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**ADOPTION OF BOVINE SOMATOTROPIN IN THE UNITED STATES
AND IMPLICATIONS FOR
INTERNATIONAL TRADE OF DAIRY PRODUCTS**

**A thesis presented in partial fulfilment
of the requirements for the degree of
Masters of Agricultural Economics**

Massey University

Palmerston North, New Zealand

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1992**

Abstract

Advancements in biotechnology have led to some of the most important changes in agriculture in this century. The development of synthetic bovine Somatotropin, a hormone which increases milk production from dairy cows, may have a significant impact on the dairy industry in the near future. While bovine Somatotropin, or bST, has been widely studied, its potential impacts, both on milk production and on the economics of the dairy industry, remain controversial.

At this time, bST has not been approved for use in any of the developed countries. It appears that, for a variety of reasons, the United States would be the most likely to approve bST in the near future. If bST is approved in the US, and widely adopted by American farmers, it could increase milk production in the US significantly, although the exact magnitude of its effects are difficult to determine at this time.

Another important factor in determining US milk production is the US government's dairy policy. The policy for 1991-1995 is contained in the recently passed 1990 Farm Bill. The dairy provisions in the 1990 Farm Bill will maintain the current support price for milk at its current level, regardless of how large dairy surpluses become.

Together, the increase in milk production from bST along with a guaranteed minimum support price could lead to significant surpluses of dairy products in the US by 1995. Since the US has traditionally sold its dairy surpluses on the international market at subsidised prices, or simply given them away as food aid, a large increase in US surpluses could have a great impact on the international dairy market. Furthermore, because the 1990

Farm Bill was only passed recently, no studies have yet been published which address the impact of bST under the current policy environment or what effect this would have on the world dairy market.

The objective of this study is to empirically estimate the impact of bST on US production, and determine the implications for international trade of dairy products. A five equation quarterly econometric model of the US dairy industry is used to forecast US production through 1995. Then the effects of bST use are incorporated into the model.

The results show that if bST is adopted in the US as assumed, by 1995 surpluses of dairy products could rise to as much as 12 billion pounds. This surplus would be nearly as large as the record surpluses of the early 1980's, which caused unprecedented disturbances to the international dairy market.

Thus, use of bST in the US could significantly increase the excess supply of dairy products in the world, and thereby lower prices, especially of butter and skim milk powder. New Zealand would be particularly vulnerable to any price reductions on the world dairy market. The European Community, which is the largest exporter of dairy products, may have to increase its own export subsidies to compete against the US. This, in itself could lead to even further turmoil in the world market.

Acknowledgements

Several people have helped me considerably in completing this work. In particular, I would like to thank Dr. Doren Chadee, my advisor, for his assistance in the development and analysis of the model, and his unfailing support. I would also like to acknowledge the rest of the faculty and staff of the Department of Agricultural Economics and Business at Massey University, all of whom have assisted me in some way during the development of this thesis.

I owe a special debt of gratitude to the New Zealand-United States Educational Foundation. Without their financial support, I would not have been able to study in New Zealand at all, much less write this thesis. In particular I would like to acknowledge Mr. Laurie Cox, the Executive Director of the foundation, for his support throughout the time I spent in New Zealand.

Finally, I would like to thank my family and friends "back home." Although they were far away, they remained close. Their support and encouragement were a great help, and greatly appreciated.

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Chapter 1

Introduction

Some of the most important and far-reaching advances in agriculture in this century have been brought about as a result of the widespread adoption by farmers of the latest developments in biotechnology. One of the most widely discussed topics in biotechnology in recent years is the development of synthetic bovine Somatotropin, or bST.

bST is a hormone which cattle produce naturally, but scientists have been able to produce synthetic bST, which has all the same effects. Dairy cows which are treated with daily injections of bST produce more milk with no apparent harm either to the cow's health or to the quality of the milk. Estimates of the amount of increase in milk production due to bST use vary, but bST may increase milk production by as much as 20%.

At present, bST is still being tested, and has not been approved for use in any of the developed nations. It has never been shown to be a risk either to people or cattle, but its use remains controversial. Aside from health concerns, bST has sparked controversy because many believe it could fundamentally restructure the dairy industry wherever it is used. Of the major dairy producing nations, the US would appear to be the most likely country to approve bST in the near future, perhaps sometime in 1992. Even in the US, however, it remains quite controversial.

Much is still unknown about bST. One debatable issue is how

many farmers would adopt bST if it were approved. This would depend most likely on other currently unknown factors such as how much bST would cost, how much it increased milk production per cow, the price the producer received for milk, and other factors. Another controversial issue is how well consumers would respond to milk that had been produced from bST-treated cows.

1.1: Statement of the Problem

Although several studies have estimated the economic impact that bST would have if it were adopted in the US, these studies are found to be lacking in what this author feels are two vital concerns. One is the change in the policy environment since these studies were written. The other is their lack of analysis of the effects that bST could have in making the US a larger exporter of dairy products, and the effects that increased exports by the US would have on international dairy trade.

Previous studies were based to a large extent on the assumption that the dairy policies in the US from the late 1980's would continue into the 1990's. However, since these studies were completed, the 1990 Farm Bill, which will guide US dairy policy from 1991 through 1995, was passed and went into effect. It altered the dairy price support system that had been in place since the passage of the 1985 Farm Bill. Thus, these previous studies have become somewhat outdated.

Furthermore, most studies which analyse bST's effects on the US dairy industry do not carry that analysis over to an examination of the impacts it would have on the international dairy market. One study which did concluded that bST may play

a part in making the US a larger exporter of dairy products. It was based, however, on the same assumptions that were discussed above, that the 1985 Farm Bill policies would be continued in the 1990 Farm Bill. Therefore, that study's conclusions may not accurately show the most probable effects of the use of bST in the US on the international dairy market.

There is, therefore, a lack of information on the effects that the adoption of bST will have on the US dairy industry, and the implications for international trade of dairy products. Since the effects of bST use could be very significant, an indepth analysis is needed to estimate the effects that bST could have if it is adopted in the US under the current policy environment. This analysis could then be used to determine the implications for the international dairy market.

1.2: Objective

This study will estimate the effects that adoption of bST in the US will have on the US dairy industry and the implications for international dairy trade. The purpose is to gain a better understanding of the effects of bST, and of the US dairy industry under the current policy environment, in order to forecast with a greater deal of confidence what the effects of bST use will be.

1.3: Methods

The general procedures followed in the study include the specification and estimation of an econometric model of the US dairy industry. The econometric model is then simulated to generate forecasts of the endogenous variables for the 1991-1995

period. Based on these forecasts, several scenarios of the use of bST under various assumptions are developed in order to analyse the empirical impacts of bST on the US dairy industry, and the resulting impacts of the excess supplies from the US that could be traded on the world market.

1.4 Outline of the Study

The next chapter in this study discusses the US dairy industry and the current dairy policies in the US. It then gives an overview of the policy environment around the world, with particular emphasis on the leading dairy exporters, the EC and New Zealand. That chapter then explains the current situation in world dairy trade, and how the US could emerge as a larger exporter. Chapter 3 discusses the impacts of bST, and reviews the literature of the economic impact of the adoption of bST in the US.

Chapter 4 gives a conceptual model of the effects of bST in the US. Chapter 5 explains the model that was used to estimate the supply, demand, and prices for dairy products in the US and shows the empirical results that were obtained. It also shows how the model was validated, and the results of using the model to forecast over the 1991-1995 period. Chapter 6 shows how the adoption of bST was incorporated into the model, and discusses the implications for international dairy trade. Chapter 7 gives a summary of the study, the conclusions that can be drawn from it, and suggestions for further research.