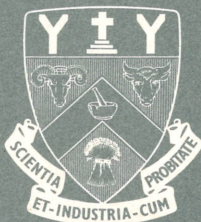


AGRICULTURAL ECONOMICS
RESEARCH UNIT



Lincoln College
UNIVERSITY OF CANTERBURY
New Zealand

THE NEW
AGRICULTURAL ECONOMICS
RESEARCH UNIT

by
B. P. PHILPOTT

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LINCOLN COLLEGE
University of Canterbury

Reprinted from the

LINCOLN COLLEGE

ANNUAL REVIEW

1963

PRINTED AT THE PEGASUS PRESS

CHRISTCHURCH, NEW ZEALAND

THE NEW AGRICULTURAL ECONOMICS RESEARCH UNIT



PROFESSOR B. P. PHILPOTT

*Professor of Agricultural Economics and Director
of the Agricultural Economics Research Unit*

IF New Zealand is to provide higher living standards for an increasing population it will have to speed up its rate of exporting. Obviously increased exports must come mainly from the agricultural industry. With a 2% per annum population increase, and to provide a 2% per annum increase in living standards, we will probably have to increase our export income by somewhere around £15 million per annum.

The farming industry has the potential to provide greater exports. A recent conference of the Institute of Agricultural Science estimated that the application of known methods of production on all our farms would lead to an increase of 80% in production above the present level. This is a reflection of the great advances which have been made in New Zealand in scientific research where, in some fields, we lead the world.

However, setting potential targets is only the first step. In order to turn an 80% potential into a 4% per annum rate of growth, we will need constructive economic policies to encourage increased exports. This means an expanded economic research programme to supplement the vigorous scientific research mentioned above.

The present article describes the programme of economic research which has now been put in train at the Agricultural Economics Research Unit recently established at Lincoln College.

THE AGRICULTURAL ECONOMICS RESEARCH UNIT

The Department of Scientific and Industrial Research established this Unit with an annual financial grant of £5,000 in August 1962. The Unit operates as an integral part of the University under

the control of the Council but drawing its financial support from the Department of Scientific and Industrial Research and other sources. The Wool Research Organization is supporting a programme of wool marketing research with a grant of £1,500 yearly and the Unit also has a grant of £700 from the Forest Research Institute for research into land use for forests and agriculture. The organization of the Economics Unit within the University follows the pattern established in Great Britain. Here, the University agrees to provide the free services of one of its staff to direct the Unit and also to provide the accommodation, physical and clerical facilities, while the Department of Scientific and Industrial Research pays for the staff, equipment, and other research costs.

The author is the Director of the Agricultural Economics Research Unit as well as being Professor and Head of the Department of Agricultural Economics. Other Lincoln College staff members acting as project leaders are associated with the work of the Unit. These staff members are Dr J. T. Ward, Senior Lecturer in Agricultural Economics, Dr J. D. Stewart, Senior Lecturer in Farm Management, and Mr A. T. G. McArthur, Senior Lecturer in Rural Education.

So far the Unit has appointed Mr R. H. Court, B.A., B.Sc., Mr R. J. Townley, B.Ag.Sc., Mr A. R. Frampton, B.Ag.Sc., as full-research officers and Mr E. D. Parkes, B.Ag.Sc., and Miss M. J. Matheson, B.Sc., as research assistants. Mr M. W. Calder is working as a temporary research assistant.

THE RESEARCH PROGRAMME OF THE UNIT

The central theme of the research programme of the Unit is to find the means of increasing the rate of growth of agricultural production from its present rate of around 3% to the needed rate of around 4%. The Unit aims to answer a whole range of questions which can be summarized in the question "What are the economic problems of a faster rate of growth of agricultural production?" This question actually breaks down into three major topics which we can summarize as follows:

(1) *Marketing Economics*

What products can we sell in the future in quantities amounting to an increase of 4% per annum and where and how can we sell them?

(2) *Production Economics*

What resources are required to increase production to 4% per annum?

(3) *Agricultural Inter-Industry Relationships*

What are the implications for the rest of the economy of an increased rate of agricultural production—in particular, what resources of an indirect nature are required in ancillary industries servicing agriculture in various ways?

Each of these three major areas of research will be under the direction of a research officer or staff member designated as a project leader. There is a large amount of overlapping between the projects. For instance, we cannot really move very far in matters concerned with production economics until we have some indication of the market prospects for various products. This means that one of the questions we will want to answer in production economics research is what products should be increased in production and what products should not.

THE METHOD OF ECONOMIC RESEARCH

Before reading of the research work in progress in these various fields, readers may wish to know something of the method used in economic research. The basic method is the same as that in other sciences, depending as it does on observation by measurement, the formulation of hypotheses and the verifying of these hypotheses. However, unlike the natural scientist, the economist has not the same opportunities for hypotheses testing. The biologist can set up a controlled experiment in which each factor which he believes to have a function can be varied independently and its effect measured. Obviously opportunities for this kind of research are limited in economics. It is not possible to divide a country in two and compare the rates of progress under two systems of taxation! As an alternative method, the economist formulates his hypothesis and then tests it to see how closely it fits the facts from the past. If it does not fit closely, then he reformulates another hypothesis and tests this one.

A study of the factors affecting lamb and mutton consumption in Great Britain illustrates one of the main techniques used in economic research. A series of figures from the British National Food Survey gives the quarterly consumption of various foods together with the prices paid by a sample of 9,000 British households between 1955 and 1960. This figure replaces the subjective assessment of practical business authorities with objective measurement.

The next step is to formulate a series of hypotheses as to the

factors which could possibly influence the variation in the demand for meat given by these figures. After looking at a whole series of factors we eventually found the following to be important.

- (1) The retail price of lamb and mutton.
- (2) The retail price of beef.
- (3) The retail price of poultry.
- (4) The retail price of so-called non-carcass meat (ham, offal sausages, prepared meats, etc.)
- (5) The income of the family.
- (6) The time of the year.

Going a step further we calculate the influence of each of these factors on demand. The demand for lamb and mutton and the above factors were all expressed as index numbers with 1958=100. That is if the average income in 1958 was £10 per week and the average income in 1962 was £12 per week the income in 1958 would be expressed as 100 and in 1962 as 120. Using the statistical technique of regression analysis it is possible to calculate the influence of each factor on the demand for lamb and mutton. For instance, it was found that when the index number for income per head rises one unit the index number for demand goes up a quarter of a unit. As index numbers are really percentages we can say that a 10% rise in income per head in the United Kingdom will lead to a 2.5% rise in the demand for mutton and lamb.

The influence of the variables is shown below:

A 10% rise

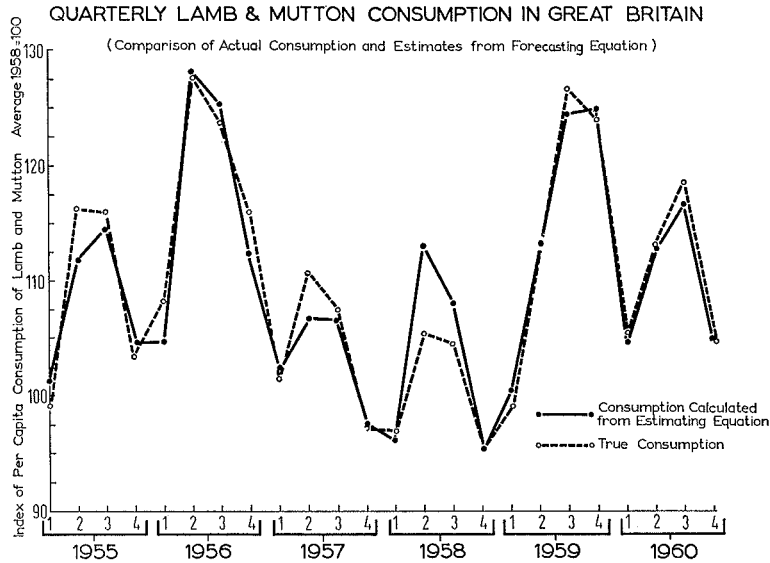
- in income per head leads to a 2.5% rise in demand.
- „ price of lamb and mutton leads to a 20% fall in demand.
- „ price of beef and veal leads to a 3% rise in demand.
- „ price of poultry leads to a 2% rise in demand.
- „ price of non-carcass meat leads to a 10% rise in demand.

There was also a 4.5% decline in demand in the first quarter of the year, a 8.9% rise in the second quarter and a 13.3% rise in the third quarter.

Using this data from our regression equation it is possible to look back into the past (between 1955 and 1960) and see how accurately we can predict the demand for lamb and mutton with the factors given above. This has been done in the diagram which compares true consumption with estimated consumption. We can explain about 93% of the variation in demand for mutton and lamb by these factors.

Useful conclusions can be drawn from this kind of data. Firstly, the retail price of lamb and mutton has by far the most important

influence. A 10% increase in price means a 20% decrease in demand. The prices of other meats do have an effect but to a very much smaller degree, except the price of non-carass meat whose influence is important. Income per head in the United Kingdom is not an important factor. Finally, demand reaches a peak in the third quarter of the year.



These conclusions can be used for policy decisions. We can calculate, for instance, what will be the influence on demand of rising incomes in Britain. Unfortunately, this can not help us much. We can calculate what will happen to the export income in New Zealand by sending an increased quantity of lamb to the British market. Finally, information on the seasonal change in demand can be used to control the flow of our meat to Britain over the course of the year in order to maximise our sales receipts.

MARKETING ECONOMICS

The question which this research aims to answer is "What sort of products can we hope to sell in the future at an increased rate of 4% per annum, where can we sell them, and what changes in marketing organization are required in order to achieve this rate of sales?" The following represents a list of the projects which are either under-way or are projected in this broad field:

Meat

- (1) Factors affecting demand and prices for New Zealand meat in Great Britain, and the future prospects for growth in demand over the next decade.
- (2) The effect of scheduling of supplies of meat over the course of the year in order to secure maximum returns.
- (3) The implications of alternative British trading policies (such as quotas, farm subsidies, etc.) with respect to British demand for New Zealand meat.
- (4) The growth of demand for meat in the European Economic Community and its member countries and the implications of alternative E.E.C. trade policies with respect to the demand for imports from New Zealand.
- (5) The prospective demand for lamb and beef in the United States.
- (6) A survey of the future growth in demand for imported meat in possible new markets such as Italy, Greece, Japan, South-East Asia.

(Projects Numbers 1, 2 and 3 are already under-way. We will start the remaining projects during 1964.)

Dairy Products

- (1) Prospective growth in British demand for dairy products and the implications of alternative British policies for the demand for imports from New Zealand.
 - (2) Prospective growth in demand for dairy products in Japan and South-East Asia.
 - (3) Arrangements required for new market development in Japan and South-East Asia.
 - (4) The role of international commodity agreements for dairy products with special reference to new market development.
- (Project 1 has been started.)

Wool

This area of research, as mentioned before, is supported by a special grant from the Wool Research Organization.

- (1) Factors affecting the world demand for wool and the reasons for wool price fluctuation.
- (2) The factors influencing the substitution of synthetic fibres for wool.

- (3) The design of wool marketing methods aimed at eliminating price fluctuations.
 - (4) Demand for New Zealand wool in various markets.
 - (5) The structure of the New Zealand wool textile industry.
- (Projects Numbers 1, 3 and 5 are now under-way.)

Should additional finance to support research be forthcoming, we hope to start research on the marketing of horticultural products in New Zealand and overseas.

PRODUCTION ECONOMICS

The question which we set out to answer in this area of research is "What additional resources (finance, labour, knowledge, etc.) are required to increase production to 4% more per annum and what new institutions and changes of organization are required to assist in the flow of these resources to agriculture?"

(a) *Resources Required for 4% Growth Rate:*

Trends in capital and labour use and the growth of efficiency in agriculture over past decades are being studied in order to elucidate the relationships between resource used and output achieved in the past. This helps to make future projections. (The initiation of this research was made possible by a special grant from the Nuffield Foundation.)

(b) *Economic Impediments to Increased Production in New Zealand Hill Country:*

This project is designed to investigate the profitability of hill country development and to assess the economic impediments which prevent farmers from embarking on development programmes, and to suggest measures needed to overcome these impediments, such as tax policies and financing arrangements.

This project is being undertaken in co-operation with the Department of Agriculture and the New Zealand Meat and Wool Boards' Economic Service. The Research Officer involved is Mr J. S. Holden, a member of the staff of the Department of Agriculture, and the leader of the project at Lincoln College is Dr J. D. Stewart of the Farm Management Department.

(c) *Adjustment Problems in the Dairy Industry:*

Initial research into the marketing field suggests that we are not going to find it as easy to increase dairy products sales by 4% per annum. It is possible, therefore, that we shall need to implement sensible policies to encourage increased production in areas suitable for dairying while inducing farmers to shift to other products in

areas which are not so suitable. This project is aimed at investigating this question in order to be prepared in advance.

(d) *Economics of Land Use for Agriculture compared with Forestry:*

The problem being investigated here is how best to decide scientifically the optimum use of developable land for either of these two products, bearing in mind alternative costs of development—the length of time involved in growing trees compared with producing grass. This research, which is under the general direction of Dr J. T. Ward, is partly financed by a grant from the Forest Research Institute.

(e) *Agricultural Finance:*

This project is concerned with the whole question of the flow of finance to agriculture and the changes which may be thought desirable in the arrangements for financing agriculture production in order to stimulate an increased rate, and it is also concerned with the type of tax policies which are desirable for agriculture.

(Projects at present under-way are a, b and d.)

AGRICULTURAL INTER-INDUSTRY RELATIONSHIPS

Here we are concerned with the relationships between the agricultural sector and the other broad economic sectors of the economy, such as manufacturing, transport, building, commerce, etc., and in particular we aim to answer the question “What are the economic implications for the rest of the economy of a 4% rate of growth of agricultural production?”

If agricultural production is to expand at a faster rate than at present, then not only will it require greater supplies of resources used directly in production on the farm, but it will also have fairly wide repercussions throughout the rest of the economy. For instance, it is well known that the agricultural labour force has not expanded over the last decade, indeed it has contracted, but to offset the contraction in direct labour use, farmers have increased immeasurably the purchases of goods and services from other sectors, all of which have involved employment of an indirect nature throughout the economy. The aim of this inter-industry study is to make clearer this pattern of inter-relationships between agriculture and the rest of the economy which springs from the fact that increased farm production will require increased use of labour and capital in other industries, in particular, those industries which are involved in providing farmers with the inputs required, such as fertilizer

and machinery, and those industries which are involved in transporting, marketing and processing farm products.

The investigation of this pattern of inter-industry relationships proceeds by the construction of what is known as an input-output table in which all the interlocking relationships between industries in the economy are set down in the form of a large matrix. The construction of such a matrix is at present under-way by the Department of Statistics in Wellington but it is necessarily being done on a fairly broad front since the Department is interested in all industries and not specifically in agriculture. The Agricultural Economics Research Unit will therefore concentrate on a more detailed study of the agricultural industry in its relationships with the rest of the economy.

The projects under this area of research are thus as follows:

- (a) The inter-industry relationships of the agricultural sector, showing for 1960 the pattern of relationships between agriculture and other industries in the economy.
- (b) Labour and capital requirements in industries ancillary to agriculture.

This project is designed to measure from published statistics and special surveys, the resources of labour and capital required and the increase in efficiency achieved by the industries which process and market farm products and which are involved in supplying farm inputs such as fertilizer and machinery.

Indirect Labour and Capital Requirements in the Economy by 1970 with Increased Rate of Growth of Agricultural Production:

By using the input-output table employed in (a) above in conjunction with the measurement of resource requirements in (b) above, the effect on the distribution of employment throughout the economy and the capital required in different sectors of the economy could be forecast for some future year, thus providing a guide to the resource requirements of the rest of the economy springing from the increased rate of output of agricultural production.

CONCLUSION

The research programme which has been outlined above is all related to the central theme of the economic implications of increased agricultural production.

An increase in agricultural production from 3% per annum to 4% per annum may not appear to be a very demanding target but, representing as it does a $33\frac{1}{3}\%$ increase, it is a very exacting task if it is to be sustained year in and year out over the next decade or

so. It is quite certain that it will not be achieved unless the nation adopts successful and coherent planning policies directed towards the desired end. While it is true that research which aims at looking to the future is always fraught with great difficulty since we can never forecast the future accurately, it is, nevertheless, imperative that we start now trying to explore the implications for the nation as a whole of achieving increased farm production. Major attention will be placed in the work of the Unit on publishing results of research projects as they come to hand, both for the general public and, in particular, for those Government departments, public bodies and firms that are vitally involved in framing Government and business policies which impinge on agriculture.