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学位論文全文に代わる要約
Extended Summary in Lieu of Dissertation

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学位論文題目：
Title of Dissertation

Production Efficiency and Marketing System of Vegetables in Bangladesh
(バングラデシュにおける野菜の生産効率とマーケティングシステム)

学位論文要約：
Dissertation Summary

Bangladesh is a developing country and its economy is expanding. The population of Bangladesh is also increasing and it is necessary to increase food production for the increasing population. Government takes initiative to increase food production for the self-sufficiency in food production to ensure food security to all the people. The government also emphasizes crop diversification for soil conservation and adjust production due to climate change. Rice is the staple food of Bangladesh but people are now concern about balance diet. People of Bangladesh like different types of vegetables and vegetables are essential for the everyday meal. Two types of vegetables are grown in Bangladesh, one is summer vegetables and another is winter vegetables. Farmers are producing vegetables because of their family need and the rest amount of the vegetables they sell in the market. It is crucial to investigate farmer's profitability in vegetable production and to monitor farm level efficiency in vegetable production. Still, farmers are not well organized to sell their vegetables in the urban market and different middlemen are involved in vegetables marketing. It is necessary to investigate middlemen marketing activities, their cost, and revenue for the improvement of existing vegetable marketing system.

Therefore, this study aimed to investigates the production efficiency of five popular vegetables (bean, bottle gourd, brinjal, cauliflower, and tomato) in the Cumilla, Rajshahi, and Mymensingh district of Bangladesh (Figure 1). Total 354 vegetable growing farmers were selected by using simple random sampling technique. The study investigated production efficiency of different vegetables and highlighted major problems of farmers in the study

areas.

Total 129 vegetable traders were purposively selected for the present study. The study identified different market actors involved in vegetable marketing and highlighted their marketing practices. This study discovered major marketing channels of vegetables in the study areas. The study examined the costs and revenue of the intermediaries and investigated their marketing problems in the study areas.

Figure 1. Study areas in Bangladesh (Map of Bangladesh)

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The main objective of this research was to examine the production efficiency and marketing system of vegetables in Cumilla, Rajshahi, and Mymensingh district of Bangladesh. The specific objectives of the study were as follows:

i. To assess the profitability of bean, cauliflower, brinjal, tomato, and bottle gourd production at farm level and find out farmers production problems in the study areas
ii. To determine the technical efficiency of different vegetable production in the study areas
iii. To recognize the major market actors, their marketing practices, and identify existing vegetable marketing channels in the study areas
iv. To compute market actors marketing costs, margins, and the major obstacles in the study area

The study is composed of six main chapters; providing for two areas: vegetable production efficiency and vegetable marketing system in Bangladesh.

The first chapter examined the revenues and costs of bean and cauliflower in three districts namely, Mymensingh, Cumilla, and Rajshahi of Bangladesh. Primary data were collected from 48 bean and 58 cauliflower producing farmers by using a pretested semi-structured questionnaire from May to July 2014. Farmer's production efficiency was analyzed by using net farm incomes and BCR taking into account the variable and total costs. Problem Confrontation Index (PIC) was computed to rank farmers problems in the study area. Pearson's correlation coefficient (r) was used to ascertain the correlation between the diverse characteristics of the beans producing farmers and their problem confrontation. This study investigated different questions related to cauliflowers and beans production. Key research questions of the present study were i) What were the socio-economic characteristics of vegetable growers? ii) Did cauliflowers and beans production profitable for farmers? iii) What were the problems of farmers producing beans and cauliflowers in the study area? iv) What were the factors which related to farmers problems in the study area? The results revealed that vegetables production was profitable in the study area, although farmers were facing different types of problems. According to Problem

Confrontation Index, low prices of beans was the first ranked order problem for beans production in Mymensingh and lack of capital was the first ranked order problem in Cumilla district. Low price of cauliflowers was first ranked order problem both in Rajshahi and Cumilla in the case of cauliflowers production. The analysis from correlation coefficient indicated that farmer's age, education, number of agricultural training, numbers of extension contact and farmer's homestead area were significantly and negatively correlated with problem confrontation.

The second chapter addressed the profitability of brinjal production in three districts namely Mymensingh, Rajshahi, and Cumilla of Bangladesh. Primary data were collected from 90 brinjal producing farmers by using the pre-tested semi-structured questionnaire in the year 2014. Farmer's production efficiency was analyzed through net farm income and benefit cost ratio (BCR) considering variable cost and total cost of production. Problem Confrontation Index (PIC) was computed to rank farmers problems in the study area. Pearson's correlation coefficient (r) was used to identify the factors which affect problems confrontation for brinjals production in different areas. This study examined different questions related to brinjal production. Key research questions of the present study were i) What were the socio-economic characteristics of brinjal growers? ii) Did brinjal production profitable for farmers? iii) What were the problems of farmers producing brinjal in the study area? iv) What were the factors which related with farmers problem in the study area? The study found that brinjals production was highly profitable in the study areas, although farmers faced different socio-economic problems. PCI indicated that low prices of brinjals was the first ranked problem followed by lack of capital, price fluctuation, high prices of inputs, disease damage, lack of storage facilities, insect damage, and unavailability of inputs. The study also found that more education, training, extension contact, and farming experience help to reduce farmer's problems.

The third chapter studied the profitability of tomato production in three districts namely Mymensingh, Rajshahi, and Cumilla of Bangladesh. Primary data were collected from 75 tomatoes producing farmers by using the pretested semi-structured questionnaire in the year 2014. Farmer's production efficiency was analyzed by using

net farm incomes and revenue over costs taking into account the variable costs and total cost of production. Pearson's Correlation Coefficient (r) was used to ascertain the correlation between the diverse characteristics of the vegetable farmers and their problem confrontation. This study examined different questions related to tomatoes production in the study area. Key research questions of the present study were i) What were the socio-economic characteristics of tomatoes producing farmers? ii) Did tomatoes production profitable for farmers? iii) What were the problems of farmers producing tomatoes in the study area? iv) What were the factors that related to farmer's problems in the study area? It reveals that tomatoes production was highly profitable in the study areas, although farmers faced different socio-economic problems. Problem Confrontation Index indicated that the low price of tomatoes was the first ranked problem and lack of capital was the second ranked problem in the research areas. The study also found that more training and extension contact help to reduce farmer's problems.

The fourth chapter outlined the profitability of bottle gourd production in three districts namely Mymensingh, Rajshahi, and Cumilla of Bangladesh. The study also highlighted input use efficiency and farmer's problems in the study areas. Farmer's bottle gourds production efficiency was analyzed by using net farm income, benefit cost ratio (BCR) considering variable and total cost of production. Cobb-Douglas production function was used to identify input use efficiency of bottle gourds production. Pearson's correlation coefficient was used to identify the relationship between the socio-economic characteristics of the tomato farmers and their problems. Primary data were collected from 87 bottle gourds producing farmers using the pretested semi-structured questionnaire in the year 2014. Key research questions of the present study were i) What were the socio-economic characteristics of bottle gourds producing farmers? ii) Did bottle gourd production profitable for farmers? iii) What were the problems of farmers producing bottle gourds in the study area? iv) What was the relationship between inputs and outputs of bottle gourds in the study area? v) What were the factors which related with farmers problem in the study area? The study found that bottle gourds production was profitable in the study areas, although farmers faced different problems. Cobb-Douglas production function

showed that farmers were under use of Urea, Triple Super Phosphate, Muriate of Potash and Zinc and there was an opportunity for the farmers to use those inputs to increase production. Conversely, farmers were over use of cow dung and pesticides which reduce production. The low price of bottle gourds was the first ranked order problem and the capital shortage was the second ranked order problem in the study areas. The present study found that more agricultural training, extension contact, and farming experience helped to reduce farmer's problems.

The fifth chapter detailed about profitability and technical efficiency of bean, brinjal, and tomato production in Bangladesh. The study documented the crucial problems of vegetables producing farms. Data were collected through a field survey of 213 vegetable producing farmers selected by multi-stage random sampling technique in three districts namely Mymensingh, Rajshahi, and Cumilla of Bangladesh in the year 2014. The profitability of vegetables was analyzed using the conventional farm income of farmers and the Benefit-Cost Ratio (BCR). Cobb-Douglas stochastic frontier production function model was used to estimate the farm level technical efficiencies. Key research questions of the present study were i) What were the socioeconomic characteristics of vegetable growers ii) Did vegetable production profitable for farmers? iii) Were vegetable farms fully efficient to produce different vegetables? iv) What were the problems of farmers producing different vegetables? Result showed that vegetables production was profitable in the study areas although farmers faced different problems. Cobb-Douglas stochastic frontier production function model showed that an increase in the magnitude of labor, Triple Super Phosphate (TSP), and irrigation would result in a corresponding increase in vegetables yield. The estimated coefficient of power tiller was negative and statistically significant meaning that this variable had negative significant effect on vegetables production.

The result also showed that agricultural training and number of adult households reduced the vegetable producers' inefficiency. Overall technical efficiency was 87.3 % and there is opportunity for increasing technical efficiency by taking different management practices.

Lastly, the sixth chapter studied the vegetables marketing system and roles of middlemen in Bangladesh. The study investigated major marketing channels, identified market actors and their function. The research also examined market actor's marketing costs and margins, and their major business obstacles were also highlighted. Data were collected from primary sources from 354 farmers and 129 middlemen by using the pretested semi-structured questionnaire in the year 2014. Descriptive statistics were mainly used to analyze data. This study examined different questions related to the vegetable marketing system in Bangladesh. Key research questions of this research were i) Who were the actors involved in vegetable marketing in the research area? ii) What were the marketing practices done by the market actors in the study area? iii) Which were the vegetable marketing channels exist in the study area? iv) Did vegetable marketing profitable for major market actors in the study area? v) What were the problems of market actors to market vegetables in the research area? The study found that Faria, Bepari, Aratdar and retailer were the major market actors in the study areas. The marketing systems of vegetables were still underdeveloped. Scientific handling and transportation of vegetables were still not developed in the study areas. In general, most of the intermediaries buy vegetables from farm houses and village markets and sell mostly in the urban markets. Intermediaries used traditional modes of transportation to transport their vegetables. Different middlemen perform different marketing practices. Among all the intermediaries, the highest marketing cost was found for Bepari and they also got the highest levels of margin. Beparis were trading large volume of vegetables in the study areas. The most common problem of intermediaries was inadequate capital. Middlemen used different sources of market information in their marketing activities and mobile phone was very popular to them for collecting price information.

Finally, the following recommendations are fruitful for more production of vegetables and improvement of vegetable marketing system in Bangladesh.

- Farmers mentioned the problem of low vegetables prices. Most of the farmers harvested their vegetables at the same time and prices of vegetables decrease in the market. The low prices of vegetables can be solved by creating more storage facilities of the farmers for storing vegetables. Extension workers may motivate the farmers about storing of vegetables in the study areas. Moreover, farmers need training about marketing tactics to sell their vegetables.
- Farmers mentioned that they are shortage of capital. Government should take appropriate policy to ensure timely agricultural loan to farmers and strong monitoring to all national, commercial, and specialized banks for agricultural credit.
- Farmer's education, number of agricultural training, and number of extension contact were negatively correlated with problem confrontation. DAE (Department of Agricultural Extension) is the appropriate authority to increase the number of extension contacts with farmers and the number of agricultural training to the farmers.
- Farmers need up-to-date price information and they also need government support to transport their vegetables. It is necessary to develop and disseminate up-to-date price information for the farmers and traders. Application of mobile related with vegetables prices would be effective to transfer information to update farmers and traders in the study areas.
- DAE also need to give training to farmers about post-harvest technologies and easy way to store vegetables. Farmers also need training about modern scientific handling and packaging of vegetables.
- The overall technical efficiency of vegetable production was 87.3% and still, there is some scope for increasing farm's efficiency by improving management practices and efficient use of inputs. Cobb-Douglas frontier production function showed that farmer's agricultural training and adult household member may raise the vegetable farms efficiency.

- Middlemen are shortage of capital and they choose cash method for the transaction of vegetables. So, it is necessary to increase credit facilities among the middlemen and involve them in for all transactions by using bank which will improve the existing vegetable marketing system.
- It is necessary to improve the existing facilities in the markets. Modern refrigerated vehicles need to introduce to transport vegetables in the study areas which will improve the existing vegetable marketing system.
- Finally, high political involvement in the vegetable trade and collecting tips and donations must be eliminated to improve the existing vegetable marketing system in Bangladesh.