THE DETERMINATION OF FUTURE OUTPUT FROM SHEEP AND CATTLE FARMS -- AN INVESTMENT STUDY

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CHAPTER ONE

INTRODUCTION

Agricultural supply analysis is concerned with the practical and important problems of explaining historical and predicting future patterns of livestock and crop production. Production at the farm level is the foundation of supply at the regional or national level. Decisions which determine the production of the different agricultural products are made at the individual farm level. The collective results of these decisions are the aggregate supplies which are available for export, local consumption or further processing.

The objectives of supply analysis are to answer three questions: Why has production changed in the past? How may aggregate production be expected to change in the future? How may production be expected to respond to alternative controls contemplated by policy makers in Government? In developing countries policy makers need to know what is required to provide sufficient incentive for farmers to expand production. Highly developed countries such as the United States have sometimes suffered from an oversupply of particular products. Policy makers in these countries may need to know how production can be reduced, or diverted to more profitable products.

One approach to answer these questions could be to survey all farmers and/or experts in the field of agriculture to obtain their opinions on the answers to these questions. This would be a very expensive and time consuming exercise, particularly since in a dynamic world of continual change, repeated updating of information gathered would be required.

An alternative approach adopted by many supply analysts is that of mathematical modelling. Mathematical models define variables precisely and assumptions explicitly, so that complex relationships can be analysed and conclusions derived that cannot be derived by

verbal or diagrammatic analysis. Abstract models can be developed to a very high degree of complexity limited only by knowledge of the system and by the ability of the researcher to translate his knowledge into functional forms. In general, increased complexity leads to added "realism", but in practice form and complexity need to be related to the objectives of the study, for interpretation of the results is highly dependent on both these attributes.

Techniques such as budgeting, mathematical programming, simulation and regression of time series data have been used in attempting to quantify supply responses to price changes and other variables of interest. In addition to the various techniques that can be used, there are various levels of aggregation from which the problem can be approached. These range from national aggregate responses to individual farmer responses.

1.1 Objectives of The Study

The objective of this study is to investigate the role of investment analysis as it relates to the processes which determine future livestock numbers and supplies of livestock products. The initial Chapters of this thesis are concerned with the principles of investment analysis and with their application to the individual farm situation. A model is then built that attempts to simulate the investment and output decisions made by a representative farmer. The representative farm modelled is the North Island Hill Country (Class 3N) farm derived from the New Zealand Meat and Wool Boards' Economic Service's Sheep Farm Surveys. If the methodology of this study is successful then similar models could be built for the other Farm Classes.

The behavioural hypothesis made is that the farmer will plan to use his productive assets to generate a stream of income of the greatest possible value to him for some period after he makes his investment/output decisions. The major productive asset of interest in this study is livestock which can be viewed as either a consumption good to be sold for slaughter or to another farmer for

further fattening, or as an investment good in which case retained for further fattening and/or breeding.

The time period with which the farmer is concerned is the time period over which income (or business activity) is important to him i.e. his time horizon. Included in the behavioural hypothesis is the assumption that the farmer fully recognises the interdependence between changes in current output and potential future production.

1.2 The Production/Investment Model: Conceptual Framework

There are two aspects to the mathematical model of a farming system developed in this study. The production process describes the on-farm physical conditions that constrain the farmer's production possibilities or plans. The decision process involves the selection of the best plan according to the farmer's objectives and expectations.

The framework of the model is based on the notion of Hicks (1946) who developed a dynamic decision-making model of the firm under certainty. According to his view, just as in static theory, the firm is to choose from among alternative available courses of action, the one which is most conducive to the achievement of its goal. The decision problem faced by the firm at any given time is the selection of the best plan over the planning horizon. A fundamental way of measuring the preferred production plan involving costs and returns in future periods is that of capitalized value of the stream of surplus, which Hicks called the capitalized value of the production plan.

Following Modigliani and Cohen (1961) and Carvalho (1972), the notion developed by Hicks is modified for this study. Long-run plans are not necessarily made up in order to be implemented, but only to utilize all the available information to make the best plan for the current period. Since expectations in one period relative to economic and environmental conditions in future periods might be held with great uncertainty, the production and investment plans which are based on expectations must continuously be adjusted or revised with time. Emphasis is placed on the first move of the

planning period which cannot be postponed and, hence, must be carried out.

1.3 Livestock Numbers or Product Supplies

A distinction should be made between models designed to project future livestock numbers and models designed to project future livestock product supplies. Approaches to both problems are very similar, the distinction usually being in the data used, with the latter requiring some sort of yield estimates. As an example, an increase in livestock numbers does not mean that at a particular time in the future, sales for slaughter will necessarily have increased as well. This will depend on market conditions at that particular time. However, an increase in livestock numbers over a period of time must affect product supplies eventually, provided that the increase does not significantly decrease yields. This study concentrates on attempting to explain increases in livestock numbers while recognising that the objectives and methodology of both types of problem may be similar.

1.4 Thesis Guide

Chapter Two is a review of the Theory of Investment as it relates to principles derived under conditions of certainty about the future.

Chapter Three applies some of the principles discussed in Chapter Two to the farm situation. The importance of viewing animals as consumption and/or investment goods is extensively discussed.

Chapter Four reviews previous work done on supply response analysis of New Zealand livestock and livestock products, and overseas studies that have the potential to improve the New Zealand studies. This is followed by a review of models of price

expectation formation, and the expectation model used in this study.

Chapter Five discusses the problems involved in using representative farms in supply analysis and outlines the main features of the representative farm to be modelled.

Chapter Six describes in detail the model and its estimation.

Chapters Seven and Eight give the results and conclusions of the study.