Form No.5

Abstract of Dissertation

Applicant

Doctoral Program in Animal and Food Hygiene

Graduate School of Animal Husbandry

Obihiro University of Agriculture and Veterinary Medicine

Student ID: 24327

Signature of Applicant: Dadhne .

Title : An economic and epidemiological analysis of Foot and Mouth Disease (FMD) in Sri Lanka

(スリランカにおける口蹄疫コントロールの経済疫学研究)

Abstract

Dairy sector is considered as the most important of all livestock sub sectors. This is mainly because of the influence it can make on the rural economy. The domestic milk production only constitutes of 28.6 percent of the requirement and the rest is imported. The import bill on dairy commodities is around 37.8 billion Sri Lankan rupees (SLR) or approximately 20 million USD annually. Therefore, the government attention is most focused on the dairy sub sector to develop this sector into a 'local industry'. The government policy on dairy development is aimed at producing country's entire requirement of milk by the year 2020.

The future development of the livestock sector in Sri Lanka is constrained by several factors: lack of profitability, insufficient use of new feeding technologies and, infectious animal diseases, such as FMD. The main purpose of this thesis was to economically and epidemiologically analyze the constraints and challenges of dairy farming systems to for future development.

The type of dairy farming management system used in Sri Lanka is highly dependent on the agro- climatic zone where the farm is located. Each dairy farm and agro-climatic zone has its own unique ability to make decisions to produce a certain output given a set of inputs and technology. "Technical efficiency" is the ability of farms to produce the maximum possible output with a given set of inputs". Thus, understanding technical efficiency, its measurement and determining factors, is of crucial importance in dairy production economics. However, no study to date has examined the technical efficiency of dairy farms in different agro-climatic zones in Sri Lanka. Studying of the factors that determine milk

production and farm efficiency in each agro-climatic zone are important from a farmer's, as well as, from a policy point of view. Policy makers can use this knowledge to identify and target public interventions to improve farm productivity and income, while farmers can use this information to improve their performance, which ultimately leads towards self-sufficiency in milk production.

The first specific objective of this thesis was to examine the resource-use efficiency in dairy production systems in the Nuwara-eliya and Kurunegala districts, which are located in Up-country and Coconut Triangle in Sri Lanka. The stochastic production frontier model and Ordinary Least Squares (OLS) regression method were used to study the technical efficiencies and their determinant factors, respectively.

The findings showed that the mean technical efficiencies were 0.77 and 0.68 in Up-country and Coconut triangle, respectively. In addition, household size, feeding costs, and farmer-training were found to contribute positively to the technical efficiency, while the farmer's age and cattle diseases reduced the technical efficiencies in the studied regions. Therefore, the authorities should encourage the older dairy farmers to produce more efficiently by providing them with trainings and extension services on modern feed management technologies. From an economic efficiency point of view, the feed resources are under-utilized in the Coconut triangle, while over-utilized in the Up-country. Hence, in order to improve the dairy farming efficiency, the government should provide information on the prices and the availability of feed resources which can be purchased from different agro-climatic zones in Sri Lanka.

Furthermore, FMD has been a serious threat to the health of dairy cattle for centuries in Sri Lanka. The disease is endemic in the country particularly in the eastern part of Northern and Eastern province. Therefore, FMD has been ranked as the highest priority disease for control and eradication. Nevertheless, in Sri Lanka, currently there is no country-wide vaccination programme aimed to control FMD. The budget for FMD control and eradication has always been low and stagnant. It has remained around 20 million during the past fiscal years. In addition, there is an insufficient FMD vaccine production capacity and Sri Lanka spends a lot of country foreign exchange to import FMD vaccines. But sometimes these are produced for foreign strains of FMD viruses, and they are ineffective against the virus strain circulating in Sri Lanka. On the other hand, the economic return from the FMD vaccination at a dairy subsector level is unknown.

Thus, the second specific objective of this thesis was to evaluate the economic viability of current preventive vaccination program using integrated epidemiological and economic model. From the epidemiological model, it clearly showed that, current vaccination rate of 35 percent is not sufficient to eradicate the FMD disease by 2020. In order to eradicate FMD, the current level of vaccination coverage required to be increased by 45 percent. Moreover, from the economic model, it is clearly indicated that, every Sri Lankan Rupee 1 spent on biannual vaccination resulted in positive benefits of Sri Lankan Rupee 3.7. Nevertheless, FMD disease control is constrained by a low budget allocation and

there is a shortfall from the actual allocation and the required allocation of Rs.13.80 million. If the government can just allocate 0.025 percent of additional budget annually for each province from the expenditure on agriculture and irrigation, it would generate Rs 78.09 million additional benefits each year from FMD eradication. Therefore, preventive biannual vaccination is recommended for the dairy sector in Sri Lanka.

Vaccination alone is not sufficient to prevent FMD outbreak. Nevertheless, improving the farmer's knowledge on distinguishing FMD from other diseases, prompt reporting of any suspicion of FMD, as well as, restrict of all movements of animals or animal products are critical activities for an effective FMD response effort. Therefore, the third specific objective of this thesis was to analyze the farmers' knowledge level and behaviour towards FMD outbreak and its control. Item Count Technique was used to estimate the proportion of farmers' "under-reporting" and selling FMD infected animals and milk during the outbreak. More over, knowledge questionnaire on FMD sysmptoms, trasmission and, control were used to measure the farmer's knowledge level. The results clearly showed that nearly, 23 % of farmers were under-reporting if there is an FMD outbreak. Further, majority of farmers (63%) have poor knowledge level on routes of FMD transmission. The group of high-knowledge level and trained farmers indicates lower rates of under-reporting and selling infected animals and milk compared to the group of low-knowledge level and untrained farmers. Thus, farmer training programs to improve farmers' knowledge of FMD transmission and control are critical. Moreover, the regulations on infected animal and milk movements should be strictly enforced and farmers should be compensated for their early reporting to prevent transmission of FMD throughout the country.

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