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# ECONOMIC IMPLICATIONS OF INCREASED WOOL PRODUCTION

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## SUMMARY

The paper analyses the implications of a national annual increase by New Zealand producers of 5% in the production of wool compared with the present long-term rate of increase of 3%. This, it is estimated, would change the rate of world wool production increase from about 2.2% p.a. to 2.6% p.a. and this, it is felt, could be readily absorbed without change in wool price provided the world production of synthetic fibres does not increase at more than about 10% p.a. Over the past 10 years the rate of increase in world synthetics has slowed markedly from 60% p.a. to about 25% p.a. in the last five years. Provided adequate volume and price competition are provided by wool on world markets, the annual rate of expansion of synthetics may well fall to 10% p.a., but if it fell to only 15%, it is estimated that this would cause a wool price decline of only  $\frac{1}{4}$ d. per lb per annum.

It is further estimated that, to preserve stability of lamb prices in the U.K., the rate of increase of lamb exports will have to be confined to 1% p.a. at most.

These factors, together with the increasing demand for mutton by eastern countries, imply, amongst other things, the need for a rapid increase in wool production and a change in the growth pattern of New Zealand primary production so that less reliance is placed on increased lamb production and more on wool and mutton.

## INTRODUCTION

THE ECONOMIC IMPLICATIONS which will be discussed here can be conveniently divided into those concerning marketing and market prospects, and those concerning production. Rather more attention will be devoted to marketing questions since this is the writer's field, but in any case it is clearly of great importance in the present context.

In order to give some degree of precision to the argument, the implications of a specific target rate of increase of wool production of 5% per annum over the next 10 years or so will be discussed (compared with the long-term rate of increase of 3% per annum from 1946 to 1963). This paper is therefore really an attempt to answer two questions:

- (a) Can New Zealand sell 5% more wool each year?
- (b) What are the economic problems concerned with producing 5% more wool each year?

In attempting to answer these two questions, it will be necessary to draw on the results of research work in progress, and wherever possible indicate what further research work is required.

#### MARKETING IMPLICATIONS OF INCREASED WOOL PRODUCTION

Econometric analysis of the wool market bristles with difficulty partly because, unlike other farm products, wool is a world commodity and the prices and demand for New Zealand wool are affected by events in many countries, wool producers and wool consumers alike. This means that the statistical models become fairly complex and it also involves a fairly arduous job in the compilation of the necessary statistical data.

Furthermore, as wool is a durable commodity, it is subject to fluctuating and sometimes quite violent speculative demand pressures which require rather special methods of analysis. This paper is concerned with long-term projections and it is necessary to ignore these short-term fluctuations around the long-term trend in prices. In this connection, the present boom in wool prices may be regarded as a short-term fluctuation and it would be unwise to regard it as a new long-run equilibrium price equating the supply of wool to the demand by wool textile consumers. However, insofar as the current wool price reflects recent mill consumption rates in excess of raw wool production rates, and the consequent destocking which has occurred over the last year or so, it is justifiable to regard the high price as a sign of the basic strength of the market even if at somewhat lower prices than are currently being received.

#### THE STRUCTURE OF THE WORLD WOOL TRADE

Even though wool is a world commodity, it is reasonable as a first approximation at any rate, to confine the discussion to a group of 21 or 22 countries.

These countries, which are shown in Table 1, make up what may be called the "wool world", within which most of the international trade in raw wool occurs, and within which most of wool produced is either consumed directly in the form of wool textiles in the countries producing or purchasing raw wool or indirectly through the import of wool textiles from some other country in the group. In addition, the group exports some raw wool and some wool textiles to other countries outside the group and this,

TABLE I: STRUCTURE OF THE WOOL AND WOOL TEXTILE TRADE 1958-60  
(Million pounds clean)

		<i>Net Trade</i>	<i>Mill</i>	<i>Net Trade</i>	<i>Domestic</i>	<i>Per capita</i>
	<i>Production</i>	<i>Raw Wool*</i>	<i>Consumption</i>	<i>Wool Textiles*</i>	<i>Consumption</i>	<i>Consumption</i>
					<i>Wool Textiles</i>	<i>Wool Textiles</i>
<b>Five Main Wool Producers:</b>						
Argentina	256		57.6	-13.2	44.4	2.2
Uruguay	102		36.0	-29.0	7.0	2.6
South Africa	163		20.7	-2.0	18.7	1.1
New Zealand	391		8.3	+ 6.8	15.1	6.6
Australia	915		70.0	-16.2	53.8	5.4
	1,827	-1,634.4	192.6	-53.6	139.0	2.66
<b>Five Wool Textile Exporters:</b>						
United Kingdom	81		478.7	-197.5	281.2	5.4
Belgium	—		78.3	- 40.8	37.5	4.0
France	31		270.9	-126.2	144.7	3.2
Italy	18		182.9	- 85.2	97.7	2.0
Japan	—		221.0	-29.1	191.9	2.1
	130	+1,101.8	1,231.8	-478.8	753.0	3.04
<b>Eleven Wool Textile Importers:</b>						
Germany	—		146.8	+107.6	254.4	4.6
Netherlands	—		22.7	+ 28.1	50.8	4.5
Canada	5		18.8	+ 34.3	53.1	3.1
Sweden	—		10.4	+ 19.4	29.8	4.0
Austria	—		10.4	+ 14.1	24.5	3.5
Denmark	—		4.2	+ 15.3	19.5	4.2
Finland	—		5.0	+ 14.9	19.9	4.5
Ireland	13		9.0	+ 3.0	12.0	4.3
Norway	—		9.2	+ 7.2	16.4	4.5
Switzerland	—		10.3	+ 18.3	28.6	5.5
Greece	14		10.0	+ 11.1	21.1	2.5
	32	+ 224.8	256.8	+273.3	530.1	4.17
21-Country Group	1,989	- 307.8	1,681.2	-259.1	1,422.1	3.33
<b>Others:</b>						
U.S.A.	141	+ 216.3	357.3	+ 98.9	456.2	2.5
Communist	615	- 5.4	609.6	+ 13.1	622.7	
Others	364	+ 35.8	399.8	+ 96.6	496.4	
<b>World Total</b>	<b>3,109</b>		<b>3,047.9</b>		<b>2,997.4</b>	

\* Imports indicated by +, exports by -.

Source: Calculations based on data from: Commonwealth Economic Committee; I.W.S.; F.A.O.

together with the wool they produce themselves, makes up the total wool consumption of the rest of the world.

Table 1 shows this structure of the world wool and wool textile trade.

#### A FIRST APPROACH TO PROJECTING DEMAND FOR WOOL

In Table 2 a relatively unsophisticated approach is adopted to projecting the demand for wool in 1970 at 1960 prices. In this approach a preliminary investigation has been made of trends in *per capita* consumption of wool and non-cellulosic fibres in the 22 countries making up the "wool world" and the results are used to project the future. In most cases a reasonable explanation of trends in *per capita* consumption is afforded by changes in *per capita* real income, except in the United States where no regular historical pattern can be discerned. For the purposes of this exercise it is necessary to exclude the U.S.A. from the group (thus reducing it from 22 to 21 countries) and to take account of the impact of the U.S.A. through its imports of raw wool and wool textiles from the 21-country group.

The relationships for the period 1952-1960 between changes in income and consumption (*i.e.*, the income elasticity of demand) have then been used in conjunction with recent projections of population and income (FAO, 1963) to build up country by country projections for 1970 which when aggregated give the results shown in Table 2. In addition, it has been assumed that there will be a continuation of recent rates of growth in net exports of raw wool and of wool textiles from the 21-country group. In passing, it should be noted that these two items of trade have been growing at a very fast rate indeed — about 6% per annum — and the maintenance of this rate will require the maintenance of liberal international trading policies throughout the world.

The upshot of these calculations is that the demand for wool at 1960 prices would rise about 3.3% per annum and the demand for synthetic fibres at 12.4% per annum. Provided synthetic fibre output did not exceed 12.4% per annum, then world wool production could increase 3.3% without prices having to fall to absorb the excess of supply over demand. The rate of increase of production for the last decade has been about 2.2% per annum. If New Zealand stepped up production to 5% per annum, the world total would rise to about 2.6% per annum — still well within the projected demand increase. On this basis the future looks very sound indeed and there should be no problem in selling 5% more wool per annum.

TABLE 2: DEMAND PROJECTION FOR WOOL IN 1970 AT 1960 PRICES

	1958-60 (million lb clean)	Forecasted Annual Rate of Change 1960-70 (%)	1970 (million lb clean)
Supply of wool from 21 countries	1,989		
Demand:			
Home consumption of wool textiles .....	1,422	1.9	1,750
Net exports to countries outside 21-country group of—			
Raw wool .....	308	5.8	573
Wool textiles .....	259	6.6	523
Total .....	1,989	3.3	2,846
Non-cellulosic synthetic consump- tion in 21 countries .....	560	12.4	2,016
Wool and synthetic consumption in 21 countries .....	1,982	6.6	3,766
<i>Per capita</i> consumption in 21 countries (lb):			
Wool .....	3.33		
Non-cellulosic synthetic .....	1.31		
Wool and synthetic .....	4.64		

#### *Assumptions Used in Projections*

- (1) *Per capita* income growth averaged for 21 countries at 3.6% p.a.
- (2) Population growth averaged for 21 countries at 0.9% p.a.
- (3) Growth in *per capita* demand for wool equals growth in income per head multiplied by 0.27.
- (4) Growth in *per capita* demand for wool plus synthetic equals growth in income per head multiplied by 1.47.

Both relationships (3) and (4) based on experience over 1952-60

#### RESULTS FROM AN ECONOMETRIC MODEL

The second approach to projecting future trends is based on more detailed statistical analysis of historical trends in prices and factors influencing such trends for the aggregate of countries making up the "wool world".

There is no space here to go into the logical structure or description of the various econometric models used. One can only give the bare results for one of them as follows:

Log deflated price of wool

$$\begin{aligned}
 &= 2.31 \log \textit{ per capita} \text{ real income in 22 countries} \\
 &\quad - 2.31 \log \textit{ per capita} \text{ supply of raw wool in 22 countries} \\
 &\quad - 0.14 \log \textit{ per capita} \text{ supply of wool type synthetic fibres} \\
 &\quad - 0.12 \text{ time (1920=1)}
 \end{aligned}$$

(All variables except time expressed as 5-year moving averages.)

Equations similar to this are also being developed for the separate analysis of crossbred wool in which allowance will be made for the influence of the declining world supply of carpet wool, and for merino wool.

By an appropriate transformation, one can derive from the coefficients of the above equation the price and income elasticity of demand for wool—*i.e.*, the percentage response by way of demand to a unit percentage change in price or income. These work out as:

Price elasticity of demand	.....	.....	-0.40
Income elasticity of demand	.....	.....	0.92

These values for the elasticities appear very reasonable when considered in the light of estimates derived from other research work on the demand for woollen clothing using time series and family budget data.

The coefficient for wool type synthetic fibre indicates that, for every 1% rise in *per capita* supply, wool prices declined by 0.14%. Synthetic production has been rising at fairly rapid rates in recent years, and to this can be attributed the major proportion of the decline in prices since about 1955.

Finally, the trend term indicates that, apart from all other factors, there has been a slow but statistically regular decline in prices amounting to about 2.7% per annum. The reasons for this trend are as yet unclear but some preliminary investigation involving the testing of some different models suggests that it emanates specifically from the United States, possibly as a result of the greater penetration of synthetic fibres into the wool market there and of the general reduction over the years in the weights and wool content of cloth produced.

The use of these results for future projections is shown in Table 3 where in section 2 the assumptions as to future population and *per capita* income are given (FAO, 1963), but in this case for 22 countries since the U.S.A. is now included in the model. Two results are given, one on the

TABLE 3: PROJECTION OF WOOL PRICES 1960-70 USING MODEL  
(Based on Regression Equation No. 86)

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1. THE COEFFICIENTS OF THE MODEL ARE:

- (a) A 1% rise in real income per head causes a 2.3% rise in wool prices
- (b) A 1% rise in supply of wool per head causes a 2.3% fall in wool prices
- (c) A 1% rise in synthetic supply per head causes a 0.14% fall in wool prices
- (d) Each year wool prices fall 2.7% — trend effect.

2. ASSUMPTIONS ABOUT FUTURE GROWTH RATES OF DATA:

- (a) Rise in real income per head in 22 countries (inc. U.S.A.) of ..... 3.0% p.a.
- (b) Rise in population in 22 countries of ..... 1.2% p.a.
- (c) Wool supply in 22 countries:
  - (i) With N.Z. production increasing at present rate world production will increase at 2.0% p.a. so world production *per capita* will increase at ..... 0.8% p.a.
  - (ii) With N.Z. production increasing at 5% p.a. world production will increase at 2.6% p.a. so world production *per capita* will increase at ..... 1.4% p.a.

3. IMPLICATIONS FOR WOOL PRICES:

		<i>With Wool Supply</i>	
		<i>Assumption</i>	<i>Assumption</i>
		(i)	(ii)
(a) Effect of income	3.0×2.3	+6.9% p.a.	+6.9% p.a.
(b) Effect of wool supply	(i) 0.8×2.3 (ii) 1.4×2.3	-1.8% p.a.	-3.2% p.a.
(c) Effect of time trend	.....	-2.7% p.a.	-2.7% p.a.
Net effect of (a), (b), (c)		+2.4% p.a.	+1.0% p.a.
Allowable growth in production of synthetic for wool price stability (net effect ÷ 0.14)	.....	17% p.a.	7% p.a.

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assumption that New Zealand and world wool production continues to increase at its present rates, and the second that New Zealand production rises to 5% per annum so that world production rises to 2.6% per annum. In the third part of the table are calculated the implications for wool prices before allowing for wool-type synthetic fibre increases and in the last line is given the

maximum growth in synthetic production beyond which wool prices would decline below their base level — in this case the year 1960. On wool production assumption (i), synthetic production can grow at 17% per annum before wool prices are affected; on assumption (ii), the figure is 7% per annum.

#### GENERAL IMPLICATIONS OF PROJECTIONS

These two projections represent two of a whole range of various approaches used but, broadly speaking, the results are not dissimilar. In the first case, it appeared that demand for wool would grow at about 3.3% per annum — still more than adequate to absorb a 5% per annum New Zealand increase. In the second case, the results indicate that New Zealand production could rise to 5% per annum without depressing prices provided synthetics grew at no more than 7% — somewhat lower than the 13% growth rate from the first method of estimation.

These projections are, of course, only as good as the assumptions on which they are based, which as it happens are on the conservative side. While some will doubt such long-term projections, no one can doubt the usefulness of laying bare the framework and exploring the operative variables. In this case the critical variable is obviously the future growth rate of synthetic fibres, a matter which will now be examined.

#### WOOL TYPE SYNTHETIC PRODUCTION PROSPECTS

What are the prospects of wool type synthetic production in the next decade increasing at no more than the critical rate of about 10% per annum? Frankly, this does not seem at all unrealistic. It is true that the annual rate of growth for the last decade has been very high indeed (which is not surprising for a product which was introduced only in the early 'fifties), but in recent years it has slowed down quite markedly from about 60% per annum in the first half to about 25% per annum in the latter half of the decade. It is not at all unreasonable, therefore, to expect a fall towards 10% per annum. Perhaps one can learn something from the experience of rayon — introduced in 1920. For the first twenty years the growth rate of world rayon production was dramatic and at the expense of cotton consumption. But from 1940 to 1960 the rayon growth rate slowed down quite markedly and in the same period world cotton consumption doubled.

The rate of expansion of synthetic production will depend on its prospective profitability, that is, on the relationship between production costs and the prices at which it is expected new output can be sold. Such expectations will depend in part on the rate at which supplies of wool are increasing. Any evidence of a retardation in the rate of increase in world wool supplies and the prospect of higher prices will encourage synthetic producers to expand plants and production. But such expansion is likely to be slower in a world continually well supplied with wool at competitive prices. On these grounds it seems that increasing production is not only desirable but is probably imperative if only to protect the existing wool markets.

Moreover, it should be noted that, even if the synthetic rate of increase does not fall to the 10% per annum which was suggested as the maximum required for wool price stability, then the effect on wool prices would not be disastrous. For example, if the rate fell to 15% instead of to 10%, the effect on prices could be a decline of only about  $\frac{1}{4}$ d. per lb per annum.

#### SOME SPECIAL NEW ZEALAND ASPECTS

One or two further matters of specific relevance to New Zealand should be mentioned.

Unlike the situation which faces New Zealand in butter and meat where we are major suppliers of one market, in the wool market we provide only about a fifth of world supplies and the effect on world prices of changes in the New Zealand supply rate is for that reason considerably reduced. Thus an increase in New Zealand supply of, say, 10% would increase world supplies by only 2% and depress prices by 4%, still leaving a clear gain in terms of increased revenue.

A further factor in the argument for increasing New Zealand wool production is that we have now become an important supplier of carpet wools to the United States. There is some evidence from the price analyses carried out for crossbred wools that the strength of United States demand for New Zealand carpet type wools is the result of a decline in the supply of these wools from traditional sources—India, the Middle East, etc.—and one can expect this demand to continue and even perhaps increase. The issues involved are discussed by Candler (1962) and the writer is in agreement with his views that if New Zealand is to exploit fully and expand this market some

radical changes in marketing and promotion procedures will need to be adopted.

One further matter, which fits into this section of the argument, concerns the wool textile industry in New Zealand. Some preliminary work done at Lincoln College on the demand for wool textiles in New Zealand has revealed that this is strongly influenced by real income per head and by the price of wool textiles relative to other textiles. The reason why *per capita* consumption of wool textiles is now, if anything, lower than it was in 1939, in spite of a 50% rise in *per capita* incomes, is that prices (in real terms) have also risen about 50% compared with an 8% rise for other textile prices. The higher price of wool textiles has come about through the substitution of high cost local production for lower cost imports. A country so vitally dependent on wool and spending a lot of money on promotion should be very concerned at such a situation. By adopting far more liberal import policies for wool textiles, particularly in respect to Japanese products, we would not only be doing a good service to the wool industry by increasing the overseas demand for our wool but also, as it happens, confer a great benefit on the New Zealand consumer.

This point can be carried further by referring back to the very rapid growth in net exports of wool textiles from the 21-country group. Obviously, the health of the world wool market depends vitally on the greatest possible freedom in international trade. New Zealand interests in wool and other export products demand that we in New Zealand behave properly in this respect so that we can more effectively press for the removal of trade restraints in other countries.

#### WOOL MARKETING CONCLUSIONS

The evidence adduced in the foregoing paragraphs, sketchy as it has necessarily been, nevertheless provides a clear-cut affirmative answer to the question posed at the start, namely, can New Zealand sell 5% more wool per annum at reasonable and stable prices?

While remaining fully conscious of the frailties of econometric models and of long term projections based on them, confidence in the present projection may perhaps be increased if it is recalled that New Zealand's experience in the wool market over the last decade, and particularly the

last few years, has proved correct an earlier projection (Philpott, 1954, 1955), using a similar, if rather more rudimentary, approach.

This section can be concluded with a note on further research into wool marketing which is required, some of which has been commenced or is planned to commence at the Lincoln College Agricultural Economics Research Unit:

- (1) Implications of improved marketing procedures for wool aimed at eliminating price fluctuations and possibly allowing fixed price selling of wool with quality guarantees, etc., as is done with synthetic fibres.
- (2) The special problems and requirements in the marketing of carpet wools in New Zealand and the United States.
- (3) The economics of wool grades — premiums for style and quality and for specialty wools such as paper felts and the penalties for wool faults.
- (4) Factors affecting demand for wool in each of the countries of the 22-country group and the nature of synthetic competition and penetration in these countries.
- (5) End use studies of New Zealand crossbred wool.

#### LAMB AND MUTTON MARKET PROBLEMS

Detailed work at Lincoln College on the British price and income elasticities of demand for lamb and mutton has confirmed earlier suggestions (Philpott, 1961) that, unless there were a considerable decline in British lamb production, New Zealand is unlikely to be able to sell greatly increased quantities of lamb in Britain without suffering fairly drastic declines in price and, therefore, little gain in money revenue. There is not space to go into this matter in great detail but, briefly, this situation has arisen from the quite low income elasticity of demand for lamb (about 0.3 compared with 1.0 for wool), the slow growth of British population and *per capita* income, and the greatly increased supplies of subsidized British lamb.

The future position is, moreover, somewhat clouded by current changes in emphasis in British agricultural policy, stemming partly from a desire to reduce the ever-growing subsidy bill and also, perhaps, to move more towards a high internal price policy for agricultural products which

is more consonant with that characterizing E.E.C. countries.

The results of the negotiations on these questions which are currently in progress are, as yet, unknown, but it seems fairly clear that New Zealand will have to accept some form of restriction on the rights of free entry of meat into Britain. A personal view is that the outcome is likely to take the form of an arrangement under which the British subsidies on lamb are restricted to some fixed standard quantity—in an attempt to restrain the British producer from increasing output—while in return New Zealand would be asked to restrain the increased quantities of lamb to be sold in Britain each year to an amount subject to prior consultation and argument, which would preserve the stability of prices in the lamb market or even increase them. The increased quantities which we hope to sell would be largely dictated by the growth of British population, income and supplies and prices of other meats. Taking into account all the complex interrelationships between prices and supplies of different meats and adopting fairly conservative assumptions about the growth in supplies, population, income, etc., some lamb demand projections for the next decade have been made (Philpott, 1963a) which suggest that to preserve stability of prices New Zealand could market at the most about 1% per annum more lamb.

The growth of new markets for lamb has so far been extremely slow and the problems involved in market development, especially in the United States, seem such that this slow growth will continue for some time. Overall it is therefore difficult to envisage selling 5% more lamb per annum over the next decade.

By contrast, the expansion of new markets for mutton, especially in Japan, has been nothing short of dramatic—from 8,000 tons in 1957–58 to 37,000 tons in 1962–63, the quantities going to Japan in that period rising from zero to 28,000 tons.

Whether this very rapid growth in mutton sales in the future will compensate New Zealand in volume and value terms for a slowing down in lamb sales is a matter to which a lot of research attention is now being devoted but it has always seemed highly probable that we would eventually have to shift the emphasis in our meat marketing away from lamb and towards mutton. This probability now seems a certainty if we are faced with the imposition of physical quotas on our sales of lamb in Britain.

Research requirements in the field of meat marketing, now under way at Lincoln College, are therefore concerned with the whole question of new market growth in demand for mutton of various types and grades. Associated with this, of course, are a whole range of very difficult farm management questions concerning a switch of emphasis from lamb to mutton and wool to which reference will be made in the next section dealing with production, rather than marketing, questions.

#### ECONOMIC IMPLICATIONS OF INCREASED WOOL PRODUCTION

After this long discussion of marketing questions, it is necessary now to turn briefly to problems relating to production with major emphasis on research required. For the purposes of the present discussion, it seems convenient to think of two major sources of increased wool production, first, that arising from increased sheep numbers in general and, secondly, increases springing from a shift in emphasis from lamb production to wool and mutton production.

#### INCREASED SHEEP NUMBERS

Here the concern is with the whole question of more intensive stocking of the developed pasture areas as well as the major problem of development of the hill country which is probably the area from which the greatest contribution in terms of increased sheep numbers can be expected. At the recent N.Z. Institute of Agricultural Science Conference, Philpott (1963b) discussed the wide range of relevant general economic problems associated with increased production, including the capital requirements (of about £40 million p.a.) and the national economic policies, such as abolition of import control, better borrowing and taxation arrangements, which are necessary to ensure that the required physical resources flow into the agricultural sector and not elsewhere. Research in this field is now under way at Lincoln College.

But, apart from these important national questions, and considering the individual farm economic level, the important area of research is concerned with assessing the profitability of increased stocking at various levels and of hill country development in particular. The very minimum in the way of incentives to develop will be that it is known to be profitable, and even this in many cases will

be inadequate and other measures will be required. Research into the profitability of development requires a lot more co-operation than has been the case in the past between workers, scientists and farm management experts in the design of small farm experiments aimed at establishing the profitability of various management systems. In the context of hill country development, the matters for consideration include such things as optimum rates of development, the overall compared with the paddock-by-paddock approach, the optimum fertilizer rates, and optimum carrying capacity.

#### CHANGE IN THE PRODUCT MIX

The second source of increased wool production is from a greater accent on wool and mutton production at the expense of increased lamb production, both on existing developed farms and in the management systems of developing areas of hill country.

In some areas of New Zealand high country and tougher hill country, such a move is possibly profitable, even at present relative wool and lamb prices (Ward, 1960), though a lot more research is needed to establish the type of country at which the break-even point occurs. Such research by farm management workers is at present hampered by lack of knowledge on the performance of dry sheep and the technical coefficients relevant to a wool production management system.

But on easier hill and lowland country, with present relative prices for wool, mutton and lamb, any switch away from lamb production appears to the individual farmer to be unprofitable — appears to be unprofitable to the individual because over the last five years or so the farming industry as a whole would probably have profited from some such change in emphasis, bearing in mind the depressing effect on lamb prices of increased supplies compared with the fairly elastic market for wool discussed earlier in this paper.

Be that as it may, the earlier analysis of the *present* lamb marketing situation suggests that New Zealand may soon be forced to put a brake on increased lamb production, whether we like it or not, probably by centrally organizing marketing procedures so that part of the proceeds of lamb sales are skimmed off and used to encourage mutton production.

On all counts, therefore, we should be looking to the future, and in our research now assessing the profitability

of alternative management systems stressing mutton and wool production. Again this involves the co-operation of farm management workers with scientists in the proper design of small farm experiments taking all aspects (e.g., fodder conservation in the dryland South Island areas) into account.

J. D. Stewart at Lincoln College has already started work on investigations of wool-orientated management policies on irrigated farms but work such as this can go only as far as the technical input-output data allow. It seems clear, therefore, that in many of the areas of applied research, such as nutrition, wool growth, and optimum fleece weights, there is a strong case for co-operation with modern farm management experts so that, wherever possible, there are derived the necessary technical data in a form suitable for use by farm management workers in assessing the profitability of alternative systems under various alternative cost price regimes.

Measurement of technical efficiency in production is important but it must be supplemented by measures of economic efficiency, for the true test for the nation and for the individual of the results of applied research is "does it pay?"

Indeed, there is no hope of inducing farmers to adopt improvements that follow from research unless, through extension work, they can be convinced that change is profitable.

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## DISCUSSION

PROFESSOR I. E. COOP: *Professor Philpott has suggested that we will be unable to sell very much more lamb on the U.K. market and that increased lamb sent there will draw declining financial returns. It is my opinion that any withdrawal of our lamb from the U.K. market would quickly be replaced by U.K., home-produced lamb, and that in spite of the probability of declining returns our policy should be to keep the U.K. market saturated.*

PROFESSOR B. P. PHILPOTT: For a detailed reply to this point I would refer Professor Coop to a press statement I made in reply to a similar view (put forward by a spokesman for Thos. Borthwick & Sons) and published in the *Christchurch Press* of February 24, 1962, where I demonstrated that higher export receipts could easily accrue to us even if other suppliers increased their supplies to fill any gap caused by New Zealand sending lamb elsewhere. This depends, of course, on the price we receive in alternative markets and it also depends on the production response of other producers or suppliers to a change in price—*i.e.*, their elasticity of supply. We have used some recent estimates of elasticities of supply of lamb in Britain, and even when one allows for this it can be clearly shown that switching supplies to other markets even at slightly lower prices is likely to be more profitable.

One final point—at no stage have I suggested that we should *withdraw supplies of lamb from Britain in order to raise prices*. What I have suggested is that we should consider *slowing down the rate of increase of supplies in order stop prices falling*—and this is a very different thing.

PROFESSOR W. V. CANDLER: *Could Professor Philpott comment on the need for institutional versus econometric research? I would like Professor Philpott's comments on the rule of thumb that, "50% of econometric work by others (and by one's self in the past) has serious errors". What sort of resources does Professor Philpott think would be optimum for the five research projects on wool he mentioned in his paper? I would also like to underline Professor Philpott's point that there is little information which would enable us to point to forms of sheep farm development which are profitable to the individual farmer.*

PROFESSOR PHILPOTT: Of course there is a need for institutional research as well as econometric work, but I am of the opinion that good institutional work—*e.g.*, in the field of wool marketing schemes—must take account of the relevant quantitative relationships which are applicable to the particular institution under study; that is, if the research is going to lead to policy suggestions and not be purely descriptive in character. Econometric research sets out to establish such quantitative relationships and I am well aware, with Professor Candler, of the difficulties of this sort of work and the errors which can be made. I would not place the proportion as high as 50%, but even if it were I do not feel that this provides a reason for not pressing on with such work and, on the basis of practical experience, endeavouring to improve our methods. In the particular field of wool economics I am heartened, as I said in

my paper, by finding earlier forecasts, made on basis of fairly crude econometric work now coming true.

As far as the allocation of resources, to the five marketing projects I mentioned, is concerned, there is both the question of allocation of research resources to these projects as a group as compared with research in production and also allocation to projects within the group. Both problems are extremely complex. If we want a rule-of-thumb, we should allocate resources on the basis of marginal "pay off" of a project per £1,000 of resources used. But it is still a guess as to what is the "pay off" of each project or of production research in general compared with marketing research.

My own *subjective* assessment is that the relative "pay off" in marketing is likely to be greater if only because of our profound technical and economic ignorance in this field, and I would certainly say that the £1,500 per annum at present generously provided by the Wool Research Organization for wool marketing research at Lincoln is hopelessly inadequate. Some of the marketing projects I have suggested would involve people working overseas and this is expensive. But bearing in mind the expenditures on market research of big industrial firms, it would not be too fanciful to suggest that up to at least one per cent. of our gross wool income — *i.e.*, about £1 million — should be spent in this way, over and above the amount which is at present spent on advertising and promotion which I might stress is *not* market research.