directed at hill country in recent years, has resulted in considerable improvement in knowledge of how best to spend money. This paper highlights some of the information that has become available for the South Island farmer in the past 4 to 5 years.

INOCULATION AND PELLETING OF LEGUME SEED

The key to hill country improvement is still the same; the introduction of high-producing legumes together with the correction of soil nutrient deficiencies. If these legumes are to fix nitrogen, effective nodulation is essential and inoculation of seed is often vital for successful establishment. On much unimproved hill country nodule bacteria are absent; where present, they are few in number, patchily distributed and often of poor strain. Despite the need to inoculate legumes, farmers have been confused by conflicting results reported by scientists in the late 1960s, particularly when poor responses to inoculation or even depressions to inoculation and pelleting were
being measured. This naturally caused farmers to adopt a "wait and see" attitude before they spent money on seed treatment. The poor responses are now known to be largely associated with inferior inoculants, but combined efforts by Plant Diseases Division, DSIR, and the inoculant manufacturers, are resulting in big improvements in the quality of inoculum now available. Farmers should use certified inoculants with confidence wherever legumes have not grown before. Specific inoculants are required for lucerne, lotus and the clovers, while for Woogenellup subterranean clover a special strain, CC2480a, is more effective than the normal clover inoculant.

Nodule bacteria are very susceptible to desiccation and may quickly die if seed is broadcast in hot, dry conditions on dry ground and germination is delayed. Simple procedures will ensure that when the seed germinates viable rhizobia will still be present and prompt nodulation occur. For example, sow immediately after inoculating the seed, sow alone rather than with superphosphate, sow the seed when cool moist weather is most likely, e.g., winter-early spring, and keep some cover on the area to protect the rhizobia from sunlight.

Pelleting or coating may sometimes give added advantage over straight inoculation. Table 1 shows the results of a trial conducted by W. L. Lowther at Te Anau in 1971.

**TABLE 1: EFFECT OF INOCULATION AND PELLETING ON ESTABLISHMENT OF WHITE CLOVER**

*(Lowther and McDonald, 1972)*

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Nodulation after 6 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uninoculated seed</td>
<td>4</td>
</tr>
<tr>
<td>Normal inoculation</td>
<td>28</td>
</tr>
<tr>
<td>5× normal inoculation</td>
<td>55</td>
</tr>
<tr>
<td>Normal inoculation + lime pellet</td>
<td>45</td>
</tr>
<tr>
<td>Commercial &quot;triplecote&quot; pellet</td>
<td>79</td>
</tr>
</tbody>
</table>

It is clear that inoculation is essential for white clover establishment in this area and that 5× normal inoculation is better than normal rates. However, commercial "triplecote" pellets were significantly better than any other treatment. The advantage of this pellet seems to be due to much better survival of rhizobia on the seed up to germination.

**GRASS SEED COATING**

Grasses are much more difficult to establish from oversowing than clovers and failure often occurs. Recent trials in the Mackenzie Country have shown significant improvements in establishment where coated seed was used (Table 2).
TABLE 2: EFFECT OF SEED COATING ON NUMBER OF GRASS PLANTS PER SQUARE METRE 8 WEEKS FROM SOWING (Vartha and Clifford, 1969)

<table>
<thead>
<tr>
<th></th>
<th>Not Coated</th>
<th>Coated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocksfoot</td>
<td>108</td>
<td>258</td>
</tr>
<tr>
<td>Ryegrass</td>
<td>247</td>
<td>721</td>
</tr>
</tbody>
</table>

This response to coating seems to be mainly due to improved moisture relations during germination, the coat acting as "blotting paper". Hence pelleting may be advantageous in dry conditions, although the possible advantage must be balanced against the higher cost of seed. The main coating material is reverted superphosphate but this is not thought to be important as a source of nutrients. New "pasture" pellets, larger than a pea and containing 4 to 5 seeds, are under test and may prove useful as a nutrient source for both phosphorus and nitrogen.

CHOICE OF COUNTRY TO IMPROVE

Areas likely to give the greatest improvements in production for the least cost should be selected first. For example, in the development of tussock grasslands in Central Otago the yellow-grey earths and upland yellow-brown earths will give greater economic returns than the brown-grey earths which have moisture limitations, or the high country yellow-brown earths which have considerable nutrient and temperature limitations. Even on the one soil, production from pastures on different aspects can vary considerably, particularly in low rainfall areas with strong prevailing nor-west winds. This has been highlighted in our own work at Hunua (White et al., 1972) and by that of the Ministry of Agriculture at Coopers Creek (Radcliffe, 1971) (Table 3).

TABLE 3: ANNUAL DRY MATTER YIELDS FROM IMPROVED PASTURES ON NORTH AND SOUTH ASPECTS (kg/ha)

<table>
<thead>
<tr>
<th>Site</th>
<th>Rainfall (mm)</th>
<th>North (sunny)</th>
<th>South (shady)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coopers Creek, Oxford</td>
<td>1070</td>
<td>2370</td>
<td>4220</td>
</tr>
<tr>
<td>Hunua, North Canterbury</td>
<td>650-750</td>
<td>2100</td>
<td>4190</td>
</tr>
</tbody>
</table>

Table 3 shows that at both sites pasture production on the shady slope was double that from the sunny aspect. Although sunny slopes may produce more growth in the cool season, particularly early spring when they become warmer more quickly, production during the rest of the year is greater on the moister shady slopes. These results reinforce the well-
known point that wherever possible sunny and shady slopes should be fenced, developed and utilized separately. It would be sound management to graze sunny slopes in late autumn, winter and early spring, then move on to the shady slopes as they come away and the sunny country dries up in the nor'wester.

**MANAGEMENT OF IMPROVED HILL COUNTRY PASTURES**

The basic aim of oversowing and topdressing is to increase both the quantity and quality of the pasture produced and improve its seasonal distribution which in turn should result in considerable increases in both stock number and performance. But the expected increases do not come unless the extra grass is fully utilized. If it is not used, pastures become rank in summer, clovers are shaded out and production declines. This has happened all too often on many tussock properties. With effective grazing, the cycling of nutrients is at a maximum and the flow of nitrogen, which is the key nutrient in the system, will be maintained. The importance of utilization has been emphasized because I am certain that too often in the past responses to improvement have been more in clover growth than stock production. This is just throwing money away. It is all too easy to organize the topdressing and oversowing. In most South Island hill country winter is the main bottleneck, and oversowing and topdressing only accentuate the problem by creating more feed in the summer. Winters are certainly shortened by 6 weeks at either end but a cold, no-growth period still remains (Fig. 1).

In recent trials at Coopers Creek, Joan Radcliffe (pers. comm.) found that 70% of the annual growth of an improved

![Graph](Fig. 1: Pasture production on unimproved and improved hill country.)
pasture was produced in 37% of the year—from October 12 to February 23. It therefore becomes clear that money for development should not all be spent on oversowing and top-dressing. Two other areas should receive their share.

**Fencing and Extra Stock**

It is essential that the increase in pasture production following oversowing is anticipated and sufficient extra stock are available to control the feed. This means fencing an area small enough to be controlled, and doing the job well. Any problems which arise can be solved here before large sums of money are spent on larger blocks.

**Improving the Winter Carrying Capacity**

In the past few years more and more farmers are realizing the importance of increasing winter feed supplies in order to carry sufficient extra stock to eat the summer flush on the topdressed hills. Depending on country and availability of flat land, a combination of some of the following are being used:

1. *Hay and silage* from either lucerne, pasture or a special cereal crop.
2. *Root crops* such as turnips.
3. *Cereals* for grain or chaff.
4. *Greenfeeds* either sown conventionally or overdrilled.
5. *High-producing pastures* containing cool season active ryegrasses. For high-yielding crops as well as for high-quality grass production, high soil fertility is essential. It is therefore important to improve pastures on the flats of hill country properties to as high a level as possible.
6. *Standing hay* on improved hill country, closed from grazing in December. This is not good for the pasture, encourages porina caterpillar and grass-grub and is very wasteful.
7. *Utilization of surplus animal body fat* produced in the summer-autumn flush and taken off in early to mid-winter.
8. *Off-wintering of stock* or *buying in feeds*.
9. *Nitrogen fertilizers*: Not at all important yet, nitrogen may have an increasing use for both crops and pastures. Already some farmers are applying 20 to 40 units of N to turnip crops at the 6- to 8-leaf stage. In the Wairarapa recently I was impressed by the strategic use of N on improved hill country pastures for early spring grass. We may see this in the South Island in the future, used particularly to provide early spring feed, and applied to
pastures containing grasses such as ryegrass and cocksfoot which will respond well at cool temperatures. I do not think, however, that there is much future for this on browntop, danthonia and sweet vernal pastures.

THE FUTURE

There are many questions on hill country improvement still unanswered. A major area where much work is required is the dry hill country where rainfall is below 600 mm. The Lincoln College property, Hunua, is typical of this. We are still not at all certain of the best legumes and grasses for dry faces, how and when they should be established, how to overcome the danthonia problem, and how this dry country should be managed. Are the tussocks just weeds or useful species? It is known that they provide a very valuable microclimate for seedling establishment and they may provide useful shelter, too, later on. But on the sunny slopes where they are most needed the tussocks may be almost completely absent while they can be embarrassingly thick on the shady side. And just how nutritive are many of the plants which occur in hill pastures? What species do cattle and sheep actually eat? Current work by J. G. Hughes of the Tussock Grasslands Institute may throw some light on the picture. It is these questions and others which we are going to attempt to answer in a new research programme just starting at Hunua.

REFERENCES

During the past decade the volume of crop production in New Zealand has increased by 89% (Fig. 1). Beef production, which has received far more publicity, increased by 77% in volume during the same period. Production in the other main agricultural sectors increased by much smaller percentages. Canterbury is the traditional centre of cropping in New Zealand and still grows close on 60% of the cash crops grown in the country (1950, 60%; 1960, 58%; 1970, 57%). The emergence of maize as an important cash crop in the North Island is indicative of the national trend towards increased crop production in regions other than the traditional ones. Development of improved cultivars and management techniques will ensure that this trend will continue; however Canterbury will remain the major cropping region in New Zealand and its area in crop will continue to expand.

DEVELOPMENTS IN PLANT

Costs

Agricultural machinery accounts for a substantial proportion of the costs of crop production. Canterbury farmers spend over $5 million annually on tractors and machinery (Fig. 2); this is approximately 10% of the gross farm income from cash crops. During the past five years prices of many agricultural machines have increased by 50% or more. During the period 1960-70 the prices of typical tractors and combine harvesters increased at rates of 5% and 3% per year, respectively (Figs. 3, 4). Since 1970 the annual increase in price has been in the vicinity of 12% for tractors and 14% for harvesters. The net result is that the price of many essential machines has risen by 50% or more in five years. The amount of capital tied up in stock and plant is concerning many crop
FIG. 1: Increase in volume of major sectors of New Zealand agriculture.

FIG. 2: Capital expenditure on farm machinery in Canterbury.
Fig. 3: Price of a typical tractor.

Fig. 4: Price of a typical header.
farmers and with projected increases in both crop production and machinery costs the amount of capital involved will continue to increase. Because of these trends the managerial decisions in planning and financing of new plant are becoming more critical and difficult to make.

**Syndication**

Syndication or group ownership of farm machinery already occurs on a relatively small scale with certain items of infrequently used plant. Generally, however, the trend is not towards syndication, perhaps with the exception of very large specialized plant, such as 3-tonne balers. There are in many instances very definite financial advantages in the syndication of machinery but the independent nature of New Zealand farmers works against its general adoption. Largely because of this, medium to large plant, not the very large and expensive, will prove the most economic on most cropping units.

**Bulk Handling**

Bulk handling is now almost universally used on farms where cropping returns a major portion of the income. While it could hardly now be called a development, improvements will still be made in the system. The main one will be the incorporation of drying facilities into this bulk storage, which will give greater flexibility both in range of crops grown and harvest dates. It will also improve quality and yield in many cases. These drying facilities could become essential especially where grass seed or new crops figure in the cash cropping programme.

Grass seed production is an example of the degree of specialization that occurs on some properties. When full use is made of bulk handling, drying facilities, moisture testers, other up-to-date agronomic techniques, and when expert advice is employed, high yields of quality seed can be obtained. However even though technology and advice are available more than one-quarter of Tama ryegrass harvested is below optimum germination levels (Table 1). In almost all cases the poor quality of the seed is due to faulty harvest and storage techniques. Grass seed yields are often reduced more by inferior production procedures than quality.

**TABLE 1: GERMINATION PERCENTAGES OF TAMA RYEGRASS SEED**

<table>
<thead>
<tr>
<th>Year</th>
<th>0-69</th>
<th>70-89</th>
<th>90-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971 (%)</td>
<td>3</td>
<td>13</td>
<td>86</td>
</tr>
<tr>
<td>1972 (%)</td>
<td>3</td>
<td>28</td>
<td>69</td>
</tr>
<tr>
<td>1973 (% to date)</td>
<td>6</td>
<td>28</td>
<td>66</td>
</tr>
</tbody>
</table>
MANAGEMENT

Mixed farming is probably the most complex and exacting from a management angle, of any farming system in New Zealand. This is reflected by the farmer/adviser ratio in Ashburton County, where the ratio is 100 farmers per adviser when non-departmental advisers are included.

With this intensive advice and the high level of management knowledge of the farmers, there is a definite trend to tighter rotations and better land utilization. Rotations tend to have more of the high return crops in them, there are very few wasteful fallows and a much better integration of stock and crop. With some farms, on good cropping soils an all-crop farming system has evolved. The trend towards more specialized intensive cropping systems is associated with the concentration of crop farming on the better soils.

WEEDS, PESTS AND DISEASES

As more intensive cropping systems are developed, weeds, pests, and diseases may become the limiting factors. Already cereal diseases such as take-all and fusarium, and pea diseases such as collar rot and bacterial blight are increasing in severity in mid-Canterbury. Attacks of insect pests such as Argentine stem weevil and hessian fly are also increasing in frequency. Weeds such as wild oats and couch also complicate some intensive crop rotations. These problems are the kind that could cause intensive or continuous cropping systems to break down. However, resistant cultivars, new agricultural chemicals and improved management techniques should solve the problems caused by weeds, pests and diseases. Soil structure or soil fertility should not become a limiting factor in intensive systems if rotations and cultivations are carefully planned.

CROP SPECIES

After 130 years of agricultural development most of our arable land grows the crops that the pioneers introduced (Table 2). Generally our main field crops are ones that have been able to give high and reliable yields without extensive manipulation of the crop environment and at the same time provide for the needs of the country. Temperate crops such as wheat, barley, oats, and forage seed crops have been successful because their pattern of growth integrates with the environment. Yields of these crops are usually determined before moisture stress becomes critical and the normal seasonal development of water deficits aids ripening and harvesting. This close relationship between the environment and the crop is emphasized by the relationship between areas and yields of crops grown on the various soil types. The most important soil characteristic appears to be the level of soil water available to the crop.
DEVELOPMENTS IN CROPPING

TABLE 2: AREAS OF FIELD CROPS IN NEW ZEALAND IN 1851 AND 1970 (ha)
(Statistics of New Zealand 1858)
(New Zealand Official Yearbook 1972)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area 1851</th>
<th>%</th>
<th>Area 1970</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>2,233</td>
<td>41</td>
<td>108,394</td>
<td>37</td>
</tr>
<tr>
<td>Barley</td>
<td>538</td>
<td>10</td>
<td>56,080</td>
<td>19</td>
</tr>
<tr>
<td>Oats</td>
<td>941</td>
<td>17</td>
<td>21,008</td>
<td>7</td>
</tr>
<tr>
<td>Potatoes</td>
<td>914</td>
<td>17</td>
<td>9,928</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>861</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peas</td>
<td></td>
<td></td>
<td>24,500</td>
<td>8</td>
</tr>
<tr>
<td>Maize</td>
<td></td>
<td></td>
<td>8,089</td>
<td>3</td>
</tr>
<tr>
<td>Process vegetables</td>
<td></td>
<td></td>
<td>10,075</td>
<td>3</td>
</tr>
<tr>
<td>Market vegetables</td>
<td></td>
<td></td>
<td>5,218</td>
<td>2</td>
</tr>
<tr>
<td>Forage seeds</td>
<td></td>
<td></td>
<td>52,712</td>
<td>18</td>
</tr>
</tbody>
</table>

Because they are well matched to the environment, the main field crops are essentially general purpose ones, which need relatively low levels of agronomic technology, and as such they are easily integrated with sheep farming. The crops that will be introduced will require additional agronomic inputs because it will be necessary to modify the crop environment considerably to ensure their success. New crops will be mainly suited to farmers who are prepared to specialize. In other words, few new crops will be suited to conventional mixed cropping farms.

Most crops that will be introduced into New Zealand agriculture in the next five or so years are probably familiar to most farmers. They are growing on research farms, in market gardens and in the paddocks of innovators right now. Only a few will make any impact on field crop statistics. Corn is increasingly important and, with cold hardiness, it and sorghum will be grown more in the south. One oil seed crop, probably rape, will be grown extensively. Sugar beet may finally be successful. Chemurgic crops (such as solanum and peppermint) will be minor crops in national terms if ever grown commercially. A feed protein crop in some form will probably be introduced. Feed protein could be extracted from leaves but initially it will probably come from a pulse crop such as lupin or field bean. New crops, almost without exception, will require new agronomic technology, mechanization and capital for growing, harvesting, processing and storage in addition to new managerial skills and the development of new processing and marketing organizations. In the next few years the conventional crops will continue to occupy most of the crop land. The rapid increase in corn cropping in the North Island and in the production of process crops, particularly in Canterbury, are obvious changes occurring at present.
More cultivable land will be used for conventional field crops in the future as demands of ever-increasing human and animal population are met. Radical changes in the types and areas of conventional field crops will occur only if substantial exports can be organized. Barley shipments to Japan may follow the pattern set by the lucerne meal industry.

**CROP CULTIVARS**

New Zealand agriculture has been and will be well served by plant breeders who continually supplant established crop cultivars by improved ones (Table 3).

**TABLE 3: WHEAT CULTIVARS BRED AND RELEASED BY CROP RESEARCH DIVISION, DSIR**

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Year of Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross 7</td>
<td>1934</td>
</tr>
<tr>
<td>Tainui</td>
<td>1939</td>
</tr>
<tr>
<td>Fife Tuscan</td>
<td>1941</td>
</tr>
<tr>
<td>Hilgendorf</td>
<td>1947</td>
</tr>
<tr>
<td>Yilder</td>
<td>1948</td>
</tr>
<tr>
<td>Arawa</td>
<td>1955</td>
</tr>
<tr>
<td>Aotea</td>
<td>1957</td>
</tr>
<tr>
<td>Cross 7-61</td>
<td>1961</td>
</tr>
<tr>
<td>Hilgendorf-61</td>
<td>1961</td>
</tr>
<tr>
<td>Kopara</td>
<td>1970</td>
</tr>
<tr>
<td>Kopara-73</td>
<td>1973</td>
</tr>
</tbody>
</table>

New cultivars produced within New Zealand or introduced from overseas will have a considerable impact on crop production. Karamu wheat, for example, has had in some cases a considerable yield advantage over established New Zealand wheats. This semi-dwarf wheat, the only sign of the "green revolution" in New Zealand, will not displace the standard varieties which are notable for both quality and yield. The "green revolution" will not change our field crop agriculture, as it is primarily concerned with cereal production in tropical and sub-tropical regions. An equivalent "green revolution" for temperate crops will not affect New Zealand agriculture in the foreseeable future. If and when it does come it will probably be sparked by the incorporation of cold hardiness into subtropical C-4 plants such as corn and sorghum.

New cultivars of commonly-grown field crops will have increasingly higher yield potentials but the national yield increments attributable to them will decline (Fig. 5). Plant breeders will become more concerned with factors such as quality, disease resistance, harvesting, storage and processing. In some cases new cultivars may need a shorter season, which may
lead to rotations in which more crops are produced per year. New cultivars will be more useful to specialist producers for they will be able to exploit them.

**CONTRACT FIELD CROPS**

An increasing proportion of field crops will be grown under contract. Process vegetables, malting barley (Fig. 6), peppermint and lucerne for dehydration are already grown this way. Organizations utilizing field crops within New Zealand or those concerned with their export will use contracts to ensure continuity of supply, quality, and price stability. Contracts may permit the buyer to exercise partial or even total control over the crop and to substitute their knowledge and technology for that of the farmer. When new crops and cultivars are introduced they will almost certainly be regulated by means of contracts. Farmers will likely prefer this means of
control to quotas. Much of the specialized harvesting and processing machinery needed for new crops will be owned and operated by the processor.

**IRRIGATION AND DRAINAGE**

In New Zealand field crops are irrigated primarily to maximize crop yields but in the near future irrigation for crop quality will become increasingly important. New cultivars of existing field crops will need irrigation for the successful exploitation of their potential. Water is the prime limitation to field crop yields in Canterbury. New crops, which will likely be more sensitive to water stress than existing crops, will almost certainly require irrigation for successful introduction. If the area of irrigated field crop increases at its present rate (Fig. 7) and other demands on water supply increase then water will inevitably become a limited resource for field crop irrigation. As the availability of water declines and its costs increase, the allocation of water to responsive crops and the scheduling of irrigation will require a higher standard of expertise and technology. Irrigation farming will become even more highly specialized.

**Fig. 6: Area of barley grown under contract for Canterbury Malting Co., 1952-72.**
Drainage and other surface surgery for crop lands will become more important. Intensive cropping programmes can be delayed by poor drainage and crops may even be lost. Uneven land surfaces create problems for irrigation and mechanization and cause variation within the crop which leads to a decrease in quality. Shelterbelts, fences and other surface features which decrease the uniformity of crops will create problems which will add to those already caused by within-field variations in soils. The cropping farm of the future may have no fences or shelterbelts.

**FERTILIZERS**

Responses of most field crops to conventional fertilizers are well documented and problems caused by the deficiencies of macro- and micro-nutrients in new crop species and cultivars should pose few problems in the next decades. Fertilizers are primarily used to increase crop yield but they will be used more and more to control crop quality. We can assume that fertility levels of most soil types will continue to rise so that crop responses to fertilizer inputs generally will become progressively smaller and more erratic. Fertilizer practices are likely to become more sophisticated and more dependent on the results and interpretation of soil and plant analyses. Farmers will have to become more familiar with the formulation, properties, and optimum times and rates of application of fertilizers for many different situations. Fertilizer application and other crop production techniques, particularly irri-
gation, will have to be thoroughly integrated to maximize yields. In some instances new crop species and cultivars will be able to exploit high rates of fertilizer or high fertility. Karamu wheat, for example, performs well under high fertility and responds more to nitrogen than conventional cultivars.

INTEGRATION OF ANIMAL AND FIELD CROP PRODUCTION

In the future it will become increasingly more difficult to integrate animal agriculture and field crop production. Ultimately the role of the ruminant in the fertility-building part of the rotation will be replaced by fertility-building crops, by fertilizer or by both. Crop residues will become increasingly valuable and smaller in volume, and their utilization will primarily be through the ruminant animal. However it is likely that other uses for crop residues will increase. The practice of burning cereal stubble will likely cease within a few years. If the price structure of grain and beef changes the finishing of beef cattle in feedlots for a short period may become profitable. In any case, feed grain usage within New Zealand will increase considerably over the next 20 years.

RESEARCH

We still do not know the scientific basis for many of the commonly-used production techniques. In other words researchers, advisers and farmers have found systems which increase yields and profits, but they have not always established the scientific basis for these. Researchers in the future must look more closely at some of the whys and wherefores. At present, there is considerable emphasis within the Ministry of Agriculture and Fisheries to encourage work in the management or systems aspect of crop research.
INTRODUCTION

When early colonists first came to New Zealand they were searching for a good life in the country; they and their descendants have achieved at least some of their objectives. If one reads the letters of the Richmond and Atkinson families who settled in New Plymouth, one gets the impression of cultured middle-class early Victorians escaping from the industrial revolution. The thought of working in an office or a factory did not appeal to them. They wanted an outside life with a chance to achieve something on their own mettle and that was why they chose New Zealand. Country life appealed to the same basic motives that stimulate a keenness for farming among young New Zealanders today.

Living in the country has reached satisfactory levels in places but in many districts the quality of life leaves much to be desired. New Zealand is a great place to farm for the man who is interested in the technology and economics of farming and his wife who shares those interests. The farmer who only wants to discuss the price of old ewes over half-a-gallon of beer will be happy almost anywhere. However, life can be very dull, mainly, I believe, because of the dour, single-purpose effort that has been required to build farms in difficult circumstances. But this does not have to be so. Country life need not be dull. Hopefully the quality of country life could be raised if the problem were attacked with the same intelligence that we have attacked the problem of farming efficiency. In fact, I admire New Zealand farmers so much that I have convinced myself they could build a lively country society that would be the talk of those searching for the good life in this age of automation.

The first question I would like to consider is whether a high quality life is in fact possible in a rural setting. Can it be anything else but dull, compared with life in town? Then I shall deal with three major problems facing countrymen,
and, finally, discuss the areas in which there is scope to improve the quality of life in the country.

**MUST LIFE BE DULL IN THE COUNTRY?**

My academic contemporaries are amused that anyone could make such a foolish suggestion that life in the country could be anything but dull. After all, the academic expression, “to be rusticated”, means being sent down to the dull old countryside from the real life of Oxbridge because of a fall from grace. I think most people believe that it is in towns where the action is. My critics argue that cities are the centre of technological and cultural development. They would argue that there is no hope for the countryside which has been denuded of its bright people by selective migrations — the brighter children seeking their fortunes in the city, leaving behind on the farms the uncultured hodges, clod-hoppers, and tussock-jumpers. While this may be the case overseas, I do not think it has happened in New Zealand.

My critics also argue that the low population density makes it impossible to provide the infrastructure for anything but a second-class society. “Cultural and sporting developments occur in town, not out in the cactus” they say. As we shall see, the country has some very real cultural and sporting advantages if country people exploit them.

The English have built a lively society in the country and this provides us with a precedent to give us confidence. This society was founded before the industrial revolution and was based on the technological farming revolution which started in the middle of the 18th century. The names of the innovators have gone down in history: Jethro Tull, who invented the drill; Robert Barewell and livestock improvement; and Lord Townsend and the Norfolk four-course rotation.

This was an elitist society of privileged gentry and underprivileged villagers, quite foreign to our healthy New Zealand egalitarianism. However, the English aristocracy did achieve a lively and high quality life for a few in a rural setting.

On the whole the English squires spent their rents back in the district — unlike the Irish landlords who tended to paint London red leaving their bailiffs the task of exploiting the peasantry. The English landed gentry built fine homes, collected treasures from abroad, patronized the arts, collected books for libraries and paintings for their galleries, and employed landscape architects like “Capability Brown” to design their private parks and gardens. Around their estates they planted hedges, trees, and copses which make the beauty of the English countryside today.

Of course all squires were not cultured men; they were a diverse lot. Some were in the tradition of William Fielding’s Squire Western and Dr Johnson’s Squire Bluster — uncouth, bucolic oafs. In general, as well as cultural activities and running their estates, the gentry shared with the villagers a
love of country sports — horse racing, hunting, shooting, and fishing. Life was far from dull for lively people.

It may be felt that this example of high quality life in the English countryside has no relevance to New Zealand today because the English gentry lived well on the backs of their villagers. But New Zealand farmers can live well on the backs of science and technology.

This precedent from English social history is not the only reason why I believe that we, too, could develop a high quality life in the country. The second reason is that I wonder if man, as a species, is well adapted to industrial society.

ADAPTION TO COUNTRY LIFE

I am sure that man is better adapted to country life than he is to living in town. Our ideas from modern biology view man as an advanced species which evolved as a hunting ape who succeeded by working in small packs with a symbiotic association with his dogs. We are pack-hunting apes who have evolved certain behaviour patterns adapted to survival under hunting conditions over hundreds of thousands of years of pre-historical times. These ideas about the nature of man were first mooted by Darwin but more recently the ethologists, Conrad Lorenz and Robert Ardray, have drawn attention to man's innate behaviour patterns and their social significance.

Man's need to have his own piece of land whether it be a farm or a section in town is now seen as territorial behaviour that is almost universal through the animal kingdom. The notion that we are pack-hunting apes explains why we get such a thrill from hunting. It explains why my fishing colleagues at Lincoln will get up at all hours of the night and stumble through the dark for the chance of a bite. It explains why deerstalkers will almost burst their lungs stalking their prey in the high country. It explains the "blood-up reaction" when foxhounds find, the headlong chase without a thought about the horse, obstacles or safety, and then the kill. It explains the wild excitement of men with sticks and dogs killing rabbits when cutting out the last patch of corn. This hunting reaction, unfortunately, can become distorted and man can perceive other men as a separate species for killing; this explains the thrill of the cavalry or bayonet charge.

Man tended to hunt in packs — the explanation of the pleasure we derive from working together in small groups under challenging conditions. Nearly all New Zealanders have experienced the thrill of belonging to a football team going out to do or die each Saturday. The keeler crew and the alpine team overcome difficult and dangerous conditions together. They are not perverted masochists but men responding with behaviour acquired in our evolution. Sir Edmund Hillary did not climb Everest because it was there; Sir John Hunt and his team conquered Everest because they are men.
It is my prediction that these ideas from modern biology will become popular over the next few years and men will become more aware of the nature of a high quality life. They will no longer see it as dozing in front of a colour television nor being regularly “stoned” on large quantities of beer. Hopefully more and more will see the pleasure of hunting and sport as activities which meet evolved and innate needs. Thinking people will see the difficulty of satisfying their instincts in town and will want to live either intermittently or permanently in the country. One can already see the trend for people to own baches by the water and in the country. If farmers use the special opportunities of country living open to them, their quality of life can only rise. Countrymen have the greatest opportunities for the good life.

Life, then, in the country need not be dull. The English gentry established a life based on both cultural and sporting activities, and it has been argued that, because of man’s evolution, activities which at least simulate the pack-hunting of the ape are those likely to give real and sustained pleasure. Hence those who live in the country have special advantages if they exploit them.

However, in developing a high quality life in the country, farmers have three problems — those of wealth or lack of it, population and attitudes.

**ECONOMICS AND HIGH-QUALITY COUNTRY LIVING**

High living in the country in England was associated with high farming and high farm prices. Reasonable prices and conditions are needed to provide the resources for the good life in the country. If we have a further period like that of the past 20 years, I see no problems. But a 20-year farming slump would put paid to raising the quality of country life.

**POPULATION**

Declining population makes it difficult for some districts to keep their social infrastructure together — the local doctor moves to the over-doctored urban areas for less work, greater pay, and the social life of the professional class; the local school gets reduced to the status of one teacher and the keen young man who has now done his country service moves into town. Empty pews cannot support the parson.

Science, technology and managerial economics are the basic causes of the shift of population from country districts. Mechanization and streamlined farming mean that farmers can manage twice the stock per man they could twenty years ago. With the cost-price squeeze and no money for development, many farmers found they could manage by themselves without permanent help on the farm.

Of course there is a tendency to use more off-farm services — the transport firm or the aerial topdresser to put on ferti-
lizer and the builder to put in new cattle yards. To increase efficiency, operators have tended to centralize and amalgamate these services. The topdresser may fly out of Christchurch airport rather than off the local strip. The large, efficient, automated dairy plant, supplied by tanker, has taken over from the high-cost local cheese factory. Because of improved transport there is a tendency for farmers to shop in the larger centre — there is a better selection of goods. This reduces the viability of the country store and the local garage.

However, the population drift is not likely to have such a serious effect on the quality of life as the figures suggest. Those remaining are a more homogeneous group with values and interests in common and are more likely, because of a higher income, to participate in cultural and sporting activities of the community. Moreover, country sports do not require a large population — in fact, the reverse can be true.

ATTITUDES AND VALUES

A more serious limitation to the good life in the country is the attitudes and values of many country people who are trapped in a narrow life because of their grinding Calvinistic ethic towards work and leisure. Protestantism was the force that established work in the modern mind as "the base and key of life". Luther believed that the best way to serve God was to do most perfectly the work of one's profession. Work was valued as a religious path to salvation. Calvin developed the idea that idleness and luxury are deadly sins. All men, even the rich, must work because it is the will of God. From this Calvinistic command to ceaseless effort, to ceaseless renunciation of the fruits of effort, the motive power and ideological justification of modern business derives. The Calvinistic tradition was strong in those who settled in New Zealand. Those Lowland Scots did a magnificent job in building this country. While the influence of the Church is much less than it was 100 years ago, the stern preacher has been replaced by the farm management consultant with the same message — farm for profit maximization. Something was mentioned about "way of life aspects" as a minor farming objective early in his education but it did not get much of a mention subsequently.

One can be sympathetic towards the farmer whose life is limited by the Calvinistic attitude; he has had to work hard to build up his farm but as a result he has no other interests except the farm when he reaches retirement. His farm is highly productive but very desolate and ugly. He has cut down all the trees and hedges to prevent barley grass infestation beneath them and, in the jargon of his farm management confessor, he has minimized farm inputs by not replacing them. The old-fashioned farm house with its surrounding verandah now stores hay and will be bulldozed shortly; it has been replaced by a modern, suburban, ranch-style house of brick
veneer, designed by a builder who knows his onions— not one of those airy-fairy architects!

Having established that a high quality life is possible in the country, and that men will come to appreciate the value of the more natural country life in the years ahead, and having also outlined the dual problem of population decline and the Calvinistic outlook of many countrymen, it would seem appropriate to make some suggestions about how to improve the quality of country life. In doing so the guiding principle will be to suggest that country people play to their real strengths rather than mindlessly ape suburbia.

Sporting Interests

In the development of sporting interests acclimatization societies have achieved a great deal for fishermen and duck shooters; there is little other game to shoot on many farms and this is a great lack. If more attention had been paid to planting trees there would have been a better environment for partridge and pheasant. It is very pleasant to pick up a gun and, with well-trained dogs, stalk a few birds—an occupation for older men who are past chasing deer in the mountains.

As far as deer are concerned, I am one of those extremists who believe that men are more important than soils! Hence I would risk a little damage to the soil to provide deer hunting opportunities for people and I agree with those who believe we should husband deer rather than exterminate them now that the helicopter can clean out large mobs in inaccessible places.

The development of new technology opens up new hunting opportunities. Just as Jo Manton's (1766-1835) development of the shotgun revolutionized game shooting, and Hugo Meynell's selective breeding of the hound made fox hunting popular, so today Hamilton's jet boat has opened up new fishing opportunities on our rivers. However, countrymen have been slow to take advantage of the new adventure of underwater fishing with an aqualung. Often farmers have the best access to coastline where crayfish abound and underwater hunting would seem an ideal sport for countrymen.

It is an interesting reflection of our Calvinistic attitudes that while New Zealanders have turned the working activities of wood chopping, shearing and working dogs into admirable sports, we have not developed sports based on the "chase" to any great extent. It is a pity that those who ride to hounds are limited to hares and aniseed trails. Imagine the indignation of city dwellers if huntsmen chased a stag—but what a thrill that would be! Hunting wild pigs with dogs is an exciting and dangerous sport which needs a hunt club organization to conserve the wild pig game, breed the dogs, and develop a ritual and discipline based perhaps on Maori culture. Such a hunt organization would offer a far greater counter attraction
to motor bike gangs than Maori dances in the local Church hall; real full-blooded stuff.

Horses and country living are closely bound together and through the activities of pony clubs there is a tremendous increase in interest in horses, not only among country children but more particularly among middle-class teenage girls in the suburbs.

Pony trekking and show jumping are developing sports which make a great contribution to country living for both sexes, while suburban sports, like bowls and golf, provide recreation for all ages, as do other non-specifically rural sports.

In summary, then, on the sporting side, I would like to see the development of small game bird shooting, the conservation of deer for stalkers, and a New Zealand version of the chase — possibly pig hunting.

Cultural Pursuits

I mentioned earlier that country people should play to their strengths when it comes to cultural pursuits.

There are some cultural pursuits which are hard to develop because of a low population. I see no future in string quartets in Southbridge nor amateur dramatics in Darfield because of the difficulty in finding the necessary talent. Hopefully the visual arts and crafts have a future in the country. There is a greater chance for useful crafts for women. The Calvinistic ethic among New Zealand men shines through when they insist that their wives throw useful pots rather than paint abstract symbols. Pottery and spinning are both useful and well established in the countryside and a boom in weaving is likely to follow spinning. In the past, the rather pathetic array in country competitions of fussy flower arrangements and raspberry jam, made by country women with little to do once their families had grown up, reflected a basic lack of education in cultural skills and aesthetic values. It is a great pity that the Ministry of Agriculture disbanded their embryo team of home science instructors just as they were needed and that the university has withdrawn its adult education services from the country to the cities where they compete with the W.E.A. for the educational market of the suburban middle-class.

The cultural activities of architecture, internal decoration, gardening, and landscape design offer enormous opportunities to improve the man-made environment from the micro to the macro level. Fortunately some of the early colonists had a tradition of good taste and left their mark on the environment. Some of them built simple but aesthetically pleasant colonial houses and rejected the worst of the over-ornate Victorian furniture with its massive scale and heavy carvings. This rubbish had the status equivalent of chrome and formica of today. These early colonists planted interesting gardens with emphasis on perennials which merged into the farm and
they would have laughed at the garish bad taste of the kind of garden that wins the suburban garden competitions of today. Some of the colonists had a feeling for the landscape on a wide scale. The trees in Hagley Park, Fitzgerald’s plantings at Lincoln, and magnificent Geraldine are local examples of the heritage which some of the early settlers brought with them and left behind. In a few places in Canterbury this tradition has carried on through the efforts of families like the Deans, Peter Smail of Hororata and the Farm Forestry Association which clothes its good efforts to improve the environment in the necessary utilitarian garb. Too often we leave the decoration of our countryside to the oil and tyre companies. This is Firestone country! The ugliness of parts of the Canterbury and Southland plains contrasts with the magnificence of the mountains behind—an ugliness which most local people have ceased to notice. Those dark satanic pines and macrocarpas send a chill up my spine.

However, there are signs that people are going to do something about raising the quality of country life through improving their man-made environment. It is often the country towns which are the most depressing and it is heartening that places like Darfield have formed associations to improve their townships. Fortunately the objectives of profit, leisure, and beauty often lie in the same direction. Planting trees in woodlots can result in profit from timber, shelter for game, and aesthetic stimulus, too. In fact the beauty of the English countryside with its trees and copses was due more to the shortage of timber during the Napoleonic wars than the good taste of the English.

Of course farming itself is a cultural activity—that is its joy, being a hobby and a business at the same time. Country life would be more varied and interesting if women who wanted to took up active farming. Thanks to mechanization and contract services, farming no longer requires the same physical effort, and more farmers’ wives would lead a fuller life if they worked on the farm. In return, husbands could give more assistance around the house. In some families it might be more sensible to set up a daughter on a farm who wanted to make a career on the land and send the son to town to get a job where his sex will give him an enormous competitive advantage. Women’s liberation will spread into the country over the next ten years. Women are unlikely to tolerate the second-class status they have put up with in the past. They have a great deal to contribute to the quality of life through rural activities which have been the prerogative of men.

So, on the cultural side, I would like to see the development of crafts, particularly pottery and weaving, the exploitation of the opportunities in landscape design, and the integration of women into farming itself.
Education

It is people who will improve the quality of life—liven it up and make it sparkle, and it is education in its broadest sense that changes the behaviour of people. I shall not cover the inadequacies of formal rural education though I think we shall see the end of this shortly with an oversupply of teachers forcing good young students into a career in the country. For adult education I see the need for landscape architects to substitute for a few farm advisory officers together with the re-establishment of the home science instructors with special skills in the crafts—not cooking only. Perhaps we should re-orientate our advisory services towards community development.

The university faculties have a major role to play. We should be producing the farming revolutionaries and the farming leaders who can bring about the social changes I have been discussing. In the past these universities have had a very utilitarian approach to education.

When I first came to New Zealand for postgraduate studies, I wrote an article in the Massey student newspaper suggesting that a function of the university was to provide students with the opportunity to develop a wider set of values. This was met with the expected response in letters to the editor of, “If you don’t like it here, why don’t you go back to England?” My professor pointed out gently that, “If a young man going farming develops non-materialistic values then he is less likely to make a success of developing hill country or punching dairy cows”.

The function of Massey and Lincoln at that time was the same as a technical institute today—the following of the simple creed of production efficiency. Giving students a wider set of goals would reduce the attainment of this primary goal and hence the economic efficiency of the industry. “A lot of learning is a dangerous thing”, could have been the motto then.

I believe that both Lincoln and Massey have more to offer today. Both offer a broader education. Hopefully at Lincoln we expose the farmers of the future to broader issues. With the corporate residential system, students can be helped to develop a wider set of interests and values than the Calvinistic ethic.

There are other important revolutionaries creeping into rural society. These are the refugees from the urban community who settle in the country as weekend farmers. Perhaps father had a yen to do some part-time farming and be near his fishing and his wife and children are keen on horses. What better than a 5- or 10-acre farmlet in the country with father commuting to work each day. Some may complain that these recreational subdivisions are a wasteful use of good soils, but I believe that these urban refugees, because of their perception of the opportunities in the country, have a great deal to offer
and the rural community should welcome them. Similarly urban refugees have a responsibility to help the community all they can.

A FINAL THOUGHT

As a final wishful thought I would like to see more of the wealth of New Zealand farmers re-invested for better living in the country so that there is a bright and lively rural community devoting more of its time to sporting and cultural activities.