IMPACT OF DIVERSIFIED AGRICULTURE ON THE SOCIO-ECONOMIC UPLIFTMENT OF THE RURAL PEOPLE OF BANGLADESH

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IMPACT OF DIVERSIFIED AGRICULTURE ON THE SOCIO-ECONOMIC UPLIFTMENT OF THE RURAL PEOPLE OF BANGLADESH

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In
Marketing

By

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Department of Marketing
University of Dhaka
Dhaka, Bangladesh
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DECLARATION

I, hereby declare that the dissertation entitled "Impact of Diversified Agriculture on the Socio-economic upliftment of the Rural people of Bangladesh" is prepared by me. This dissertation is an out come of a socio-economic research consisting of both theoretical and empirical works. The study has been designed to search unexplored areas to make an additional contribution in the field of diversified agriculture in rural Bangladesh. I, humbly submit this thesis to the Department of Marketing, University of Dhaka, Bangladesh for the award of the Degree of Doctor of Philosophy. The contents of the thesis have neither in part nor in full been submitted to any other institution for any other academic degree.

09, November, 2006

Md. Jahangir Alam

CERTIFICATE

We are pleased to certify that the dissertation entitled "Impact of Diversified Agriculture on the socio-economic upliftment of the Rural People of Bangladesh" has been prepared by Mr. Md. Jahangir Alam, Deputy Director, Rural Economics and Management Division, Bangladesh Academy for Rural Development (BARD), Kotbari, Comilla. It is an Original Work and an addition to the knowledge in the field of diversified agriculture. To best of our knowledge, no other person has carried out exactly such type of work. We have gone-through the draft and final version of the dissertation thoroughly and found it as satisfactory for submission to the Department of Marketing, Faculty of Business Studies, University of Dhaka, Dhaka, Bangladesh for fulfilling of the Degree of Doctor of Philosophy.

09, November, 2006

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DEDICATED TO THE MEMORY OF MY RESPECTED PARENTS LATE ABDUL BARI AND LATE SYARA BEGUM WHO LAID THE FOUNDATION OF MY EDUCATION

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Abstract

Introduction : Diversified agriculture is the fortune of the present century of Bangladesh agriculture. Majority of farm households of Bangladesh engage with subsistence agriculture and very much dependent on mono crop cultivation like rice. The country is self-sufficient in rice production but far away from required production and consumption of diversified crops like pulses, oilseeds, vegetables, chilies and other minor crops which are the main source of nutrition. Due to tremendous population pressure, squeezing trend of agriculture land for other use and degrading of land fertility limit , possibility of more food production remains unexpectable for the rural people of Bangladesh. Poverty stands as a common phenomenon for the landless, marginal and small farmers. In such an undesirable condition of Bangladesh agriculture, the best alternative way to uphold the rural economy is to diversify and commercialize the crop sector for changing the livelihood of the rural households and also to have a reasonable extent of contribution in mitigating poverty of the rural population. However, with such a view in mind, the present study on "Impact of Diversified Agriculture on the Socio-economic Upliftment of the Rural People of Bangladesh" has been undertaken in four villages of Bangladesh in order to make an elaborate assessment on the objective about to what extent diversified agriculture is contributing to rural economy as well as to eradicate poverty of the rural people under study. The broad objective of the study was to determine the impact of diversified agriculture on the socio-economic upliftment of the rural people of Bangladesh. The specific objectives of the study were: (i) To know the socio-economic condition and Land ownership and utilization pattern of the study households; (ii) To know the origin, evolution and extent of diversified agriculture in Bangladesh; (iii) To measure the comparative cost and return of diversified crops with that of rice crops; (iv) To analyze the impact of diversified agriculture on consumption pattern and poverty and also to find out the factors affecting diversified agriculture in the study households; (v) To identify the existing marketing problems of diversified crops and finally; (vi) To draw conclusions and policy recommendations for the overall development of diversified agriculture that can uplift the livelihood of the rural people of Bangladesh.

However a preliminary investigation has been made in four Upazillas namely Chandina Upazila under Comilla district of Chittagong division, Mithapukur Upazilla under Rangpur district of Rajshahi Division, Patuakhali Sadar Upazilla under Patuakhali district of Barishal division and Sonargaon Upazilla under Narayangonj district of Dhaka Division for choosing diversified villages for the study in the period of January 2004. Comilla, Rangpur,

Patuakhali and Dhaka were selected on the basis of different agro-ecological zones. An exercise was made to find out diversified index among all the districts of Bangladesh. On the basis of such index and also on the basis of suitable agro-ecological zones ,four said districts under four divisions of Bangladesh were selected finally for the study. The Comilla district was taken from Middle Meghna River Flood Plain (Region – 16), Rangpur district was taken from Northern Eastern Barind Tract (Region 27), Patuakhali district from Ganges Tidal Flood Plain (Region – 13) and Narayangonj district was taken from Arial Bill (Region – 15) agro ecological zone. Again these agro-ecological zones were catagorized as high land category in Rangpur, medium high land category in Comilla, low-land category in Narayangonj, and very low land category in Patuakhali district. The studied four villages under four Upazilas were namely Srimantapur under Chandina Upazila of Comilla district, Jadabpur under Mithapukur Upazila of Rangpur district, Dhaukhali under Patuakhali Upazila of Patuakhali district and Sammanthee under Sonargaon Upazila of Narayangonj district have been selected purposively on the basis of intensity of diversification in crop-agriculture with in the respective Upazila. On the other hand, based on diversified index (calculated from herfindhal method of diversified index from twenty old districts of Bangladesh) Comilla and Rangpur districts were selected as more crop diversified zone, and Patuakhali and Narayanngonj districts were selected as less crop diversified zone. The value of herfindhal index lies from 0 (zero) to 1 (one). If the value tends to zero it indicates perfect diversification and while it tends to 1, indicates perfect specialization. Household head who cultivate land for agriculture and share-croppers were considered as respondents for the study. Full enumerations of all the four villages were taken underconsideration for the study.

The farmers in the study areas were classified on the basis of ownership of land like small farmer owning land from 0.05-2.49 acres, medium 1 farmers from 2.50-4.94 acres, medium II farmer from 5.00-7.49 acres and 7.50 acre and above as large farmers. The study was carriedout during the period of January 2004 to June 2004.

However, The study has made an attempt to find out the extent of diversification in twenty districts under four old divisions of Bangladesh during the past twenty years from 1980-81 to 1998-99. The periods of diversification was classified into three stages : (i) from 1980-81 to 1998-99, (ii) from 1980-81 to 1990-91 and (iii) from 1990-91 to 1998-99 to observe the periodical difference of diversification in the respective twenty old districts of Bangladesh. Herfindhal index was calculated to find out the extent of diversification. The findings indicate

that during the past twenty years of diversification, there was a positive trend of diversification in all the districts of Bangladesh. There was a positive trend of diversification in all the districts of Bangladesh from 1980-81 to 1990-91. It was evident that 50% of the districts had positive trend of diversification while the other 50% of the districts had negative trend of diversification from 1990 to 1998-99. Reason identified for the negative impact of diversification included withdrawal of the crop diversification programme from the grass roots level; impact of structural adjustment policies in the name of withdrawal of subsidies for fertilizers, insecticides and irrigation equipments; the un-planned development and ignorance of government polices; higher price of fertilizers; and impact of privatization of delivery system of agriculture inputs.

The comparative cost and return analysis of diversified crops indicates that compare to rice almost all the crops were more profitable by categories of farmers. The findings revealed that small farmers who were the most prominent cultivators could earn more profit irrespective of crop cultivation than medium I, medium II and large farmers because of higher labor involvement and indigenous knowledge practiced for their cultivation than those of other farmers. The comparative picture of return on different crops can also be reflected from Benefit Cost Ratio (BCR) analysis. BCR signifies differently incase of different categories of farmers like small, medium I, medium II and large because of variation of cost incurred in the production process and variation in yield. But BCR was observed to be highest in case of small farmers among other farmers irrespective of all the crops under measurement, which also indicates that small farmers are more benefited than medium 1, medium 2 and large farmers.

Diversified agriculture can be spelled into frequency of crops. Correlation, chi-square test, and multiple linear regression model were used to measure the influences of diversified agriculture on socio-economic variables. The findings indicate that there was positive and significant correlation with crop frequency and socio-economic variables. The cross tabulation between socio-economic variables and crop frequency also revealed that maximization of crop frequency could be achieved with utilization of available maximum socio-economic variables.

The relationship was also justified from the value of chi-square, which was positive with probable level of significance. In case of linear regression model where crop frequency was considered as dependent variable and socio-economic variables considered as explanatory variables, also reflected a positive relationship. Explanatory variables were contributing

positively for the development of diversified agriculture interms of crop frequency which was confirmed from value of Beta, adjusted R-square and also from the value of F.

Consumption pattern is an indication of household's livelihood. The findings of the consumption pattern of the study areas indicate that average calorie-intake in the four study areas was above the poverty line calorie-intake (<2122 Kcal), although there was a significant proportion of poor who were lying below the poverty line both interms of absolute (<2122 Kcal) and hard core poverty (<1805 Kcal). The findings indicate that absolute poverty stricken people was less than 35.79% whereas 12.7% of the population was lying below the hardcore poverty which was below than the study conducted by household expenditure survey (HES, 2000).The level of diversification and incidence of poverty relationship indicates that poverty is also less than that of national average in individual strata of the level of diversification which varies from 30.90% to 44.82% . The relationship between level of diversification and poverty among the poverty stricken people also indicates that poverty is decreasing with the increase of diversification from some extent of level of diversication .Regarding the factors affecting household's consumption, the study indicates that there was positive and significant correlations with total as well as individual food consumption with some specific socio-economic variables. There were also some negative but significant correlations with total as well as individual food consumption which indicated that although socio-economic variables were the strong determinants of households food consumption but these were not properly utilized and strengthened by the study households. The effectiveness of multiple regression model indicates the extent of consumption of the study households, where total consumption was considered as dependent variable and variables like family size, age of household head, operational holding, net yearly income, income from agriculture and yearly expenditure was considered as independent variable. The findings remark that explanatory variables were positively contributing to household's total consumption which was reflected from the value of regression co-efficient, level of significance, adjusted R-square and also value of F.

Problems of agricultural marketing are highlighted on four points of view. These include price deprivation, over-supply of produces, inadequate marketing infrastructures and overall problems of agricultural marketing systems. From these four categories of marketing problems, sub-problems of each of the main problems were also categorized and farmer's opinions were also incorporated and analyzed on the basis of both arithmetic and weighted arithmetic mean.

Three agricultural marketing problems which were ranked by the study households in order of importance included inadequate initiatives of planned production and export of diversified crops; poor infrastructure of marketing regarding communication, storage, and processing; and inadequate government initiatives for marketing diversified crops. The study households also suggest some ways and means to solve the agricultural marketing problems. These are establishment of linking institutions at village level, like introduction of contact farming and joint cultivation system, sell of produces through government contact or agents, establishment of credit organisations at village level, and establishment of marketing organisations like cooperative marketing associations at the village level. The felt need important government initiatives expressed by respondents included continuation of crop diversification programme , timely supplying of fertilizers and insecticides at fair price, supplying of quality seeds and providing irrigation facilities.

Subsistence farming through rice cultivation is very much common in Bangladesh agriculture. But continuous degradation for over pressure of land and rising population, increase of per unit area productivity has no alternative to achieve self sufficiency in food production . So, proper cultivation of diversified crops for the sake of commercial as well as capitalistic agriculture in the rural economy is essential. As small farmers are the majority of the farming population and crop specific profitability is higher among other cultivators, farmer's specific programme on diversified agriculture should be implemented by both government and non-government organisations in the grass root level. Extent of diversification indicates a dismal picture of diversified agriculture in Rural Bangladesh. So crop diversification programme should be continued. Diversified agriculture is encouraged by raising the number of crop production. It is also encouraged and influenced by socio-economic variables. So specific attention should also be given to socio-economic and demographic factors for have an optimum outcome of crop agriculture. Diversified agriculture has a positive impact on reducing poverty through consuming nutritional food There also exists positive influence of socio-economic variables in household food consumption. So diversified agriculture may be a leader of uplifting socio-economic condition through effective and pragmatic planning on income and nutrition. Problems relating to marketing should be solved through policy formulation and implementation for the sake of overall development of diversified agriculture in rural Bangladesh.

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Glossary of Words

APO	:	Asian Productivity Organisation
BADC	:	Bangladesh Agricultural Development Corporation
BARC	:	Bangladesh Agricultural Research Council.
BARI	:	Bangladesh Agricultural Research Institute
BBS	:	Bangladesh Bureau of Statistics
BCR	:	Benefit Cost Ratio
BVRDC	:	Bangladesh Vegetable Research and Development Centre
CDP	:	Crop Diversification Programme
CF	:	Crop-frequency.
CPD	:	Central for Policy Dialogue
DAE	:	Directorate of Agricultural Extension
DCL	:	Direct Calorie Intake
EEC	:	European Economic Commission
FAO	:	Food & Agricultural Organisation
FFYP	:	Fifth Five Year Plan
GDP	:	Gross Domestic product
GOs	:	Government Organizations
H.I	:	Herfindhal Index
HDI	:	Human Development Index
HES	:	Household Expenditure Survey
HYV	:	High Yielding Varieties
IGAs	:	Income Generating Activities
IPM	:	Integrated Pest Management
KCAL	:	Kilo-Calories.
L. V.	:	Local Variety

MV	:	Modern Variety
NGOS	:	Non-government Organizations
MNS	:	National Nutritional Survey
NNS	:	Ordinary Least Square,
OLS	:	Ordinary Least Square.
PETRRA	:	Poverty Elimination through Rice Research Assistance
SFYP	:	Second Five Year Plan
SWOT	:	Strengths Weakness Opportunities and Threats
TFYP	:	Third Five Year Plan
URRA	:	Uruguay Round Agreement on Agriculture.
V-AID	:	Village Agricultural and Industrial

Chapter 1: Introduction

1.1 Background of the Study

Bangladesh is a country of scarce land resources having per-capita arable land of only 0.17 acre with a Population density of 834 per sq. km. and a per capita food supply of only 2000 kcal (UNDP, 2000). Land is degrading and fragmenting because of tremendous population pressure and the possibility of bringing more lands for food-production is very much acute specifically for Bangladesh compared to other Asian countries. In a recent study, it was mentioned that there has been a gradual decline of cultivated land from 20.16 million acres in 1983-84 to 17.78 million acres in 1996 which indicates that near about 2 lakhs acres of cultivable land have gone every year out of the cultivation of agriculture. At the same time, there has been observed dramatic proliferation of small and marginal farms with relative consolidation of middle farms and a gradual decline of large farms over a Span of Previous one decade (Saha, 2000). In such a perspective of declining trend in cultivable land in agriculture, research studies suggest that the best alternative to uphold and change such condition of our agriculture is to increase production of per unit of land with sufficient diversification of our agriculture interms of crops as well as interms of products (Akhanda, 1978).

In recent years, both policy planners, agricultural economists and researchers rightly emphasized that an exclusive focus on rice production does not necessarily bring positive result and can not change the structure of the entire agricultural economy. There is recognition that livelihood strategies are increasing diversely and enhancing the household income that will not exclusively come from the income of rice production, rather it comes from the income of diversified agriculture which is supposed to be supported by the crop-diversification programme. It was also observed by the researchers that although a decade ago, importance of rice was far more compared to other crops, now rice remains as the most important crop while vegetables,

pulses, potato are also recognized as important which are not far from rice (Field DI, 1995). The goal of the crop-diversification programme of the government is to improve the nutritional status of the mass people through increased production and consumption of CDP crops by accelerating both area and yield per acre of land.

However, the Five Year Plans of the government have duly emphasize on crop diversification programme. The second five (1980-85) year plan first emphasized and gave thrust on the production of minor crops than rice. The second five year plan quoted that production base of other cash-crops like pulses, oilseeds, vegetables would be expanded through utilization of irrigation facilities and multiple cropping with a view to take care of protein deficiency of small and landless farmers and also to stabilize farmer's income through the process of crop-diversification (SFYP, 1980-85).

The Third Five Year Plan (1985-90) specifically emphasized on the crop-diversification programme with the strategy of replacing the current variety of crops with more profitable ones by substituting over to crops that would yield more at a lower cost. The plan indicated that the major crops under crop diversification could be potato, sweet potato, oilseed, mustard, maize, pulses and all kinds of vegetables. The plan also mentioned that as a precondition for the development of minor-crops within the framework of crop-diversification an analysis of the current problem is essential to determine the strategy of comprehensive programme under crop diversification (TFYP, 1985-90).

The Fourth Five Year Plan (1990-95) mentioned that although crop-diversification was a goal of the third five year plan, the crop base did not expand to improve dietary quality and food security. Pulses and oilseeds, the crops selected for first major diversification efforts, continued to loss out to cereals. The fourth plan also mentioned that the contribution of domestic

production to calorie availability has declined to some extent than that of the early seventies. The fourth five year plan also indicated that the essential task of crop diversification was to select appropriate crops and to assist farmers to adopt them through adequate incentives in terms of cost effectiveness and relative cost advantages. Sufficient emphasize was given to promote gradual diversification of agriculture through changes in the cropping system to move away from present mono-culture in rice to diversified agriculture through enhancing production of horticultural crops, vegetables, pulses and oilseeds (FFYP, 1990-95).

The Fifth Five Year Plan (1997-2002) also emphasized on due importance of crop diversification. The plan mentioned that Bangladesh has a favourable climate and there exist ample opportunities for crop diversification balancing major crops with minor crop production. The diversification of cropping pattern will encourage crop-rotation in crop production. Specially towards production of high value crops that would contribute to enhance farmers income and also to maintain better soil structure for long term sustainability in agricultural production (FFYP, 1997-02).

Poverty in Bangladesh is still wide and deep with an estimated 53% of the population living below "basic needs" poverty line, of whom 36% are living in acute poverty (PETRA, 2001). Poverty is now recognized as a dynamic phenomenon with households moving in and out of poverty. Graduation of poverty may occur through a number of path ways. Now both government and non-government organisations are promoting agriculture with greater emphasize on the crop diversification. It is assumed that Diversified agriculture can directly benefit the rural poor through improving their socio-economic condition as a means of minimizing economic risk by offering better market facilities and price incentives to the farmers. In search of this pertinent issues on crop diversification, questions arises to what extent diversified

agriculture has benefited the rural poor so far profitability and income earning from diversified products are concerned; to what extent diversified agriculture is acceptable, so far comparative cost and return for cultivating diversified and rice crops are concerned; to what extent diversified agriculture is acceptable, so far consumption pattern ,livelihood changes , food security and poverty are concerned; and to what extent diversified agriculture is encouragable so far possible forward and backward linkage institutions and marketing facilities are concerned. In search of these basic questions, the present study was undertaken for searching out the constrains remain in Bangladesh agriculture and also for finding a new line and horizon of improving the present structure of agricultural economy of the country.

1.2 Objectives of the Study : The broad objective of the study was to determine the impact of diversified agriculture on the socio-economic upliftment of the rural people of Bangladesh. The specific objectives of the study are as follows :

i) To know the socio-economic condition and Land ownership and utilization pattern of the study households;

ii) To know the origin, evolution and extent of diversified agriculture in Bangladesh;

iii) To measure the comparative cost and return of diversified crops with that of rice crops;

iv) To analyze the impact of diversified agriculture on consumption pattern and poverty and also to find out the factors affecting diversified agriculture in the study households;

v) To identify the existing marketing problems of diversified crops and finally;

vi) To draw conclusions and policy recommendations for the betterment of diversified agriculture in Bangladesh.

1.3 Scope of the Study

The study investigated the following variables to analyse its objectives :

a) Land ownership (homestead land. Owned land cultivated, owned land cultivated by others, others land cultivated by the farmer) and operational holding;

b) Family size, Age, education, occupation and yearly income etc.;

c) Land under cultivation for diversified crops, crop-wise per acre production, Price per maund, number of crops produced in the whole year by a household, cropping pattern etc.;

d) Per acre cost & return of rice crops & diversified crops, Benefit Cost Ratio (BCR), etc.;

e) Yearly income from agriculture, yearly expenditure of the households;

f) Diversified index in different old districts during the past two decades from 1980 to 1988;

g) Daily food consumption of households in different study areas and per capita calorie intake;

h) Calculation of absolute and hard-core poverty interms of calorie intake;

i) Problems of diversified crops at grass root level;

j) Farmers suggestions to improve diversified agriculture.

1.4 Organisation of the Study

The study organized with fourteen chapters. The first chapter is the introduction which is followed by the review of literature of the study. The third chapter is the methodology of the study. The fourth chapter is the socio-economic structure of the study villages. The fifth chapter is the landownership and utilization pattern of the study villages. The sixth chapter is the diversified agriculture : evolution and extent which is followed by cost and return of rice and diversified crops : a comparative analysis. The eighth chapter is diversified agriculture, consumption pattern and poverty in the study villages which is followed by Food Consumption Pattern of the Households of Diversified Villages : Assessing Correlations with Some Socio economic Variables. The tenth chapter is Impact of diversified agriculture on socio-economic

variables : some statistical Interpretations which is followed by Marketing problems of Diversified crops in Bangladesh : Some opinions and remedies from grass root level. The twelfth chapter is the test of research Hypothesis which is followed by Discussions on findings of the study. The final chapter is constituted with conclusions and policy recommendations.

1.5 Research Hypothesises : The following hypothesis's have been established to search the objectives of the study. These are as follows :

i) Diversified crop production is better than that of mono culture of rice production interms of yield per acre & interms of profit per acre respectively;

ii) Diversified crop production is more helpful for small farmers interms of yield and return per acre;

iii) Diversified crop production is helpful for changing consumption pattern and reducing poverty of the farmers;

iv) Diversified agriculture can be promoted through the contribution of socio-economic variables;

v) Diversified agriculture can not be uplifted sufficiently due to marketing problems;

vi) Establishment of more linkage institutions is necessary for promoting diversified agriculture.

Chapter II

Review of Literature

2.1 Introduction

In the field of diversified agriculture and rural poverty alleviation, although a number of studies have been conducted both at home and abroad, but among them, a very few touched the crucial issue like the "Impact Analysis of Diversified Agriculture on Socio-economic Upliftment". Although after the independence of Bangladesh, several government and non-government programmes were adopted for the sake of poverty eradication in the different fields of agriculture, but there laid a few studies in this issue through which the policy planners can realize about the matters like to what extent livelihood can be encouraged to be developed through the contribution of diversified agriculture. The present chapter gives an elaborate ideas about related literatures on diversified agriculture and poverty alleviation in order to make a clear vision about the statement of the issues for generating new ideas which were carried out through grass root level investigations . Some of the important studies are discussed below through which several ideas about diversified agriculture , poverty and livelihood changes can be realized.

The study entitled "The Impact of Prices and Micro-economic Policies on Agricultural Supply: a Synthesis of Available Results" by Maningi. N (1996) highlights the impact of prices and micro economic policies on agricultural supply especially for the Africa and sub-shaharan region. The article deals with the literature about how agricultural incentives are effective in boosting up agricultural supply and output. However the article concentrates on econometric analysis and gives emphasize on agricultural supply situation of the developing countries with special reference to sub shaharan Africa. The author in the introduction indicates that the issue of agricultural supply response is very important as it has the multi-dimensional impact on

agricultural growth, poverty and environment. The author mentions that the size of agricultural supply response is informative about whether a policy for taxing agriculture through lower farm prices or through overvalued exchange rates and industrial policies will generate resources for investment in other sectors of the economy or, whether the these policies will retard agricultural growth and create food and input bottlenecks which eventually bring down the rate of growth of the economy as a whole. However the main thrust of this article is to review some empirical studies with special attention on theoretical issues and specification of agricultural supply models. The article ends with some concluding remarks and recommendations.

Regarding the theoretical aspects of agricultural supply theory and specification of agricultural supply models, the author indicates that agricultural supply response represents the agricultural output response inconsideration with change in agricultural price response. Agricultural supply response can be analyzed from the viewpoint of aggregate output or sub sectoral output and individual crop output. In other words, agricultural output or supply can be meant as acreage under cultivation, per unit yield of the produces, and also the yield per acreage. However, regarding the supply response of output and specification of the supply response models, the author emphasizes on the most influential model of crop supply known as "Nerlove Model" which states that output (quantity or area) is a function of expected price, output and some other exogenous variables. In this regard, the author mentions the form of the model, which is formed with the combination of both sets of dependent and independent variables of the first order. In relation to the model the author ask the question about how real output rice can be measured. The author answers that the price of real output can be measured as such : the price of the crop actually receives by the farmers; ratio of price of the crop receives by the farmer to some consumer price index; ratio of price of the crop receives by the farmers to some price index

of the farmers inputs; ratio of the price of the crops receives by the farmers to some index of the competitive crops.

With respect to the price expectation, the author indicates that the price of perennial crops may vary from the annual crops. More ever, price of crops may vary from one type of crop to another depending its durability and quality. Regarding the output or production of specific crops, the author indicates that micro level production of agricultural crop depends on several factors like the following : An increase in the price of a crop is an incentive to produce a crop, an increase in the input price for a crop is a disincentive to produce more of the specific crop, an increase in the price of the most alternative crop is also a disincentive to produce more of the earlier crop; an increase in the price of consumer goods and wages also adversely affect the crop production of different crops. Relating to the micro level policies, the author indicates that agricultural price incentives are influenced by macro economic policies, which include trade policies, exchange rate policies, and also by the fiscal policies. These policies affect the farmers real income and terms of trade between tradable and non-tradables. The author also explains the exchange rate policies and its effect on the output prices both in case of internal and foreign trade. In brief, the author indicates that agricultural output price can boost up production by increasing the returns from inputs. Agricultural output prices are affected by market forces and also by the government interventions through application of trade polices, exchange rate policies, taxation and subsidy policies and also by the price policies.

Regarding the impact of other determinants, the author indicates that factors like agricultural inputs like fertilizers, irrigation, technical know how etc. and some types of human and physical capitals like adult literacy, life expectancy, research, extension, etc. have also positive impact on the output and productivity of agricultural produces. The author elaborately

mentions that irrigation water is expected to affect positively on the growth of agricultural output. Adult literacy by helping individual's education and technical knowledge can increase positively the agricultural output. An increase in life expectancy indicates the measurement of health, which affects output through productivity. Population density has an impact on agricultural production through intensification of cultivation or increasing frequency in cropping pattern through the effective involvement of the active labor force. Household composition interms of active labour force also has a positive impact on agricultural production. On the other hand, income of households has a positive impact on agricultural output to the extent that higher farmers income inspires positively to higher level of production. The author also indicates that increase in research in the sense of technological advancement has the impact of agricultural output. Rural infrastructure is very important in augmenting agricultural production indicating efficient access to roads, transport, communications, agricultural services and marketing facilities, which can enhance the better price of agricultural commodities and thus can increase the output and yield of agricultural commodities. In relation to the literature about how agricultural incentives are effective in boosting up agricultural supply, the author on the basis of several studies on the asymmetric approach to price and area changes indicates that farmers are more responsive to price and area under acreage increase or decrease.

In the concluding remarks the author mentions that farmers are everywhere rational and they expand their production as output prices increase. The author also mentions that for individual crop, the short run own price elasticity is smaller than long run elasticity because while in the short run some factors are fixed, in the long run all factors are varied. Finally, the author suggests for taking measures to eliminate price distortions since an increase in output price leads to an increase in the overall aggregate agricultural output. Similarly, other incentive elements like agricultural subsidies, non-price factors like infrastructure, storage, distribution,

transport & other marketing facilities should be ensured for sustaining the price response from the consumers of both home and abroad for having the greater and surplus output of the total agricultural sector.

The article entitle, "Crop Diversification and Self sufficiency in Food Grain" by Pandey V.K. and Sharma K.C (1996), highlights the conceptual issues of diversified agriculture in India with special reference to the self sufficiency of foodgrains in India. The authors indicate that the country, which is predominated by agriculture and where people's livelihood depends on it, availability of food, is a major concern for ensuring food security for the whole nation. As far as raising income and productivity of the crops are concerned, the authors indicate that crop diversification can resolve such problems by shifting cultivation practices from foodgrain to non foodgrain crops. The article indicates that agricultural growth need not stay longer by limited to self-sufficiency in foodgrain production, rather it may be shifted to new crop cultivation with favourable domestic production, greater marketable surplus, and export for foreign earnings. Thus it demands for raising higher productivity & yield from the agricultural sector. However, in the present article, the authors have made an attempt to evaluate the performance between crop diversification with that of self-sufficiency in foodgrain during the post green revolution of Indian agriculture.

The article indicates that while in the period of 1967-68 to 1980-81, there exists a marginal increase in foodgrain production; it witnesses a marginal decrease in foodgrain production during the later period of 1980-81 to 1994-95. On the other hand, there perceives a moderate increase in the area under non-food grains in the period of 1967-68 to 1980-81 while in the later period, there observes a substantial increase both interms of area coverage and yield. The findings thus show a positive trend in favour of diversified agriculture in the greater India.

So far growth rate of area, production and yield of rice and diversified crops are concerned, the article indicates that total area, production and growth rate of yield of rice, wheat, and cereals decreased over the periods of past twenty five years from 1967-68 to 1994-95. But the growth rates of area, production and yield of diversified crops like pulses, oilseeds, potato, and other profitable crops like vegetables have increased during the past years indicating greater importance of diversified agriculture. However to examine the crop diversification index, the authors have worked out Herfindhal Index for each of the year from 1970-71 to 1994-95 in which the author indicates that the value of the crop diversification index while closer to zero reflects perfect diversification and it tends to one, while there exists perfect specification. On the basis of simple lined trend equation, the authors have calculated crop diversification. Index for three sets of foodgrains and other crops for the year from 1970-71 to 1994-95, has been shown. The diversified indices are presented for the decennial years of 1970-71, 1980-81 and 1990-91 and also for the year 1994-95. The results of these indices for foodgrains and non foodgrains for three sets of data indicates high level of diversification reflecting higher decimal figures for the diversified crops.

The authors indicate that the issue of the self sufficiency incorporates both the issue of food requirement and food availability. In this regard, the author indicates that per capita net availability of rice, wheat, cereals, and other foodgrains have shown an increasing trend during the 90's. The per capita availability of pulses and cereals have deteriorated during this period. So far prospect of productivity growth in rice and wheat are concerned, the author indicates that the growth rate of rice and wheat has exceeded the population growth rate and thus these two crops like rice and wheat promise a significant contribution in future supplies of staple food and thus crucial for maintaining self sufficiency for foodgrain in the greater India. So the authors indicate that there needs to examine the prospect of both these crops to have a regional

perspective of future production of foodgrains. The authors examine that about 58 and 68 percent of the potential yield in case of rice and wheat while area under irrigation of rice and wheat are about only 42 percent and 82 percent respectively and the average fertilizer consumption per hector is only 70 kg and thus there exists a tremendous scope of accelerating the productivity growth of rice and wheat through proper application of irrigation and fertilizer. The authors also mentioned that among different districts of India, some districts have achieved significant level of potential yield while some other districts are far from the potential yield, which are observed from the average yield of the demonstration farms. The author also indicates that on an average, the districts which are exclusively oriented for rice and wheat cultivation have achieved about 50 percent of the potential yield and showing the demand for greater investment in irrigation fertilizer, and also for other support services for achieving the potential yield of rice and wheat.

Regarding the position of crop diversification and its strategies, the author indicates that agricultural diversification has received greater interest during these decades due to new economic policies and trade opportunities that has been created as a result of greater emphasize on globalization and trade liberalization in case of world trade policies and also for the adverse consequences of the intensive rice-wheat cultivation. The author emphasises that the pace of crop diversification can be accelerated by increasing total cropped area through the increase of cropping intensity and also brining all the fallow and wast land under cultivation.

In the concluding remarks, the authors interrogate that what should be the right strategy for diversified agriculture to be followed. The right answer from the part on the authors is to introduce and adopt varietal diversification of crops which has both the demand for domestic consumption as well as export potentials for the international markets. The authors also suggest

for bringing all the fallow and waste lands for cultivating non-cereals and vegetable crops and searching for by products through processing which has greater export potentials. Finally for ensuring better price for the farmers in order to have a sustainable production in agriculture, the author also suggests for maintaining proper market regulations with a view to ensure stable market price for the mass people in general and also for the sake of remunerative price for all of the farmers at the grassroots level.

The article entitled "Agricultural Research and Crop Diversification in Bangladesh" by Quashem Md. Abdul & Rahman, Lutfor(1993) highlight the process of crop diversification with emphasize on location specificity of minor crops and inadequacy of agricultural researches in the crop sector of Bangladesh. The article indicates that with the increase of diversified agriculture, the crop economy of Bangladesh has turned to specific few crops. The authors also emphasize that cultivation of single crop is harmful and risky due to pest constraints and also for the non viability of high yielding varieties.

As crop diversification indicates location specificity of specified crops, soil requirements and its quality in different seasons, level of flooding, timing of rainfall, day and night temperature, and its variations are important considerations for raising productivity of the specified crops. Moreover, crops are grown betterly based on soil characteristics and agro economical conditions. The article also categorizes crops into three broad sub heads like pulses, oilseeds, and spiciess. In pulses : mung, masur, maskalai, and gram are important while tin oilseeds : rap, mustard, sesame, linseeds and groundut are the important crops. In species : onion, garlic, turmeric, and ginger are important crops which are grown invariably in all districts. However, the authors also indicate that Jessor, Faridpur, Rajshahi, and Kustia are the important areas of producing pulses although there has been some changes in areas under pulse production.

So far yield of pulses is concerned, the article indicates that Faridpur and Pabna also have greater yield in pulse production. In case of species, the author indicates that the major species producing in Bangladesh are onion, garlic, ginger, turmeric, and coriander seeds. The best districts in terms of production are Rajshahi, Rangpur, Pabna, Faridpur and also the Chittagong Hill Tract districts, which are important districts for spicies production. On the other hand, the important vegetables growing districts are Comilla, Dhaka, Chittagong, Jessore, Rangpur, Kustia, and Rajshahi.

So far agricultural research in case of crop diversification is concerned, the authors indicate that increases in yield through crop species are the outcome of the agricultural research efforts. The authors emphasize that agricultural research institutes in Bangladesh are largely crop specific specially for rice, wheat, jute, sugarcane, tea and also for fish. But Bangladesh Agricultural Research Institute (BARI) is the only organisation which is exclusively conducting the scientific researches for pulses, oilseeds, vegetables, spicies, fruits and also for other new crops. So the authors urge the need of due importance for improving the varieties of all crops through the advancement of biotechnology in all sectors like crops, livestock's, and fisheries. Although some benefits are also accrued from the field level experiments on several crops like rice, wheat, potato, oilseeds, pulses, etc. but the authors suggest that as there has been the problems of bacteria and other contaminations and strains in the soil quality, mixed culture incase of crop production can be adopted for getting higher yield and also for maintaining soil quality.

In the concluding remarks, the authors indicate that although rice is our staple food and contributes with three fourth of the total cropped area, production of pulses, oilseeds, spices, and vegetables are also shared in rest of the areas and also cultivate seasonally in the farmers areas alternatively. The authors also conclude that the per acre production of these diversified crops

are still very low in terms of yield and area coverage, so it demands effective policy implementation for promoting the potentiality of these crops in wider areas where these crops are cultivated in a limited way in the different districts of Bangladesh. The authors also suggest for planting practical demonstration on biotechnology researches for raising improved varieties of these diversified crops for developing a forward looking agriculture in rural Bangladesh.

The article entitled "Problems and Prospects of Crop Diversification in Bangladesh" by Zohir, S. (1993) very analytically highlights the process and extent of crop diversification in Bangladesh. The article also identifies the factors that stand in the way of diversification of the crop economy of the rural Bangladesh. In the introduction, the author indicates crop diversification as a follow up effect of the cropping pattern in a given land in different seasons with in a year. In another way, the author indicates cropping pattern as the proportionate distribution of land under various crops for cultivation. As far as extent of crop diversification is concerned, the author indicates that cropping pattern includes several types of crop varieties and crop groups. Therefore considering all types of cereals, non-cereals and vegetables include hundreds of cropping pattern in case of allocation of land under cultivation. The author indicates that about 50 per cent of net cropped area is accounted for rice dominated cropping pattern while about 20 percent of land is accommodated for cultivation of pulses, vegetables, and potato, which is associated with the cropping pattern of both aus and amon rice, and the rest of the cropped area is allocated for oilseeds, spicies, and other cash crops.

So far relative profitability is the precondition for making decision on crop cultivation, the author indicates that every farmer would consider the matter in producing a crop which gives higher relative return. However, the empirical findings on crop cultivation indicate that average return from non-rice crops is greater than the return of rice crops. Although modern boro rice

covers the significant proportion of cropped area in consideration of surplus food production, but in case of relative profitability, findings suggest that vegetables, spices, and modern variety of potato are much more profitable than modern variety of boro rice. The author also judges that there is a positive correlation between increased profitability and growth of acreage under cultivation which confirms that as jute, oilseeds, and pulses observe to have lower acreage profitability and negative impact on the growth rate of area allocation among these crops is observed.

Although profit maximization is the prime concern for any commercial farmer in cultivating land, but in Bangladesh this hypothesis is not always true for the farmers at grassroots level because of several reasons as identified by the author. One important argument in favour of the above statement is that crop economy of Bangladesh is basically subsistence one and therefore, farmers would expect greater proportion of available land for cultivating the most subsistence one like rice for survival and also for meeting the subsistence needs. Another important argument against this hypothesis is that the farmers of Bangladesh do not give due importance on minor crops because of risk involvement in its nature. Rabi crops are basically perishable with probable limitation of technological constraints and also the risk of marketing because of inelastic market demand as a result of which they can not ensure its price and thus ignores the decision of producing these profitable but perishable agricultural produces. So the author suggests that probable facilities regarding storage and processing should be ensured which can sustain its tradability and durability. Therefore, the farmers may encourage to reallocate more lands for cultivating these cash crops.

As far as non-market constraints of crop diversification are concerned, the author indicates that various factors like rainfall, land and technological constraints are prominent

hindrances for augmenting crop diversification in Bangladesh. The author mentions that return from a crop under given market condition largely depends on yield. Again yields are expected to be influenced by variation in input uses, and thus indicate that flood-depth, soil quality, cropping pattern, and mode of irrigation have a noteworthy influence on crop yield. The author also indicates that non-market forces like rainfall and technological interventions are positively correlated with the farmer's decision on allocating land under cultivation. As for an example, the author mentions that areas received greater rainfall and having proper irrigation facilities have significant influence on allocation of land for cultivating both cereals and non-cereals, although cultivation of minor crops are more suitable for high land and in the areas of low rainfall. The author further indicates that minor irrigation is perceived to facilitate cereal production at the cost of non-cereal production. Adoption of minor irrigation is also expected to led the adoption of modern variety of boro rice in high and medium high land. The author categorically indicates that broadcast amon is primarily grown on medium low and low land while aus is produced only in high and medium high land which is also followed by non-cereal crops. Thus scopes for crop diversification on high and medium high land with traditional irrigation is limited because of the above cropping pattern. The author also mentions that within such an intact condition of land allocation, vegetables enter in the dominant cropping patterns of irrigated high and medium high land as a result of greater intervention of technology and market forces.

In the concluding remarks, the author suggests that expansion of acreage under modern variety of boro will inevitably lead to a less diversified crop economy which also leads to a lower cropping intensity. In this regard, the author also identifies several constraints to rapid expansion of area under non-cereal crops in the near future. First, the high and medium high land in Bangladesh are limited and its expansion is quite dependent on large scale investment on flood

control. Second, in order to let the farmers of distant areas realize higher prices for such perishable items like vegetables; and infrastructure has to be developed substantially. Finally, irrigation technology and policies towards it have greater implications for crop diversification. However, the author suggests some policy interventions for uplifting crop diversification. One important intervention is diminishing the marketing risk associated with the non-cereal produce, which requires widening the market with the facilitation of export, enhancing durability of products through promoting agro processing industries and also developing infrastructure to stress the potential benefits all over the country. The second area of intervention for promoting crop diversification is promoting researches on infrastructures relating to irrigation, particularly the development of field channels for facilitating simultaneous production of both cereals and non-cereals crops within the command areas under mechanized irrigation. Since the coexistence of traditional irrigation and cultivation of minor crops also may sustain in the near future, efforts may be taken to make the surface water more readily available through excavating of canals. Moreover, private investment should be increased for ensuring more allocation of lands for cultivating minor crops like vegetables and spices for the wider coverage of diversified agriculture in the rural Bangladesh.

The study entitled, "Poverty Issues in Rural Bangladesh" by Rahman Md. P.K. Motiur (1994) is one of the important study in the field of rural poverty alleviation. The study was the outcome of the authors Ph.D dissertation. The main thrust of this study was to critically examine and analyze the crucial issue of poverty and the process of impoverishment in rural Bangladesh. Through estimation of poverty line income, the author has made tremendous efforts to analyze the extent of poverty through establishing relationships between socio-economic and demographic variables with that of the estimated rural poverty. So far inequality in income distribution and also the ownership of land are the prime concerns of poverty alleviation in rural

Bangladesh, the author also analyses different inequality aspects and poverty indices with the help of Gini Coefficient measurement and also by taking measurement of the Atkinson Index of inequality. The author also judges the relationship between population and poverty in terms of household parameters in order to make a deeper sense of relationship considering both micro and macro aspects. So far landlessness and nearly landless households are the core of the rural poverty, and intergenerational transformation of land are the prime concern for sustaining ownership of land and also for reducing landlessness, the author very pragmatically analyze the transition of land ownership pattern of rural Bangladesh through sketching the markob chain Model in order to know the mobility aspects of land among different size classes between the two successive generations. The author also highlights the problems of rapid population growth interms of unemployment, underemployment, and seasonal unemployment in order to show the pervasiveness of rural poverty. The author very categorically analyzes the positive impact of education as an important social indicator that can contribute sufficiently in reducing rural poverty. The author duly emphasizes rural Development as a comprehensive strategy for poverty eradication in rural Bangladesh. In this regard, the author also indicates the efforts of "Comilla-Approach" as a pioneer of poverty alleviation programmes in rural Bangladesh.

So far regional disparity is a prime concern of overall development and poverty eradication, the author very analytically examines the socio-economic and demographic factors of the four greater divisions namely Dhaka, Chittagong, Khulna, and Rajshahi with a view to show a complete picture of poverty scenario of the rural Bangladesh. Finally, the author also integrates all the socio-economic and demographic factors to analyze and measure the variation and extent of poverty with the technique of logistic regression model in order to explain the impact of all the explanatory variables in poverty status of the households. In analyzing logistic regression model, the author indicates that poverty is concentrated among the households with

larger size, higher dependency burden, higher number of female members, prime and middle age head, little or no educational attainment, little or no assets (land), poverty also occurs where there is not rural development programmes or where programmes are in the remote areas. The author also indicates that education, landownership and small household size have a greater and significant effect on reducing poverty.

The author concludes that poverty in rural Bangladesh is rooted deeply because of inadequate use of labour force. Still Agriculture is our prime sector and source of survival of the millions of the people of rural Bangladesh. Still there is wide problems of landlessness and land polarization and also the problem is continuing. so with out sustained, and productive employment, poor households can not survive and can not purchase adequate food, improve their dwellings and send their children to school for education in order to improve their skill for better adulthood employment. Thus the author emphasizes that with out effective measures to combat unemployment, policy for increased production in agriculture, formulation of wage policy etc will be the little use to improve the lot of the poor. So the author concludes that eradication of rural poverty demands a series of interlocking packages programmes at least in three inter related sectors like demographic, social, and economic in order to overcome the aforesaid problems of poverty, starvation, and malnutrition from the rural Bangladesh.

The study done by the author is an excellent one in the field of poverty alleviation which is based on both secondary and primary data. Household Expenditure Survey(HES), 1985, Bangladesh Bureau of Statistics (BBS, 1985), Population and Agricultural Census are the important secondary sources while independent sample survey is also used as the primary source. The study was conducted during the period of 1988 and 1990 respectively. The methodology includes determination of poverty line income through establishing poverty measures based on

calorie intake and also considering the cost of non food necessities. For estimating poverty incidences, its depthless and severity, Head count Ratio (Hp), Poverty Gap (IP) and Gini Index (GP) of income distribution are also designed and measured by the author which are extensively applied for data analysis. Actually, the author incorporated more or less all the relevant issues of poverty in Rural Bangladesh which can provide indepth insight in the field of poverty alleviation in rural Bangladesh.

A research note entitled "Diversification of crops in west Bengal : A Spatio Temporal Analysis by Kumer Utpal De (2000) highlights the performance of crop diversification programme in west Bengal. The article indicates that the state west Bengal is a major contributor to the total agricultural economy of India which provides a significant proportion of agricultural output through diversified agriculture. The author indicates that advancement of technology in different fields of agriculture, development of varieties of seeds, changing markets and other infrastructure have encouraged the agricultural economy of the west Bengal to reallocate land resources toward different crops. The author mentions that the very problem of diversified agriculture in west Bengal is the decision making process about profit maximization strategies through the production of diversified crop.

Mentioning the importance of diversified agriculture, the author indicates that the process of crop diversification is initiated for avoiding risk and uncertainty involved in assurance of price sustainability and market opportunities, the diversified crops have the advantages of producing by products and also keeping it for the time of consumption and also for higher prices. The author categorically mentions that in the early years of development, the farmers used to grow subsistence crops mainly for their own requirement, but with the advantages of modern market

facilities, farmers become increasingly commercialized and realized the need for long term return through changing pattern of crop cultivation in case of producing diversified crops.

The author indicates several measurement techniques like Herfindhal Index, Ogive Index, Entropy Index for calculating the extent of diversification or concentration on crop cultivation among different districts of west Bengal. The author mentions that while the value one of the Herfindhal Index indicates concentration or specialization for cultivation of only one crop, its value tends to zero while perfect diversification arises due to the cultivation of several crops in a land or due to the changes in the total cropping pattern. Through time series data, the author also tries to observe the changing scenario of crop production in different districts of west Bengal during the period of 1970-71 to 1994-95. The author also observes that the growth rate of acreage of Boro rice was the highest followed by potato, mustard, and jute while Aus, wheat, sugarcane, and also pulses indicate negative growth rates. Annual compound growth rates of Boro were 7.78 percent while potato and mustard were 5.56 and 5.62 percent respectively. Growth rate of area under oilseeds as a whole was more than 5 percent because of good climatic condition. However Amon rice has been occupying the major portion of total area under cultivation from the very beginning. The author also indicates that annual growth rate of pulses shows a declining rate of 4.4 percent together with a very marginal growth rate of area acreage in case of cereals.

So far extent of diversification is concerned, the author observes that mustard production in terms of area expands much faster in all the districts except purulia while potato also shows higher growth rate. Although sugarcane has lost its area but jute experienced positive rate of growth in area in the districts of Hoogly, 24-Pargana, Nadia, Murshidabad, and also in coach Behar. However, due to increasing commercialization of agriculture, relative profitability of

crops led to faster growth of boro rice, potato, and mustard, the author also observes. The percentages of the indices indicates that among the different districts of west Bengal, Nadia is the highest followed by Malda, west Dinajpur, Hoogly, Coach Behar incase of expansion of agricultural diversification during the period of 1991-94. The extent of changes also indicates that during the peiod of 1970-73 to 1991-94, diversification was the highest in Nadia (61.88) followed by Midnapur (31.72), 24 Pargana (24.69) Burdwan (23.68), Darjeeling (11.3), Howrah (7.17), and Jalpaiguri (5.5). there are also some negative changes in the districts of Birbhum (17.31), west Dinajpur (-7.24), Purulia (-2.58) which indicates concentration of crop cultivation among the districts. However, the author also calculates other indices like Ogive & Modified Entropy Index of Crop diversification that also shows more or less equal extent of diversification and also concentration among the different districts of west Bengal.

In the concluding remarks, the author indicates that there has been a movement in the cultivation of agricultural crops towards subsistence to commercial cultivation of crops. The varieties of crops like boro rice, potato, and mustard have gained significant changes in terms of both area and yield while in other districts diversification experiences little yield in terms of area coverage and growth in yield. Finally the author mentions that the overall area under cultivation of diversified crops was expedited due to the growth of integrated market infrastructure where farmers have the increasing possibility of exchanging their products according to their desire. The author comments that possible studies in the field of diversified agriculture will encourage the policy planners for proper planning in acreage coverage of cultivation and also for choosing profitable crops for proper utilization of land resources in the best possible way with the objective of attaining sustainable achievement in the wider field of agriculture.

An article entitled "Changing cropping pattern in Bangladesh from 1971-75 through 1991-93 : Implications on Crop Sector Growth by Alam S and Abedin Md. J. (1996) discusses the changing cropping pattern for a period of more than two decades in order to make understandable the shifting composition of the crop sector. The article also identifies similar economic and non economic factors that might be the cause of the change in cropping pattern. The authors indicate that over the past 25 years after the independence of Bangladesh, cropping pattern in agriculture has shifted towards cultivation of traditional rice crops to modern variety of rice crops together with profitable non cereals and other cash crops like vegetables The authors calculate the change in total returns obtain from the cropping pattern changes during the three successive period of 1971-75 to 1981-85 and 1971-75 to 1991-93 and also 1981-85 to 1993-95 respectively.

In the introductory explanation, the authors define cropping pattern from different perspectives. As for example, the authors mention that cropping pattern is dependent on several contributory factors like changes in the area allocated to a particular crop and Yield rates while area allocation is also influenced by the expanded output prices in consideration with the price of inputs. In the context of total cropped area, cropping pattern for a single crop in a specific period of time is expressed by the proportionate area of crop to the total cropped area. In multiple crop situation, cropping pattern for single crop in a specific period of time is expressed by the proportionate of the total cropped area of the specific crop under cultivation in comparison to the area under cultivation of other crops. However, relative position of a single crop area may increase or decrease or may unchange depending on the area under cultivation of the other crops. Thus the pattern for a single crop cultivation to the total cropped area is called the single cropping pattern while the pattern for a crop cultivation with other crops may be called the multiple cropping pattern. So far shifting cropping pattern is the important issue for diversified

agriculture, the article indicates that it is the composition of the crops in relation to the contribution of the total crop land under cultivation. The author emphasizes that analysis of cropping pattern is important to understand the direction of change in the crop sector itself and also to reflect the contribution of each crop to the total crop sector interms of land productivity and revenue received from the specific crop.

Regarding the changes in total returns for the cause of cropping pattern change (1971-75 to 1991-93), the authors indicate that cropping pattern has changed towards HYV boro and amon rice varieties during the nineties which indicates that HYV boro rice while contributed about 57 percent of the cropped area. During the period, six crops out of eleven contributed positively over the period of seventies. The changes in return as a result of cropping pattern change were estimated to be about 15 percent over the period of seventies. Other than rice and wheat, all the rabi crops reflected positive change in terms of return because of the changes in the cropping pattern over the period of seventies.

Regarding the change in return due to the cropping pattern changes during 1971-75 to 1981-85, the article indicates that the period of 1981-85 in case of earning return from the crop sector resultant from the output of the changes in cropping pattern have earned positive result over the period of seventies, while in the eighties cropping pattern earned negative return in cultivating local varieties of rice, jute and other minor crops like groundnut, mustard, lentil, onion, garlic, chilli, etc. However, return from the contribution of HYV boro, HYV Aus & HYV amon earned about 138%, 65% & 5% return respectively over the period of seventies. During the period of eighties, although cropping pattern has changed significantly in rabi crops, the contribution interms of yield and profitability was negative. So far growth of net cultivated area is concerned, the article indicates that area under HYV boro, HYV amon and Sugarcane have

increased significantly over the period of 1971-72. Share of Rabi crops to the total crops was about 33% during this period due to changes in the cropping pattern. So far changes in return due to cropping pattern changes during 1993-94 over 1981-85 indicates that there has been the trend of positiveness in cropping pattern changes in both rabi & kharif seasons. Area under cultivation of HYV boro, HYV amon & sugarcane increased. share of rabi crops to the total crops was 14% in terms of return and at the same time proportionate area of rabi crops under cultivation also increased over the period of 1981-85. The authors indicate that cropping pattern of HYV amon, mustard, lentil, potato, and some other rabi crops also have shifted sharply towards these crops and earned higher return in nineties over the period of seventies due to cropping pattern changes.

In the concluding remarks, the authors indicate that percentage share of contribution of kharif crops including HYV boro rice while contributed about 88%, it was only 12% for the non rice rabi crops during the period under consideration. For the period of 1971-75 to 1981-85, share of kharif crops interms of contribution of earning return, it was 67% while in case of non rice crops, it was 33%. The share of kharif and rabi crops during 1981-85 to 1991-93 interms of earning return was 86% & 14% respectively. The authors also indicate that due to change in cropping pattern, farmers have shifted their cultivation towards HYV rice and Profitable crops. Due to the areas decreasing in case of boro rice areas of some rabi crops have increased significantly which contributed positively in the increase of trend of area acreage & yield in the diversified agriculture. The author also remarks that increased return has also generated from the proportionate increase in the area allocation for the rabi crops which inspired the farmers for cultivating more and more rabi crops. thus the authors suggest to improve the cultivation practices by adopting improved & diversified verities of different profitable crops in the present situation of the cropping pattern change for the greater improvement of the agricultural sector of rural Bangladesh.

The article entitled "Pesticide use in Indian Agriculture in Relation to Growth in Area, Production & Technological Change" by Chand. R & Birtham. S.P (1997) indicates the concerning adverse effect of over use of pesticides in Indian agriculture. The article reviews the quantification of pesticides in farming sector and also made comparison with that of the other Asian countries. The article broadly examine the use of pesticide in Indian agriculture during the triennium period from 1957-58 to 1992-93. The article analyses the implication of agricultural diversification from the view point of proper utilisation of pesticides in Indian agriculture. The article finally draws the attention of the farmers as well as agriculturists for searching & adopting alternative technologies to combat with the adverse effect of pesticides and also to protect insects, pests, diseases and weeds with a view to have a sound and ecologically balanced farming land for maintaining a fertile and sustainable agriculture in rural India.

The findings of the article indicates that as a result of wide transformation of technological advancement in Indian agriculture, there has been a tremendous increase in the use of pesticide in Indian agriculture which is observed from the data that use of pesticides has increased about 30 times during 1992-93 over the period of 1957-58. The authors mention that use of pesticides was little known to the farmers and its use was confined to very selective crops & regions till 957-58 but after that pesticide use in agriculture observed to be increased in an exponential growth rate till 1974-75 as a result of increased grossed cropped area and yield per acre of different crops in agriculture. The authors mention that the reversal trend of pesticide use after 1974-75 was due to higher price of agrochemicals, and also for the wider awareness of farmers about the adverse effects of pesticides in agricultural farms, and simultaneously for the proper attention on the Integrated Pest Management technologies offered by the National Centre for Integrated Pest management (IPM) of India. The authors very insightly indicate that in the

initial years of green revolution (1957-58) for attaining food security and surplus food production, the main concern of the Indian crop scientists was to maximize yield and so that proper attention on pest management was not paid during this period through genetic manipulation. But during the period of seventies, the adverse effect of pesticides attracted the attention of the scientists and thus leads the scientists for taking crop researches on pest resistant crop varieties. More ever, higher price of pesticides also diminished the farmers intention to reduce pesticide use after the mid seventies.

Regarding regional variation in pesticide use, the authors indicate that among the all states of India, per unit area of pesticide use the highest in Andra Pradesh which it is about 18 percent followed by Haryana, Punjab & Tamilnaru. The states while is about 1 kg, it is 100 gm lower in case of the later states of India. However, the variation of pesticides use was due to changes in cropping pattern, promotion of modern crop production, more specifically due to the cultivation of HYV rice with the wider faculties of modern irrigation as observed by the authors.

As far as inter country comparison of pesticide use is concerned, the authors mention that use of pesticides per unit of area is the highest in Japan (11 kg per hector of arable land) followed by Malaysia (9 kg per hector of arable land) and the lowest one is the Pakistan which is only 260 gm per hector of arable land. The ranging figure of pesticide use per hector among the countries like Thailand, Indonesia, India, Pakistan, and Bangladesh in making economic use of pesticides looks creditable. These countries are not only the low pesticides users but also reaped higher returns form pesticides use. The authors categorically mention that quantity of pesticide use and also the manner in which the pesticides is used both are equally important for maintaining environment, human health, and also for eliminating the adverse effect of pesticides.

considered to be a crop economy. The authors mention that the level of diversification of crop enterprises reflects the extent of economic development in the rural sector. The author also indicate that omnipresent problem facing by the farmers in agriculture lies in the decision making about the profitable levels of diversification of the crop farming. For the rural economy, in general, for small and marginal farmers, crop diversification has been largely considered as a ray of hope for economic upliftment. The article mentioned that, in the early stage of development, the farm generally grow subsistence crops. With the increase in human population, they try to produce more to maximize total farm output. In the third stage, the farm again try to diversify their agriculture to strengthen the existing level of development as also quoted by an earlier study by Chand and Singh : 1985. The author indicates that crop diversification varies form region to region because of agro-climatic conditions and resource endowments of the farmers. The article also mentioned that the farmers use to shift their cropping pattern from the subsistence to commercial cultivation when diversification is a priority concern of agricultural development.

The editorial report of the Bangladesh observer entitled, "Farmers Need Support" indicates that the agricultural sector of Bangladesh is largely traditional with the million of farmers who use the arable land only for rice & wheat which are very un- economic. The farmers also cultivates jute, sugarcane, potato, and green vegetables in most of the fragmented lands with limited use of modern inputs and services and thus incur poor margin. The article emphasized that farmers as a whole can be empowered if they are provided with technical and financial assistance sufficiently. The article indicates to take lessons from the experience of Netherland for diversifying the agriculture sector in the field of dairy farming, jute and jute products. The article suggested for bilateral trade relations among the developed and industrial countries for establishing diversify enterprises in the field of agriculture.

Gopalappa D.V. (1996) entitled, "Crop diversification and income levels in Karim Nagar district of Andhra Pradesh", India mentioned that farm diversification is adopted as a strategy for profit maximization through reaping the gains of complementary and supplementary relationships or in equating substitution and price ratios for competitive products. Farm diversification acts as a powerful tool in minimizing risk in the field of farm business. The author indicates that in India farm diversification have mainly focused on traditional crops like paddy, sugarcane, groundnut, wheat, cotton as the main crops, while pulses and horticultural crops are considered as subsidiary crops although some studies emphasized on dairying farming, fish farming, animal husbandry as diversified agriculture. The author thus indicate that overall diversification of the total farming sector can help the farmers in uplifting their economic condition.

PETRA (2001) in a concept paper on "Diversified Livelihoods: Developing Robust Diversified Systems for Resource Poor Farm Households" formulated for the resource persons of the "Poverty Elimination through Rice Research Assistance (PETRRA) Project Indicated that because of population growth, demand for rice will grow in absolute terms which is projected to reach 46 million mt by 2010. The paper indicates that rice production must be double in order to meet this demand. Eventually demand for rice will level off because of slower population growth and rising incomes of the farm households. As income rises, diets become more varied and rich in proteins. Demand will rise for livestock products, fish and edible oils, potato, vegetables and pulses. The paper also mentioned that a 10% increase in income will increase demand for meat and milk by 15% and fish by 8% respectively.

The paper categorically mentioned that a decade ago importance of rice was far more compared to other crops. At present rice remains as the most important but crops like

vegetables, pulses, potato, chill are also very important and not far from rice. Now fruits and vegetables are more profitable than rice because of improved transportation facilities and thus farmers started shifting towards more intensive commercial crops in response to market opportunity. Farmers are gradually shifting towards vegetable because they incurred losses in paddy production. The paper also highlights that many poor rice growers of Bangladesh are now experimenting with crop diversification as a means of minimizing the economic risk of farming. Growing non-rice crops in rotation with rice, in neighboring fields, even within the agriculture are changes as a strategy of sustaining agriculture so far environmental hazard and pests management are concerned.

Bayes Abdul (2002) in a article entitled "Rural Economy : A look back into the 1990s" indicates that farmers in Bangladesh has been continuing the fuel of engine of growth of the Bangladesh economy. The author mentions that in the face of stagnant supply of land over the decades, covering around 10-11 million hectors, rice production in paddy units stood at 38 million mt. in 2000-01 compared to 14 million tons before independence and 18 million tons in the early 1970s which implies that growth rate of 2.6% per annum as against a population growth rate of 1.5%. The author mentioned that rice production per capita increased to 194 kg (milled rice) in 2000-01 compared to 151 kg before independence. But poverty persists because of the lack of exchange entitlements, the author further emphasizes.

The author in the article mentions that a remarkable drawbacks of our development is the lack of crop-diversification which is the constraint of our overall agricultural development. Respectable growth in the production of wheat, potato, and vegetables emerged as a boon but substantial slash in the areas under jute, sugarcane, pulses and oilseeds remain as a bane as a result of which scarce foreign exchanges are being used for importing non-cereal product. Thus

the author emphasizes on production of non-cereal crops and vegetables as a source of nutrition and reducing trade balance. The author concludes that diversified agriculture can offer a number of chain effects through generating demand for modern inputs in agriculture; demand for services, processing, storage, marketing; demand for trade, transport, construction, education, health services etc. as farm households spend a large proportion of incremental income of purchasing non-farm goods and services.

The study entitled, "Diversification of Agriculture : A comparative study of three villages in Bangladesh" by Abul Quashem (1997) is a new addition in this line. The author indicates that reasonable progress has been occurred in case of modern rice and wheat under irrigated condition. As far as minor crops like pulses, oilseeds and vegetables are concerned; their coverage is low and not adequately diversified despite the instance of the present government programme of crop diversification. Still Agricultural diversification in terms of non-crop agriculture like livestock, fishing and forestry is far behind from modernisation of agriculture. The author indicates that diversification is now practiced keeping in view the question of sustainability of land productivity. The study is conducted in three categories of villages (a) Advanced village (b) Progressive village (c) Traditional village. During survey, the whole population is divided into two categories (a) agricultural householders (b) Non-agricultural leaseholders, depending in the principle source of income. Regarding production of diversified crops, the author indicates that in progressive village rice has grown in three seasons of the year simultaneously there produce vegetables and potato which is 13% and 8% respectively. The traditional villages has little vegetable acreage and there is no potato. In crop sector, per acre – employment finds about 108 man days, highed being in progressive village is 153 mandays and lowest in the traditional villages. The author also noticed that employment opportunities has raised due to the rise in crop diversification. The author investigates poverty at two levels (a) per

capita income (b) per capita calorie intake level. Regarding calorie intake measurement of poverty, the author indicates two measures of poverty: (a) 2122 k.cal per person per day which is general poverty level called absolute poverty and at 1805 k.cal known as hard care poverty. For measurement of poverty 30% of food consumption is considered for non-food items. On the basis of income level, general poverty or absolute poverty is considered as Tk.6601 or US$154.00 per capita per year while hard core poverty is estimated at Tk. 3945.00 or US$.92.00 at 1995 market price. The author indicates that on the basis of income level poverty, about 1/3rd of the households are living below the poverty level and about 50% household fall on hard core poverty. Regarding standard of living or quality of life. The author indicates that level of living is far better in modern villages.

As far as determinant of Agricultural diversification is concerned, the author finds major determinants like : (a) village characteristics, (b) state-support for different community services. Village characteristics indicates (a) land topography and soil characteristics and access to infrastructure facilities like irrigation, electricity, roads, markets etc.

In the concluding remarks, the author indicates that actual practise of crop-diversification is little in the trust sense of the term although a wide variety of crops, vegetables and fruits are grown in the country. The author mentions that little is known about income, employment and investment so far agricultural diversification is concerned and these open for further searching out for better result on the above variables or determinants of diversified agriculture. The author touches that agricultural diversification is still being very much limited, their wide-scale expansion are due and also possible through efficient distribution of institutional credit and the farmers will be encouraged to grow more diversified crops considering the limitation of marketing for outputs and inputs. The author indicates that this is the area of globalization of

trade so that structural transformation in agricultural production is due to make our agriculture more efficient and competitive.

The study entitled, "Irrigation for Crop Diversification in Rice-based System in Bangladesh" by Mandal, M.A.S. & Dutta, S.C.(1993) highlights the current status of rice and non-rice irrigation, cropping pattern and their profitability with some policy recommendations and implication for crop diversification on irrigated land.

Regarding the irrigation status, cropping pattern and profitability, the author indicates that the farmers of Bangladesh are familiar with irrigation both for cereals and non-cereal crops. the author indicates that rice and wheat, the two major cereals occupy about 82 percent and 9 percent of the total irrigated area and the rest 9 percent irrigated areas are occupied for non-cereal crops. However, according to the author, in 1991-92, percentages of gross cropped area under potato, vegetables and cotton were 66, 18 and 26 percent respectively while these crops together accounted for only 6 percent of the total irrigated area. However, the author mentions that use of modern irrigation facilities for potato, and vegetables is growing considerably in recent years and the growth rate of area under irrigation for potato, cabbage, cauliflower and tomato were 4.6, 2.5, 3.4 and 4.2 percent respectively. Vegetable area as a whole grew at 7.8 percent annually during the period of 1986-87 to 1990-91.

The author mentions that with the expansion of irrigation facilities and increasing commercialization of crop sector. More potato and vegetable crops are gradually being incorporated in the rice-based cropping pattern. The degree of such adoption varies according to regions, depending on soil, climate, and facilities provided for marketing the outputs, the author also mentions. Regarding the profitability of crops and cropping pattern, the author indicates that the most important reason for farmers to increase the production of non-rice crops especially

irrigated potato and vegetables is due to higher return from these crop compared to irrigated rice production in rabi season. The author also mentions that returns from diversified crops like potato, vegetables under irrigated condition is significantly higher than irrigated HYV boro and HYV T aus, wheat compets with HYV boro is a loosing concern, the author also indicates.

As far as irrigation management is a necessary condition for raising productivity of both rice and non-rice crops, the author mentions that although in case of HYV Boro rice, farmers are more aware about the application method of irrigation, time and depth of irrigation; but in case of horticultural crops like potato, vegetables etc. farmers have little or no experience about the application of irrigation. The author mentions from evidence that while DTW and Shallow Tubewell irrigation coverage for non-rice crops occupying about 55 percent and 68 percent of the total command area respectively it receives about 20 percent and 33 percent of irrigation on the command area in Chandina. But HYV boro rice occupied more than 60 percent of the command area which receives about 80 percent of the total water supply for irrigation purposes, thus indicating more use of irrigation water for non-rice crops. The author indicates that there observes some management patterns regarding unlined irrigation channels, repair and maintenance of irrigation channels after the harvest of transplanted Amon but the flow of deep-tubewell irrigation is very high which requires wider command area for both rice and non-rice crops for its optimum utilization. But it is observed by the authors that Shallow-Tubewell (STW) irrigation is betterly managed by the farmers compare to Deep-tubewell in case of irrigation management of diversified crops. Thus the authors suggest for modifying and adjusting the supply of water both for rice and vegetable fields through proper management and introduction of new canals in the rice and vegetable fields. However, for effective application of irrigation water in vegetable fields, the author suggest minor irrigation as suitable method for water application in the non-cereal crops.

In the concluding remarks, the authors indicate that as irrigated non-rice crops are more profitable than irrigated HYV boro rice, there are both physical and agronomic potentials to incorporate non-cereal crops in the rice-based cropping pattern for better coverage of crop-diversification. As irrigation is the leading input for crop cultivation, the limitation regarding irrigation technologies for water discharges, depth of canals, application method of water and water adequacy need to be managed appropriately for maximum utilization of irrigation water in both cereals and non-cereal cultivation. However, the authors recommend to make intervention in the following areas for overall performance of production of cereals and non-cereals: (a) improving the farmers knowledge, and perceptions about the quality, time and application methods of irrigation for non-rice crops. (b) Encouraging the application of small-scale irrigation machines, manual pumps and hand tubewells for small-flow and equal distribution of irrigation water for satisfying time-specific irrigation of non-rice crops. (c) Providing extension services to farmers for improving the traditional production practices of horticultural crops like shifting cropping patrern, crop-rotations, shifting the timing of planting etc. for better utilization of irrigation facilities both for cereal and non-rice crops.

Vyas, V.S. (1996) in a study entitled, "Diversification in Agriculture : Concept,, Rational and Approaches" highlights the conceptual issues of diversification. The study also looks into the matter related to the rational for agricultural diversification between farm and non-farm sector. The author also discusses the determinating factors of diversification. Finally the author indicates some policies reflecting for the overall growth of diversification of Indian Agriculture.

In the introductory discussions, the author defines diversification both in terms of macro and micro perspective. A move away from agriculture to industries and services denotes diversification at the macro-level. In the micro-level, shift of farming from one crop to another

crop, or from one enterprise to another indicates diversification. Thus in micro-level, diversification suggests three situations:

(a) a shift from farm to non-farm activities

(b) a shift from less profitable crop or enterprise to more profitable crop or enterprise:

(c) use of resources in diverse but complementary activities:

The first type of diversification is essentially the diversification of the rural economies rather that agriculture, the second one is related to the farmer's response to price signals and their efforts to adjust changes in market condition. The third type of diversification is related to the proper utilization of resources for unemployed or underemployed populations in the agricultural sector.

However, the author indicates that the pace of diversification in Indian economy suggests for sectoral composition which is slower than several other countries or reflected in the condition of gross Domestic Product (GDP) which has reflected from 54.7 percent in 1980-81 to 27.7 percent in 1993-94 which further indicates that more and more resources are being diverted to the non-agricultural sector. The author also indicates that within agriculture, share of output and employment in case of non-crop sectors has also increased but it is in very slow rate, which is only about 10 percent of the total agricultural output. The author also mentions that more significant changes have taken place in the crop sector, which also indicates that the area under commercial crops has increased by 50 percent since 1960s. But the author also cautiously mentions that there also shows a declining trend in case of share of agricultural crop, decomposition in work-force, faster growth in non-crop sub-sectors with in agriculture, faster growth in non-foodgrain crops, and also faster growth in superior cereals which and what are also happening in other developing countries.

Regarding the rational of diversification, the author indicates that several consideration have prompted to accelerate the pace of diversification. The important objectives of encouraging the pace of diversification are: (i) objective of income – stabilization which needs major shift in enterprises of the rural economy (ii) the objective of increasing the income of the small farmers and (iii) the objective of full employment of the farm household and also optimum utilization of the natural resources.

To satisfy the problem of price induced instability of income, the author suggests for introducing crops or engaging in enterprises which would enable to them to ensure a steady flow of income over the year, and thus search for a major strategy of crop-diversification for providing gainful employment for the unemployed and underemployed labour-force in agriculture.

Regarding the determinants of diversification, the author identifies the most important factor of diversification is the market which suggests high elasticity of supply of various crops in response to prices. Second important determining factor of diversified agriculture is the change in the cropping patterns. Cropping pattern change is highly correlated with and advocates the advantages of crop diversification. Market infrastructures and institutional arrangements are also other important forward looking determinants of crop-diversification which are equally important for the producers for taking cropping decisions. The agro-economic conditions in a given region and the technological innovations and availability are also the two-important determining factors for crop-diversification. Another important determining factors of diversified agriculture is policy interventions like price policy, credit policy, research and development policy which directly reinforce the practical augmentation in agricultural production. Such macro-economic policies affect the profitability of the agriculture sector as a whole.

Regarding the future agenda on policy issues of diversified agriculture, the author also acknowledges the relevant experiences of other developing countries. The author indicates that with the sharp decline in rice prices in international markets in the 1980's many of the countries were under pressure for voluntarily effort for crop diversification. The common policies as taken by the countries are : Concentration on substituting crops and enterprises which had high income elasticity of demand. Alternatively, some successful countries emphasized on cultivating high value crops for expanding export markets for horticultures. Some countries also tried to provide conducive policy environment for the growth of non-farm sector.

In the concluding remarks, the author emphasizes that for the accelerated pace of diversification with a view to meeting the objectives of higher income, higher employment, stabilization in income and conservation of natural resources, three categories of policy measures like technological development, economic reforms and institutional development for ensuring irrigation facilities, proper delivery of inputs and credits, at grass-root level should properly implemented by the respective countries. For ensuring better price for the diversified crops, proper market regulations, processing and marketing facilities, import restrictions should be implemented and followed by the respective institutions. Similarly, policy interventions interms of action-research programme for the growth of non-farm activities should be properly evolved and implemented as a complementary to the farm sector for a wider outlook of the process of structural transformation of the total agricultural economy.

Sidhu (1997) on "Measure to Enhance the Efficiency of Agricultural Marketing Systems : Case of India" touches the constraints regarding the improvement of marketing performance of agricultural produces. The author mentions mainly four aspects that behind the in-efficiency of agricultural marketing system. The first aspect is the preponderance of various marketing acts

and trading practices. The second aspect is constraint of infrastructure. The third aspect is related to institutional arrangement of marketing and the fourth aspect is related to the constraint of quality management. The author emphasizes that there should be one uniform act and set of rules and regulations so that malpractices regarding hidden sales and excessive market charges would be stopped. Regarding infrastructure, the author indicates that poor state of infrastructure has seriously affected the export capability of the country. In the concluding remarks, the author suggests to induce private sector investment for the infrastructure development of the country. Finally the author suggests for maintaining quality standard of the agricultural commodities both for domestic and international markets to improve the overall efficiency of agricultural marketing system in India.

Dasgupta.S.K (1998) on "Vegetable Marketing in Bangladesh: some problems and prospects" indicates that improvement of both production and marketing of vegetables in Bangladesh is mutually supportive. Although low purchasing power is a drawback of expanding domestic market in Bangladesh economy in the short run, but the country is not following export led agricultural growth strategy for expanding its vegetable market in abroad although it has been followed by the developing countries like Vietnam, China, Pakistan, Srilanka, Philippines and Thailand. The author indicate that incase of expansion of exports, Bangladesh faces two challenges. Firstly regular export is a challenging job for Bangladeshi vegetables because of higher standards of specifications demanded by the foreign consumers. Secondly, the exporters have to face competition of similar products with different countries. The author in the findings indicated that major problems of vegetable marketing in the grass roots level are deprivation of getting fair price in the primary and secondary markets due to mal price done by the market participants, problems of storage and processing, transportation, grading, packaging and market intelligence and export. The author thus indicates that the entire state of vegetable production

and its marketing in Bangladesh needs a forward push with respect to technology, infrastructure, and institutional facilities right from cultivation to marketing of vegetables. The author suggests that introduction of training, appropriate technology and contact farming in cultivation, grading, packaging, facilities of transportation and storage, and market intelligence needs to be improved for sustained production, marketing and export of vegetables in Bangladesh.

Alam Md. J (2001) on "Marketing of Vegetables in Bangladesh : A study of six villages highlights the important issues of agricultural marketing in Bangladesh both on micro and macro level perspectives. The author indicates that for a take off country like Bangladesh, agricultural marketing has a greater role to make economic development more dynamic and realistic. In the introduction, the author mentions that Bangladesh has achieved great success in rice production and became self sufficient in rice production during 1999-2000. At the same time cropping pattern has also changed significantly with the changes in economic and non-economic factors like relative changes in output prices, changes in cost structure of production, changes in the climatic pattern and also changes in the soil characteristics of the country and in this way, cropping pattern has shifted towards high value crops like vegetables, oils seeds, fruits and vegetables and also the crops with advanced technology of production. The author mentioned that this increasing growth and its impact on agricultural sector enhanced the growth in production with more per capita income and per capita food supply for the overall population. The article mentioned that there has been the opportunity to achieve surplus agricultural production, but constraint lies for ensuring higher income for the people. Thus the author emphasized for implementing effective agricultural marketing system which can be termed as a system of physical distribution of commodities; a financial system to make possible the transfer of goods and services, a system of integrating that fulfils human wants, needs and demands

meaningfully and a system of creating purchasing power both of the producers and consumers through maximum possible utilization of human capacities and resources for production.

Regarding the agricultural marketing structure in Bangladesh, the author indicates that there are three categories of markets like primary market, secondary market and terminal market while market participants like bepari, aratdar, wholesaler, retailer, exporter are involved in these markets to transfer vegetables from producer to ultimate consumers. Regarding marketing cost and marketing margin, the author indicates that marketing cost and marketing margin varies due to the variation of cost incurred in performing the different marketing functions by different categories of market participants involved in the marketing process. Regarding the marketing efficiency the author mentions two categories of efficiencies like economic or functional efficiency and operational or technical efficiency. Economic efficiency indicates improvement of marketing functions like transportation, storage and marketing communications while operational or technical efficiency related to reduction of physical losses during the whole process from post harvest to transfer the commodities from producer to ultimate consumer. The author also mentions that marketing efficiency is directly related to marketing cost. That is, less the cost of marketing to transfer the produces from producer to ultimate consumer, the higher is the marketing efficiency. Thus any improvement in the whole marketing functions that can reduce marketing cost indicates an improvement in the efficiency of marketing. The author through primary data analyzed that marketing efficiency interms of producers share by different categories of vegetables varies due to variation of distance from production to place of consumption, involvement of market participants and the cost involved in performing the marketing functions. The author suggests that marketing efficiency for agricultural commodities like vegetables can be improved if the cost involved in performing the services can be reduced with proper improvement of both physical (transportation, processing) as well as other

facilitating functions. Finally, the author concludes with an integrated approach called as marketing system approach where all the factors from production to ultimate consumption are interlinked in order to have a strong footing for the development of an agricultural economy.

Malik (1996) in "Enhancing International trade in Tropical Agricultural Products" highlights the changes in the export of agricultural products from the developing countries. The author states that the share of agricultural export in the total export has declined from 31.7 per cent to 25.4 per cent during the period of 197-72 to 1990-92 . The share of fruits during the same period has increased from 33.1 per cent to 37.3 per cent while that of vegetables declined from 23.4 per cent to 19.1 per cent. The author mentions that a number of tariff and non- tariff barriers has affected the export of agricultural products from the developing countries. The author also indicates about the Uruguay Round Agreement on Agriculture (URAA), which seeks to bring the agriculture under a comprehensive multilateral discipline. Regarding the impact of URAA, the paper indicates that while a significant degree of trade liberalization is likely to occur for agricultural products, many products of interest to developing countries will continue to face high tariffs, often coupled with a relatively high level of tariff escalations. Regarding the export potential of tropical agricultural products, the writer suggests to take the full advantage of this potential and mentions that the developing countries need to reorient their domestic economic policies to give a best to their production and export.

West fall (1997) in a study on "Export- Marketing Strategies for Tropical Agricultural Products" indicates that an export lead marketing plan must address four issues: which product will be exported, to what form, where will be exported and also the product positioning, which is really a function of demand in the target country. The author mentions that this demand will be influenced by: the level of local production, the stage of national economic development and its

impact on food production and distribution sector, the pace of economic expansion and intense growth, the rate of population growth, and finally local taste and preferences. However, the author emphasizes that in order to decide where, what and how to market a product either at home or abroad can be structured by SWOT analysis, which is a acronym for strengths, weakness, opportunities and threats which as an approach can help the exporters to assess themselves where their products stand in relation to competitors and it should be an important part of the preliminary analysis conducted as part of the marketing strategy. The writer further emphasizes that after reviewing the SWOT analysis and issues it raises, an exporter must begin formulating a marketing strategy by thinking about how the product meshes with the market. A matrix that outlines four strategies market penetration, market development, product development, and diversification can be a useful tool in selecting an appropriate approach. The author also identifies two basic paradigms for successful international marketing: marketing boards and intergraded companies to cooperatives. The paper concludes in such a way that government may also play an important role by providing assistance with planning; funds for market research, guidance on market conditions and opportunities, financial support, periodic evaluation and redirection of market development.

Islam (1995) in a study on "Development of an Effective system for vegetable Marketing in Bangladesh" investigates that the present market intelligence system in Bangladesh is not yet organized. Communication system to link wholesale and retail markets in different areas has not been strengthened. Transportation for domestic and foreign markets is still poor. The study observes that out of 64 field offices of Department of Agricultural marketing only 24 have telephone lines, where market information's are sent mostly by mails. Farm-level prices are broadcasted over radio once a week. Farmers do not get good vegetable seeds at the right time at a reasonable price. Exporters get their money for exporting vegetables to the parties of the

importing countries after four weeks of export and exporters repay cash to farmers through traders after five to six weeks. The study suggests that for greater interest of the special programme on vegetable, market information's regarding demand, supply, price, quality, packaging and grading of vegetable should be broadcasted through mass media, Exporters should provide credit facilities in order to compete with exporters of neighboring countries and refrigerated vegetable vehicles should be used to transport vegetables from farmers to wholesale markets.

Hossain and Arangzeb (1992) "Vegetable Production Policies and Future" indicates that the present production is around one million tons per year of which 70% produced in the cool season. Thus seasonal fluctuation in the availability of vegetables exists in the market. The authors mentioned that vegetable production is far below the requirement in Bangladesh, which leads to low consumption of vegetables. Present consumption is only 8.5 kg / head / annum i. e. 25 gm/ head / day. The author acknowledges that during the 1950s the then V- Aid programme was the initiator of vegetable programme in the country which encouraged rural households to implement various activities to produce vegetables. But still vegetables are considered as minor crops. The authors mention that there is high potential for exporting fresh vegetables to the Middle- east and EEC countries. But export earnings is declining due to lack of initiative and drive by concerned organizations. So the author suggests the government to reorient policy framework for vegetable production and export to earn more foreign exchange.

Hasan (1994) in a study in " prospect of Vegetable Fresh Fruit Export from Bangladesh" observes that India is far ahead than Bangladesh in respect of vegetable export. A major share of the Middle- east market of vegetables is captured by India because of its favorable agro-climatically situation, scientific method of farming and discovery of high variety of vegetable

seeds enhanced India to produce more quality vegetables than Bangladesh. Thus per hectare yield of vegetables in India is much more higher than Bangladesh. The author also in indicates that there is a shortage of quality seeds of vegetables in Bangladesh particularly for summer vegetables. There is a need of 250 tons of seeds of different vegetables annually for the existing cultivable land under vegetable production. But only 4% of this requirement is met from production of public sector organizations. 10 per cent is imported and rest is fulfilled by farmer to farmer exchange. The author also observes that preservation quality of vegetables is also poor. Fresh color and appearance cannot be maintained up to the time of sale in overseas market. Moreover, Bangladesh has no standard vegetable export packaging system, the author also adds.

Hussain and Elias (1994) in a study "Socioeconomic potential of vegetable crops: present status and Future Needs" mentions that production area and yield of different winter and summer vegetables have varied among different districts. Pointed gourd production is more in Rangpur, Bogra, Rajshahi, Kushtia and pabna; lady's finger in Chittagong, Comilla, Rajshahi and jessore; arum and arumroot in Comilla, Rangpur, Dinajpur Kustia and Sylhet. Considerable price variation also exists during different months of the year. Price is always High during early harvest period and tends to decrease over time during peak harvest time, the author mentions. This price variation is not only at the grower's level, but also in rural and urban consumers level. The author also indicates that there is a big gap between growers market and urban retail markets and maximum benefits go to the intermediaries. The share in price received by the growers and that of consumers is about 49%. The author suggests that farmers share can be increased by providing physical facilities and eliminating unnecessary and inefficient middlemen from the marketing channels.

Elias (1992) in a study on "Marketing and Credit for Increased Vegetable Production" mentions that vegetables have not yet attracted the attention of the public sector for a credit program. Credit is required for efficient production and utilization of vegetable marketing. At present, the major part of the production credit is supplied by private sector. Mostly it is the traders who contract the farmers in advance and provide credit for vegetable production on the condition that products would be sold to the consumer. It is observed by the study that traders pay less than the prevailing market price.

Ahmed (1995) in a study on " Role of Farmers, Private Sectors, NGOs and the Government in Vegetable Crops Agribusiness", mentions that in recent times, the NGOs concerned with agricultural activities are getting interested in vegetable production effort, and tend to fill in a gap lying between farmers, researches, extension works and in a matter of providing credit facilities. The author also mentions that obviously it has become essential to consider the question of collaboration between the government organizations and NGOs as well as other sectors, in the matter of vegetable production, seed production, seed procurement, processing and export The study further emphasizes that more recently some NGOs have shown considerable success in agricultural development activities and they can fill the gap in improving vegetable production of the country.

Baker, M.A. and Hamid, A (2003), "Crop Diversification for Poverty Alleviation incorporating Legumes in Rice-Based cropping systems in Bangladesh" states that agriculture is the main source of income and livelihood of the major segment of population in Bangladesh. Most farmers have small holdings and poverty and malnutrition are widespread. The findings of the article indicates that a number of programs and projects are being implemented for poverty reduction and economic development. Rice dominates the cropping system and its production

needs to be sustained to meet the growing demand. Continuous and intensive rice production systems have led to the degradation of natural resources. Growing legumes in rice based system helps increase total production and income, improve nutrition and livelihood, and maintain soil productivity. However the article also indicates that area and production of grain-legumes (or pulses) declined over the years with the expansion of rice and wheat cultivation. Low yield potentials, vulnerability to weather changes, incidence of diseases and insect pests are also the causes of the decline in area and production of legumes (pulses). Soil physical environment often presents problems in establishing legumes where proceeding crop was a lowland rice. Pulses generally do not respond to high management and are poor competitors with high yielding or high value crops. In certain districts, farmers grow pulses under irrigated condition applying adequate inputs.

So far area and production of grain legumes is concerned, the article indicates that major Pulses gown in Bangladesh are lentil, mungbean, groundnut, blackgram, cheakpea, cowpea, pea and pigonpea. But with the expansion of irrigation, most farmers tend to grow high yielding varieties of cereals and high valued crops including vegetables. Thus pulses are gradually pushed to non-irrigated and marginal lands of crops. Of course, there is exceptional. Production of mungbean in the South-western districts is an exception where farmers grow mungbean applying irrigation and fertilizers. Chickpea is produced in barind land. However, most legumes are produced in winter season. Yield of most grain pulses are poor and farmers are often reluctant to grow legumes if more profitable crops are available. Area and production of groundnut tend to increase in the seventies and eighties but remained almost static throughout the 1990s. Mungbean and cowpea seem to have registered increase in area and production in recent years. Cowpea has been a recently introduced crop; but within few years its cultivation expanded dramitically in south-eastern coastal areas. There has been drastic reduction in the area and

production of lentil and chickpea during the recent years. So far scope and potentials of legumes are concerned; the article indicates that government has taken massive campaign in the form of action plan to grow legumes in cereal based cropping system. The plan targets to increase production by nearly 50% in three years relying largely on the improvement of yields by replacing old varieties with modern ones and through expanding area where pulses are not traditionally being grown. The article concludes that increased population coupled with low growth in pulse production created a serious negative impact on human nutrition. Protein intake rate has declined during the recent years and trend remains unchecked. Rice still remains the single most important crop interms of area and production. Therefore major challenge for the Bangladesh government is to increase pulse production through expansion of crop diversification. Reducing production cost and risk of crop failure or vulnerability to pests and diseases will also help attract farmers in growing pulses. Development of infrastructures, access to market and provision of minimum support price may encourage farmers to produce pulses.

The article entitled 'Diversification of Indian Agriculture and Food Security' by Satyasai K.j.S and Viswanathan, K.U (1996) defines agricultural diversification as producing increased variety of agricultural commodities. The author indicates that as cereals can not alone support food requirement, diversification becomes as an essential strategy for meeting the needs of supplying staple foods, minimizing the risk of crop failure, increasing source of income and foreign earnings and above all for the economic development a country. However, in the present article, the author examines the different facts of diversification in Indian agriculture with specific emphasis on the implications of food and nutrition security. Diversification index based on Herfindhal index is calculated from the crop sector data on area and value of output for the triennium period to observe the change of contribution of different crops within the sector. The author in the article identifies four important trends of cropping pattern (area shares) during the

four and half decades in Indian agriculture particularly in the crop sector. The findings indicate that share of non-food grain crops in the gross cropped area has increased from 26.42 percent in the triennium ending (TE) 1952-53 to 32.37 percent in TE 1992-93 resulting in diminishing of shares of food grain area. Among food grains, wheat has gained area shares from 7.21 percent to 13.06 percent whereas coarse cereals have lost from 35.55 percent to 18.92 percent. Shares of area under oilseeds has increased from 8.81 percent in 1952-53 to 14.50 percent in 1992-93. Shares of fruits and vegetables has increased from mere 0.58 percent in 1952-53 to 2.29 percent in 1992-93.

Regarding food security the article indicates the food security of a country can be ensured by making available sufficient food supply to feed the entire population. The findings of the article also indicates that food production has increased by 3.7 times from 2.35 lakh billion calories in 1950-51 to 8.74 lakh billion calories in 1993-94. The article also indicates that although population of India increased from 363.2 million in 1951 to 899.9 million in 1993-94, there was a tremendous improvement in per capita per day calorie consumption. The findings reveal that while in 1952-53 per capita per day calorie intake was 1920 kcal, it raised to 2876 kcal in 1993-94. The author indicates that relatively more calories are coming from non-food gain items like oilseeds, fruits & vegetables compared to food grains.

In the concluding remarks the article indicates that with in the crop sector the pattern of diversification is characterized by growth in share of non-food grain crops. The share of area under oilseeds as well as fruits and vegetables in the total crop sector has increased over time, which is the result of positive diversification in Indian agriculture. At the same time increased share of calorie intake from non-food grain items like oilseeds fruits and vegetables also reflects

a positive improvement of the quality of food security over a period of four and half decades in the Indian economy.

Gosh Madhusudan (1996) on "Agricultural Development and Rural Poverty in India" highlightes the effects of agricultural development using state wise cross sectional data at four points of time, 1972-73, 1977-78, 1983 and 1986-87 to examine the effects of agricultural development and some socio-economic variables on rural poverty in India. The author indicates that the prominent issues which attracts considerable attention regarding agricultural performance and poverty involve three questions like : (a) whether improved agricultural performance has been associated with reductions in the incidence of rural poverty ? (b) whether nominal prices of commodities consumed by the rural poor have any adverse effect on the incidence of poverty ? and (c) Is there any discernible time trend in the incidence of poverty ? considering the three issues, the author tries to analyze the effect of agricultural performance on poverty.

However, the author identifies two sets of factors like general factor and specific factors to measure the effect of agricultural performance and rural poverty. Since rural people depends for their livelihood on agriculture, state domestic product in agriculture per head of the rural population (SDPAR) as a measure of agricultural performance is considered as a general factor which can influence the incidence of rural poverty. In defining the specific factors which can influence the incidence of rural poverty, the author states that the agricultural labour households and primary cultivator (self employed in agriculture) households consisting of marginal and small farmers are identified as the rural poor who constitute 79.32 percent of rural poor households in India. As the rural households primarily the cultivator households earn their livelihood mostly on the income of land, so average size of operational holding of the small and

marginal farmers (AVMSH) is considered as an important specific factor which can affect the incidence of rural poverty. Again level of income and purchasing power of the agricultural labour households depend on the real wage rate (RWAL) of the households; it is considered another important factor for determining their living condition which may also reflect in the incidence of rural poverty. Finally the author augures that since one cannot expect wage income without having any employment, current day status of unemployment rate among rural males (CDURM) is considered another specific factors, which can affect the livelihood of the rural poor as well as incidence of rural poverty.

In order to examine the effects of these factors on rural poverty, the author estimated two equations for rural poverty involving general and specific factor on the basis of Ordinary Least Square (OLS) method with the basis of state-wise cross sectional data for four points of time like 1972-73, 1977-78, 1983 and 1986-87. The specific equations are :

$$RPOV = L_0 + L_1 SDPAR \qquad (i)$$

$$RPOV = = B_0 + B_1 AVMSH + B_2\ RWAL + B_3\ CDURM \qquad (ii)$$

The findings of the article indicates that since co-efficient of SDPAR turns out to be significantly negative, it implies that there is an inverse relationship between rural poverty and agricultural production per head of rural population which suggests that improved agricultural performance is associated with reductions in the incidence of rural poverty. Since rural poverty is found to be inversely (negative co-efficient for all SDPAR in all time) associated with agricultural production in all times and R^2 value is declining (0.696 in 1972-73 0.586 in 1977-78, 0.547 in 1983 and 0.473 in 1986-87) indicates that trickle down mechanisms have weakened considerably in the later points of time which suggests that agricultural production alone will not

bring about sufficient reduction in the incidence of rural poverty rather increasing importance of rural development programmes may influence in improving the livelihood of the rural poor.

The results of rural poverty in case of specific factors together indicates 63 percent (R^2= 0.631) variation in rural poverty which are also significant individually. The co-efficient of average size of holdings of marginal and small farmers is negative (-24.320) indicates that a small increase in the average size of small and marginal farmers can reduce incidence of rural poverty expectably. The negative co-efficient of real wage rate of agricultural labours (-9.436) and significant positive co-efficient (1.041) of current day unemployment status of Rural Male (CDURM) indicates that rural poverty can be reduced by ensuring employment to the landless agricultural labourers at real wage rate that is reasonable to maintain the basic needs of the rural households.

In the concluding remarks, the author mentions that the power of the trickle down mechanism has been found to be very limited and weakened overtime which demands specific programme of alleviating poverty in rural India. The results of the estimated relationship between rural poverty and specific factors suggests that incidence of rural poverty can be reduced significantly by increasing productive employment in rural areas and also by maintaining real wage rate at reasonable level.

Khan, T.A (1994) on "Concerted Intervention of Donors, NGOs, the Government and Para-statal Organizations in Vegetable Production and Homestead Production Activities" indicates that there has been a significant extent of deterioration in the nutritional status of the population due to rapid growth in cereals and scant attention paid to the production of nutritionally rich crops like vegetables, pulses, oilseeds, fruits and spices. The author in the article highlights the interventions of various donors, government and non-government

organisations in vegetable production as well as homestead production activities of vegetables. The author indicates that implementation of horticultural programmes like massive programmes for vegetable production might be a viable means to reduce mal-nutrition. The author observed that there are numerous government and non organisations like Directorate of Agricultural Extension (DAE), Bangladesh Agricultural Research Institute (BARI), Bangladesh Vegetable Research and Development Centre (BVRDC), UNICEF, Horticultural Development Board, Bangladesh Agricultural Development Corporation (BADC), CARE- Bangladesh, are the mentionable which are directly involved in vegetable production. The author observes that comprehensive programmes on crop diversification and massive initiatives on the production of nutritional crops like vegetables, oilseeds, pulses and spices also has been sufficiently reflected in the five years plans of the government. In this regard several projects on the production of diversified crops have also been proposed and implemented in the plan period. The author emphasizes that attention should be drawn on the advocacy and contracting role of donors to implement such programmes for poverty alleviation through the initiatives of both GOs and NGOs. The author suggests that donor should also be involved in the sectors like crop diversification, nutrition, women in development, agro processing and seed industry in the broad sector of agriculture. However, in the concluding remarks the author concludes that donor should be involved with national initiative programmes particularly the programmes which are more involved with rural development and poverty alleviation where most of the target populations are disadvantaged and vulnerable. To implement such programmes donor should contract through government administrative departments to implement such programmes.

The article entitled "Costs, Returns, and Profitability of Vegetable Cultivation to Small Farmers in Southeastern Bangladesh", by J.D. Buckland & A.K. Kar (1989) Indicates that many development organisations in Bangladesh are extended new vegetable cultivation practices. The

purpose of this article was to evaluate costs and returns for different vegetables and compare profitability between regions, over time.

The article reveals that kachushak was the most profitable vegetable as it was reflected that 6.1 decimals was devoted to the cultivation of Kachu Shak and brought about an average yield 49 kg per decimal. Market price received by the farmer ranged from Tk. 2 to 5 per kg. The study reveals that pupkin, ridge ground, indicated similar levels of profitability amount of 140 Tk/decimal. Vegetable cultivation was found to be very profitable. Growing Kachu Shak on 6.1 decimals brought Tk. 1148.6 profit, which is 559 percent rate of return per Tk. invested. Even from puishak a farm family earned Tk. 285 profit from 3 decimals of land i.e, 531 percent return to cash invested. Okra has the highest return per Tk. invested at 836 percent.

So far significant relationship occurred between profitability and total cash costs, implying that larger the cash investment, the larger the profit occurred. So far profitability was concerned; cabbage was the most profitable vegetable which occupy about 170 Tk. per decimal. At 95 percent level of significance cabbage, cauliflower, egg plant and tomato displayed similar levels of profit of about 145 Tk. per decimal while sweet potato, puishak, raddis and lal shak all exhibited a similar level of profit at a lower rate (100 Tk. per decimal).

So far comparison of vegetable profitability is concerned, the article indicates Borboti, eggplant, raddis showed downward trends. All other vegetables showed constant profit over the time, or increasing profit. Bitter ground, cabbage and okra are significantly more profitable at 95% level of significance in the high land than in the medium high land.

In the conclusion it is said that some summer and winter vegetables are more profitable than others high profit vegetables required high cash costs. Thus both are important for ensuring

the improvement of the subsistence farmers. The study also remarks that a common family can earn Tk. 100 to 200 per decimal profit from vegetable cultivation. Rates of return were above the 100 to 200 percent per year as the opportunity cost of capital provided to alternative vegetables.

"Productivity and Resource Use Efficiency of Rice Under Favourable and Unfavourable Production Environments in Bangladesh". By M.A. Jabbar & Dr. Mihir Kumar Roy (1994) indicates that Bangladesh is basically an agricultural country. Agriculture sector alone contributed about 38 percent of GDP in 1991-92. The crop sector specifically rice contributed about 35 percent of GDP (BBS, 1991). But the present 2.62 percent annual production growth rate failed to feed its population of 110 million. So, existing annual grain production growth rate needs to be increased. The only way to achieve this target is to expand land area under cultivation. But the scope for expanding cultivable land beyond the current level is only 9.12 million hectares which is extremely limited. So the article is searching for increasing the annual growth rate of production through increasing the productivity by producing HYV rice. The article also indicates that expansion of MV of rice areas involves acceleration of investment, which encourages investment in irrigation. The article also indicates that significant differences of input used and yield between favourable and unfavourable environment have been tested by using statistic and Cobb-Douglas production function model was also used for making relationship between dependent and independent variable while yield in kg is the dependent variable, land in hector, fertilizer in kg, manure in tons, human labour in days, animal labour in days were considered as independent variable. The findings of the article indicates that irrespective of LV Aus & Amon MV of Aus & Amon all the inputs like human and animal labour, fertilizer and insecticides and also cow dung and irrigation were used significantly in favourable areas compared to unfavourable condition. Higher cost of irrigation in favourable

condition were observed due to higher cost of fuel and agricultural equipments. But in unfavourable areas irrigation cost was low because it has been done from pond and river water.

So far resource productivity is concerned the study reveals that in MV Boro rice cultivation if additional investment is added per unit of land, productivity is significantly higher in favourable condition. In addition to that it is also significant both at favourable and unfavourable condition in case of MV Aus and MV Amon.

Regarding allocation of efficiency the article indicates that efficiency refers to the achievement of maximum out put from a given set of resources. It means the greater the output relative to inputs, the higher the level of efficiency. In this connection the article emphasizes on equip-marginal principle which indicates that the employment of an input in the production for any output should be expanded upto that level where marginal value products equals to the price per unit of that input. To compute such measurement the article needs to compute marginal physical product. In this regard the article added that physical product of fertilizer manure and animal power were higher incase of unfavourable environment than favourable environment in producing MV Boro, MV Aus and MV Amon because of allocative efficiency. But a reverse picture can be seen from the article is that in producing MV Boro, farmer of favourable environment were more allocatively efficient in using fertilizer, manure and labour than those of unfavourable environment.

The concluding remarks of the article is that resource productivities were significant in producing MV boro, MV Aus and MV amon rice in both favourable and unfavourable environment. Farmers in favourable environment used more inputs obtained higher yield which received a higher net return as compared to unfavourable environment irrespective of varieties and seasons.

The article recommended that unfavourable areas could be developed through the introduction of modern irrigation facilities which will increase labour & input demand as well as output of per unit of land. By lowering the input price higher profitability to farmers will encourage the expansion of MV of rice production.

The study entitled "Farmers Adoption of CDP Crop in the Selected Areas of Bangladesh" by Mikail Shipar, et al (1998) indicated Bangladesh is an agricultural country. According to BBS (1996), the existing acreage of potato, sweet potato, oilseed and pulse crops for 1994-95 crop season were 325000 acres, 11300 acres, 1307000 acres and 1755000 acres respectively. The production of potato, sweet potato, oilseed and pulse crops for 1994-95 crop season were 1,46,8000 metric tons, 4,35000 metric tons, 45,3000 metric tons and 53,4000 metric tons respectively whereas domestic requirement of pulses and oilseeds are 58 gm/head/day and 15 gm/head/day but domestic availability of pulses and oilseeds are 5 gm/head/day and 2 gm/head/day.

However, adoption of CDP crops by a farmer is influenced by their personal and socio-economic characteristics. Farmer's characteristics such as age, education, farm size, annual income, extension, contact and organizational participation were the independent variables of the study. The dependent variable of the study was adoption of CDP crops. The average adoption scores of each crop were computed. the respondents were classified into four categories such as : non-adopter, low adopter, medium adopter and high adopter. The objective of the study was to determine the level of adoption of CDP crops and also to determine the relationship between farmer's socio-economic characteristics with that of the CDP crops.

Regarding relationship between selected characteristics like overall adoption of CDP crops, the article stats that significant positive relationship was found between over all adoption

of CDP crops and farmers extension. Extension contact helps people to acquire more information and skills on new improved practices, which may help them to adopt CDP crops. It was also found that positive relationship existed between farmer's organizational participation and their adoption of CDP crops. This indicates that respondents with higher extension contact had higher tendency to adopt CDP crops than those with low extension conduct.

There was a significant positive relationship between educational level of the respondents and their overall adoption of CDP crops. Education broadens ones out look and helps to understand the social, political, economic, and cultural issues in the society. Overall adoption of CDP crops had positive significant relationship with the farm size of the farmers. It means that larger the farm size, the greater the extent of adoption of CDP crops. This might be the reason of more opportunity to diversity their farming than the small and a marginal farmers.

Annual income of the farmers and adoption of CDP crops had significant positive relationship. The reason behind this might be high annual income of the farmers enable them to invest more for the adoption of high cost technology related to CDP crops. A significant positive relationship was found between the age of the respondents and their overall adoption of CDP crops. That is older farmers are more concerned than the younger farmers about the GDP crops.

In the conclusion, the article reveals that there was a positive impact of GDP demonstration in Kapasia Thana of Gazipur district. Adoption scopes of potato (39.16), groundnut (33.16) and mungbean (32.29%) are appreciable as the general trend of adoption of those crops in Bangladesh is low. Correlation analysis indicates that age, deduction, farm size, annual income extension contact and organizational participation showed significant positive relationship with the overall adoption of CDP crops.

The article entitled "A Quarter Century Experience of Crop Productivity Trends in Bangladesh: Implications for a Future Strategy" by Shamsul Alam (1997) indicates efforts have been made to attain a break through in agriculture particularly in the crop-sector during the period of a quarter century. The development impact now needs to be assessed crop wise for better understanding of the progress made by each crop. Yield of a crop is the reflection of technological advancement in production activities. Total output of supply of a crop may increase even in the face of declining yields through area increase at the expense of other crops. Crop yield acts as real indicator of progress in crop production activities. Therefore, this study has been designed to assess yield growth performances of crops for the entire period of post Bangladesh year.

The study has been conducted for three periods (i) 1971-72 to 1993-94, (ii) 1971-72 to 1982-83, (iii) 1983-84 to 1993-94. However, the first sub-period may be identified as high period of government market intervention interms of provision of input subsidy, product price control and regulated exchange rate. The 2nd sub-period may be identified as a period of market friendly environment owning to acceptance of structural adjustment policies. The third period 1983-84 to 1993-94 may identify as with drawl of subsidies, minimum pursuance of price support as a policy of raising productivity in agricultural sector.

The findings of the study indicates by testing the hypothesis that yield of amon, and varietal types do not exhibit significant acceleration i.e. no phenomenal yield growths have taken place during the last quarter century of Bangladesh. The non-significance of the log-quadratic equations for all amon, transplanted and broadcast amon signify that growth rates have not accelerated or decelerated overtime, i.e. technological breakthrough has not been so massive that could influence phenomenal change of yield levels of this major rice variety.

In the conclusion, it is summarized that productivity analysis for a period of a quarter century of development of crop sector agriculture reveals a rather disturbing phenomenon of retarded yield levels of HYV rice's of amon, Aus, and boro crops. Increasing yield trends for local variety of rice's also do not exhibit any phenomenal rising trend. Garlic, ground nut, barley, have poor performance of yield. Thus emphasis should be given on improvement of diversified crops. Ways have to be found out to improve the yield levels of important cash crops. Care should also be taken for improving yield levels of usual slow growth crops like oilseeds, pulses & spices for a better outlook of improving the performance of diversified agriculture in Rural Bangladesh.

From the above analysis of the literatures, it reveals that over the past two decades a volume of researches have been conducted on the field of diversified agriculture like shifting cultivation practices or changing cropping pattern, price behaviour and micro-economic policies of agricultural produces, diversification and food supply, profitability of diversified crops, technological development and diversification, agricultural performance and poverty, and also identification of marketing problems and opportunities at the grass roots level for crop diversification. But among them a very few acknowledged about how diversification in the crop sector is contributing the rural economy and helping the rural people for socio-economic upliftment or for reducing poverty through better agricultural performances particularly in the crop sector. Thus the present study on "Impact of Diversified Agriculture on the Socio-economic Upliftment of the Rural People of Bangladesh" is an attempt in this line to have an indepth and better out look regarding diversified agriculture and poverty in rural Bangladesh.

Chapter III

Methodology

3.1 Introduction : A preliminary investigation has been made in four Upazillas namely Chandina Upazilla under Comilla district of Chittagong division, Mithapukur Upazilla under Rangpur district of Rajshahi division, Patuakhali sadar Upazilla under Patuakhali district of Barishal division and Sonargaon Upazilla under Narayangonj district of Dhaka division for choosing diversified villages for the study during the period of January-June 2004. The specific four districts namely Comilla, Rangpur, Patuakhali and Narayangonj have been selected purposively on the basis of different agro-ecological zone and land category for final selection of the diversified zone. The Comilla district was taken from Middle Meghna River Flood Plain (Region – 16) agro-ecological zone, Rangpur district was taken from Northern Eastern Barind Tract agro-ecological zone (Region – 27), Patuakhali district was taken under Ganges Tidal Flood Plain agro-iconological zone (Region – 13), Narayangonj district was taken from Arial Bill agro-ecological zone (Region – 15). From the agro-ecological zone, Rangpur was taken as high land category, Comilla was taken as medium high land category, Narayangonj was taken as low-land category and Patuakhali was taken as very low land category. Four Upazillas and four villages were also selected purposively on the basis of intensity of diversification and commercialization in crop agriculture of the respective Upazillas. The specific four diversified villages are namely Srimantapur village under Chandina Upazilla of Comilla district, Jadabpur village under Mithapukur Upazilla of Rangpur district, Dhaukhali village under Patuakhali sadar upazilla of Patuakhali district and Sammanthe village under Sonargaon Upazilla of Narayangonj district. A respondent for the study was considered as a household head who cultivate land for agriculture. The sharecroppers and marginal farmers were also considered as respondent household as they cultivate other's land for

their livelihood. Thus all the selected four villages were taken under full enumeration for the study.

The farmers in the study areas like Comilla, Rangpur, Patuakhali and Narayangonj were classified on the basis of ownership of land[1] like (0.05-2.49 acre) as small farmer, (2.50-4.99 acre) as medium-I farmer, (5.00-7.49 acre) as medium – II farmer and (7.50 acre and above) as large farmer. The study was carried out during the period of January 2004 to June 2004. The reference period of the study was from January– December 2003. However the present study was both an empirical as well as descriptive study.

3.2 Secondary sources : The secondary sources of data used in this study include publications of Bangladesh Bureau of statistics (BBS), documents of different Five Year Plans of the planning commission. Published documents and research articles from different research organisations and universities are also consulted for writing the thesis.

3.3 Primary sources : The data collection from primary source has been completed on the basis of designed sample survey. The details of which are discussed below:

3.3.1 Selection of study districts : The study districts were selected on the basis of different agro-ecological zone & land category.

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[1] *In BBS (2003), the farmers are classified in three categories according to ownership of land as small farmer (0.05-2.49 acre), medium farmer (2.50-7.49 acre) and as large farmer (7.50-acre and above). Farmers are also categorized by different authors in different ways. In a study by Alam Md. J (2002), farmers are also classified as small farmer (0.05-1.49 acre), medium (2.50-4.99 acre) and large (5.00 acre and above) respectively. In the present study, for formulation of farmers category as a nation wide study, others classification regarding farmers category was also consulted from BBS under different issues.*

Table – 1: Name of the Study Villages, Agro-ecological Zones & Land Category

Name of the study Village	Name of the Upazila	Name of the District	Name of the Division	Name of the Agro-ecological zone	Land Category
Jadabpur	Mithapukur	Rangpur	Rajshahi	Northern-Eastern Barind Tract (Region – 27)	High
Srimantapur	Chandina	Comilla	Chittagong	Middle Meghna River Flood Plain (Region – 16)	Medium high
Sammanthe	Sonargoan	Narayangonj	Dhaka	Arial Bill (Region-15)	Low
Dhaukhali	Patuakhali Sadar	Patuakhali	Barisal	Ganges Tidal Flood Plain (Region – 13)	Very low

Source : Brammer, H. et.al (1988) "Agro-ecological regions of Bangladesh : Land resources appraisal of Bangladesh for agricultural development".

3.3.2 Selection of Study Upazilas and Villages : The Upazilas and villages were selected purposively based on intensity of diversification and commercialization of crop-agriculture.

Table - 2 : Selection of Sample Study Villages :

Name of the study Village	Name of the Upazila	Name of the District	Name of the Division	Diversified Index (1998-99)	Status of Diversification
Srimantapur	Chandina	Comilla	Chittagong	0.000026	More diversified
Jadabpur	Mithapukur	Rangpur	Rajshahi	0.000026	More diversified
Dhaukhali	Patuakhali Sadar	Patuakhali	Barisal	0.000048	Less diversified
Sammanthe	Sonargoan	Narayangonj	Dhaka	0.000033	Less diversified

Source : Field survey, 2003-04.

3.3.3 Determination of Respondent Household : Actually four villages were selected purposively on the basis of intensity of diversified crop-cultivation. Farmers were considered to those who had cultivable land or had no cultivable land but cultivated others land for crop cultivation. Thus the whole four villages were taken under full census. Villagers who were not at all involved in cultivation were excluded from

farmer's category. A total of 1031 respondents households were enumerated in four study villages which are distributed according to farmers category in four study areas. The distribution of respondent household are as follows.

Table – 3 : Distribution of Respondent Households According to Farmers Category

Name of the village	Farmers Category				
	Small (0.05-2.49 acre)	Medium-1 (2.50-4.99 acre)	Medium-2 (5.00-7.49 acre)	Large (7.50 acre and above)	Total
Jadabpur	180	15	8	8	211
Srimantapur	280	43	3	2	328
Sammanthee	231	9	4	1	245
Dhaukhali	179	51	7	10	247
Total	870	118	22	21	1031

Source : Field Survey, 2003-04

3.4 Conceptual Issues of Diversified Agriculture:

Before go through the calculation technique of diversified index, brief understanding about diversified agriculture is needed to explain. Diversified Agriculture means diversification of the crop sector including animal husbandry, livestock, poultry raising, fishery and also forestry. But in this study diversification is included only to crop-cereal & non-cereal like oilseeds, pulses, and minor crop sectors like vegetable cultivation for the study. Basically diversification is the orientation of subsistence farming to commercial farming. It indicates cultivation of mono crop (HYV rice) to diversified crops like potato and other vegetables, pulses, oilseeds etc. Diversification also indicates maximization of the crop economy interms of return or profit. It indicates maximization of net return of land by cultivating crops, which gives maximum output. Zahir,S (1993) & Akanda, A,M (1978) indicate that, level of diversification indicates extent of economic development in the rural sector. The

authors also mention that crop diversification varies from region to region because of agro climatic condition and also resource endowments of the farmers .

Conceptually diversified agriculture means deviation of the agriculture or crop sector from rice and inclination of the agriculture sector to non rice crops like vegetables, oilseeds and pulses. Agriculture diversification means production of not only rice but production of other crops like vegetables, cash crops like pulses, oilseeds and spices. For small and marginal farmers, crop diversification indicates as a means of hope for economic upliftment. Several authors indicate that farm diversification indicates as a strategy for profit maximization through reaping the gains of complementary and supplementary relationships among the competitive crops (Pandey V.K. & Sharma : 1996; Osiru : 1994 and PETRRA : 2001). If we critically analyze diversification from different point of view, the following definitions can be offered for indepth conceptualization of crop diversification . These are as follows:

Terminology / Theme	Description/Concept
Diversified Agriculture	i) Increase in number of different crops that is, it means cultivation of more crops in terms of crop-frequency (Matzel, J & Ateng, B : 1993).
	ii) Shifting cropping pattern in different seasons of cultivation (Zohir : S : 1993).
	iii) Profit maximization through cost minimization and wider scope of employment generation (Ibid : 1993).
	iv) Profit maximization through market oriented agriculture, selection or choice of appropriate crops for commercial agriculture rather than subsistence agriculture (FFYP : 1990-95).
	v) Alleviation of rural poverty by involving small and marginal farmers in alternative farming and creating the source of income and employment. It also means changing the livelihood of the small, marginal and landless people through the cultivation of alternative crops (PETRRA : 2001).
	vi) Structural transformation of agriculture from traditional to modern agriculture or export lead agriculture (Vyas. V.S. 1996).

3.5 Measurement Techniques of Diversified Agriculture :

There are many techniques for measuring diversified Index through which extent of diversification for individual farmer can be understood. Two important measures for diversification are :

(a) Herfindhal Index

(b) Ogive Index

But because of more simplicity , Herfindhal Index of diversification is used in this study. Herfindhal Index indicates the diversification or specialization for cultivating crops. Its value lies between 0(Zero) to 1 (One). Herfindhal Index indicates the sum of all squares of proportionate cultivable land which is as follows (Chand, Ramesh, 1995).

$$H.I = \sum_{i=1}^{n} P_i^2$$

$$= P_1^2 + P2^2 + \ldots\ldots\ldots\ldots\ldots + P^2_n$$

Where P_i = Proportion of i^{th} crop to the total cropped area

n = Number of crops under cultivation.

When H.I tends to 0(zero), it indicates perfect diversification.

When H.I tends to 1(one), it indicates perfect specialization.

Diversified agriculture indicates cultivation of more crops interms of crop –frequency. Crop-frequency indicates number of crops cultivated by a farmer in his available cultivable land during the whole year. Mathematically it can be defined as :

$$C_f = \sum_{i=1}^{n} C_i$$

Where n= number of crops cultivated by the farmer during the whole year. C_f = or > 1

While C_f=1 indicates mono-crop cultivation/crop specialization .

While C_f >1, it indicates multiple crop cultivation. or crop diversification

3.6 Working Definitions of Some Important Issues Related to the Study

Agriculture : Agriculture includes cultivation of crops, fisheries, livestock and poultry sectors. But in this study, Agriculture includes only the crop sector.

Crop Diversification : Basically crop diversification is the orientation of subsistence farming to commercial farming. It indicates cultivation of mono crop (HYV rice) to diversified crops like potato and others vegetables, pulses, oilseeds etc. Diversification also indicates maximization of the crop economy interms of return or profit.

Perfect Diversification : Perfect diversification indicates absolutely diversified of crop sector. Where there is a perfect diversification the Herfindhal index tends to zero (0) which means farmers cultivate more crops in their lands.

Perfect Specialization : Perfect specialization indicates absolutely specialized in cultivating crops. In such a situation the Herfindhal Index tends to one (1), which means the farmers are specialized in cultivating a very few crops.

Benefit cost ratio : Benefit Cost Ratio (BCR) is the ratio between net return earned from the sale of the producer with that of cost incurred for cultivating the produces. There are two categories of cost. These are full cost and cash cost. The cost which calculates the cost items that are paid on cash is called cash crop. These costs are land preparation cost, seed & seedling cost, fertilizer cost, irrigation cost, harvesting cost etc. Family cost is also considered for family contribution. Thus full cost is the summation of cash cost and cost incurred for family contribution.

Farm-size : Generally farm-size is measured from two points of view : (i) owner's point of view (ii) operational point of view. From owner's point of view, farm size refers to actual amount of land in acre legally owned by a farm family. From operational point of

view, farm size refers to the effective farm size of the family which was used to indicate the cultivated area either owned or cultivated others land under the system of share-cropping by a family.

Household : Household means a group of persons who live together and take food from same cooking arrangement for a household. One person may also form a household by making separate arrangement for food.

Food-security : Food security is the basic human right. The Food and Agricultural Organisation (FAO) defined food security as "the security of food for all people at all times for having access to safe and nutrition's food to maintain a healthy and active life. Thus entitlement and safety are intrinsic elements of food security.

Standard of living : Standard of living of a household indicates the way of life or fulfillment of basic needs, i.e. what they consume in their daily life, how they are educated, how they are sheltered, what are their mean of sanitation, what sorts of amenities they are availing for their recreation are totally termed as standard of living.

Poverty : Poverty is defined as a state of deprivation from basic needs like food, clothing, shelter, health, education etc. It is defined as an inadequate relative income or calorie intake to maintain minimum standard of living. From Nutritional Point of view, poverty is defined as the minimum requirement of food consumption necessary to maintain physical requirement to continue individual's livelihood. In the present study, poverty is classified into two-categories:

Absolute Poverty : Absolute poverty is considered as a state of poverty where people consume less than 2122 kcal per day from their daily food consumption. That is while a

person consume less than 2122 kcal, the reference person is said to be absolutely poverty stricken poor.

Hard-core Poverty : Hard-core poverty is another state of poverty where people is deprived from availing 1805 kcal from their daily consumption. That is, while a person consumes less than 1805 kcal per day from its daily food consumption, the reference person is said to be Hard-core poverty stricken poor.

Marketing : Marketing is the performance of business activities involved in the flow of goods and services from the point of initial agricultural production to the hands of ultimate consumer. It includes the functions like assembling, transporting, processing, packaging, storing, and pricing. The totality of all these functions is known as marketing.

3.7 Execution of Field Work :

The data used in this study were collected from purposively selected study areas by the researchers himself. Four sets of questionnaires were prepared to collect data. The first set of questionnaire was prepared for assessing the socio-economic & land ownership aspect. The second set of questionnaire was for production related aspect of farmers. The Third set of data for livelihood aspect & the fourth set of questionnaire was for marketing problems of diversified crops & suggestions for remedies Of the problems from farmers point of view. Formulated questionnaires were pre-tested in different villages of Comilla & Narayangonj districts by the researcher himself and then the formulated questionnaires were finalized for the study. Field investigation was carried out during the period of January 2004 to June 2004. The reference period of the collected data was from January-December 2003.

3.8 Tabulation and Processing of Data :

After data collection, tabulation design was made by the researcher himself. Data were incorporated in computer by experienced computer programmer. The researcher himself analyzed and interpreted the data from the obtained result to make a final draft for the study. Several statistical tools and tests like averages, weighted averages, ratios, percentages, summation, Karl Pearson correlation model, multiple-linear regression model were used by the researcher to analysis the Primary data. However, before going through the tabulation process, the filled up questionnaires were checked by the researcher himself so that obvious omissions and errors could be checked and corrected.

3.9 Limitation of the Study :

The findings of the study were the outcome and observations of some specific areas of Bangladesh and hence these were not reflected to confirm the results of other studies done by different researchers in different areas and in different context. Because of budget constraint, coverage of study areas was limited only four villages of Bangladesh. Inspite of some limitations like distant locations for collecting primary data & time allocations for collecting data, the scope of the study was very much relevant to meet the objectives. However, it is expected that the recommendations in the study would be helpful for future research and policy contribution. Finally it was expected that the study would contribute to a reasonable extent for understanding the contribution of diversified agriculture to the upliftment of the rural people of Bangladesh.

Chapter – IV

Socio-Economic Structure of the Study Villages

4.1 Introduction

There is persuasive explanation which suggests that many socio-economic, cultural and other forces act and interact to generate, sustain and extend the rural poverty of Bangladesh (Hamid et al, 1998). In the context of such explanation, little attention has been made to find out the socio economic condition of the sample farmers. However, before going to indepth analysis of socio-economic condition of the sample farmers it is necessary to introduce the study areas for a better outlook about some selected issues mentioned below.

The field survey was carried out during the period of January to June 2004 in four villages of Bangladesh namely Srimantapur under Chandina Upazila of Comilla district, Jadabpur under Mithapukur Upazilla of Rangpur district, Dhaukhali under Patuakhali sadar Upazilla of Patuakhali district and Sammanthe under Sonargaon Upazilla of Narayangonj district. A brief description of the study villages are given below.

The village Srimantapur is popularly known as a diversified and export village. The topography of the village is such that most of the land belong to medium high land category with some areas of low lands. Although rice is the main crop of the villagers but due to land suitability vegetables and other diversified crops are produced here. The village has a well communication facility with a pacca road which is 3 km away from Chandina upazilla. The land is very much fertile for diversified crops cultivation. Due to proper irrigation facilities HYV rice is also produced here commercially. Farmers are very knowledgeable for agricultural practices. Except the

facilities provided by the Block Supervisors of Department of Agricultural Extension, there also works BRAC, a reputed non-government organisation for exportable vegetable production. Because of land suitability, diversified crops are grown throughout the whole-year. The important crops other than rice & wheat are potato, lady's finger, cucumber, brinjal, tomato, raddis, onion, garlic, spices etc. Farmers are very much progressive here and all sorts of modern agricultural productions are followed in their cultivable land. Proper marketing facilities also prevails here. Farmers know how to plan to produce diversified crops, how to nurse it, how to irrigate it how to harvest it, how to grade it and also how to market it for better price. Above all, the farmers are really encouraged to equip themselves as modern farmers rather than involve in other professions.

The topography of Jadabpur village is mainly high and medium high land with limited low-lying areas in adjacent areas of the village. It is 3 km away from Mithapukur Upazilla and connected with pacca road. Due to adjacent area of the Upazilla, all sorts of modern facilities like electricity, cold storage, deeptubewell & low lift pump are available there for modern agricultural practices. HYV rice is commercially produced here in the low-lying areas. In addition, potato, pulses like lentil & cowpea; oilseed like mustard, till, HYV vegetables like potato, lady's finger, cucumber, brinjal, kachu, raddis, ribbed gourd, tomato, are produced here commercially. Farmers are indigenous here but know the modern practices of agriculture. Land are very much productive here and farmers used to cultivate HYV vegetables alternatively. The farmers are very much encouraged to produce HYV vegetables because of higher price of the produces. Besides, because of well communication facilities from the capital city and Narayangonj district town, vegetables are transported to the city markets and at the same time create facilities for exporting the same in abroad.

Jadabpur is a semi-developed village and farmers are also encouraged to cultivate diversified crops with rice because both diversified crops and rice are produced here scientifically & traditionally from long time.

The Daukhali village under the Patuakhali sadar Upazilla is a low-lying area which is located at eastern side of the upazilla. The village is very much adjacent to Patuakhali and 2 km away from the Upazilla. The road is semi-pacca. The village is sorrounded by canals and rivers. There is no proper irrigation facilities in this village. Local variety of rice is traditionally & commonly produced here. Other than rice, non cereals like oilseeds namely mustard & til; pulses namely lentil, blackgram, mug & cowpea; chilli & onion, garlic and also some vegetables are prdoduced here. Farmers are not indigenous in cultivation practices. Modern irrigation facilities like deeptubewell or low lift pump is not available here. Paddy fields are covered by water in low-lying areas. As a result, paddy is cultivated only once in a year. In the summer season, although pulses and oilseeds are cultivated but it is too much traditional. As a result, productivity is very much low here. Farmers do not know how to sow or plant seeds, how to nurse it, how to irrigate it, how to harvest it and how to market it. Although productivity is low but due to locational advantage, farmers can sell their produces in Patuakhali sadar and get higher prices for their produces. But if farmers can be trained with modern farming practices, productivity can also be raised in these areas. Construction of embankment is also needed here for flood control & commercial cultivation.

The sammanthee village is also a low-lying area with some medium high land. In the low-lying areas, the farmers of Sammanthee used to cultivate boro, aus, and aman rice while in the medium-high land, they cultivate pulses, oilseeds and vegetables. The village is in the northern side of the Narayangonj Comilla high way and very much

near to the capital city. Local Aratdars used to come to the village and farmers directly sell their produces to the Beparies. The vegetables like bitter gourd, potato, water gourd, cucumber and beans are normally produced here and farmers get higher price compared to other areas. Farmers are aware of their cultivation practices but productivity is very low here for rice cultivation. Embankment is also needed here to protect flood and also for commercial cultivation of both rice and diversified crops.

4.2 Socio-economic Characteristics of the Study Households

4.2.1 Family size of the study households in different study areas : Family size is one of the important demographic indicators of the population, which indicates the number of members included in a family. It also indicates about the economic condition as well as economic pressure of the family. The bigger the family size, the lower the economic condition and higher the economic burden on the family head. The smaller family size indicates the family is more sound and wealthy in economic condition and also the burden on the family head is minimum. With this views in mind, family size of the respondents in different study areas were observed. It reveals from table-4 that majority (41.9%) of the respondents family size belongs to 5-6 members while 31.33% have family size 3-4 persons. 14.84% have family size 7-8 members followed by 7.95% who have family size of 9 and above. Only 4.07% has family size of only 1-2 members. The average family size of the households is the highest in Narayangonj (5.84) followed by Comilla (5.69), Patuakhali (5.37) and Rangpur (4.33). In the study areas most of the farmers are landless, small & medium farmers. So it can be concluded that as the farmers are poor, and their livelihood is very much dependent on agriculture, so they are aware of keeping their family size small as a strategy of survival in a different socio-economic phenomenon like poverty.

Table-4 : Distribution of Study Households According to Family Size in Different Study Areas

Family Size	Comilla	Rangpur	Patuakhali	Narayangonj	All
1-2	9 (2.74)	18 (8.53)	9 (3.69)	5 (2.04)	42 (4.07)
3-4	76 (23.17)	99 (46.92)	80 (32.38)	68 (27.76)	323 (31.33)
5-6	157 (47.86)	84 (39.81)	101 (40.84)	90 (36.73)	432 (41.90)
7-8	58 (17.68)	6 (2.84)	39 (15.79)	50 (20.41)	153 (14.84)
9 and above	28 (8.53)	4 (1.22)	18 (7.28)	32 (13.06)	82 (7.95)
Total	328 (100.0)	211 (100.0)	247 (100.0)	245 (100.0)	1031 (100.0)
Average Family Size	5.69	4.33	5.37	5.84	-

Source : Field Survey, 2003-04

4.2.2 Educational Status of the Household's Head in Different Study Areas :

Education is a process of teaching, training and learning by which an individual can be able to develop their skills for accomplishing their day to day agricultural performances. It also develops awareness and consciousness of individual to every aspect of human life. As a farmer, education develops and changes the mind of the farmers about their cultivation. It also develops individual skills and knowledge for maximum utilization of resource & in cultivating their farms. Farmers who have better education can do better in their agricultural activities and vise-versa. Assuming such views in mind, educational status of the sample farmers is observed to have a clear picture about their educational performances in the study areas. While observing the educational status of the sample respondent in different study areas, it reveals from Table- 5 that majority (57.52%) of the sample farmers have the educational level of class (I-V) followed by class VI-X (26.58%), illiterate (9.79%) and secondary to graduation level (6.4%).

Table- 5 : Distribution of Household Head According to their Level of Education

Level of Education	Comilla	Rangpur	Patuakhali	Narayangonj	All
Illiterate	46 (14.02)	21 (9.95)	7 (2.83)	27 (11.02)	101 (9.79)
Class I-V	150 (45.73)	132 (62.55)	160 (64.77)	151 (61.63)	593 (57.52)
Class VI-X	111 (33.84)	44 (20.85)	70 (28.34)	49 (20.0)	274 (26.58)
SSC and Above	21 (6.40)	14 (6.64)	10 (4.04)	18 (7.35)	63 (6.11)
Total	328 (100.0)	211 (100.0)	247 (100.0)	245 (100.0)	1031 (100.0)
Average Years of Schooling	5.09	4.12	4.90	4.54	-

Source : Field Survey, 2003-04

4.2.3 Age-Structure of the Households Head :

Age structure or age belongs to a specific range is very much important for analyzing the socio-economic characteristics of the specific region. Categories or classification of age of household head helps the researchers about the activeness of the population exist in the specific group. Age group belongs to 15-64 years is considered as the active labour force. However, in a traditional society like Bangladesh, household head is the key person who is often the chief bread earner and sole decision marker of all household matters (Ibid : 1994). The mental maturity, education and skill of household head depends upon his age which must influence the economic status of the household as a whole. Thus age of household-head is expected to influence the economic position as well as welfare of the households.

From table – 6, it is observed that average age of the household head is the highest in Patuakhali (50.46%), followed by Narayangonj (48.09%), Comilla (46.99%) and Rangpur (43.92%). However, to assess the intensity of household's head in different age-group, household head's age were classified in to five categories like age group belongs to below 29 years, age group belongs to 30-39 years, age group belongs to 40-49 years, age group belongs to 50-59 years, and age group belongs to 60 years and

above. From table-6, it reflects that of the total households, majority (28.42%) of the household head, belongs to the age group 40-49 years followed by age 60 years and above (24.25%). While 21.14% belongs to the age group 30-39 years, 19.11% belongs to 50-59 years age group and only 7.08% belongs to age group below 20 years. The age group distribution indicates that majority of the households (71.78%) belongs to the age group more than 40 years which reflects that the households are enough matured both in mental and physical indicating their activeness both economic and social activities. Only 28.26% of the households belongs to the age group below 40 years, which indicates that these households are very new in their social and economic life reflecting their few skillness in the labour market.

However, if the intensity of distribution of household-head in four study areas is analyzed, it is observed from the table-6 that, highest proportion of household head belongs to the age-group (40-49) i e, 28.42%. The proportion of household head in this group in Comilla is 31.09%, Rangpur is 31.75%, Patuakhali is 27.94% and Narayangonj is 22.45% which also reflects that in all the four study areas majority of the household heads are very matured, skilled and active in their economic & social life. The age group below 29 years is the highest in Rangpur (10.43%) followed by Comilla (7.62%), Narayangonj (6.94%) and Patuakhali (3.64%) which also indicates a proportion of tendency of entrance in social and economic activities of the household heads in their early life. However the other distributions of age of household head can also be observed from the table -6. The proportionate variation of the distribution of age of household head in different study areas also reflects the variation of skillness, economic and social maturity of the households in different study areas.

Table – 6 : Distribution of Age of Household Heads in Different Study Areas

Study Areas / Age-Distribution	Study Areas				
	Comilla	Rangpur	Patuakhali	Narayan gonj	All
Age below 29	25 (7.62)	22 (10.43)	9 (3.64)	17 (6.94)	73 (7.08)
Age 30-39	69 (21.04)	55 (26.07)	40 (16.19)	54 (22.04)	218 (21.14)
Age 40-49	102 (31.09)	67 (31.75)	69 (27.94)	55 (22.45)	293 (28.42)
Age 50-59	66 (20.12)	31 (14.69)	48 (19.43)	52 (21.22)	197 (19.11)
Age 60 above	66 (20.12)	36 (17.06)	81 (32.79)	67 (27.35)	250 (24.25)
All	328 (100.0)	211 (100.0)	247 (100.0)	245 (100.0)	1031 (100.0)
Average Age	46.99	43.92	50.46	48.09	-

Source : Field Survey, 2003-04

4.2.4 Occupational Status of the Household Head :

Occupation indicates an act of moving a person from one place to another for searching activities for earning or for maintaining their livelihood. Occupation & profession are used synonymously. It also indicates the spending of time for working or earning. Occupation is considered as one of the important indicators of social development which indicates earning sources of a person that determines his or her economic condition or position. Depending on the occupation or profession, nature of work is different among individuals and their earning sources are also different. Individual economic position also depends on individual occupation or profession.

It has been observed from the study as shown in table 7 that majority of the respondents are involved in agriculture (64.45%) in all the areas followed by service (10.08%), wage labourers (8.35%) & small trade (6.69%). A very small proportion of the respondents are involved in fish cultivation and also in poultry and dairy farming. The other professions of the respondents are as NGO workers, motor car driving, village doctor, tailoring, Imam, Mechanic etc. The area-wise occupational distribution can be observed from Table - 7.

Table 7 : Occupational Status of the Household Head in Different Study Areas

Occupation	Comilla	Rangpur	Patuakhali	Narayangonj	All
Agriculture	199 (60.67)	140 (66.35)	147 (59.51)	180 (73.46)	666 (64.59)
Fishery	2 (0.60)	1 (0.47)	2 (0.80)	4 (1.63)	9 (0.87)
Livestock / Poultry Rearing	1 (0.30)	3 (1.42)	3 (1.21)	2 (0.81)	9 (0.87)
Service	18 (5.48)	20 (9.47)	48 (19.43)	18 (7.34)	104 (10.08)
Small Trade	14 (4.26)	16 (7.58)	20 (8.09)	19 (7.75)	69 (6.69)
Wage Labour	45 (13.71)	8 (3.79)	18 (7.28)	15 (6.12)	86 (8.34)
Others (NGO workers, Motor / Car Drivers, Village Doctors, Tailoring, Imam, Mechanic etc.)	49 (14.93)	23 (10.90)	9 (3.64)	7 (2.85)	88 (8.53)
Total	328 (100.0)	211 (100.0)	247 (100.0)	245 (100.0)	1031 (100.0)

Source : Field Survey, 2003-04

4.2.5 Yearly Income of the Study Households in Different Study Areas :

Yearly income is considered as an important socio-economic and demographic variable which is very much important for households livelihood. It also indicates the social and economic status of the households. To observe the economic strength of the study households, yearly income of the respondent households is calculated by adding the income of different sources. The important sources of yearly income are agriculture, business, service, wage-earning, foreign remittance and others. However to have an indepth idea about yearly income of all the study households, total yearly income are classified into five categories. These categories of income distribution of the study households are Tk. less than 50,000. Tk. 50001-100000, Tk. 100001-150000. Tk. 150001-200000 and Tk. 200000 and above.

However from the table-8, it is observed that the intensity of respondent households concentrated highest (50.4%) in the yearly income category belonging to Tk 50001 to 100000 followed by income category less than Tk. 50,000 (28.2%). Tk. 100001 to Tk. 150,000 (13.6%) and Tk. 150001 to 200000 (4.1%). The rest 3.7% of the households yearly income belongs to the income group of Tk. 200000 and above. The distribution of yearly income can be observed from table -8.

Table – 8 : Distribution of Yearly Income of the Study Households in Different Study Areas

Study Areas / Categories of Yearly Income (Tk.)	Comilla	Rangpur	Patuakhali	Narayang onj	All
<50000	65 (19.8)	91 (43.1)	88 (35.6)	47 (19.2)	291 (28.2)
50001-100000	158 (48.2)	96 (45.5)	108 (43.7)	158 (64.5)	320 (50.4)
100001-150000	57 (17.4)	12 (5.7)	37 (15.0)	34 (13.9)	140 (13.6)
150001-200000	23 (7.0)	6 (2.8)	9 (3.6)	4 (1.6)	42 (4.1)
200001 and above	25 (7.6)	6 (2.8)	5 (2.0)	2 (0.8)	38 (3.7)
Total	328 (100.0)	211 (100.0)	247 (100.0)	245 (100.0)	1031 (100.0)

If the yearly income distribution of the respondent household of Comilla is analyzed, it is observed that majority of the respondent (48.2%) belongs to the income group of Tk. 50001 to 100000 followed by the income group of Tk. less than 50000 and Tk. 100001 to Tk. 150000. The same trend of distribution is also observed in other study areas. The percentage of income distribution in the income group of Tk. 150001 to 200000 and Tk. 200001 and above is very insignificant in all the study areas. The intensity of distribution of income indicates that most of the household's livelihood depends on agriculture in rural areas and also most of them are poverty stricken. As a

result of which most of the study household's yearly income belongs to the lowest tier of the income group.

However, the average yearly income of the of respondent household in four study areas like Comilla, Rangpur, Patuakhali and Narayangonj can also be observed from table - 8. The table indicates that among the four study areas highest average yearly income is observed in Comilla (Tk. 96195.43) followed by Patuakhali (Tk. 73,701.82), Narayangonj (Tk. 72,682.75) and Rangpur (Tk. 64,029.77). The highest average yearly income stands in Comilla village because the study village is more equipped with diversified agricultural practices and ample opportunities of income from other sources are available here. The average yearly income in Rangpur is the lowest. Although the village under study at Rangpur experiences wider diversification of crops but opportunities of earning income from other sources is comparatively less here. However, as all the villages are more or less experienced with diversified cropping system, average yearly income variation is insignificant among the four study villages. The average yearly income among the four study areas is Tk. 78,636.28.

Table – 9 : Average Yearly Income of the Households in Different Study Areas

Study Areas	No. of Respondents	Average Yearly Income
Comilla	328	96195.43
Rangpur	211	64029.77
Patuakhali	247	73701.82
Narayangonj	245	72682.75
Total	1031	78636.28

4.2.6 Conclusion :

In the conclusion it can be said that among four study villages Srimantapur and Jadabpur are more diversified in cropping pattern than the same at Dhaukahli and Sammanthe villages under the study. The socio-economic characteristics of the respondents like family size, educational status, age structure, occupational status, yearly income of the households etc. are observed. The findings of the socio-economic characteristics of the respondent households reflect an idea about the socio-economic and demographic variables of the respondent households which gives a general picture about overall demographic scenario of the sample villagers under the four study villages.

Chapter V

Land Ownership and Utilization Pattern in the Study Villages

5.1 Introduction

Land is the most important factor of production in a society where agriculture is the main source of income and employment. It is the main source of productive asset and basis of both economic and social status. Land takes the leading role for generating income and earning opportunities in rural areas (Rahman, M 1994). Ownership of land and its utilization directly affects income opportunities and welfare of the rural households. Thus ownership of land and its proper utilization is obviously important to all farm households in an agrarian economy like Bangladesh.

However, in this chapter an attempt has been made to analyze the land ownership and its utilization pattern of the surveyed farmers in the four study areas.

5.2 Land Ownership Pattern of the Study Households

Ownership of land was calculated by summing up homestead land together with that of total owned land cultivated by the households and also the owned land cultivated by others family. However in the present study a total of I594.94 acres of land are owned by the study households where highest acres of land is owned by Patuakhali (530.38 acres), followed by Rangpur (412.55 acres), Comilla (403.84 acres) and Narayangonj (248.17 acres). On the contrary, among the four categories of farmers, highest proportion (52.89%) of land is owned by the small-farmers, followed by medium-I (25.07%), large farmers (14.15%) and medium II farmers (7.90%). The ownership of land by categories of study areas varies because of availability of land owned by the specific study villages while the proportion of land owned by different categories of farmers varies because of variability of the number of farmers

belong to the specific farmer's category. The ownership pattern of land in four study areas can be observed in Table-10

Table – 10: Landownership Pattern in the Study Villages

Farmers Category	Comilla (328)	Rangpur (211)	Patuakhali (247)	Narayangonj (245)	All (1031)
Small farmers (0.05-2.49 acre)	231.12	219.07	203.87	189.43	843.49 (52.89)
Medium-I (2.50-4.99 acre)	139.02	48.48	183.46	28.96	399.92 (25.07)
Medium-II (5.00-7.49 acre)	18.2	44.86	41.25	21.56	125.87 (7.90)
Large (7.50-above)	15.50	100.14	101.80	8.22	225.66 (14.15)
All	403.84 (25.32)	412.55 (25.87)	530.38 (33.25)	248.17 (15.56)	1594.94 (100.0)

However, if per household ownership of land in four study areas by categories of farmers is analyzed, it is also observed that incase of small farmers (0.05-2.49 acres) per household ownership of land is the highest in the village of Rangpur (1.21 acres) followed by the village in Patuakhali (1.14 acre), Comilla (0.83 acre) and Narayangonj (0.77 acre). The average per household ownership of land in the four study areas incase of small farmers is 0.97 acre which is much more less than the national average of 1.69 (BBS : 2001). The average per household ownership of land incase of medium-I (2.50-4.99 acre) farmers is the highest in the village of Patuakhali (3.59 acre) followed by village in Comilla (3.23 acre), Rangpur (3.23 acre) and Narayangonj (3.22 acre). The average per household ownership of land in the four study areas incase of medium-I farmers is 3.39 acre which is equal to the national average of 3.39 acre (ibid : 2001). On the other hand, incase of medium-II (5.00-7.49 acres) farmers, per household ownership of land is the highest in the village of Comilla (6.06 acre)

followed by Patuakhali (5.89 acre), Rangpur (5.60 acre) and Narayangonj (5.39 acre). The average per household ownership of land in case of medium – II (5.00-7.49 acre) farmers is 5.72 acre which is slightly less than the national average of 5.86 acre (Ibid : 2001). Finally the per household ownership of land for large farmers is the highest incase of the village in Rangpur (12.52 acre) followed by the village in Patuakhali (10.18 acre), Narayangonj (8.22 acre) and Comilla (7.75 acre). The average per household ownership of land in the four study areas is 10.74 acre, which is less than the national average of 12.31 acre (Ibid : 2001). The per household ownership of land in the four study areas can be observed from table – 11.

Table – 11 : Per household Ownership of Land in the Study Villages

Farmers Category	Comilla	Rangpur	Patuakhali	Narayangonj	All	National Average (Census1996/ BBS: 2001)
Small farmers (0.05-2.49 acre)	0.83 (280)	1.21 (180)	1.14 (179)	0.77 (231)	0.97 (870)	1.69
Medium-I (2.50-4.99 acre)	3.23 (43)	3.23 (15)	3.59 (51)	3.22 (9)	3.39 (118)	3.39
Medium-II (5.00-7.49 acre)	6.06 (3)	5.60 (8)	5.89 (7)	5.39 (4)	5.72 (22)	5.86
Large (7.50-above)	7.75 (2)	12.52 (8)	10.18 (10)	8.22 (1)	10.74 (21)	12.31

Note : The figures in the enclosure indicates number of respondents in different study areas according to farmers category.

Per household ownership of land also indicates that there is wider inequality and disparity of land ownership in different categories of farmers in Comilla, Rangpur and Narayangonj than that of Patuakhali.

5.3 Operational Holding of the Study Households :

The operational holding of the study households in four study areas of Comilla, Rangpur, Patuakhali, and Narayangonj is analysed in table – 11. From the table, it is observed that of the total 1595 acres of land 530.82 acres is operated by the farmers of Patuakhali, followed by Rangpur (411.80 acres), Comilla (403.61 acres) and Narayangonj (248.77 acres). On the other hand, in case of different categories of farmers of the total operated land. Major proportion of land is operated by small farmers (58.12%) followed by medium – I farmers (23.82%), large farmers (10.09%) and medium II farmers (7.97%). The coverage under land operation in all the four study areas is the highest incase of small farmers followed by medium I farmers because they hired land from large and medium II farmers for their cultivation for share cropping. The distribution of operational holding by categories of farmers can be observed from table – 12.

Table – 12 : Operational Holding in the Study Villages

Farmers Category	Comilla (328)	Rangpur (211)	Patuakhali (247)	Narayangonj (245)	All (1031)
Small farmers(870)	231.18	249.50	256.74	206.56	943.98
(0.05-2.49 acre)	(280)	(180)	(179)	(231)	(59.18)
Medium-I(118)	143.33	59.05	140.18	20.41	362.97
(2.50-4.99 acre)	(43)	(15)	(51)	(9)	(22.76)
Medium-II (22)	18.30	36.45	52.50	19.80	127.05
(5.00-7.49 acre)	(3)	(8)	(7)	(4)	(7.97)
Large (21)	10.80	66.80	81.40	2.00	161.00
(7.50-above)	(2)	(8)	(10)	1)	(10.09)
All (1031)	403.61	411.80	530.82	248.77	1595
	(25.30)	(25.82)	(33.28)	(15.60)	(100.0)

On the other hand, if per household operational holding in the four study areas by categories of farmers is observed, it is seen from table – 13 that incase of small farmers, per household operational holding is the highest incase of the village in Rangpur (1.37 acre) followed by village in Patuakhali (1.04 acre), Comilla (0.83 acre) and Narayangonj (0.82

acre). The average per household operational holding in all the four study areas is only 1.09 acre. In case of medium I farmers, per household operational land is the highest incase of the village in Narayangonj (4.16 acre) followed by the village in Rangpur (3.94 acre), Comilla (3.33 acre) and Patuakhali (2.47 acre). The average per household operated land in case of medium I farmers is 3.22 acre. Incase of medium II farmers, per household operational land is the highest in case of the village in Patuakhali (7.50 acre) followed by the village in Comilla (6.10 acre), Narayangonj (4.95 acre) and Rangpur (4.56 acre). The average per household operated land is 5.78 acre. However, in case of large farmers, per household operational holding is the highest incase of the village in Rangpur (8.35 acre), followed by the village in Patuakhali (8.14 acre), Comilla (5.40 acre) and Narayangonj (2.00 acre). The average per household operated land incase of large farmers is 7.67 acre. The per household operational holding in the four study areas is much more than ownership of land because of more utilization of land by categories of farmers.

Table – 13 : Per Household Operational Holding in the Study Villages

Farmers Category	Comilla	Rangpur	Patuakhali	Narayangonj	All
Small farmers (0.05-2.49 acre)	0.83 (280)	1.37 (180)	1.04 (179)	0.89 (231)	1.09 (870)
Medium-I (2.50-4.99 acre)	3.33 (43)	3.94 (15)	2.74 (51)	2.27 (9)	3.08 (118)
Medium-II (5.00-7.49 acre)	6.10 (3)	4.56 (8)	7.50 (7)	4.95 (4)	5.78 (22)
Large (7.50-above)	5.40 (2)	8.35 (8)	8.14 (10)	2.00 (1)	7.67 (21)

5.4 Land Utilization of Diversified Crops : A Macro Perspective

Production of a crop is the product of an area and yield. Crop production can be changed (increased or decreased) due to change in area and or yield. Bangladesh is now in a position of attaining self-sufficiency in rice production. This self sufficiency has been achieved due to expansion of crops in new areas and due to increase in yield. Thus increase in

cultivable area is very much important for increasing production of any crop. In the following section, changes in crop sector interms of area and yield is trying to analyze for have an idea abut the trend of this sector interms of area and yield.

5.4.1 Changes in Area for Rice and Wheat Production

The annual compound rates of growth for rice and what interms of area and yield is shown in table – 14. The table reveals that area under rice has increased in the 1990s at an annual growth rate of 0.6 percent. Although areas under aus and aman in the 1990s were decreased, area under boro rice cultivation was increased by 4.5%. Aus (HYV), aman (HYV) and boro (HYV) areas were increased by 2.0%, 2.8%, and 5.1% respectively. Both areas for aus (Local) and boro (Local) were declined by 5.7% and 2.8% respectively. Growth rate of area for aman (Local) was stagnated during 1990s. In this period, yield was positive for all rice crops. In the first half of 1990s, the economy experienced a declining trend for overall rice areas and yield while in the second half of 1990s, areas of total rice production were increased by 1.6%. In this period, total areas under amon and boro cultivation were increased by 0.2% and 8.4% respectively. While other crops interms of area was declined. Areas under aman (HYV) and boro (HYV) were increased significantly. During the second period of 1990s, growth rate of production was much more higher than the growth rate of in same in 1990s. Growth rate of area and yield were positive during the three periods of 1990s.

Table 14 : Changing Scenario of Annual Compound Growth Rate of Area in Cereal Crops During 1990s

Crops	1991/92-1995-96		1995/96-2000-01		1991/92-2000-01	
	Area	Yield	Area	Yield	Area	Yield
Total paddy	-0.8	-0.6	1.6	6.1	0.6	2.7
Aus total	-4.8	-2.0	-5.1	4.9	-3.6	1.9
Aman total	-0.2	-2.1	0.2	4.6	-0.2	1.1
Boro total	1.1	0.0	8.4	4.0	4.5	2.5
Aus (Local)	-6.7	-3.0	-3.9	5.3	-5.7	1.3
Aus (HYV)	1.3	-3.3	-1.5	2.7	2.0	0.1
Aman (Local)	-0.8	-2.1	-0.2	5.5	0.0	0.3
Aman (HYV)	0.6	-1.8	3.3	3.7	2.8	0.5
Boro (Local)	-3.7	0.0	-6.7	7.8	-2.8	2.2
Boro (HYV)	1.7	-0.3	9.6	3.3	5.1	2.4
Wheat	4.0	1.6	2.1	0.9	4.3	12.7
Total Cereal	-0.6	-4.0	1.6	5.8	0.8	-

Source : Bangladesh Facing the Challenges of Globalization, A Review of Bangladesh Development, 2001, CPD, Narayangonj.

5.4.2 Changes of Areas and Yield for Non-cereal Crops

The growth scenario for non-cereal crops can be observed from table – 14. During the 1990s both areas for potato and vegetables were increased by 8.8% and 3.9% respectively. In this period cultivable areas for pulses and oilseeds were deceased while areas for spices production were increased. During the first period of 1990s, areas for potato and vegetables were increased by 1.1% and 2.3% respectively while areas for other three crops like pulses, oilseeds and spices were declined but yield growth rates were positive and significant except spices. During the second half of 1990s, areas for potato, vegetables and spices increased tremendously and claimed increase of 23.8%, 8.2% and 16.5% respectively. In this period pulses and oilseeds areas were declined sharply by 9.9% and 2.7% respectively. From the analysis, it is clear that except potato and vegetables, pulses and oilseeds had serious short fall

of growth rate of areas which is a matter of concern for the policy makers for raising the productivity of the two types of essential crops like oilseeds and pulses.

Table – 15 : Changing Scenario of Annual Compound Growth Rate of Area and Yield for Non-cereal Crops

Crops	1991/92-1995-96		1996/97-1999-2000		1991/92-2000	
	Area	Yield	Area	Yield	Area	Yield
Potato	1.1	1.1	23.8	2.0	7.7	1.0
Vegetables	2.3	0.5	8.2	-1.6	4.1	-0.2
Pulses	-0.4	1.2	-9.9	0.9	-3.0	1.0
Oilseeds	-0.5	1.0	-2.7	0.6	-0.7	0.5
Spices	-2.1	1.4	16.5	-9.4	3.0	-1.8

Source : Ibid, 2001, CPD, Dhaka.

5.5 Land Utilization Pattern in the Study Areas

Land is scarce in the rural economy of Bangladesh. It is the prominent factor of production. So its proper utilization is very much important for higher productivity and income for the rural households.

In the present study, land utilization pattern of four villages were surveyed. A total of 2166.24 acres of land were utilized for different crops like rice, wheat, pulses, oilseeds, potato, vegetables, onion, garlic, and chilly etc. (Table-16). Of the total land utilization highest land was utilized by farmers of Patuakhali for different crops which was 729.23 acres followed by land utilized by the farmers of Comilla (634.34 acre), Rangpur (425.41 acres) and Narayangonj (377.69 acres). On the other hand, of the total land under utilization, majority of the land was utilized for rice (61.09%) cultivation followed by potato (12.87%), pulses (10.28%) and oilseeds (10.28%), vegetables (7.65%) onion garlic (3.52%) and wheat (0.92%). Of the total land utilized in Comilla, highest acres of land is utilized for rice (62.78%) production followed by potato (26.21%) ,vegetables (10.18%), oil seed (0.47%) and onion garlic (0.35%). In Rangpur, highest percentage of land is also utilized for rice (65.25%)

cultivation, followed by potato (18.42%) vegetables (8.63%), oilseed (3.55%), wheat (2.98%) and onion & garlic (1.78%). In Patuakhali, highest land is also utilized for rice (60.0%) cultivation followed by pulses (21.24%), oilseeds (7.13%) onion garlic (6.6%), vegetables (2.69%) and potato (2.32%). In Narayangonj, highest land is also utilized for rice cultivation (55.73%) followed by pulses (17.93%), vegetables (11.9%) onion garlic (5.52%), oilseeds (2.47%) and wheat (1.95%). If the land utilization pattern for different crops is analyzed, it is observed that rice as the staple food domintes the agriculture in all the four districts. Wheat cultivation is very meager and cultivated only in two study areas of Rangpur and Narayangonj. Pulses are prominent in Patuakhali and also in Narayangonj. Oilseeds are cultivated more or less in all districts but highest coverage was found in Patuakhali followed by Rangpur and then Narayangonj . Potato is although cultivated in all the districts but very prominent crop for Comilla followed by Rangpur. Vegetables other than potato are cultivated in all the study areas but highest in Comilla followed by Narayangonj and then Rangpur. Finally onion, garlic are very neglected in cultivation and is highest in Patuakhali and Narayangonj. The findings reveal that because of land suitability and opportunity of available modern technologies, potato and other vegetables are more cultivated in Comilla and Rangpur. Pulses, oilseeds and onion garlic are more cultivated in Patuakhali and Narayangonj . So for proper utilization of land and also for the consumption of all crops by the households more importance should be given on the minor crops like pulses, oilseeds, onion, garlic, chilly etc. depending upon the land suitability of the respective study areas.

Table – 16 : Land Utilization Pattern for Different Crops and their Contribution in Different Study Areas

Districts	Rice (acre)	Wheat (acre)	Pulses (acre)	Oil seeds (acre)	Vegetables			
					Potato (acre)	Other vegetables acre)	Onion garlic (acre)	Total (acre)
Comilla	398.27 (62.78)	-	-	3.0 (0.47)	166.29 (26.21)	64.58 (10.18)	2.20 (0.35)	634.34 (100.0)
Rangpur	277.56 (65.25)	12.66 (2.98)	-	15.10 (3.55)	78.37 (18.42)	36.72 (8.63)	5.00 (1.78)	425.41 (100.0)
Patuakhali	437.65 (60.00)	-	154.93 (21.24)	52.02 (7.13)	16.94 (2.32)	19.63 (2.60)	48.17 (6.6)	729.23 (100.0)
Narayangonj	210.51 (55.73)	7.37 (1.95)	67.73 (17.93)	9.35 (2.47)	16.97 (4.49)	44.93 (11.90)	20.83 (5.52)	377.69 (100.0)
Total	323.45 (61.09)	20.03 (0.92)	222.66 (10.28)	79.47 (10.28)	278.57 (12.87	165.86 (7.65)	76.20 (3.52)	2166.24 (100.0)

Note : Figures within the brackets indicate percentage.

5.6 Land Utilization Pattern for Different Diversified Crops and their Contribution by Categories of Farmers

If the total land utilized by different categories of farmers is analyzed it is observed from table -17 that a total 2166.24 acres of land is utilized by different categories of farmers of which 1398.46 acres of land is utilized by small farmers followed by medium – 1 farmers (464.56 acres), large farmers (165.24 acres) and medium 2 (137.98 acres) farmers. The contribution of different crop cultivation by farmer's category is observed from table-17. Major portion of cultivation for different crops is contributed by small farmers (65.54%) followed by medium I farmers (21.44%). Thus it is concluded that though there is land scarcity for each of the small farmers, but they shared maximum coverage of land than medium-I, large and medium-II farmers for their maximum number of population in study sample and for involving in commercial production and thus contributes the highest land utilization among different groups of farmers.

Table – 17 : Land Utilization Pattern for Different Crops and their Contribution by Categories of Farmers

Farmers Category	Crops under Cultivation (acre)							Total (acre)
	Rice	Wheat	Pulses	Oil Seeds	Potato	Vegetables	Onion Garlic Chilly	
Small farmers (0.01-2.49)	820.65 (65.00)	10.08 (50.32)	130.25 (58.49)	56.91 (71.61)	194.53 (69.83)	131.27 (79.15)	54.77 (71.88)	1398.46 (64.58)
Medium- I farmers (2.50-4.99 acre)	309.29 (23.37)	1.50 (7.48)	54.15 (24.32)	10.65 (13.40)	49.16 (17.64)	25.51 (15.38)	14.30 (18.77)	464.56 (21.44)
Medium- II farmers (5.00-7.49 acre)	94.19 (7.11)	1.45 (7.24)	20.03 (8.99)	3.11 (3.91)	11.51 (4.13)	5.74 (3.46)	1.95 (2.55)	137.98 (6.37)
Large farmers (7.50 acre and above)	99.33 (7.50)	7.0 (34.95)	18.23 (8.18)	8.80 (11.07)	23.37 (8.39)	3.34 (2.01)	5.18 (6.79)	165.24 (7.63)
Total	1323.45 (100.0)	20.03 (100.0)	222.66 (100.0)	79.47 (100.0)	278.57 (100.0)	165.86 (100.0)	76.20 (100.0)	21.66.24 (100.0)

Note : Figures within the brackets indicate percentage.

5.7 Land Utilization for Rice Cultivation by Categories of Farmers

In the study areas, total rice was classified into six categories. These are aus (local), aus (HYV), boro (local), boro (HYV), aman (local) & aman (HYV). The findings of table – 18 indicates that, of the total 1323.45 acres of rice, 62.00% is cultivated by small farmers followed by medium-1 (23.37%) large (7.5%) and medium – 2 (7.12%) farmers. It is also observed from the table – 18 that small farmers utilize 820.65 acres of land which, highest proportion of land is utilized for aman local (36.89%) followed by HYV boro (19.25%) and HYV aus (14.98%). Incase of medium – 1 farmers, of the total 309.29 areas of land under utilization, highest proportion is contributed for local aman (45.49%) followed by HYV aman (19.08%) HYV and boro (14.70%). Incase of medium-II farmers, highest proportion is also contributed by local aman (50.22%), followed by boro HYV (20.43%), & HYV aman (20.06%). Incase of large farmers highest proportion is also contributed by local aman (42.31%) followed by boro HYV (25.98%). If it is analyzed the cultivation of rice by categories of farmers, it is observed that small farmers contributes more among all categories of farmers. On the other hand, aman (local), boro (HYV), aman (HYV) and aus (HYV)

contributes more than other local varieties of rice cultivation which indicates that because of introduction of HYV seed, fertilizer and insecticides, contribution of HYV rice cultivation increases next significantly to local aman which might be considered as a positive sign of achieving surplus rice production for the mass people of rural Bangladesh.

Table – 18 : Contribution of Different Categories of Rice by Categories of Farmers

Farmers Category	Aus (Local)	Aus (HYV)	Boro (Local)	Boro (HYV)	Aman (Local)	Aman (HYV)	Total
Small farmers (0.01-2.49)	82.53 (10.05)	122.93 (14.98)	47.10 (5.74)	157.95 (19.25)	302.76 (36.89)	107.38 (13.08)	820.65 (62.00)
Medium- I farmers (2.50-4.99 acre)	43.94 (14.20)	13.24 (4.28)	6.89 (2.23)	45.47 (14.70)	140.71 (45.49)	59.04 (19.08)	309.29 (23.37)
Medium- II farmers (5.00-7.49 acre)	4.62 (4.90)	2.80 (2.97)	1.32 (1.40)	19.25 (20.43)	47.30 (50.22)	18.9 (20.06)	94.19 (7.12)
Large farmers (7.50 acre and above)	15.50 (15.60)	3.40 (3.42)	0.60 (0.06)	25.80 (25.98)	42.02 (42.31)	12.0 (12.08)	99.32 (7.50)
Total	146.59 (100.0)	142.37 (10.76)	55.91 (4.22)	248.47 (18.77)	532.79 (40.26)	197.32 (14.91)	1323.45 (100.0)

Note : Figures within the brackets indicate percentage.

5.8 Land Utilization for Pulses Cultivation by Categories of Farmers

Pulses are important food crops in Bangladesh and occupy an area of about 1.83 million acres which constitute 2.34% of the total cropped area. It produces 0.52 million tons of grains from the total 1.83 million acres (Malek, 1994). Pulses play vital role in the national economy and in the diet, as they are cheapest sources of protein. But pulse is treated as minor crops and little attention has been given to pulse production due to its low yield-potential. However, per capita availability of pulse is only 16.5 gm/day which is far below the recommended consumption of 60 gm/day. (Shajahan, Md. 1994). So for increasing pulse consumption, its cultivation and production should be increased for the resultant increased of recommended diet.

However from table 19, it is observed that in the four study areas, a total of 222.66 acres of land is utilized for pulse cultivation of which majority of the land is utilized for *kheshari* (55.63%), followed by *mug* (32.90%), lentil (7.50%), cowpea (2.91%) and blackgram (1.05%). On the other hand, major proportions of land under pulse cultivation is utilized by small farmers (58.49%) followed by medium-I (24.32%), medium – II (8.99%) and large (8.19%) farmers. If total utilization of land for pulse cultivation by categories of farmers is analysed, it is observed from the table - 19 that incase of small farmers *keshari* contributes about 60.0% of the total land under utilization, followed by *mug* (29.93%) and lentil (8.72%). In case of medium 1 farmers *keshari* also contributes the highest (56.14%) among different pulses, followed by *mug* (28.24%) cowpea (9.42%) and lentil (6.20). On the other hand, Medium II farmers cultivate only *keshair* (71.89%) and *mug* (28.10%). Although large farmers cultivate all the five pulses, among them *mug* contributes the highest (73.23%) followed by lentil (10.86%). The findings of pulse cultivation reveal that all categories of farmers cultivate five categories of pulses like lentil, cowpea, blackgram, *keshari*, and *mug* except medium-II farmers who cultivate only two types of pulses i.e. k*hesari* & mug and also medium –1 farmers who cultivate four types of pulses i.e., lentil, cowpea, *khesari* & mug respectively. As pulses have low yield potential, large farmers cultivate more *mug* and lentil for their own consumption and higher profitability than those of blackgram, *khesari* and cowpea.

Table – 19 : Contribution of Different Categories of Pulses among Different Categories of Farmers

Categories of farmers	Categories of Pulses					Total
	Lentil	Cowpea	*Blackgram*	*Kheshari*	*Mug*	
Small farmers (0.01-2.49)	11.36 (8.72)	0.48 (0.36)	1.25 (0.95)	78.17 (60.01)	38.99 (29.93)	130.25 (58.49)
Medium- I farmers (2.50-4.99 acre)	3.36 (6.20)	5.10 (9.42)	-	30.40 (56.14)	15.29 (28.24)	54.15 (24.32)
Medium- II farmers (5.00-7.49 acre)	-	-	-	14.40 (71.89)	5.63 (28.10)	20.03 (8.99)
Large farmers (7.50 acre and above)	198 (10.8)	0.90 (4.94)	1.10 (6.03)	0.90 (4.94)	13.35 (73.23)	18.23 (8.19)
Total	16.7 (7.50)	6.48 (2.91)	2.35 (1.06)	123.87 (55.63)	73.26 (32.90)	222.66 (100.0)

Note : Figures within the brackets indicate percentage.

5.9 Land Utilization Pattern for Oilseeds Cultivation by Categories of Farmers

Oilseed is an important cash-crop which include, mustard, til, sunflower, groundnut etc.. Bangladesh is almost totally dependent on import of edible oils and fats though a number of oilseed crops are grown in this country. It is estimated that the country experiences about 70-75% shortage of oilseed which results low intake of fats and oils by mass people. Average consumption rate of oils and fat is only 11.37 gm/head/day, while the recommended intake of fats and oil per head is 30 gm/head/day. On an average 33% of oil consumption is contributed by local production while 67% is contributed by export (Ahmed, 1994). So area under oilseed cultivation should be increased for better consumption as well as to reduce import of edible oils. It is noted here that area under oilseed crops increased from 13,51,090 acres in 1987-88 to 13,95,550 acres in 1992. In 1997-98, area under oilseed crops cultivation was 13,86,000 acres while in 2002-03 it was 9,87,000 acres. That is during this five years

period area under oilseed cultivation was decreased by 28.78 percent. Production of oilseed was also decreased by 23.89 percent due to decrease in area under oilseed crop cultivation during these 5 years (BBS, 2003). Although oilseed crops were not considered as important crops, but with the starting of crop diversification programme, oilseed crops were getting importance in increasing trend. So this effort should be continued for the promotion of this crop as well as for increasing production of edible oil and also to reduce the import of edible oil and oilseeds.

If oilseed cultivation by different categories of crops is analyzed in the study areas, it is observed from table- 20 that a total of 79.47 acres of land is utilized for oilseed cultivation of which 44.36% is for *till* and rest 35.11% is for mustard cultivation. Among the different categories of farmers, small farmers contributed 71.61% of the total oilseed cultivation, followed by medium-I (13.40%), large farmers (11.07%) and medium-II (3.91%) farmers. Incase of small farmers, highest proportion of oilseed is for till (62.41%) and rest by mustard (37.59%) crops. Incase of medium-I farmers, highest proportion of land is utilized for mustard (68.45%) and rest by *till* (31.55%) crops. In case of medium-II farmers, highest proportion of land is utilized for mustard (79.74%) and rest by till (20.26%) crop and finally incase of large farmers, highest proportion of land is utilized for till (55.11%) and rest by mustard (44.89%) crop. From the analysis, it is observed that only two oilseed crops is cultivated by the farmers in the study areas and the choice of cultivation varies among different farmers. The findings also indicate that farmers of study areas are reluctant to cultivate oil seeds. The reason is that farmers are interested to cultivate other crops like vegetables or pulses for their land suitability and higher profitability. Besides, traditional practice to cultivate *till* and mustard for their own consumption and also for getting higher income is another reason of cultivating these oil seed crops.

Table – 20 : Contribution of Different Categories of Oilseeds by Cultivation Among Different Categories of Farmers

Farmers Category	Oil Seeds (acre)		Total
	Till	Mustard	
Small farmers (0.01-2.49)	35.52 (62.41)	21.39 (37.59)	56.91 (71.61)
Medium- I farmers (2.50-4.99 acre)	3.36 (31.55)	7.29 (68.45)	10.65 (13.40)
Medium- II farmers (5.00-7.49 acre)	0.63 (20.26)	2.48 (79.74)	3.11 (3.91)
Large farmers (7.50 acre and above)	4.85 (55.11)	3.95 (44.89)	8.80 (11.07)
Total	44.36 (55.82)	35.11 (44.18)	79.47 (100.0)

Note : Figures within the brackets indicate percentage.

5.10 Land Utilization Pattern for Vegetables Cultivation by Categories of Farmers

As important sources of nutrition and food ,vegetables have been growing since time immemorial. But still apathy and feelings of the general masses towards cultivation of vegetables production has not been increased as per expectation although higher production of vegetables can play a dominant role in reducing malnutrition and poverty. Being nutritionally very poor, people of Bangladesh, still mostly depend on rice because of food security. Vegetables are very rich in nutrition. Six basic nutrient elements of food can be obtained from different kinds of vegetables. These are carbohydrates, fats and oils, protein, vitamins, irons, minerals and water. Vegetables are also essential for balanced diet. According to National Nutrition Survey (1984), daily per capita vegetables requirement is about 300 gm but per capita vegetables consumption is only 200 gm in rural areas (Ibid, 2002). So land under vegetable cultivation should be increased to meet the recommended diet of vegetables for the rural people of Bangladesh.

However, from table – 21, it is observed that in the four study areas, a total number of 16 categories of vegetables are cultivated by the different categories of farmers. The sixteen categories of vegetables are potato, long bean, pointed gourd (patal), sweet potato, bitter gourd , *usta*, brinjal, tomato, bottlegourd , snakegourd , raddis, ladies finger , country bean , *jali*, sweet gourd, and cucumber . A total of 444.43 acres of land is utilized for vegetable cultivation, among them potato contributes highest (62.68%) followed by bittergoard(8.31%), pointed gourd(5.9%), country bean (5.12%) bottlegourd (3.85%), brinjal (3.50%) ladies finger (2.49%), sweet potato (1.90%), sweet gourd (1.79%), barbati (1.44%) and others. So far land utilization for vegetable cultivation by different categories of farmers is concerned, it is observed that highest proportion of land is cultivated by small farmers followed by medium – I, medium-II and large farmers. Incase of small farmers highest proportion of land is for potato (59.7%) followed by bitter gourd (7.64%), pointed gourd (6.25%), country bean (6.05%), and others. Incase of medium I farmers, highest proportion of land is cultivated for potato (65.84%) followed by bitter gourd(12.01%), brinjal (8.27%), pointed gourd (4.25%), bottle gourd (3.84%), country bean (3.18%) and others. Incase of medium-II farmers highest proportion of land is also utilized for potato (66.72%) followed by pointed gourd (10.95%), bitter gourd (9.56%), sweet potato (7.65%) country bean (2.60%) and others. And finally incase of large farmers highest proportion of land is utilized for potato (87.49%) followed by better gourd (5.35%) brinjal (3.41%) and pointed gourd (2.99%). If we analyse the land utilization pattern among sixteen vegetables, it is observed that potato, bitter gourd, pointed gourd, brinjal, bottlegourd and country bean are the prominent and profitable vegetables, which are cultivated commercially by all categories of farmers. Other vegetables are also cultivated for higher income and household consumption.

Table – 21 : Contribution of Different Categories of Vegetables in Cultivation by Categories of Farmers

Category of Farmers	Vegetables																To
	Potato	*Long bean (Barbati)*	*Pointed gourd (Potal)*	*S. potato*	*Bitter gourd (Karala)*	*Usta*	*Brijjel (Begun)*	*Tomato*	*Bottle gourd*	*Snake gourd (Chichinga)*	*Rad dis*	*Ladies fingwe (Deros)*	*Country bean*	*Jali*	*Cucumber*	*Others*	
Small farmers (0.01-2.49)	**194.53** (59.7)	6.40 (1.96)	20.38 (6.25)	7.13 (2.19)	24.88 (7.64)	1.68 (0.51)	8.17 (2.50)	4.34 (1.33)	14.25 (4.37)	3.75 (1.15)	0.15 (.04)	11.05 (3.39)	19.74 (6.05)	0.85 (.26)	0.56 (.17)	7.94 (2.43)	32 (1
Medium- I farmers (2.50-4.99 acre)	49.16 (65.84)	-	3.17 (4.25)	-	8.97 (12.0)	-	6.18 (8.27)	-	2.87 (3.84)	-	-	-	2.38 (3.18)	-	1.94 (2.6)	-	74 (1
Medium- II farmers (5.00-7.49 acre)	11.51 (66.72)	-	1.89 (10.95)	1.32 (7.65)	1.65 (9.56)	-	0.28 (1.62)	-	-	-	-	-	0.45 (2.60)	-	.15 (.87)	-	17 (1
Large farmers (7.50 acre and above)	23.37 (87.49)	-	0.80 (2.99)	-	1.43 (5.35)	-	0.91 (3.41)	-	-	-	-	-	0.20 (0.75)	-	-	-	26 (1
Total	278.57 (62.68)	6.40 (1.44)	26.24 (5.9)	8.45 (1.9)	36.93 (8.31)	1.68 (0.38)	15.54 (3.50)	4.34 (0.98)	17.12 (3.85)	3.75 (0.84)	0.15 (.03)	11.05 (2.49)	22.77 (5.12)	0.85 (0.19)	2.65 (.60)	7.94 (1.79)	44 (1

Note : Figures within the brackets indicate percentage.

5.11 Cropping Pattern in the Study Villages

Cropping pattern generally indicates the crop production plan of the farmers by which they can draw an outline as what crop is cultivated in which plot depending on the land quality and suitability. It can also be termed as the way of crop cultivation by which a farmer can raise his production from a piece of land by raising the crop frequency. Cropping pattern may be defined as the yearly sequence of crop production followed in specific area for crop production. Cropping pattern may vary from location to location depending on the climatic condition, land quality and suitability. In the present study cropping pattern of four study villages was observed. The following cropping pattern was observed in the respective study areas. These are as follows :

A. Cropping Pattern followed by the Farmers in Comilla :

a) Aman (HYV) – Potato-Boro (HYV)
b) Aman (HYV) – Lau – Bitter gourd/shim/cucumber
c) Aman (HYV) – Nil-Boro (HYV)
d) Aman (HYV) – Boro (HYV) – Aus (HYV)
e) Chilly – Bittergourd – Lalshak
f) Lalshak – Cabbege/Cauliflower-bittter gourd / Chichinga / Sweet – Kumra
g) Aus (HYV) – Boro (HYV)
h) Ladies finger/Chilly – Ccumber – Lalshak
i) Cucumber/Sweet Kumra / Lau – Nil – Tomato
j) Barbati – Kaida / Sweet Kumra – Lal shak/Palongshak
k) Bringal – Aus (HYV)
l) Bainjal – Nil – Nil
m) Mustard – Boro (HYV) – Nil
n) Mustard – Boro (HYV) – Aus (HYV)
o) Potato – Boro (HYV) – Cucumber
p) Tomato – Cucumber / Bitter gourd – Raddis/shak

B. Cropping Pattern followed by the Farmers in Rangpur :

a) Aman (HYV) - Boro (HYV)- Nil
b) Aman (HYV) – Potato – Boro (HYV)
c) Aman (HYV) – Wheat / Mustard – Boro (HYV)
d) Aman (HYV) – Pointed gourd - Nil
e) Aman (HYV) – Pointed gourd / Bittergourd – Boro (HYV)
f) Amon (HYV) – Potato / Mustard – Boro (HYB)
g) Aus (HYV) - Potato/Mustard Boro (HYV)
h) Boro (HYV) – Pointer gourd– Nil

i) Aman (HYV) – Chilly/Onion/garlic - Bitter gourd
j) Aus (HYV) – Barbati – Nil
k) Aman (HYV)- Cucumber - Nil
l) Bringal – Brinjal - Nil
m) Barbati – Kaida - Lalshak
n) Potato – Pointed gourd - Puishak
o) Aus (HYV) – Potato – Cucumber.

C. Cropping Pattern followed by the Farmers in Patuakhali :

i) Aman (Local) + Khashari - Nil
ii) Aman (Local) – Chilly / Onion/ Garlic - Nil
iii) Aman (Local) – Mustard - Nil
iv) Aus (Local) – Amon (Local) - Lentil
v) Aman (Local) – Til - Nil
vi) Amon (Local) – Mug - Nil
vii) Amon (Local) - Sweet Potato- Boro (Local)
viii) Amon (Local) – Wheat– Nil
ix) Amon (Local) – Maskalai – Nil
x) Aus (Local) – Potato - Aman (Local)
xi) Potato - Deros - Paishak
xii) Lau - Cucumber - Lalshak

D. Cropping Pattern followed by the Farmers in Narayangonj :

i) Aus (Local) – Aman (Local) - Nil
ii) Aman (Local) – Wheat - Nil
iii) Aman (Local) – Potato – Boro (HYV)
iv) Aus (HYV) – Potato - Lau
v) Aman (Local) – Chilly/Onion/garlic – Aus (Local)
vi) Boro (HYV) – Nil – Amon Local
vii) Amon (Local) - Mug / Lentil – Aus (Local)
viii) Brinjal - Nil
ix) Lau – Cucumber - Palongshak
x) Aman (HYV) – Deros – Barbati.

5.12 Conclusion

In the conclusion, it can be said that land is scarce in rural Bangladesh and it is the only dominant factor for income and resource generation for the rural households. So its optimum utilization is very much essential for raising different crops. And thus for the greater interest of crop diversification land should be utilized effectively and efficiently depending upon the profitability of crops for improving the livelihood of the rural households of Bangladesh.

Chapter VI

Diversified Agriculture in Bangladesh : Evolution & Extent

6.1 Introduction

Bangladesh is predominantly an agricultural economy with a high population pressure of 834 residents occupied per sq. km. (BBS, 2001). The population mainly engages with subsistence agriculture where poverty is the common phenomena in rural Bangladesh. Still most of the population of rural Bangladesh is dependent on rice cultivation for survival. In Bangladesh, rice still dominates our agriculture in the crop sector. As staple food, rice provides 75% calorie and 55% protein which occupies about 77% of the countries total cropped area and contributes about 70% of the value of crop out put (Bhuiyan, et al., 2002; and FFYP, 1997-2002). In recent report, it is known that rice production has achieved great success, which is the highest during the past 30 years. In 1971-72, production of rice and wheat was 10.05 million metric tons, while it is 26.80 million metric tons in 2000-2001 which was the country's highest food production since independence (Hoque, 2005). Now we are almost self-sufficient in rice production but we cannot reflect our success in minor crops, non-cereals, oilseeds and vegetables.

However, agriculture contributes about 31.55 percent in the Gross Domestic Product. At present crop sector contributes about 22.62 percent of the total GDP and other crops and cereals contribute the rest. In addition, rice crop dominates the agriculture in-terms of both cropped area and crop production. Now rice covers 75 percent of the cultivated area. Area coverage of other crops are pulses 4.64 percent, wheat 3.92 percent, oilseeds 3.77 percent, jute 3.71 percent, sugarcane 1.23 percent, potato 1.11 percent, fruits 0.84 percent and vegetables 1.39 percent. For greater success and survival of the agricultural economy, equal importance should be given on other minor sectors or crops for overall improvement of the total economy, (Mid Term Review of FFYP, 1997-2002. In comprehensive view agricultural

economy of Bangladesh is composed not only of crop sector consisting of cereals and non cereals, but also includes the other sectors like fisheries and livestock within the crop-sector as a whole. This sub-sector plays a significant role in our economy. An estimated about 1.2 million people are directly employed in this sector. In addition, about 12 million people are indirectly earn their livelihood out of the activities related to fisheries. This sub-sector alone contributes about 10.67 percent to the agricultural GDP and also positioned third in the country's export. So fisheries sector should be improved for greater achievement of nutrition, employment and also export earning. Livestock sector which also plays significant role in our economic development. also contributes 3.27 percent to the country's GDP and accounted 10.37 percent of the agricultural GDP of the country. Meat ,Milk and egg are mainly coming from this sector. During 1998-99, the production of milk was 1.71 million tons against a target of 1.764 million metric tons. Production of meat was 0.65 million tons against the target of 0.662 million metric tons, and production of eggs was 35.30 million against a target of 35.50 million which indicates that the performance in livestock sector is quite significant (Ibid ,1997-2002). Thus it is all the sub-sectors should be performed equally for the overall development of the total agricultural economy. In this perspective, the present efforts provide the analysis of the extent of diversified agriculture that has been taken place during the past 20 years.

6.2 Conceptualization of Diversified Agriculture

Conceptually diversified agriculture means diversification of the crop sector including non-cereals, oilseeds, pulses, vegetables and other peripheral sector like animal husbandry, poultry, fishery and also the sub sector like forestry, (Zahir, 1993). Basically, diversification is the orientation of the subsistence farming to commercial farming (Ibid). It indicates maximization of the crop economy interms of return or profit. That is diversification indicates maximization of net return of per unit of land under cultivation or per unit of land

productivity (Akhanda, 1978). It also indicates cultivation of crops which gives maximum return to the farmers. Thus the level of diversification indicates extent of economic development in the rural sector although it varies from region to region because of soil quality and agro climatic condition and also for the resource endowment occupy by the farmers (Ibid).

However, in a greater sense, diversified agriculture means deviation of agriculture or crop sector from rice and inclination of the agriculture sector to non rice sector (Pandey & Sharma, 1996 and Shiro, 1994). Agricultural diversification means more emphasize of the non cereals and minor crops other than rice and wheat and cultivation of more pulses and oilseed's, spices and vegetables (PETRRA, 2001). For small farmers, crop diversification indicates as a means of hope for economic upliftment. Diversification in other word indicates as a strategy of profit maximization by reaping the gains of complementary and supplementary relationships among competitive crops (Ibid).

In the perspective of poverty alleviation, diversification indicates rural poverty alleviation by involving small and medium farmers in alternative farming and creating the source of income and employment. It also means in a greater way, changing the livelihood of small, marginal and landless farmers by changing their cultivation and consumption practices for the greater sake of calorie and protein intake or for the greater sake of poverty alleviation from the rural Bangladesh.

6.3 Agricultural Structure and Agricultural Economy of Bangladesh

There are mainly two sectors in the agrarian structure of Bangladesh .Farm sector and non-farm sector. The distinction between farm households to non-farm household is that the households who occupy less than 0.05 acre of land is considered as non-farm household. Actually agricultural structure composed of mainly ownership of land, tenurial conditions and

the relation of land and labour as the dominant point in analyzing the agrarian structure (Saha, 2002). The following table indicates the shift of farm to non-farm households. Table – 22 indicates the gradual shift of farm sector to non-farm sector. In 1983-84 there were 72.70 percent household was in farm sector while in non-farm sector it was from 27.30 percent to 34 percent within a period of 12 years (1984-96). So, non-farm households grew at the rate of 3.98 percent per annum which was almost double to the farm sector. Similarly in case of agricultural labourers, it shows a decreasing trend from 66.18 percent to 47.18 percent while in non-farm sectors it is increasing from 33.82 percent in 1983-84 to 52.82 percent in 1996-97. This is because of migration of the people from rural to urban areas.

Table – 22: Distribution of Households by Farm, Non-Farm and Agricultural Labourers

Sector	1983-84		1996		Annual Growth rate (%)	
	% of H/H	0% of agricultural labourers H/H	% of H/H	% of agriculture labourers	House hold	Ag. labourer household
Farm	72.70	57.08	66.18	47.18	1.35	-0.26
Non-farm	27.30	43.47	33.82	52.82	3.98	2.89
All	100.0	100.0	100.01	100.0	2.15	1.28

Source : BBS : 1986 and 1999 and Saha, B.K., 2002.

Landlessness is another form of agricultural structure in rural Bangladesh. The following Table-23 indicates the proliferation of landlessness where landless households are classified into five categories.

First category indicates households without homestead land. Category II indicates the landlessness without any cultivated land but owns homestead. Category III indicates households with homestead and cultivated land (Upto 0.50 acre). Category IV indicates households with homesteads and cultivated land (0.51-1.00 acre) Category –V indicates households with homestead and cultivable land up to 1 acre and above.

Table – 23 : Agrarian Structure in Terms of Land Category in Bangladesh :

Category of Households 1 Landless	1983-84		1996-97		Growth (%) per annum
	Number of households	%	Number of households	%	
Landless: Category – I	276977	2.00	162229	0.91	-2.93
Landless: Category-II	2713969	19.64	5003042	28.06	5.23
Landless: Category-III	3898181	28.21	5191979	29.12	2.42
Landless: Category-IV (marginal)	1702652	12.32	2494606	13.99	30.23
Rest of the household Category-V	5225867	37.82	117828182	100.0	2.15
All	13817646	100.0	17828182	100.0	2.15

Source : Ibid, 2002.

Table – 23 indicates that landless households were decreasing at the rate of 3 percent per annum i.e., extreme landless (Poverty) was reduced to some extent but functional landless i.e. without cultivable land was increased sharply at the rate of 5.23 percent per annum. Landlessness with homestead and cultivable land up to 0.50 acre was increased from 28.21 percent to 29.12 percent. Functional landlessness i.e. marginal farmers was increased from 12.32 percent to 13.99 percent and finally, the functionally landless people with one acre of cultivable land was reduced in some extent from 37.82 percent to 27.91 percent. The percentage distribution thus indicates that increasing tendency of landlessness and marginalization was reflected the unequal distribution of land ownership in the rural economy of Bangladesh.

Table – 24 : Tenurial Changes in of Agricultural Structure in Bangladesh Economy

Type of tenure	1983-84			1996-97		
	% of households	% of area	Average size of area	% of households	% of area	Average size of area
Owner	62.78	58.76	2.13	61.50	57.80	1.61
Owner cum tenants	35.83	40.69	2.58	37.50	41.61	1.90
Tenants	1.39	0.55	0.89	1.00	0.50	0.88
All	100.0	100.0	2.27	100.00	100.0	1.71

Source : Ibid, 2002

There are three types of tennurial structure : (a) owner (b) owner-cum-tenant (c) tenant. Table - 24, indicates the land tenure system for all categories of tenure. The above table indicates that average size of farms was reduced for all types of tennurial system. Average size of holding of owner-cum-tenants was the highest among three types of tennurial pattern.

6.4 Policy Changes and Diversification of Agricultural Crops

There are tremendous changes in the contribution of Gross Domestic Product (GDP) of the economy. Because of population pressure and change in labour market, people of the farm sector are shifting the position of the farm sector to non-farm agricultural sector for better wage-employment. During the independence and after that agricultural contribution to GDP was about 60 percent. The contribution was also similar during the First Five Year Plan (1973-78), Second Five Year Plan (1980-85) and Third Five Year Plan (1985-90). The contributions of agriculture to GDP were 54.85% and 54.3% respectively during the second and third five year plans . But there happened tremendous change in the contribution of agriculture GDP during fourth and fifth five-year plan. In the fourth and five-year plan, the contribution of agriculture to the GDP decreased tremendously because of shifting tendency of the farm families and farmers to non-farm activities. Thus it is indicative that during these two plans period contributions of agriculture to GDP were about 36.51 and 25.28 percent

respectively. The contribution of agriculture to GDP reduced to about 50% in the fifth plan period compared to the contribution of it during second and third plan period. Thus there occurs a great structural change in agricultural economy of the country and the people are now more inclined to off-farm activities. The annual growth rate showed the right scenario of performance of agricultural sector and thus demanded for policy interventions to cope with the present anomalies lie in our agricultural sector.

Table – 24: Structural Change in GDP and Its Annual Growth Rate

Year	Agricultural contribution to GDP	GDP growth rate of agriculture
First Five Year Plan (1973-78)	60.1%	6.1%
Second Five Year Plan (1980-85)	54.58%	3.8%
Third Five Year Plan (1985-90)	54.3%	3.5%
Fourth Five Year Plan (1990-95)	36.51%	3.42%
Fifth Five Year Plan (1997-2002)	25.28%	2.7%

Source : Five Year Plans (1973-78 to1997-2002)

So far policy changes of diversified agriculture are concerned it is evident that during the first five year plan (1973-78), 40 percent of the total GDP came from crop agriculture of which 28 percent was from the rice alone. In the first five year plan, greater emphasize was given on yield of rice sector. Non-cereal production like wheat, pulses, oilseeds and vegetables were not given due importance in the First Five Year Plan (SFYP, 1980-85). Although achieving the self-sufficiency in food grain-production was the major objective of the Second Five Year Plan (1980-85), a more balanced diet for the mass people was also inspired through substantial cultivation of oilseeds, pulses, and vegetables (Ibid). During the third five year plan (1985-90), shifting cultivation from mono crop (rice) to multiple crop production of pulses, oilseeds and vegetables was given due emphasis through the government massive initiatives on crop diversification programme. The third plan remarks that as the soil and climate of Bangladesh is very much suitable for growing minor crops like

pulses, oilseeds and vegetables, due emphasis was given to cultivate these minor crops to overcome the declining trend of production. The plan also gave emphasize for the production of exportable vegetables for earning foreign currencies. During the fourth five year plan it was known that although crop diversification was a goal of the third year plan but the crop base did not expand to achieve the goal to improve the dietary quality and food security. The crop selected for major diversification efforts continued to lose out to cereals. Among non-cereal crops, only potato registered a rising trend of per capita production, while most other crops like pulses, oilseeds, and vegetables revealed in declining trends (FFYP, 1990-95). The fifth five year plan (1997-2002) indicates that agricultural contribution to the country's total GDP was 31.55 percent where crop sector alone contributed to 22.62 percent of the total GDP. Crop sectors contribution to agricultural GDP is 72 percent while it was about 78 percent to agricultural GDP in the earlier years which revealed that contribution of other sectors like pulses oilseeds, and vegetables were increased in the agricultural GDP. The plan also indicates that vegetable production was increased by 31.72 percent in 1998-99 over the benchmark period of 1996-97. The rates of increased productions of potato, oilseeds, pulses, spices, vegetables, jute and sugarcane in 1998-99 over the benchmark period of 1996-97 were 49.19 percent, 29.72 percent, -5.66 percent, -6.06 percent, 31.72 percent, -8.008 percent, -14.20 percent respectively.

So far disaster and other natural uncontrollable factors are concerned, it can be said that different environmental factors like river erosion, flood, and cyclone are closely related to the development of crop diversification as well as for the sake of poverty reduction and livelihood development. These factors are natural and controllable to some certain extents but precautions and human actions are needed in every individual, community and national level for the cause of minimizing the loss of lives and also for recovering properties like land properties for food security and agricultural development (Ahmed, 1994).

6.5 Origin and Evolution of Diversified Agriculture in Bangladesh

Diversified agriculture in the name of crop diversification programme is now not a new programme in our agricultural sector, rather it is quite known to the farmers at micro-level and to the government officials and policy makers in the macro level. The programme aims at facilitating all the farm families with optimum amount of food and nutrition in their daily meal and thus diversified agriculture has been promoted at the grass-root level as a safety net and safety ground for poverty alleviation.

The objective of the crop-diversification programme is to ensure sufficient amount of food to all the people of Bangladesh. The Department of Agricultural Extension is being implemented the crop-diversification programme since early 1980. CDP is now officially implementing in 55 districts of Bangladesh.

Once Bangladesh was deficit in rice cultivation but now the country is almost self-sufficient in rice production. So the policy planners emphasize on non-creal crop production. And thus cultivation of diversified crops will act as a matter for increasing full time employment through out the whole year. CDP crops are more profitable than rice crops and because of this reason farmers are giving increased emphasis on producing more pulses, oilseeds and other minor non-cereals like vegetables. Farmers are trying their best practices for cultivating the CDP crops and they are initiating bottom-up advantage for the urban people. They are controlling the supply-side for the urban people through transferring their products in the urban areas. At the same time they are getting more price. So, a positive environment has been created through which farmers are encouraged to produce more CDP crops and thus make equilibrium to the demand and supply diversified crops.

From nutritional view point, the importance of CDP is acknowledged by all concerned. The present and previous governments took the right decision to implement such an important programme through out the whole country. So far food scarcity and nutrition are

concerned, CDP can act as a mile-stone for reducing poverty and overall development of the country.

6.6 Extent of Development of Diversified Agriculture : A Chronological Review

Diversified agriculture is no more a new concept in Bangladesh. It indicates the maximization of profit through minimization of unit cost of both land and labour through cultivating diversified crops like non-cereals, oilseeds, pulses and vegetables rather than cultivating only mono crop rice.

In order to know the extent of development of diversified agriculture, Herfindhal Index, a measure for calculating crop diversification is estimated in the different districts of the old four divisions. Five years intervals period like 1980-81, 1985-86, 1990-91, 1995-96 and 1998-99 were considered to find out the values of index.

Ogive index method can also be used to measure the extent of crop diversification. But because of more simplicity, only Herfindhal Index of measurement is used for the study.

The calculation method of diversification indices for the five consecutive period like 1980-81, 1985-86, 1990-91, 1995-96, 1998-99 for the greater 4(four) divisions including 20 (twenty) districts are shown below :

$$H.I = \sum_{i=1}^{n} p_i^2.$$

$$\text{i.e } H.I = p_1^2+p_2^2+p_3^2+.....+p_{20}^2$$

Where, n= Number of crops under cultivation

P_i= Average proportion of ith crop in total cropped area.

To measure the extent of diversification 20 (twenty) diversified agricultural crops are taken under consideration. These are namely : Aus (P1), Amon (P2), Boro (P3), Wheat (P4), Other cereals (P5), Pulses (P6), Oilseeds (P7), Spices and Condiments (P8), Sugar & Jute

(P9), Pumpkin (P10), Brinjal (P11), Beans & Barbati (P12), Arum Jinga & Karala (P13), Cabbage & Cauliflower (P14), Tomato (P15), Raddis (P16), Potato (P17), Watergourd (P18), Pointed gourd, Ladies finger & Cucumber (P19) & Other crops (P20).

Table-26: Diversified Indices During the Five Consecutive Periods, 1980-81, 1985-86, 1990-91, 1995-96, 1998-99

Year / District	1980-81	1985-86	1990-91	1995-96	1998-99
Chittagong Division					
Chittagong	0.000043	0.000029	0.000037	0.000038	0.000035
Chittagong Hill Tract	0.00003	0.000024	0.000017	0.000020	0.00002
Comilla	0.000048	0.000030	0.000029	0.000030	0.000026
Noakhali	0.000036	0.000037	0.000028	0.000030	0.000039
Sylhet					
Dhaka Division					
Dhaka	0.000011	0.000026	0.000017	0.000018	0.0000183
Faridpur	0.000036	0.0000212	0.000015	0.000024	0.000035
Jamalpur	0.0000345	0.000026	0.000021	0.000043	0.0000225
Mymensingh					
Tangail	0.000060	0.000034	0.000024	0.000021	0.000016
Khulna Division					
Barisal	0.000041	0.000041	0.000029	0.000031	0.000033
Jessor	0.000033	0.000026	0.000031	0.00002	0.000018
Kulna	N.A	0.000056	0.000061	0.000052	0.000041
Kustia	0.000028	0.000026	0.000030	0.000026	0.000034
Putuakhali	0.00006	0.000056	0.000041	0.000064	0.000048
Rajshahi Division					
Bogra	0.000035	0.000026	0.000027	0.000038	0.000033
Dinajpur	0.0562896	0.031628	0.04148	0.0302	0.0000485
Pbna	0.000049	0.000019	0.000017	0.000022	0.000019
Rajshahi	0.000034	0.000026	0.000025	0.000025	0.000023
Rangpur	0.000032	0.000028	0.000030	0.000027	0.000026

Source: Year book of Agricultural statistics from 1983-84, 1985-86, 1994 and 1999.

Now by using Herfindhal Index ,the extent of development of diversification in the four divisions of Bangladesh can be found out in the following Table -27.

Table-27 : Development of Diversification in Bangladesh During (1980-81 to 1998-99)

Year / District	Diversified index 1980-81	Diversified index 1998-99	Level of development (%)
Chittagong Division			
Chittagong	0.000043	0.000035	18.6 (+ive)
Chittagong Hill Tract	0.00003	0.000020	33.33 (+ive)
Comilla	0.000048	0.000026	45.83 (+ive)
Noakhali	0.000036	0.000039	8.33 (-ive)
Sylhet	0.00004	0.000038	5.00 (+ive)
Dhaka Division			
Dhaka	0.000011	0.0000183	63.36 (-ive)
Faridpur	0.000036	0.000035	2.77 (+ive)
Jamalpur	0.0000345	0.0000225	28.98 (+ive)
Mymensingh	0.000028	0.000028	0.00 (stagnant)
Tangail	0.000060	0.000016	73.33 (+ive)
Khulna Division			
Barisal	0.000041	0.000033	19.51 (+ive)
Jessor	0.000033	0.000018	45.45 (+ive)
Kulna	N.A	0.000041	N.A
Kustia	0.000028	0.000034	21.41 (-ive)
Putuakhali	0.00006	0.000048	20.00 (+ive)
Rajshahi Division			
Bogra	0.000035	0.000033	5.71 (+ive)
Dinajpur	0.0562896	0.0000485	99.91 (+ive)
Pbna	0.000049	0.000019	61.22 (+ive)
Rajshahi	0.000034	0.000023	32.35 (+ive)
Rangpur	0.000032	0.000026	18.75 (+ive)

In the old Chittagong division during the past 20 years we observe a positive trend of development in diversification. Here all the indices tend to be zero indicating a positive trend

of development of crop diversification. In case of Chittagong Division all the indices are positive except Noakhali (-8.33). Here highest level of development in diversification occurs in Comilla (45.83%) and lowest in Sylhet (5%).

In the Dhaka Division during the past 20 years similar trend is also reflected. Here except Dhaka (showing -ive trend) and Mymenshing (Showing stagnant trend) all the three districts namely Faridpur, Jamalpur and Tangail have shown positive development of diversification. Here the highest diversification is found in Tangail (73.33%) and lowest is in Faridpur (2.77 percent).

In the Khulna Division, except Kushtia and Khulna where the former district has reflected negative (-21.41%) trend of development and the later district has shown stagnant development, all other three districts namely Barisal, Jessor and Pathuakhali reflected positive trend of development of diversification. The highest development was found in Jessore which is about 45.45% and the lowest was found in Barisal which is 19.51 percent.

In Rajshahi Division, during the past 20 years, an excellent development of diversified agriculture has been observed. Here all the districts have positive development in diversified agriculture. The highest development occurs in Dinajpur which is about 99.91% and lowest in Bogra which is about 5.71 percent. The present analysis also indicates the policy reflection of the government as formulated in the second and third five year plans.

During the past 10 years a positive development of diversification is also observed in the old and greater four division which can be seen from Table-28.

Table-28: Development of Diversified Agriculture During 1980-81 to 1990-91

Year / District	Diversified index 1980-81	Diversified index 1990-91	Level of development (%)
Chittagong Division			
Chittagong	0.000043	0.000037	13.95 (+ive)
Chittagong Hill Tract	0.00003	0.000017	43.33 (+ive)
Comilla	0.000048	0.000029	39.58 (+ive)
Noakhali	0.000036	0.000028	22.22 (+ive)
Sylhet	0.00004	0.000033	17.50 (+ive)
Dhaka Division			
Dhaka	0.000011	0.000017	54.45 (ive)
Faridpur	0.000036	0.000015	58.33 (+ive)
Jamalpur	0.0000345	0.000021	39.13 (+ive)
Mymensingh	0.000028	0.000024	14.29 (+ive)
Tangail	0.000060	0.000024	60.00 (+ive)
Khulna Division			
Barisal	0.000041	0.000029	32.55 (+ive)
Jessor	0.000033	0.000031	6.06 (+ive)
Kulna	N.A	0.000061	N.A
Kustia	0.000028	0.000030	7.14 (-ive)
Putuakhali	0.00006	0.000043	33.33 (+ive)
Rajshahi Division			
Bogra	0.000035	0.000027	22.86 (+ive)
Dinajpur	0.0562896	0.04148	27.99 (+ive)
Pbna	0.000049	0.000017	65.31 (+ive)
Rajshahi	0.000034	0.000025	26.47 (+ive)
Rangpur	0.000032	0.000030	6.25 (+ive)

In Table-28, it is observed that all the five districts of Chittagong Division has (+ive) impact of diversification showing positive result in all the five districts. The highest development has occurred in Chittgong Hill tracts which is 43.33 percent and lowest in Chittagong which is 13.95 percent.

However, in Dhaka division except Dhaka all the four districts have positive indication of development through crop diversification. The highest diversification in this division has occured in Tangail and the lowest was in Mymensingh which is 60.00% and 14.29% respectively.

In Khulan Division except Khulna and Kushtia, all the three districts have positive indices showing positive development of diversification. The highest diversification is in Barisal which is 32.55 percent and the lowest is in Jessore which is 6.06 percent.

The Rajshahi Division during the past 10 years from 1980-81 to 1990-91 all the five districts have positive impact of diversification. Here the highest diversification was in Rajshahi which was 65.31 percent and the lowest was in Rangpur which is 6.25 percent. However, because of massive plan for crop diversification initiated by the then government during the past 10 years of development, more or less almost all the divisions and specific districts showed positive reflection of diversification which is also similar to the comments of the second and third five year plan.

During the period of 10 years from 1990-91 to 1998-99, we see a reverse picture of development in diversification which can be observed from Table-29.

Table-29: Development of Diversified Agriculture (1990-91 to 1998-99)

Year / District	Diversified index 1990-91	Diversified index 1998-99	Level of development (%)
Chittagong Division			
Chittagong	0.000037	0.000035	9.05 (+ive)
Chittagong Hill Tract	0.000017	0.000020	17.64 (-ive)
Comilla	0.000029	0.000026	10.34 (+ive)
Noakhali	0.000028	0.000039	39.28 (-ive)
Sylhet	0.000033	0.000038	15.15 (-ive)
Dhaka Division			
Dhaka	0.000017	0.0000183	7.64 (-ive)
Faridpur	0.000015	0.000035	133.33 (-ive)
Jamalpur	0.000021	0.0000225	7.14 (-ive)
Mymensingh	0.000024	0.000028	16.67 (-ive)
Tangail	0.000024	0.000016	33.33 (+ive)
Khulna Division			
Barisal	0.000029	0.000033	13.79 (-ive)
Jessor	0.000031	0.000018	41.94 (+ive)
Kulna	0.000061	0.000041	32.79 (+ive)
Kustia	0.000030	0.000034	13.33 (-ive)
Putuakhali	0.000041	0.000048	17.07 (-ive)
Rajshahi Division			
Bogra	0.000027	0.000033	22.22 (-ive)
Dinajpur	0.04148	0.0000485	99.88 (+ive)
Pabna	0.000017	0.000019	11.76 (-ive)
Rajshahi	0.000025	0.000023	8.0 (+ive)
Rangpur	0.000030	0.000026	13.33 (+ive)

Here we see that about 50% surveyed districts have negative picture in case of diversified agriculture. However, if we analyze the diversified index in all the four divisions we will observe the real picture.

In Chittagong Division, 3 districts namely Chittagong Hill Tract, Noakhali and Sylhet showing negative trend of diversification. The district Chittagong and Comilla have a positive index of diversification in the crop sector. Highest diversification occurs in Comilla which is 10.34 percent and lowest diversification is in Chittagong which is 9.05 percent in the Chittagong Division.

In Dhaka Division a very negative picture has been shown in case of crop diversification which can be observed from table-28. Here except Tangail (33.33%) all other four districts namely Dhaka, Faridpur, Jamalpur and Mymenshing has the negative indices of crop diversification.

In Khulna Division, an increase in the picture of diversification has been occurred in the division. Here out of five districts only two districts namely Jessor and Khulna have been showing positive indices of diversified agriculture which is 41.94 percent and 32.79 percent respectively. The negative indices showing in the three districts are Barisal, Kushtia and Patuakhali where development of diversification is negative, then the previous years.

In Rajshahi Division, there occurs a positive trend of diversification in the three districts namely Dinajpur, Rajshahi & Rangpur showing a very strong and excellent percentages of diversification in Dinajpur which is 99.88 percent, in Rajshahi district which is 8.0 percent and also in Rangpur which is 13.33 percent. The negative trend of diversification occurs in Bogra which is 22.22 percent and Pabna which is 11.76 percent.

Actually during the present 10 years extreme trend of negative diversification was identified because of several reasons. One prominent reason is the winding up process of the crop diversification programme in the later part of the 90's from the field level, other reasons might be ignorance of the govt. policy interventions which also reflected in the Fourth Five

Year Plan indicating negative growth of pulses (-5.66%), spices (-6.06%), jute (-8.008%) and sugarcane (-14.20%). Besides, structural adjustment policies in the name of withdrawal of subsidies for fertilizers, insecticides and irrigation equipments might have negative impacts of diversification. The high price of fertilizer and insecticides, impact of privatization of delivery systems of agricultural inputs also might be the causes of negative development of diversified agriculture.

6.7 Conclusion

In the conclusion it can be mentioned that diversified agriculture is the fortune of the present century of Bangladesh agriculture. People of Bangladesh are dependent on rice as staple food but at the same time other crops like pulses, oilseeds, vegetables and spices can not be ignored for practical reasons. During the second (1980-85) and third (1985-90) five year plan period, trend of diversification indices are almost all positive in most of the districts of the greater four divisions but during the present decade development of diversification in the sectors of oilseeds, pulses vegetables and spices is not similar as expected. So in order to adjust such a negative condition of diversification, policy interventions as well as people's participation in the crop diversification programme are very much essential. As far as vitamin, protein, and calorie intake are concerned, greater emphasize is needed to be given on diversified agriculture. To modernize agriculture, quality seeds, fertilizer insecticides, agricultural credit & agricultural equipments etc. should be made available within the farmer"s reach at reasonable price for the wider scope of diversified agriculture in rural Bangladesh .

Chapter VII

Cost and Return of Rice and Diversified Crops : A Comparative Analysis

7.1 Introduction

Crop sector is still dominated by the production of cereals. The agro-climatic condition of Bangladesh is suitable for production of about 200 crops in a year. Bangladesh is near about of attaining self sufficiency in rice production. Due to heavy cereal based food habits and low production of other food items such as fruits, vegetables and pulses, these crops are less than that of our daily requirement. So it is necessary to find out the comparative advantage of producing these crops for which it is necessary to calculate cost and return of the crops. The basic idea of cost and return analysis is simple. For the purpose of weighing up the advantages and disadvantages from a product, cost and return analysis or cost and benefit analysis is necessary. Before producing something it is the rationality to weigh up the pros and cons of the product. So that individual farmer should search out which product will be produced or which product will be referred by the farmer for production purposes. So cost benefit analysis ultimately acts as the deciding factor of producing a crop. Cost benefit or cost and return analysis inform a decision maker what can be chosen from a number of options (Dasgupta and Pearce, 1974).

However, it is argued that farmer's economic prosperity rises and falls with the ups and downs of agriculture production. So farmers should cultivate profitable crops. The increasing pressure of population on land, poor facilities of farm credit, defective marketing system, and illiteracy all these factors contributing to lowering the efficiency of farming. So farmer should maximize his return from per unit of land. The importance of cost and return analysis acts as a basis for sound agricultural policies. Now emphasize has been given to the development of the farm as an

individual unit through proper combination & utilization of available resources (Jain, 1981). That's why systematic study on cost and return for farm products is very much essential to make an overall idea about the agricultural performances of an economy. Besides, cost and return analysis on agricultural product is very much important for methodological analysis of farm accounts. Thus study on cost and return help to find out ways and means of increasing efficiency through improvement of input and output relationship. In a situation where investible resources are scarce and have alternative uses, careful undertaking of cost benefits analysis particularly in agricultural farm enterprises or other enterprises is a must. Basically cost benefit analysis does not involve new economic theory. It belongs to that part of conventional theory and policy which deals with the question of efficient resource use or allocation. In a market economy, the objective of individual farmer is to maximize his own profit. In a perfect competitive economy, maximization of profits ensures efficient allocation of resources under the following conditions (Rahman. 1965) :

a) every product in a perfect competitive market must be marketable;
b) the market price of the product must be independent. That is, no single producer or buyer can be able to influence the market price of the product by his individual action;
c) no producers derive economic loss from the provision of consumption of others.

However, the present chapter is an attempt to analyse the comparative cost and return of selective rice and diversified crops like amon (local), aman (HYV), aus (local), aus (HYV), boro (local), boro (HYV) , pulses like lentil, keshari, vegetables like potato, bitter gourd, and chilli. The chapter also highlights the benefit cost ratio of the respective rice and diversified crops.

7.2 Cost and Return Analysis of Selected Rice and Diversified Crops

The implication of analyzing cost and return of the sample crops is a forward looking about how better agricultural practices and improved technologies can be used for over all improvement of production. Costs are calculated on the basis of all cost incurred in production process. In the study, the costs involved in production are land preparation cost, seed & seedling cost, plantation cost, irrigation cost, concentrated cost (weeding cost & drainage cost and fencing cost) and harvesting cost. All sorts of employment interms of labour are converted in to cash considering the prevailing market price during the period of investigation to calculate the cost of production.

Now total cost & return of selected crops namely aus (local), aus (HYV), amon (local) amon (HYV), boro (local), boro (HYV), potato, *keshari*, lentil, mustard, bitter gourd, and chilli are discussed below :

7.2.1 Cost and Return Analysis of Aus (Local) :

From table 30 it is observed that average per acre cost of a aus (local) production for large, medium 1, medium II and small farmers are Tk. 6382.50, Tk. 6127.50, Tk. 5787.50 and Tk. 5545.00 respectively which indicate that medium II & small farmer"s cost of cultivation for aus (local) is less than that of large and medium I farmers. Gross average returns for aus (local) per acre cultivation for large, medium-I, medium II and small farmers are Tk. 7000.00, Tk. 7280.00, Tk. 7280.00 and Tk. 7560.00 respectively. Thus average net returns for cultivating aus (local) for large, medium –I, medium II and small farmers are Tk. 617.50, Tk. 1152.50, Tk. 1492.50 and Tk. 2015.00 respectively which indicate that small farmers are more benefited in cultivating aus (local) rice compared to large and medium farmers.

7.2.2 Cost and Return Analysis of Aus (HYV)

In case of aus (HYV), it is observed that per acre average costs of production for large, medium I, medium II & small farmers are Tk. 8355.00, Tk. 7912.50, Tk. 7630.00 & Tk. 7425.00 respectively while average per acre gross returns for aus (HYV) cultivation for large, medium I, medium II & small farmers are Tk. 11400.00, Tk. 11700.00, Tk. 12000.00, and Tk. 12000.00 respectively. Net average returns for producing aus (HYV) incase of large, medium I, medium II & small farmers is Tk. 3045.00, Tk. 3787.50, Tk. 4370.00 & Tk. 4575.00 respectively. Total average cost for cultivating aus (HYV) is greater than that of aus (local) because of higher irrigation and fertilizer cost. Profit is also better in case of aus (HYV) than that of aus (local).

7.2.3 Cost and Return Analysis of Amon (Local)

In case of aman (local) cultivation, it is observed that average per acre costs of aman (local) cultivation for large, medium-1, medium-II & small farmers are Tk. 5100.00, Tk 4837.50, Tk. 4700.00 & Tk. 4422.25 respectively while gross returns for aman (local) cultivation are Tk 7040.00, Tk 7040.00, Tk.7360.00 & Tk. 7680.00 respectively. Thus average returns for amon (local) cultivation per acre for large, medium-I, medium-II & small farmers are Tk. 1940.00, Tk. 2202.50, Tk. 2660.00 & Tk. 3257.75 respectively. A study indicates that average costs of production, average gross-returns and average net returns for amon (local) production are Tk. 4160.65, Tk. 6853.63 and Tk. 2693.18 respectively (Alam et al., 1999). Actually amon (local) is cultivated during monsoon period, so cultivation cost is less compared to aus (local) and aus (HYV). Although there is no irrigation cost for amon (local) but profit or return is better for small farmers because they can contribute more labour than the large and medium farmers for amon (local) cultivation.

7.2.4 Cost and Return Analysis of Amon (HYV)

In case of amon (HYV) cultivation, average per acre costs of production for large, medium-I, medium-II & small farmers are Tk. 8175.00, Tk. 7879.77, Tk. 7537.50 & Tk. 7037.50 respectively while average gross returns for amon (HYV) cultivation are Tk. 12480.00, Tk. 12480.00, Tk. 12800.00 & Tk. 12800.00 respectively. The average net returns for amon (HYV) cultivation for large, medium-I, medium-II and small farmers are Tk. 4305.00, Tk. 4600.83, Tk. 5262.50 & Tk. 5762.50 respectively. It is observed that average net return for amon (HYV) cultivation is not more than that of amon (local). This is due to higher cost of fertilizer, irrigation, and intercultural operation although average comparative profit for amon (HYV) cultivation is higher in case of small farmers compared to large and medium farmers.

7.2.5 Cost and Return Analysis of Boro (Local) :

In case of boro (local) cultivation, per acre average costs of cultivation for large, medium-I, medium II & small farmers are Tk. 5650.00, Tk. 5462.50, Tk. 5299.50 and Tk. 5012.50 respectively while gross returns for cultivating boro (local) for large, medium-I, medium II & small farmers are Tk. 7360.00, Tk. 7360.00, Tk. 7680.00 & Tk. 7680.00 respectively. The average net returns for boro (local) cultivation for large, medium-I, medium II & small farmers are Tk. 1710.00, 1899.50, Tk. 2380.50 and Tk. 2667.50 respectively. A study conducted by Biswas T.K. (1990) indicates that average cost of production, gross returns and net return of boro (local) cultivation are Tk. 6422, Tk. 10,622 and Tk. 4200 respectively.

7.2.6 Cost and Return Analysis of Boro (HYV) :

In case of boro (HYV), average costs of production for large, medium-I, medium II & small farmers per acre are Tk. 8450.00, Tk. 7937.50, Tk. 7970.80 and Tk. 7033.33

respectively while gross returns for boro (HYV) cultivation for large, medium-I, medium II & small farmers are Tk. 13120.00, Tk. 13120.00, Tk. 13440.00 and Tk. 14080.00 respectively. The average net returns for boro (HYV) cultivation per acre for large, medium-I, medium II & small farmers is Tk. 4670.00, Tk. 5182.50, Tk. 5469.20 and Tk. 7046.67 respectively. The comparative advantage of higher net return from boro (HYV) cultivation was due to higher yield per acre compared to boro (local) production.

7.2.7 Cost and Return Analysis of Potato :

In case of vegetables cultivation, it is observed that people are more inclined to cultivate vegetable because of higher profit. In potato cultivation, it is observed that per acre average costs of production for large, medium-I, medium-II & small farmers are Tk. 14300.00, Tk. 13449.50, Tk. 13100.00 and Tk.12562.50 respectively while average gross returns for potato cultivation per acre for large, medium-I, medium-II & small farmers are Tk. 37000.00, Tk.38,000.00, Tk.39,000.00 and Tk. 40,000.00 respectively. The average net returns for potato cultivation for large, medium-I, medium-II and small are Tk. 22700.00, Tk. 24,500.50, Tk. 25,900.00 & Tk. 27.437.50 respectively. The average higher net returns for potato cultivation for all categories of farmers are due to climatic condition, favourable environment, favourable irrigation facilities, land suitability and soil quality and also for higher prices of potato incurred by the farmers during harvesting period. Among all the farmers small farmers earn more profit compared to large, medium-I & medium-II farmers because of their indigenous cultivation practices and more labour they can employ in vegetables field.

7.2.8 Cost and Return Analysis of Bitter Gourd :

In case of bitter gourd production it is found that average per acre costs of production for large, medium-I, medium-II & small farmers are Tk. 7920.84, Tk. 7566.67, Tk.

7370.33 and Tk.7087.00 respectively while average per acre gross return for bitter gourd production for large, medium-I, medium-II & small farmers are Tk.36,000.00, Tk.38,000.00, Tk.40,000.00 and Tk. 40,000.00 respectively. Average per acre net returns for bitter gourd cultivation for large, medium-I, medium-II and small farmers are Tk. 28,079.16, Tk. 30,433.33, Tk. 32,629.67 and Tk. 32,913.00 respectively. Alam Md. J (2002) observed that per acre cost of bitter gourd cultivation for small, medium, and large farmers are Tk. 19,038.80, Tk. 19,532.00 & Tk. 12,777.00 respectively. Average gross returns for bitter gourd cultivation for small, medium & large farmers are Tk. 34,226.00, Tk. 38,936.00 & Tk. 28,890.00 respectively. Thus net return for bitter gourd cultivation Tk. 15,188.00, Tk. 19,404.00 & Tk. 16,113.00 respectively. Munshi S.K. (2002) observed that cost of production and gross & net returns for bitter gourd cultivation for all categories of farmers are Tk. 26,853.00, Tk. 52,889.00 and 26,036.00 respectively. It is observed that among the four categories of farmers, irrespective of farmer's category, almost all the farmers are benefited through cultivating bitter gourd because every and each category of farmers incurs high amount of profit, although small & medium-II farmers earn more profit compared to large and medium-I farmers.

7.2.9 Cost and Return Analysis of Chilli

Incase of chilli, it is observed that average per acre costs of production of chilli for large, medium-I, medium-II & small farmers are Tk. 5,100.00, Tk.4,929.19, Tk. 4,550.00 & Tk. 4,155.00 respectively. Average gross-returns for chilli cultivation by large, medium-I, medium-II & small farmers are Tk. 16,800.00, Tk. 18,000.00, Tk. 18,000.00 & Tk. 19,200.00 respectively. Thus the average net returns for chilli cultivation for large, medium-I, medium-II & small farmers are Tk. 11,700.00, Tk. 13,170.81, Tk. 13,542.00 & Tk. 15,045.00 respectively. Compared to oilseeds, chilli

cultivation is more profitable. Here small farmers are more benefited than the large & medium farmers.

7.2.10 Cost and Return Analysis of *Kheshari*

Compared to vegetables cultivation, pulses are comparatively less profitable but more profitable than rice cultivation. In the study areas, it is observed that average per acre cost, of *kheshari* cultivation, incase of large, medium-I, medium-II & small farmers are Tk. 2,875.00, Tk.2,575.00, Tk. 2,325.00, & Tk. 2,025.00 respectively. Incase of *kheshari* cultivation, average gross returns for large, medium-I, medium-II & small farmers are Tk. 5,200.00, Tk. 5,200.00, Tk. 6,500.00 & Tk. 6,500.00 respectively. Thus average net returns for *kheshari* cultivation for large, medium-I, medium-II & small are Tk. 2,325.00.00, Tk.2,626.00, Tk.4,175.00 & Tk. 4,475.00 respectively. Although kheshari cultivation is less profitable but because of consumption it is cultivated in most plans. In the southern areas of Bangladesh, particularly in Patuakhali, it is cultivated in the paddy field. It has no ploughing and irrigation cost and for this reason it incurs less cost in production. But it is more profitable than local varieties of rice crops.

7.2.11 Cost and Return Analysis of Lentil

Lentil is one of the common pulses of Bangladesh which is consumed by almost every household and everyday. It is abundantly grown in almost all areas of Bangladesh during winter season. The average per acre costs of production of lentil for large, medium-I, medium-II & small farmers are Tk. 2,800.00, Tk.2,840.00, Tk. 2,435.00, & Tk. 2,350.00 respectively. Average gross-returns for lentil cultivation by large, medium-I, medium-II & small farmers are Tk. 6,400.00, Tk. 6,400.00, Tk. 8,000.00 & Tk. 8,000.00 respectively. Thus the net returns for lentil cultivation for large, medium-

I, medium-II & small farmers are Tk.3,600.00, Tk.3,560.00, Tk. 5,565.00, & Tk. 5,650.00 respectively. Compared to kherashi, lentil is more profitable and for this reason, although small farmers incur higher profit in lentil cultivation but the large, medium-I and medium-II farmers also cultivate lentil for daily consumption and also for incurring higher profit in lentil cultivation. Thus all the farmers irrespective of study areas cultivate lentil commercially for higher profit as well as for daily consumption.

7.2.12 Cost and Return Analysis of Mustard

Incase of edible oil, mustard is a common name for daily consumption and it is cultivated all the study areas commercially and also particularly for higher profit and consumption. Incase of mustard, average per acre costs of cultivation for large, medium-I, medium-II & small farmers is Tk. 3,762.50, Tk.3,840.25, Tk. 3,665.00 & Tk. 3,390.00 respectively. Average per acre gross-returns for mustard cultivation are Tk. 5,200.00, Tk. 5,200.00, Tk. 6,500.00 and Tk. 6,500.00 respectively. Thus average net returns for mustard cultivation are Tk. 1,437.50, Tk. 1,359.75, Tk.2,835.00 & Tk. 3,110.00 respectively. Although mustard cultivation is not more profitable because of low yield performance but compare to rice , it is more profitable. Thus irrespective of farmers category all farmers incur profit more or less in mustard cultivation but small farmers earned better profit because of their cultivation practices.

Table – 30 : Cost and Return Analysis of Selected Rice and Diversified Crops

Name of the Crops		Aus (L)	Aus (HYV)	Aman (L)	Amon (HYV)	Boro (L)	Boro (HYV)	Potato	Bitter Gourd	Chilli	Khesh ari	Lentil	Must ard
Yield per Acre (maund)	Large	25	38	22	39	23	41	185	180	14	8	8	8
	Med-I	26	39	22	39	23	41	190	190	15	8	8	8
	Med-II	26	40	23	40	24	42	195	200	15	10	10	10
	Small	27	40	24	40	24	44	200	200	16	10	10	10
Average Price per mound (Tk.) All farmers		280	300	320	320	320	320	200	200	1200	650	800	650
Gross Return (Tk.)	Large	7000	11400	7040	12480	7360	13120	37000	36000	16800	5200	6400	3200
	Med-I	7280	11700	7040	12480	7360	13120	38000	38000	18000	5200	6400	5200
	Med-II	7280	12000	7360	12800	7680	13440	39000	40000	18000	6500	8000	6500
	Small	7560	12000	7680	12800	7680	14080	40000	40000	19200	6500	8000	6500
Cost per Acre (Tk.)	Large	6382.50	8355	5100	8175	5650	8450	14300	7920.84	5100	2875	2800	3762.50
	Med-I	6127.50	7912.50	4837.50	7879.17	5462.50	7937.50	13499.50	7566.67	4929.19	2575	2840	3840.25
	Med-II	5787.50	7630	4700	7537.50	5299.50	7970.80	13100	7370.33	4458.00	2325	2435	3665.00
	Small	5545	7425	4422.25	7037.50	5012.50	7033.33	12562.50	787.00	4155.00	2025	2350	3390.00
Net Return (Tk.)	Large	617.50	1545	1940	1425	1710	2110	22700	28079.16	11700	2325	3600	1437.50
	Med-I	1152.50	2287.50	2202.50	1720.83	1897.50	2302.50	24500.50	30433.33	13170.81	2625	3560	1359.75
	Med-II	1492.50	2870	2660	2382.50	2380.50	3229.20	25900	32629.67	13542	4175	5565	2835
	Small	2015	3075	3257.75	3020.50	2667.50	4166.67	27437.50	32913	15045	4475	5650	3110

Source : Field Survey, 2003-04

7.3 Benefit Cost Ratio Analysis : Incase of analysis of comparative benefits of cultivating crops, Benefit Cost Ratio (BCR) is a good measure for measuring profit or benefits interms of costs. BCR can be analyzed interms of both gross return and net return. But the best measure is to analyze benefit cost ratio on the basis of net return. BCR helps to assess the economic worth of the individual farm enterprise. It is a technique which permits to select priorities and to decide on the relative economic ranking of the farmers. It can also assist a farmer to compare economic worth among different farmers and also helps the farmer to determine what should be the optimum size of the farm (Khan, 1965). BCR is defined as the ratio of benefits to the cost; or it

is defined as the ratio of cost to the benefits; or, it is the difference between benefit and cost. All three concepts are much related. The first two are infact inverse of one another. The third one is quantitative related to the first two. What are benefits or profit? Benefit or profit is synonymous. It is used in economic terms. There is the third party called beneficiary who has to pay to the producer. It is the profit of the producer. Incase of consumer it is termed as utility accrued from the product (Ahmed, 1965). The other concept of benefit is the profitability. If a benefit is preferred over another benefit, then it is called more preferable than the next. However benefits are two kinds : (a) Primary Benefit (b) Secondary Benefit. Primary benefit is the value of the immediate product while secondary benefit are the value added over and above the immediate product (Pasha, 1965). Incase of agricultural performances for different products, in the present study, only tangible benefits are used and analyzed. The present section highlights the benefit cost ratio of selected rice and diversified crops produced by different categories of farmers.

Table – 31 : Benefit Cost Ratio According to Farmers for Different Rice and Diversified Crops

Name of the Crops		Aus (L)	Aus (HYV)	Aman (L)	Amon (HYV)	Boro (L)	Boro (HYV)	Potato	Bitter Gourd	Chilli	Kheshari	Lentil	Mustard
Benefit Cost Ratio (Gross Return)	Large	1.10	1.36	1.32	1.53	1.30	1.51	2.58	454	3.29	1.80	2.28	1.38
	Med-I	1.19	1.48	1.45	1.58	1.34	1.61	2.81	5.02	3.65	2.01	2.25	1.35
	Med-II	1.25	1.57	1.57	1.70	1.45	1.69	2.97	5.42	4.03	2.79	3.28	1.77
	Small	1.36	1.62	1.73	1.82	1.53	2.00	3.18	5.64	4.62	3.20	3.40	1.91
	All	1.20	2.03	1.54	1.67	1.43	1.71	2.88	5.02	3.86	2.93	2.76	1.57
Benefit Cost Ratio (Net Return)	Large	0.09	0.36	0.38	0.53	0.30	0.58	1.58	3.54	0.69	0.80	1.28	0.38
	Med-I	0.18	0.48	0.45	0.58	0.35	0.65	1.81	4.02	2.72	1.01	1.25	0.35
	Med-II	0.26	0.59	0.56	0.70	0.45	0.69	1.97	4.42	3.03	1.79	2.28	0.77
	Small	0.36	0.62	0.74	0.82	0.53	1.00	2.18	4.64	3.62	2.20	2.40	0.91
BCR (Net return)	All	0.22	0.50	0.54	0.67	0.43	0.70	1.88	4.02	2.86	1.38	1.76	0.60

Source : Field Survey, 2003-04

If we observe Benefit cost ratio of rice crops , it is observed that highest benefit cost ratio is 1.00 incurred by small farmers for HYV Boro cultivation and lowest is 0.09 incase of large farmers for aus (local) cultivation. Benefit cost ratio is less than one (1) in terms of Net return indicates that crop is less profitable. Here it is observed that all the rice crops cultivated with marginal profit as indicative from BCR of the rice crops in terms of net return . So far comparative advantage of vegetable, pulses, oil seed and spices cultivation is concerned, we observe that except mustard all other corps is more profitable(Table–31) .

Incase of potato cultivation, highest Benefit cost ratio (2.18) is incurred by small farmers which indicates that profit is more than 218 % higher than that of cultivation cost. Other Benefit cost ratios for large farmer is 1.58, medium-I is 1.81 and medium-II is 1.91 .In case of bitter gourd cultivation , Benefit cost ratio is the highest for small farmers (4.64) which indicates that profit is more than 464 % higher than that of cultivation cost of bittergourd .Rest of the Benefit cost ratios are 4.42 is for medium – II farmers ,4.02 for medium – I farmers and 3.54 for large farmers .(Table –31).

In case of pulse cultivation, it is observed that among *keshari* and lentil, highest BCR is incurred for lentil compared to *kheshari*. Benefit cost ratio is highest for small farmers in case of lentil and it is 2.20 i.e. small farmers can earn 220% more profit on their investments in cultivating lentil. The lowest Benefit cost ratio is found in *kheshari* cultivation and it is only 0.80 for large farmers which indicates that *kheshari* cultivation is less profitable for large farmers. (Table –31)

Incase of mustard cultivation, Benefit cost ratio is highest for small farmers which is 0.91 and lowest is 0.35 for medium-I farmers i.e. mustard cultivation is also less profitable. Incase of chilli cultivation BCR is not less than expectation. Here highest

the BCR is incurred by small farmers which is 3.62 and lowest is 0.69 for large farmers i.e. small farmers can earn almost 396 % more profit by cultivating per acre cultivation of chilli while large farmers earn marginal profit by cultivating chilli (Table –31).

If we analyse the cost and return structure of rice crops, we see that per acre average yield is highest for HYV rice crops than local varieties of rice crops. Average yield of boro (HYV), amon (HYV), aus (HYV) is 42, 40 and 39 respectively while per acre average yield for boro (local), amon (local) and aus (local) are 24, 23 and 26 respectively. The average yield of rice crops were observed to be less due to crop damage in the different study areas like patuakhali , Rangpur and also in Narayangonj . In case of average costs per acre it is observed that HYV rice crops incurred more cost than that of local rice crops. Per acre average costs of boro (HYV), amon (HYV) and aus (HYV) are Tk. 7847.91, Tk. 7657.29 and Tk. 7830.63 respectively while average cost per acre of boro (local), amon (local) and aus (local) is Tk. 5356.12, Tk. 4764.99 and Tk. 5960.63 respectively. Average net returns for boro (HYV), amon (HYV) and aus (HYV) are Tk. 5559.09, Tk. 5142.71 and Tk. 3863.37 respectively while average net returns for boro (local), amon (local) and aus (local) are Tk. 2323.88, Tk. 2595.01 and Tk. 1319.38 respectively (Table 32).

Table- 32 : Comparative Picture of Cost and Return Analysis of Selected Diversified Crops and Rice Crops (Summary)

Name of the Crops	Aus (L)	Aus (HYV)	Aman (L)	Amon (HYV)	Boro (L)	Boro (HYV)	Potato	Bitter Gourd	Chill	Khesha ri	Lentil	Mustard
All farmers (Per acre yield)	26	39	23	40	24	42	193	193	15	9	9	9
Average price per maund (All)	280	300	320	320	320	320	200	200	1200	650	800	650
Gross Return (All)	7180	11700	7360	12800	7680	13440	38600	38600	18000	5850	7200	5850
Cost Per Acre (All)	5960.63	7830.63	4764.99	7657.29	5356.12	7847.91	13365.50	7681.75	4660.54	2450	2606.25	3664 44
Net Return (All)	1319.38	3863.37	2595.01	5142.71	2323.88	5559.09	25234.50	30918.25	13364.45	3400	4593.75	2185 56
BCR Gross Return (All)	1.20	2.03	1.54	1.67	1.43	1.71	2.88	5.02	3.86	2.93	2 76	1 57
BCR Net Return (All)	0.22	0.50	0.54	0.67	0.43	0.70	1.88	4.02	2.86	1.38	1.76	0 60

Note : Gross Return : Gross return indicates total volume of production per acre multiplied by price per maund.

Net Return : Net return indicates gross return – total cost of production per acre

BCR : Benefit Cost Ratio indicates the division of benefit by cost of production per acre.

From the analysis of rice crops, it is observed that high yielding varieties of rice are more profitable than local variety of rice crops. Local varieties has lower yield while HYVs of rice has higher yield. In some cases yields of local varieties are stagnated. The reason behind such stagnancy or lower yield of local variety of rice was due to low yield capability, intensive cultivation of the mono crop with imbalanced use of modern inputs and less attention of micro technologies. Some socio economic constraints like illiteracy, subsistence nature of farming system, less extension contact, high cost of production because of high fertilizer cost etc. have influenced on yield decline (Hamid et al, 2002; Illah & Bose, 1996). Thus for overcoming lower yield or yield stagnancy, more demonstration and training programmes should be implemented at grass root level, with a view to develop awareness about modern HYV varieties, organic fertilization, more use of green manure, more interaction between farmers and technical field workers as a strategy of over coming lower yield or yield stagnancy from the rural Bangladesh. (Ibid)

However, if cost and return of diversified crops is analyzed, it is found that per acre average cost for bitter gourd, and potato is Tk. 7681.75 and Tk. 13365.50 respectively. Average gross returns for bitter gourd and potato are Tk. 38,600.00 and Tk. 38,600.00 respectively. Thus net returns per acre for bitter gourd and potato are Tk. 30,918.25, and Tk. 25,235.00 respectively. Thus bitter gourd is more profitable than potato cultivation because of per acre less cost in bittergourd cultivation than that of potato . If we analysis profitability of bitter gourd, and potato cultivation by all categories of farmers we observe that bittergourd is more profitable (BCR is 4.02) than potato (BCR is 1.88).

Incase of pulses cultivation like *kheshari*, and lentil it is observed that lentil is more profitable than *kheshari* cultivation. Mustard & chilli are also profitable, but chilli is more profitable than mustard as indicative from the BCR of the particular crops . If the profitability of diversified crops cultivation is compared ,it is seen that compared to local varieties of rice, other non-cereal crops like vegetables, pulses, oilseeds and spices are more profitable. Small farmers are the best cultivators interms of incurring profit among the different categories of farmers like large, medium I, & medium II farmers. The reason is that small farmers are more indigenous in their cultivation practices and they have more family labour through which they can employ more labour in their cultivation practices. More ever they are always eager about their profitability from the cultivating crops because they want to maximize their profit from their small farm size .

If the benefit cost ratio for the selected crops is analyzed from table-32 , it is observed that local rice cultivation is less profitable than HYV rice cultivation. Vegetable cultivation are more profitable than rice crops cultivation irrespective of farmers

category and also irrespective of crop category. Incase of oilseed, pulses & spices cultivation, it is also more profitable than local varieties of rice crops.

7.4 Conclusion

From the analysis it is observed that benefit cost ratio signifies differently incase of different categories of farmers like large, medium I, medium II and small farmers because of variation of cost & yield in the process of production by different categories of farmers. small & medium I farmers are more benefited than medium II & large farmers irrespective of all crops. So farmers' specific programme should be supported by the government in specific region depending up on commercialization prospect of the crops, land fertility and crop suitability for the sake of overall crop diversification & economic development of the country.

Chapter VIII

Diversified Agriculture, Consumption Pattern and Poverty in the Study Villages

8.1 Introduction

The economy of Bangladesh is mainly based on agriculture. Rice sector is still dominates our agricultural economy which offers 73 percent of the value added from crop-production (FFYP: 1997-2002). But for balanced nutrition and adequate source of protein, energy and micro-nutrients and also for balanced diet, there should be structural change in Bangladesh agriculture. So equal emphasize should be given for the cultivation of nutritional crops like vegetables, oil seeds and pulses which will create two-told benefit from the rural economy. Firstly it will generate higher income and profit for the rural masses and on the other hand, it will enrich nutritional capability of the mass people through diverse consumption. Thus if it is possible to change the agricultural economy of Bangladesh by giving emphasize on nutritional crops cultivation, peoples consumption pattern will be changed and poverty will diminish. It is generalized that when people can be able to met a balanced diet through consuming diversified crops from his threshold income, per capita consumption on staple food starts declining and they can spent their additional income for nutritional food items like vegetables, oil and fat, fruits, fish and vegetables (Hossain, 2000). However, the present chapter is an attempt to have an overview on diversified agriculture , consumption pattern and poverty in the study villages and also an attempt to make relationship between poverty and some socio-economic variables of the households.

8.2 Diversified Agriculture and Poverty : A Macro-Perspective

Over the past three decades, considerable attention was given to increase food production in Asia and the pacific region including Bangladesh not only for self sufficiency in food production but also for the better nutritional status of the country. As a result Bangladesh achieved great success in rice production and became self-sufficient in rice-production. Cropping pattern has also changed and shifted towards high value crops like vegetables, oilseeds and pulses. But this achievement has been eroded by a continued high rate of population growth. Rapid population growth has been considered as the most important obstacle to economic development. High population growth rate generally results lower growth rate in GDP and per capita income thus resultantly creates backwardness to overall economic development. Population growth rate, per capita GDP and per capita income can be seen from the following Table 33:

Table – 33 : Population Profile, GDP and Per Capita Income (1999-2003)

Year	Population	Population Growth Rate	GDP Per Capita US $	Per Capita Income US$
1999-2000	12.81	2.17	368	381
2000-01	12.99	1.47	362	374
2001-02	13.16	1.47	361	378
2002-03	13.34	1.50	389	411
2003-04	13.52	1.47	418	440

Source : Bangladesh Economic Review 2005.

Still in Bangladesh, Agriculture is the prime sector of the rural economy, which contributes about one-third of the Gross Domestic Product (GDP) and nearly two-thirds of employment. But due to tremendous population pressure net-cultivable land as well as per capita cultivable land is diminishing gradually. Growth rate of GDP, and agriculture and also the growth rate of crop-sector are fluctuating and at the same time contribution of agricultural

sector to GDP is declining gradually. Per capita cultivable land, growth rate of agriculture, growth rate of crop sector and contribution of agricultural sector of GDP can be seen from the following Table-34.

Table – 34 : Population Profile, Cultivated Land and Other Macro-economic Indicators

Year	Population (in crore)	Per Capita Cultivated Land (in acre)	Growth Rate of GDP (%)	Growth Rate of Agriculture (%)	Growth Rate of Crop Sector (%)	Contribution of Agriculture to GDP (%)
1999-2000	12.81	0.17	7.91	6.92	8.10	19.49
2000-01	12.99	0.15	6.94	5.53	6.18	19.51
2001-02	13.16	0.15	7.75	-0.62	-2.39	18.58
2002-03	13.34	0.14	10.02	3.24	2.88	18.22
2003-04	13.52	0.14	10.78	4.38	4.27	17.97

Source : Bangladesh Economic Survey, 2005, BBS (1999-2003).

In such a discouraging and stagnant condition of the agricultural economy of Bangladesh, poverty situation of rural area cannot reduce as expected. During the mid eighties, 54.7% of the total population belong to absolute poverty (<2122 K cal per person per day), after 2000-01, still there were 42.3% people living below the absolute poverty line. Similar discouraging trend of hard-core poverty (<1805 Kcal per person per day) also prevailed in the rural economy. Rural Poverty Scenario during from mid-eighties to 2000-01 can be observed from the following Table-35.

Table – 35 : Population below Poverty Line

Year	Absolute Poverty (2122 per person per day)	Hard Core Poverty ((<1805 Kcal per person per day)
1985-86	54.7	26.3
1988-89	47.8	28.6
1991-92	47.6	28.3
1995-96	47.1	24.6
2000	42.3	18.7

Source : Household Expenditure Survey, 2000.

But as the rural economy is totally based on agriculture there always prevailed the pressure on agriculture and household's cultivable land which was in reducing trend and poverty was also continuing. So what was needed for an agricultural economy like Bangladesh was to diversify its production and at the same time per capita productivity of land was needed to be increased to keep pace with the increasing pressure of population. At the same time land under vegetables, oilseeds and pulses were needed to be increased for increasing nutritional status, migrating mal-nutrition and reducing poverty of rural Bangladesh.

8.3 Diversified Agriculture and Consumption Pattern in the Study Villages

In all the less developing countries of the world like Bangladesh, large number of people suffers from hunger and malnutrition. In Bangladesh, majority of the population reside in rural areas among which significant number survive without adequate food and nutrition. Diversified agriculture provides a different items of food bundle like rice, potato, vegetables, pulses, oil and fat, meat and milk. However, in rural areas of Bangladesh, rice constitutes the most important item of food. Nearly two-thirds of the daily diet consists of rice, vegetables, pulses, and fish. Milk and meat are consumed occasionally. Fruits intake is seasonal. Intake

of edible oil and fat and also sweet is very meager in the rural societies (Hossain M & Jahan K, 1998). The diet of the rural people is not well balanced. Dietary habits do not confirm good nutritional requirement. Preference is always given to rice and then other food-items. However a comparison with balanced requirement of food items and actual consumption in rural areas can be seen from the following Table– 36.

Table – 36 : Per Capita Consumption of Different Food Items in Rural Areas Compared to Required Balanced Nutrition

Food Items	Minimum Intake Required for Balanced Nutrition (gm)	Rural Areas		
		During 1991-92 and in gm	During 1995-96 and in gm	During 2001-02 and in gm
Rice	390	481	479	502.46
Other Cereals	100	42	43	60.54
Vegetables	225	176	201	156.44
Pulses	30	17	13	10.96
Oils & Fat	20	9	8	20.55
Spices	10	26	35	9.86
Fruits	50	16	25	31.50
Sugar	10	9	9	8.22
Fish	45	32	42	39.73
Meat & Egg	34	12	12	18.08
Milk	30	18	27	19.18
Total	944	838	894	877.52

Source : Hossain Mahbub, 2000, BBS : 2003.

Cereals are the most important source of energy and carbohydrates. It is also the source of protein, iron, thiamin, riboflavin and niacin. Nearly two-third of protein is obtained from cereals by rural people of Bangladesh. Pulses are another important source of protein and oilseeds are the sources of fat, protein as well as vitamin. Vegetables are the important sources of vitamin and minerals. Fish is the source of protein, fat and iron calcium. Meat, milk, egg etc. are the sources of energy, protein and fat (Ibid, 1995). Per capita nutrition intake by different sources can be observed from the following Table 37.

Table – 37 : Per Capita Nutrient Intake in Rural Areas (%)

Nutrients	Cereal (%)	Pulses (%)	Meat (%)	Egg (%)	Fish (%)	Milk (%)	Oil (%)	Vegetables (%)	Others (%)
Calorie (Kcal)	82.40	2.39	0.37	0.24	2.37	0.55	3.09	6.27	2.32
Protein (gm)	65.70	2.50	3.11	0.73	14.06	1.23	-	7.04	5.63
Fat (gm)	14.15	6.58	0.92	2.33	10.96	4.10	43.99	10.11	6.86
Carbohydrate (gm)	89.52	1.62	-	-	0.21	0.17	-	6.31	2.17
Calcium (mg)	14.69	2.87	0.35	0.51	45.80	5.67	-	24.11	6.00
Iron (mg)	56.59	6.90	0.27	0.73	5.90	0.27	-	26.7	2.64
Vitamin- A (mg)	0.23	0.58	1.98	2.4	0.32	2.6	0.07	91.06	0.76
Vitamin-C (mg)	-	0.16	0.16	-	8.17	0.62	-	88.7	2.19

Source : National Nutritional Survey, 1995.

It is observed that during the past years, energy and protein intake increases very insignificantly in the rural areas of Bangladesh, which is one of the reasons of producing inadequate to nutritional crops in the rural Bangladesh.

Table – 38 : Average Per Capita Energy (Kcal) and Protein Intake (1985-86 to 2000-2001)

Year	Energy Intake (Kcal)	Protein Intake (Gm)
1985-86	2263	61.88
1988-89	2251	64.45
1991-92	2267	62.29
1995-96	2217	63.30
2000-01	2203	63.23

Source : Household Expenditure Survey, 2000.

However, in the present study food-consumption pattern of the sample households in four study areas of Comilla, Rangpur, Patuakhali and Dhaka was observed. The study households consumed mainly rice, potato, vegetables, pulses, oil and fat, fish, onion garlic, meat, milk, sugar and egg. The per capita consumption of all food items in the four study areas of Comilla, Rangpur, Patuakhali and Dhaka were 891.24 gm, 889.21 gm, 890.04 gm,

and 880.81 gm. The average per capita per day consumption in four study areas in 887.81 gm, which can be seen from the following Table 39.

Table – 39 : Average Per Capita Daily Intake of Major Food Items (in grams) in Different Study Areas

Food Items	Study Areas				Average(gm)
	Comilla (gm)	Rangpur(gm)	Patuakhali(gm)	Dhaka(gm)	
Rice	492.25	492.01	502.40	501.96	497.16 (55.60)
Potato	69.19	88.88	70.56	64.90	73.38 (8.27)
Vegetables	158.19	145.35	121.07	149.46	143.52 (16.17)
Pulses	25.10	5.10	31.16	28.80	22.54 (2.54)
Oils	15.42	11.32	14.97	17.52	14.80 (1.67)
Fish	48.02	42.12	46.75	44.18	45.27 (5.10)
Onion, Garlic, Chilly etc.	20.47	19.83	20.14	20.16	20.15 (2.27)
Others (Milk, Meat, Sugar, egg, etc.)	62.60	84.60	82.99	53.83	71.00 (7.98)
Total	891.24	889.21	890.05	880.81	827.81 (100.0)

Source : Field Survey, 2003-04.

From the table, it reveals that highest consumption is intaked from rice which is 55.60% of the total food consumption followed by vegetables 16.17% and potato (8.27%). The contributions of other food items are pulses (2.54%), oil (1.67%), fish (5.10%), onion, garlic and chilly (2.27%). Other items like meat, milk, sugar, egg and fruits combinedly contribute 7.98% of the total food consume by a person per day. However, the average per capita per day consumption is 887.81gm which is less than the survey year 2000-01 and 1995-96 conducted by Bureau of Statistics which can be seen from Table - 40. Although average consumption is less than BBS study but consumption of some items like rice, potato, vegetables, pulse, oil and fat, fish and onion consumption is better than the previous period. But consumption of egg, milk, meat, and fruits etc is less than the previous period in the study areas.

Table– 40 : Comparison of Item-wise Average Daily Intake of Food (in gram) in Different Study Year

Food Items	Present Study 2003-04 (Rural)	HES 2000 (Rural)	HES 1995-96 (Rural)
Rice	497.16	478.84	479.0
Wheat	NA	14.00	32.4
Potato	73.38	54.71	32.4
Vegetables	143.52	141.11	154.40
Pulses	22.54	14.97	12.90
Oils	14.80	11.24	8.40
Fish	45.27	37.83	32.50
Onion, Garlic, Chilly etc.	20.15	14.08	9.9
Others (Milk, Meat, Sugar, egg, etc.)	71.00	131.90	148.6
Total	887.81	898.68	910.5

Source : a. Field Survey, 2003-04
b. Household Expenditure Survey, 2000.

However, if average energy intake per capita (kcal) from different food items in different study areas is considered it is observed that energy intake is highest in the study areas of Patuakhali (2274.47 kcal), followed by study area of Dhaka (2254.60 kcal), Comilla (2207.74 kcal) and Rangpur (2125.42 kcal) which can be observed from Table – 41. However, energy intake varies among different locations because of the varied value of micro-nutrients of the food items. If the average per capita energy intake from different food items is analyzed, it is seen that average energy intake is the highest incase of rice (78.31%) followed by edible oil (6.02%), pulses (3.89%) and meat, milk and sugar (3.40%). The proportion of other items are vegetables (1.55%), fish (2.17%), onion garlic and chilly (1.47%).

Table– 41 : Per Capita Average Calorie-intake from Different Food-items in Different Study Areas

Food Items	Study Areas				Average in gm (%)
	Comilla (gm)	Rangpur(gm)	Patuakhali(gm)	Dhaka (gm)	
Rice	1717.95	1717.11	1753.38	1751.84	1735.07 (78.31)
Potato	66.63	85.59	67.95	62.50	70.67 (3.19)
Vegetables	37.96	34.88	29.06	35.87	34.44 (1.55)
Pulses	96.00	19.51	119.19	110.16	86.22 (3.89)
Oils	138.78	101.88	134.73	157.68	133.27 (6.02)
Fish	50.90	44.65	49.56	46.83	47.99 (2.17)
Onion, Garlic, Chilly etc.	33.16	32.12	32.63	32.66	32.64 (1.47)
Others (Milk, Meat, Sugar etc.)	66.36	89.68	87.97	57.06	75.27 (3.40)
Total	2207.74	2125.42	2274.47	2254.60	2215.57 (100.0)

Source : a. Field Survey, 2003-04.
b. INFS, 1980, Nutritional Status of Domestic Food Items.
c. Ahmed Tofail et al., 2004. *Poverty line and poverty measurement system.*

However, a comparison of average per capita food intake (in gram and in kcal) with the national picture can be seen from Table – 42. From the table it is observed that average total food intake (in gram) and average total energy intake (in kcal) is less than the national average. Average per capita intake of total food items in 2000 was 898.70 gm (for Rural areas) while in the present study it was 887.81 gm. On the other hand, while average per capita energy intake (in kcal) was 2263.00 kcal for rural areas in 2000, in the present study it is 2215.57 kcal which is also less than the previous period. Which is reflected in Table – 42.

Table – 42 : Average Per Capita Per Day Food Intake in Different Study Areas

Study Areas	Food Intake (in gram)	Food Intake (in kcal)
Comilla	891.24	2207.74
Rangpur	889.21	2125.42
Barisal	890.05	2274.47
Dhaka	880.81	2254.60
Average	887.81	2215.57
National Average for Rural (HES : 2000)	898.70	2263.00

Source : a. Field Survey, 2003-04
b. Household Expenditure Survey, 2000.
c. INFS (1980) : Nutritional Status of Domestic Food Items.

8.4 Diversified Agriculture and Poverty

Generally, poverty is defined as a state of deprivation from basic needs like food, clothing, shelter, health and education. It is also defined as an inadequate relative income level. It is also generalized as lack of goods and services for maintaining minimum standard of living.

Poverty means destitution. It signifies conditions of life limited by low nutrition, illiteracy, disease, squalid surrounding, high infant mortality and low life expectation. It denotes a sub-human condition in which people survive (Choudhury, 1994). World Bank Development Report 1990 defines poverty as the "inability to sustain a minimum standard of living". This definition indicates that poverty line is a level of consumption that is necessary for continued survival.

Amartya Sen (1981) has pointed out that concept of poverty must involve the issues of identification of poor and the issues of aggregation of the set of poor. He argues that due to variation in the physical features, climatic conditions and work habits, nutritional requirement would be different. Sen mentioned that it is difficult to translate minimal nutritional

requirement into minimum food requirement as the choice of commodities vary and non-food requirement are not easy to specify.

However, there are three methods of measuring poverty, viz (a) income method (consumption based) (b) calorie income graph method and (c) actual calorie intake method. The basic concept of income method involves calculating the amount of income necessary by an individual or a household to purchase the pre determined bundle of food intems for fulfilling recommended daily calorie requirement and a minimum non-food essentials. Minimum income needed to meet the adequate calorie intakes and non-food essentials is calculated by taking prices of those food items and resultant value is considered as poverty line income. An individual or a household is considered as poor if he or it fails to meet this minimum requirement. The second method indicates an income level from a calorie income graph at which calorie intake is just equal to recommended daily calorie requirement of an individual or a household. In this method poverty line is estimated in terms of nutritional requirement alone and non-food essentials are not taken into consideration. The third method of poverty measurement involves calculating actual intake by an individual or household. This method does not take into cognizance the question of ability to consume. That is a high income group may consume less food while a low income group may consume more food (Ibid, 1994).

However, Bangladesh Bureau of Statistics (BBS) uses two methods of estimating poverty. The first method is called calorie intake method and the second method is termed as cost of basic needs method (HES, 2000). Under calorie intake method, poverty is measured in two ways : the first way is that a household in which per capita calorie intake is less than 2122 kcal per day is considered as "Absolute Poor". The second way is that a household in which per capita calorie intake is less than 1805 kcal is called "hard core poor". Under the second

method, i.e. cost of basic need method, poverty is estimated by the level of per capita expenditure on food consumption as well as non-food consumption.

However, in the present section an attempt has been made to calculate poverty by calorie-intake method. If the poverty scenario in the macro level is analyzed, it is observed that both absolute poverty (<2122 kcal) and hard-core poverty (<1805 kcal), has been diminishing gradually. From the macro level data, it is observed that while 1985-86, about 54.7% of the total population were under the absolute poverty, in 2000-01, absolute poverty stricken people were 42.3%. On the other hand, incase of hard core poverty in 1985-86 about 26.3% on the total population were below the poverty line while in 2000-01, about 18.7% of he total population were below the hard core poverty line. The positive impact of poverty in recent years was due to higher household consumption as a result of higher income of the households for various supports and services of both GOs & NGOs. More-ever, government has implemented crop-diversification programme almost in all the districts of Bangladesh from the early 80's, which might encourage the farmers in rural areas to cultivate more nutritional crops for household consumption as well as for higher income of the households. In addition to that, non-government organizations have been involving the rural poor for different income generating activities, which are also the source of higher income and consumption of rural poor of Bangladesh.

However, in the present study, poverty is measured in Direct-calorie intake (DCI) method in four villages of the study districts. It can be observed from Table 43 that on an average about 35.79 percent of the total population (N=1031) was under the absolute poverty (<2122 kcal) while about 12.7% of the total population was below the hard core poverty. If we consider the four study areas, it is seen that absolute poverty is the highest in Dhaka (39.6%) followed by Rangpur(34.5%), Patuakhali(34.3%) and Comilla(32.7%). Incase of hard core poverty, percentage of poverty is highest in the study village of Dhaka (15.91%)

followed by villagers of Patuakhali (13.1%), Rangpur(11.8%) and Comilla(10.9%) which can be seen from Table-43.

Table – 43 : Percentage of Population below Poverty Line in Different Study Areas

Districts	Absolute Poverty(%)	Poverty Gap (%)	Hardcore Poverty(%)	Poverty Gap (%)
Comilla	32.7	14.03	10.9	15.46
Rangpur	34.5	14.06	11.8	16.29
Patuakhali	34.3	17.24	13.1	20.24
Dhaka	39.6	17.09	15.9	24.12
Average	35.79	15.63	12.7	19.44

Source : Field Survey, 2002-04.

However based on per capita monthly income of Tk. 594.95 (Bangladesh Economic Review, 2005), highest proportion of poor below poverty line is in Rangpur (41.7%) followed by Comilla (36.9%), Patuakhali (34.8%) and Narayangonj (30.6%) which can be observed from the following Table – 44.

Table – 44 : Population Below Poverty Based on Monthly Per Capita Income

Poverty/ District	Comilla (%)	Rangpur (%)	Patuakhali (%)	Narayangonj (%)	All (%)
Below the Poverty Line	36.9	41.7	34.8	30.6	35.8
Upper the Poverty Line	63.1	58.3	65.2	69.4	64.2
All	100.00	100.00	100.00	100.00	100.00

Source : Field survey ,2002-03

Among the four districts, poverty was minimum in Comilla. One of the reasons is that Comilla is more crop diversified area. Farmers are more indigenous in diversified crop cultivation and modern facilities of agricultural diversification and opportunities for IGAs are also available here. More ever consumption pattern is also diversified which might be the causes of lower poverty in terms of food consumption method. It can be mentioned here that

poverty scenario in other study areas is also minimum because all these study villages own better crop diversification like Comilla. More or less all the villagers are habituated with diversified crop cultivation.

The poverty gap in the four study areas are 14.03%, 14.06%, 17.24% & 17.09% which indicates that the poor in the study areas will have to increase their consumption by 14.03%, 14.06%, 17.24% and 17.09% respectively to overcome the poverty line of consumption. The hardcore poverty gap in the four study areas are 15.46%, 16.29%, 20.24% & 24.12% respectively. The average gap from the poverty line in case of absolute poverty is 15.63% while in case of hardcore poverty it is 19.44% which indicates that the poverty stricken poor will have to increase their consumption by 15.63% and 19.44% to over come the poverty line of consumption of 2212 kcal and 1805 kcal respectively.

However, if a comparison is made to the national average of absolute and hard core poverty, it is observed from Table – 45 that both absolute poverty and hard core poverty is less than the previous period which is a positive sign of economic upliftment of the farmers of the study areas.

Table – 45 : Number and Percent of Population Below Poverty Line

Survey Year	Poverty Line-1 : Absolute Poverty : 2122 Kcal Per Person Per Day		Poverty Line-2 : Hardcore Poverty : 1805 Kcal Per Person Per Day	
	Population	% of Population below Poverty Line	Population	% of Population below Poverty Line
2004-05 (Present Study)	1031 (369)	35.79	1031 (131)	12.7
2000-01 (HES)	55.8 million	42.3	42.9 million	18.7
1995-96	55.3 million	47.1	29.1 million	24.7

Source : a. Field Survey, 2003-04.
b. Household Expenditure Survey, 2000.

8.5 Incidence of Poverty in the Study Villages: Some Interrelationship

In this section an attempt has been made to make some relationship with socio-economic variables of the households like family size, age of household-head, education of household head and land-ownership of the households with the incidence of poverty. The relationship are discussed below :

8.5.1 Incidence of Poverty and Family Size of the Study Households

Incidence of poverty is observed in both categories of poverty like absolute poverty and hard core poverty with that of the family size. Table – 46 indicates that poverty incidence increases with the increase in family size. The table also indicates that lowest incidence of poverty (22.22%) occurs in family size belongs to 1-2 members followed by the family size 3-4, 5-6 and 7-8 members. The same trend of incidence of poverty is also similar incase of hard core poverty. The findings of the table indicates that family size has a positive relationship with the incidence of poverty that is small family size belongs to smaller incidence of poverty while bigger-family size belongs to larger incidence of poverty.

Table-46 : Incidence of Poverty and Family Size of the Households

Family size	Total no. of population	No. of Population below absolute poverty (<2122)	% of Population below 2122 kcal absolute poverty	No. of Population below hard core poverty (<2122)	% of Population below 2122 kcal hard core poverty
1-2	36	8	22.22	3	8.33
3-4	296	69	23.31	20	6.75
5-6	457	178	38.95	67	14.67
7-8	164	78	47.56	30	18.29
9 and above	78	36	46.15	11	14.10
Total	1031	369	35.79	131	12.7

Source : Field Survey, 2003-04.

8.5.2 Incidence of Poverty and Age of the Household Head :

There is also the relationship between incidence of poverty and age of the household head. From Table-47, it is observed that highest incidence of poverty (47.90%) is occurred in the age group 30-39 years followed by the age group below 29 years which is 43.66%. Lowest incidence of poverty is observed in the age group of 60 years and above (26.94%) followed by the age groups 40-49 and 50-59 years which are 33.11% and 34.82% respectively. The same trend of poverty incidence is also occurred incase of hard-core poverty. The analysis of the findings indicate an inverse relationship between poverty and increase of the age of household head to some extent indicating that the lower age group of the study households occupied with higher poverty incidence. The relationship remarks that as the household heads are quite new in the labour market, their earnings are poor and inadequate to meet their consumption and dietary needs as a result of which poverty is higher among these groups. The lower incidence of poverty in the higher age group of the household head indicates that these households have larger number of earning members and diversified sources of income which provide them diversified source of income provide them high income to facilitate higher consumption and meet up their dietary needs.

Table – 47 : Incidence of Poverty and Age of Household Head

Age Classification (Years)	Total No. of Population	No. of Population below Absolute Poverty (<2122)	% of Population below Absolute Poverty	No. of Population below Hard core Poverty (<1805)	% of Population below Hard core Povert
Below 29	71	31	43.66	7	9.86
30-39	218	104	47.70	43	19.72
40-49	296	98	33.11	40	13.51
50-59	201	70	34.82	27	13.43
60 +	245	66	26.94	14	5.71
Total	1031	369	35.79	131	12.7

Source : Field Survey, 2003-04.

8.5.3 Incidence of Poverty and Education of the Household-head :

Education is an essential element of acquiring knowledge, skill and human capital to enter in the labour market. It is considered to be an important factor for having the access to economic resources for his or its individual development. Education provides an individual to earn for his livelihood. Thus it is hypothesized that an educated person can earn more for himself and can be better off than an uneducated person. However, the relationship between households head education and poverty in the study villages can be observed from Table 48. The findings of the table indicates that poverty is lowest incase of the households head who have the educational level SSC and above (26.01%) followed by the household head's education of class (VI-X) which is about 37.19%. About 37.94% of the households are living below the absolute poverty who have education less than class V. The same trend is also observed incase of hard core poverty. Thus it can be concluded that education is negatively associated with the incidence of poverty. That is more the education, less the poverty.

Table – 48 : Incidence of Poverty and Education of Household Head of the Study Households

Education of Household Head	Total no. of Population	No. of Population below absolute poverty (<2122)	% of Population below absolute poverty	No. of Population below Hard core Poverty (<1805)	% of Population below Hard core Poverty
Illiterate	122	37	30.32	13	10.65
Class I-IV	529	210	39.69	75	14.18
Class VI-X	207	77	37.19	25	12.07
SSC +	173	45	26.01	18	10.40
Total	1031	369	35.79	131	12.70

Source : Field Survey, 2003-04.

8.5.4 Incidence of Poverty and Land Ownership of the Households

Still today land is the most important determinant of social status and economic upliftment of the rural households. Wider inequality and disparity in rural households is observed because of ownership of land. Land generates more income and earning opportunities. While higher land owned households are more economically solvent and landless, marginal and small land owned households are lack of income, earning opportunities and always in vulnerable in their economic position. So, the reality of the rural society is that landless, marginal and poor land owned households constitute the majority among the poverty stricken poor.

The Table – 49 indicates a relationship between incidence of poverty and ownership of land of the study households. The finding of the table indicates that highest proportion (38.05%) of absolute poverty stricken poor belong to the land categories (0.01-2.49) acre followed by land category (5.00-7.49 acre) which is 27.27%. Proportion of absolute poverty is less in medium 1 (2.50-4.99 acre) farmers group which is 25.42% followed by large farmers (7.50 and above) which is 9.52%. The same trend is also observed incase of hard-core poverty. The findings of the Table 49 remarks that poverty is predominantly occurs in landless and small ownership of land categories and it decreases with the increase of landholding size.

Table – 49 : Incidence of Poverty and Land-ownership of the Study Households

Categories of farmers	Total No. of Population	No. of Population below Absolute Poverty (<2122)	% of Population below Absolute Poverty	No. of Population below Hard core Poverty (<1805)	% of Population below Hard core Poverty
Small (0.01-2.49 acres)	870	331	38.05	117	13.44
Medium-1 (2.50-4.99 acre)	118	30	25.42	11	9.32
Medium-2 (5.00-7.49 acre	22	6	27.27	2	9.09
Large (7.50 and above)	21	2	9.52	1	4.76
Total	1031	369	35.79	131	12.70

Source : Field Survey, 2003-04.

8.5.5 Relationship Between Level of Diversification and Extent of Poverty

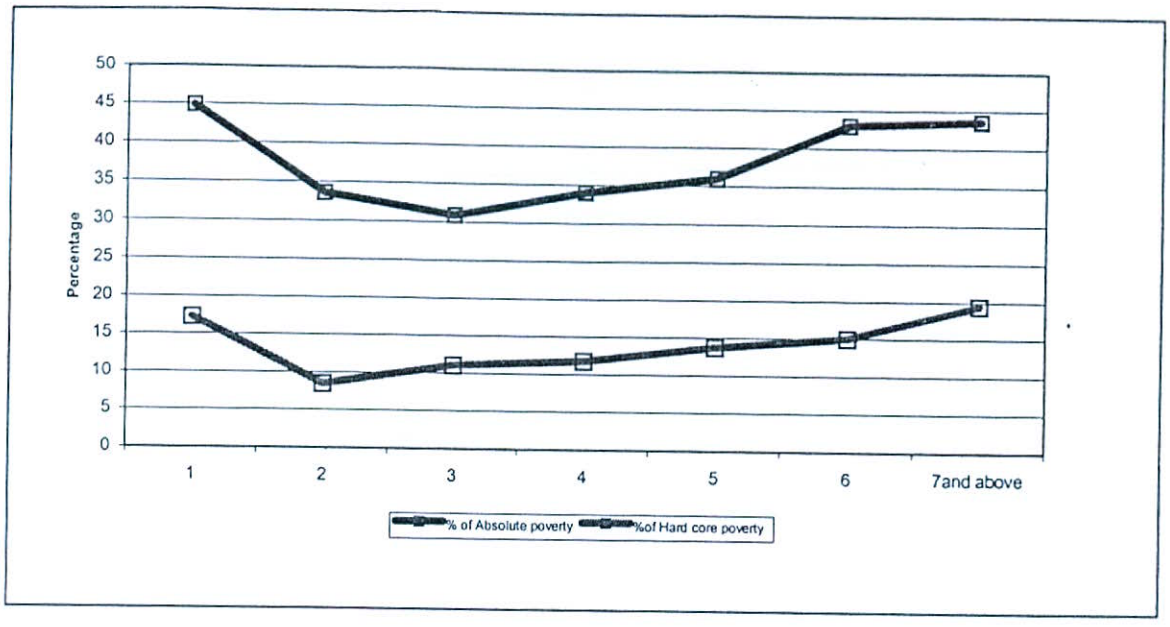
Diversified agriculture in the present study has been defined as increasing number of different crop production by a farming household in his available cultivable land throughout the whole year. As the study households are farming households and crop agriculture is the major sources of consumption and livelihood of the households in rural Bangladesh, an attempt has also been made to find out the extent of poverty both interms of absolute (<2122 kcal) and hard core (<1805 kcal) poverty in relation to the level of crop diversification. From the following Table- 50, the level of poverty corresponding to the extent of diversification can be observed. However level of poverty is calculated in seven-strata of diversification from 1 to 7 and above number of crops produced by the study households through out the whole year.

Table– 50: Relationship Between Level of Crop Diversification and Incidence of Poverty Interms of Both Absolute and Hardcore Poverty

Level of Crop Diversification	No of Households below Absolute Poverty (<2122)	Average Operational Holding	% of Population below Absolute Poverty	No of Households below Hard Core Poverty (<1805 Kcl)	Average Operated Land	% of Populatio below Hardcore Poverty
1	13	0.938	44.82	5	0.852	17.24
2	36	1.033	33.60	9	1.133	8.41
3	73	1.342	30.60	26	1.568	11.0
4	90	1.616	34.0	31	1.501	11.7
5	71	1.933	36.0	27	1.834	13.7
6	52	1.774	43.0	18	1.473	15.0
7 and above	34	2.512	43.58	15	2.90	19.48
All	369	1.628	35.79	131	1.669	12.7

From the Table-50 it is observed that although about 35.79% of the population living below the absolute poverty but it varies from 30.90% to 44.82% while incase of hardcore poverty, although about 12.7% of the population living below the poverty line, but it varies from 8.41% to 19.48% corresponding to level of diversification .

Although there is a fluctuating tendency of poverty in different strata of households corresponding to the extent of diversification but extent of poverty in each strata of households corresponding to level of crop diversification is less than that of the previous year's level of poverty (HES, 2000). The relationship can also be reflected from the following graph-



Graph : 1 Level of Diversification and Extent / Incidence of Poverty

But if the relationship between level of crop diversification and insistence of poverty is analyzed among the poverty stricken people under study, it shows an encouraging picture of level of crop diversification and extent of poverty. Which can be shown from the following Table –51.

From the Table - 51 it is observed that level of diversification is positive in reducing rural poverty of the study households from a point of diversification. From the table – it is observed that extent of poverty decreases corresponding to the increase of level of diversification from 4 crop frequency. The reason may be due to less involvement of the households in crop-agriculture due to less average operational holding of the households and may be due to higher income obtained from other sources. However poverty is the highest corresponding to 4 level of diversification. But there is a decreasing trend of poverty reduction with corresponding increase in the level of diversification. The same trend is also observed incase of hard-core poverty.

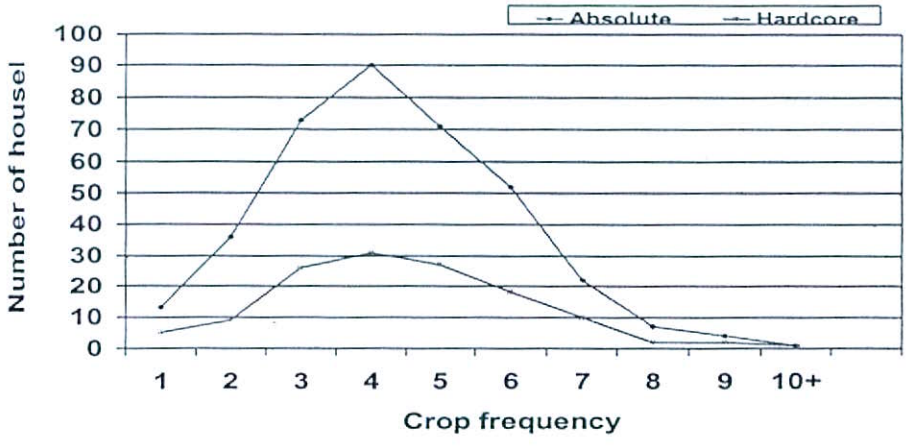
Table – 51 : Relationship Between Level of Crop Diversification and Extent of Poverty Interms of Both Absolute and Hardcore Poverty Among the Poverty Stricken People in the Study Areas

Level of Crop Diversification	Incidence of Poverty					
	Absolute Poverty (<2122 Kcal)			Hardcore Poverty (<1805 Kcal)		
	Households	Per Household Operated Land	% of Poverty	Households	Per Household Operated Land	% of Poverty
1	13	0.938	3.52	5	0.852	3.82
2	36	1.033	9.76	9	1.133	6.87
3	73	1.342	19.78	26	1.568	19.84
4	90	1.616	24.39	31	1.501	23.66
5	71	1.933	19.24	27	1.834	20.61
6	52	1.774	14.09	18	1.473	13.71
7	22	1.950	5.96	10	2.257	7.63
8	7	3.257	1.90	2	4.80	1.53
9	5	2.975	1.08	3	3.90	1.53
Total	369	1.628	35.90 (100.0)	131	1.669	12.7 (100.0)

N = 1031

From the graphical representation, relationship between level of diversification and extent of poverty can be observed (graph-2).

Figure II. Crop frequency and incidence of poverty



The relationship can also be supported from the corresponding average operational holding and level of poverty, which can also be observed from the graph-3 & 4.

Figure III: Mean operation holding and percentage of absolute poverty

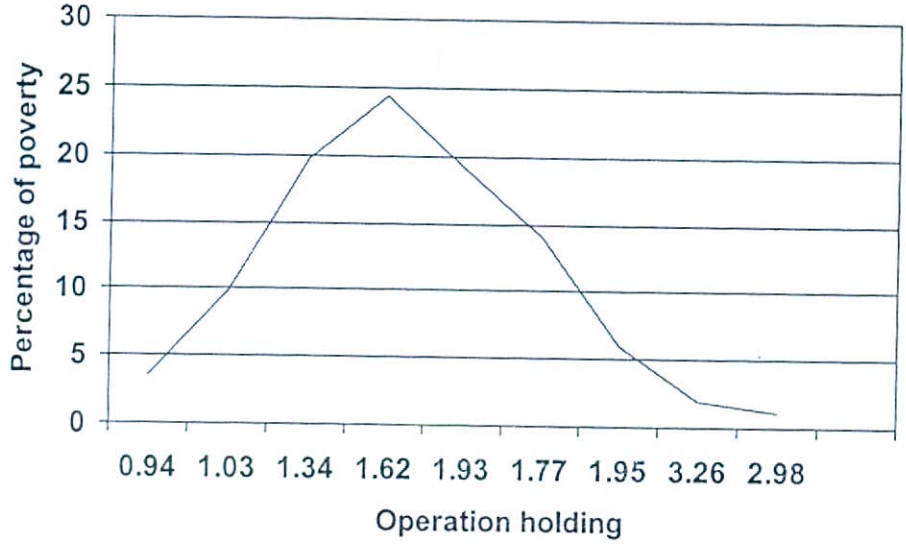
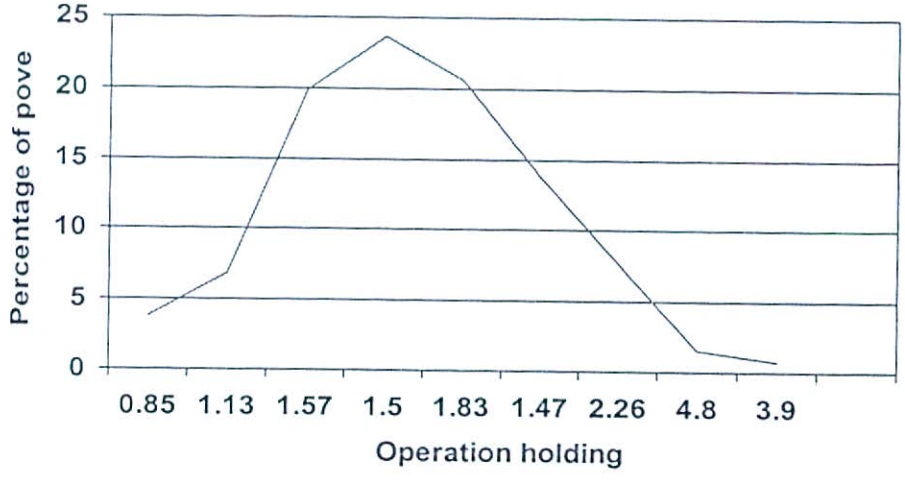


Figure IV Mean operation holding and percentage of hardcore poverty



8.6 Conclusion :

In the conclusion, it can be said that consumption pattern of the households is more or less similar among the four study areas. Poverty is less than national average both interms of absolute and hard-core poverty. The relationship between socio-economic variables like family size, age of household's head, education of family head has a positive relationship except land ownership both interms of absolute and hardcore poverty. The level of diversification and incidence of poverty relationship indicates that poverty is also less than that of national average in individual strata of level of diversification which varies from 30.90% to 44.82%. The relationship between level of diversification and poverty among the poverty stricken people indicates that poverty is decreasing with the increase of diversification from some extent of the level of diversification. The findings also remarks that as the villages were diversified where numerous number of crops are produced, consumption of all items except meat, milk, egg is better in the diversified villages which enhance the reduction of poverty in the study villagers.

Chapter IX

Food Consumption Pattern of the Households of Diversified Villages : Assessing Correlations with Some Socio-economic Variables

9.1 Introduction

It is generally said that there might have some socio-economic variables which affect consumption pattern of rural households. In search of this pertinent issue, an attempt has been made in this chapter to examine interrelationships between socio-economic variables with that of total as well as individual food consumption. The important influencing socio-economic variables are family size, education of family head, education of mother, age of household head, number of earning member, operational holding, income from agriculture, income from other sources, and net yearly income. However, to assess the correlations of socio-economic variables with total as well as individual food consumption like consumption of rice, consumption of potato, consumption of vegetables, consumption of pulses, consumption of edible oil, consumption of meat, consumption of fish, consumption of onion, garlic, chilly etc Karl Pearson correlation coefficients are calculated . Before analyzing the correlationships of different socio-economic variables with total as well as individual food items, a brief description of the important socio-economic variables are discussed below :

(i) Family size

Family size is an important socio-economic variable. It is a generalization that the family size might affect the consumption pattern of any household. If the size of a family is small, it needs small quantity of consumption and vice-versa. Thus family size is considered as an influential socio-economic variable which might have significant correlations with total as well as individual food consumption.

(ii) Education of Household Head

Education of household head is considered another important correlated socio-economic variable, which might have influence on food consumption. It is generally said that education makes the knowledge and skill by which a household head can avail better opportunities for income. In addition, education can aware the household head about his dependents regarding consumption of food. Thus education of family head is considered another significant correlated variable, which can influence household consumption for better livelihood.

(iii) Education of Mother

Education of mother is also considered another socio-economic variable, which can affect the consumption pattern of the households. It is also generalized that an educated mother is more aware about better food consumption than an uneducated mother. More ever in rural societies, most of the cases mother provides all sorts of food by cooking to the children of the households. So if a mother is educated, it can provide her adequate knowledge about nutritional food for balanced diet to the members of the households.

(iv) Age of the Household-head

Age of the household head is considered another important socio-economic variable, which can affect the consumption pattern of households. It is also hypothesized that a higher aged person is more knowledgeable by dint of his experience. So an experienced and aged person can think better about his consumption pattern. Thus age of household-head is considered another influencing correlated variable

(v) No. of Earning Member

No. of earning member is another socio-economic variable which is also considered as an influential factor for household food-consumption. It is an assumption that if no of earning member is one , income will be limited. If earning member is more than one household income will be higher and the household can afford better and adequate nutritional food for their consumption.

(vi) Operational Holding

Land under operation is also considered as an important socio-economic variable which might affect the consumption pattern of the rural households. It is also the source of more income of the households. So it is hypothesized that more the operational holding, more the opportunity of cultivation for higher income and also for higher consumption of the households. Thus operational holding is considered as a significant socio economic variable, which might be correlated with the consumption pattern of the household.

(vii) Income from Agriculture

In Bangladesh majority of the population depends on agriculture for their livelihood. So it is the assumption that if the rural households cultivate diversified & more profitable crops, their income will be raised and they can earn more income from agriculture for providing more fooding for the households. Thus income from agriculture is considered another important socio-economic variable which can influence food consumption.

(viii) Income from Other Sources

Although agriculture still dominates our rural household's income but because of land scarcity rural households are inclined to engage in non-farm sectors for their employment and higher income. Thus the households who have no land or few land, might have the tendency

to earn from other sources. So if the household's income is taken from other sources, it can provide additional opportunities, which can provide better and adequate food for the household members. Thus income from other sources is considered as an important socio-economic variable, which can affect total as well as individual food consumption.

(ix) Net Yearly Income

Net yearly income of the household is considered another significant socio-economic variable, which must affect the consumption pattern of the households. It is an assumption that if households yearly income is better, it can provide proportional income for adequate and diversified nutritional food for its members. Thus net yearly income of household is considered another important socio-economic variable which affect total food consumption.

9.2 Explanations of the Relationship

In order to make a relationship between different socio-economic variable like family size, age of household head, education of household head, education of mother, no. of earning member, operational holding, income from agriculture, income from other sources, and net yearly income etc with total as well as individual consumption food , Karl Pearson correlation co-efficient is calculated to find out whether any significant correlation is exist between these two categories of variables. The result of the interrelations from Karl person correlations is shown in table – 52. The statistical interpretations are discussed below :

(i) Family Size and Consumption of Food

It is hypothesized that family size has a significant positive relationship with the consumption of total food as well as individual food items. It is observed from the table-52 that family size has a significant correlation with total food consumption (r=.592**) as well as individual food items like rice (r=.701**), vegetables (r=.203**), edible oil (r=.328**). These correlations are significant at 1(one) percent level of significant except the

consumption of potato, pulses, fish and onion, garlic. The former food items have strong positive correlation with family size because of the fact that these food items may be available for the households and also may be affordable to the households compared to the latter food-items.

(ii) Education of the Family Head and Food Consumption

It is an assumption that education of the household head may influence the consumption pattern of the households. From the table-52 it is observed that education of the household head is poorly related to the consumption of all food items but there is not any significant relationship with these two groups of variable which indicates that although education is considered as a significant socio-economic variable that can influence food consumption, but the study household's head education might not enough to make them aware about household food consumption.

Table-52 : Relationship Between Socio-economic Variables and Food Intake of study households in the Study Villages

Socio-economic Variables	Rice (gm)	Potato (gm)	Vegetables (gm)	Pulses (gm)	Edible Oil (gm)	Fish (gm)	Onion Garlic Chilly (gm)	Total Food Intake (gm)
Family size Pearson Corr. Sig. (2 tailed) N=	.701** .000 1029	.028** .327 1000	.203 .000 1029	.344 .000 1031	.328** .000 1031	.339 .000 1031	.340 .000 1031	.592** .000 1031
Education of Family head Pearson Corr. Sig. (2 tailed) N=	0.010 .740 1031	.026 .415 1007	.033 .283 1031	.049 .118 1031	0.029 .000 1031	.023 .457 1031	.006 .843 1031	.033 .393 1031
Education of Mother Pearson Corr. Sig. (2 tailed) N=	-.042 .183 1031	0.078* 0.013 1007	-.038 .219 1031	.013 .667 1031	.027 .000 1031	.046 .137 1031	.008 .808 1031	.020 .601 1031
Age of household head Pearson Corr. Sig. (2 tailed) N=	.163** .000 1031	.005 .880 1007	.081** .009 1031	.140** .000 1031	.130** .000 1031	.080* .010 1031	.100** .001 1031	.163** .000 1031
No. of Earning Member Pearson Corr. Sig. (2 tailed) N=	0.111** .000 1031	.024 .453 1007	.058 .062 1031	.082** .000 1031	0.020 .512 1031	.047 .131 1031	.018 .568 1031	.132** .000 1031
Operational holding Pearson Corr. Sig. (2 tailed) N=	0.086** .006 1031	.105** .001 1007	0.013 .001 1031	.057 .065 1031	.026 .401 1031	.017 .577 1031	.098** .000 1031	.062 .113 1031
Income from Agriculture Pearson Corr. Sig. (2 tailed) N=	.090** .000 1031	.051 .109 1007	.069** .027 1031	.034 .269 1031	.048 .123 1031	.015 .000 1031	-.057 .069 1031	.142** .000 1031
Income from other sources Pearson Corr. Sig.(2 tailed) N=	.205**	-.037 .242 1007	.160** .000 1031	.273** .000 1031	.130* .000 1031	.050 .109 1031	.093** .003 1031	.192** .000 660
Net Yearly Income Pearson Corr. Sig. (2 tailed) N=	.241** .000 1031	.004 .898 1007	.187** .000 1031	.212** .000 1031	.078* .012 1031	.153** .000 1031	.040 .203 1031	.272** .000 1031

Note : ** correlation is significant at 0.01 level
* correlation is significant at 0.05 level of significant level
Source : Field Survey, 2003.

(iii) Education of Mother and Food Consumption

Education of mother is very much necessary to make her more conscious about the consumption of total food items as well as individual food consumption interms of quality and nutritional importance. Thus it is also a hypothesis that education of mother has the strong

relationship with the consumption of food. From table – 52 it is seen that education of mother has poor correlation with all the food items except potato (r=0.078*) which indicates that most of the study mothers have less education which might not enough to make them aware about food consumption and also might be the cause of insignificant relationship regarding the food consumption of the households.

(iv) Age of the Household Head and Food Consumption

Age of the household head indicates the experience of a family head about his family life. Thus it is an assumption that age of household head might have the relationship with the total food consumption as well as individual food consumption. The findings of the table – 52 indicates that there is significant correlation between age of household head with the total food consumption (r=.163**) as well as individual food consumption like rice (r=.163**), vegetables (r=.081**), pulses (r=.140**), oil (r=.013**) and onion (r=.10**). These relationships are significant at 1(one) percent level of significant. There is also the relationship between age of household head and consumption of fish (r=.08*) which is significant at 5% level of significant. The result also makes a generalization that experience and higher aged household head might have better knowledge about his livelihood which might be the cause of better food consumption to its household members.

(v) No. of Earning Member

No. of earning member is considered another socio-economic variable which can provide more income to the households for their consumption. Thus it is also considered that there is relationship between the number of earning member with that of total as well as individual food consumption. The table – 52 also indicates that there is significant correlation between the number of earning member with the consumption of total food items (r=.132**) as well as consumption of rice (r=.111**), and pulses (r=.082**). The relationship is also

significant at one percent level of significant. There is no relationship with other food items. The result indicates that the households who have more earning member, may provide their income to the respected food items. At the same time the insignificant relationship indicates that the households who have more earning members do not provide their income to the respective households consumption.

(vi) Operational Holding and Consumption of Food

It is an assumption that the households who have more operated land, produce more for family consumption and for earning more income. Thus it is also considered that there is the relationship between operational holding and consumption of food. The table-52 indicates that operational holding has a strong correlation with the consumption of rice (r=.086**), potato (r=.015**), and onion garlic (r=.098**). These relationships are also significant at one percent level of significant. Operational holding has also poor relationship with the consumption of other food items. The analysis of the findings can be summarized in this way that although Bangladesh has a country of land scarcity, but if the households have the opportunity to cultivate land, they can also provide food to their household members and thus they can able to change their livelihood.

(vii) Income from Agriculture and Food Consumption

As Bangladesh is an agrarian country, most of the households are engaged in agriculture and depends on its incomes for their livelihood. The study villages were diversified, and most of the households more or less were involved in agriculture. So it is the assumption that the income earned from agriculture has also the positive relationship which can influence total as well as individual food consumption. The findings of the table – 52 indicates that there is a significant correlation of income from agriculture with total food consumption (r=.142**) as well as consumption of food items like rice (r=0.90**), pulses (r=.273**) & fish (r=.154**). The relationship is significant 1% level. The income from

agriculture has also the relationship with consumption of vegetables (r=0.069*), which is significant at 5% level. Thus the findings indicates that as study villagers are mostly dependent on agriculture their earned income has a significant impact on the consumption of total as well as individual consumption of food.

(Viii) Income from Other Sources and Food Consumption

It is also the assumption that if income can be obtained from other sources, it can supplement the income from agriculture for additional and more consumption. So there might be the relationship between income from other sources and total as well as individual food consumption. The findings of the study indicates that there is significant relationship between income from other sources with total food consumption (r=0.192**), consumption of rice (r=0.205**) vegetables (r=0.160**), edible oil (r=0.130**) & onion and garlic (r=.093**). The relationship is significant at one percent level. There is also the relationship between income from other sources and consumption of edible oil (r=0.13*) which is significant at 5 percent level of significace which justifies that if income can be earned from other sources, it can contribute additionally in the consumption of total food as well as consumption of other food items.

(ix) Net Yearly Income and Food Consumption

Finally it is the consideration that net yearly income has a positive impact on total food consumption as well as individual food consumption. As income is related to expenditure, so it is the assumption that if income of rural households is improved, consumption of total as well as individual food items can also be enhanced. Thus there might be significant relationship between net yearly income with that of households total food consumption as well as individual food consumption. The findings of the table – 52 indicates that there is positive correlation between net yearly income with that of total food consumption (r=0.272**) as well as consumption of rice (r=0.241**), vegetables (r=0.187**),

pulses (r=0.212**) and fish (r=0.153**). These relationship is correlated at 1% level of significant. Net yearly income is also significantly correlated with consumption of edible oil (r=0.078*), which is significant at 5% level. Thus the findings strongly support that net yearly income is a strong socio-economic variable for total as well as individual food consumption although the allocation of net yearly income may vary according to the relative importance of consumption of total as well as individual food items.

9.3 Factors Affecting Food Consumption of the Study Households in Diversified Villages

Assessing the contribution of different significant factors on food consumption can be considered as an important dimension of formulating new policy for the development of food security as well as nutritional policy for the rural households. As consumption of rural households is interrelated with several factors like family size, Age of household head, operational holding, Income from agriculture, Net yearly income, and yearly expenditure, it is also the matter of search that to what extent these contributory factors are significantly affecting the food consumption of the study households. To draw such contributory interference regarding food consumption, an attempt has been made in this chapter to assess the extent of contribution of the related factors on food consumption through multiple regression model.

9.4 Methods of Estimation of the Multiple Regression Model :

To assess the relative contribution of the significant factors on food consumption, variables like family size, age of household head, operational holding, income from agriculture, net yearly income and yearly expenditure are considered as explanatory or independent variable while total food consumption per household per day is considered as dependent variable.

However, to assess the contribution of independent variable on dependent variable, the following multiple regression model is used for estimating the relationship.

$$Y = B_0 + B_0X_1+B_2X_2+B_3X_3+B_4X_4+b_5X_5+B_6X_6+b_i$$

$$= B_0 + \sum_{i=1}^{6} B_iX_i + b_i \qquad \text{(i)}$$

Where Y = Total food consumption per household per day.

X_1 = Family size

X_2 = Age of household

X_3 = Operational holding

X_4 = Net yearly income

X_5 = Income from agriculture

X_6 = Yearly expenditure

B_0 = Intercept value

B_i = Regression co-efficient

b_i = Error-term.

9.5 Interpretations of the Explanatory Variables :

However, for better understanding about the explanatory variables a brief description of the variables are given below :

1. **Family size :** Family size has been considered as an independent or explanatory variable in the regression model. The variable, family size is considered as explanatory variable because it has significant effect on total food consumption. That is if the size of a family increase total food consumption will increase and vice-versa. Thus family size is an important explanatory variable.

2. **Age of household head :** Age of household head is considered another important explanatory variable which has been incorporated in the regression model. As age of household head is an indicator of experience in households livelihood, it is also

assumed that an experienced household head has more knowledge about food consumption than a low aged household head. Thus age of household head can affect total food consumption in household level.

3. **Operational holding :** Land under operation has been taken into consideration as another important explanatory variable in the regression model. Land under operation is the important source of income and also the source of food consumption in the rural households which can affect total food consumption in household level. Thus the variable is considered as another significant explanatory variable.

4. **Net yearly income :** Net yearly income is considered another important significant explanatory variable which is included in the regression model. Income is the dominant factor for livelihood development and still now in rural households major portion of household's income is spent for food consumption. Thus net yearly income affects total food consumption and it is considered as another significant explanatory variable.

5. **Income from agriculture :** Income from agriculture also has been considered an important significant explanatory variable which is incorporated in the regression model. As rural households mostly depend on agricultural income for their livelihood, food consumption also might be affected by its income. So if the households are more involved in diversified agriculture, there income will be raised and it will affect households total food consumption. Thus the variable is considered as an important explanatory variable.

6. **Yearly expenditure :** Yearly expenditure has been considered another important explanatory variable which has been incorporated in the regression model.

Household's livelihood is mainly depend on total expenditure on food, housing, education, health care etc. But major proportion of households expenditure still is spent for food consumption. Thus the variable yearly expenditure directly affect total food consumption and it is considered an important explanatory variable.

9.6 Interpretations of the Results :

In table-53 the values of co-efficient and related statistic of multiple regression function for six explanatory variables namely family size, age of household head, operational holding, income from agriculture, net yearly income and yearly expenditure is shown. However the interpretations regarding the multiple regression model are as follows :

Table – 53 : Estimated Value of Co-efficient and Related Statistic (Beta :s value) of Multiple Regression Model :

Explanatory Variables	Value of standardized co-efficient (Beta : S value)	Value of Significance
Constant	-	0.00
Family size	0526	0.00
Age of household head	0.031	0.194
Operational holding	0.027	0.254
Net yearly income	0.085	0.004
Income from agriculture	0.007	0.787
Yearly expenditure	0.147	0.00
Adjusted R^2	0.459	-
D.f	6	-
F value	146.082	0.00

Source Field Survey, 2003-04.

(i) **Family size :** Estimated values of regression coefficient for family size and other related statistic has been observed from table 53. The estimated value of regression coefficient is positive with it is 0.526 which is highly significant (0.000). The relationship states that if number of family members per unit (family size per unit) is increased by 1 (one) percent, there is a probability of increasing consumption per unit of household by 0.526% which implies that number of

family members is an important demographic and explanatory variable which affect household food consumption as well as food security.

(ii) **Age of household head :** It is observed from the estimation of multiple regression model (table 53) that regression coefficient for age of household head is positive and it is 0.031. Although the relationship is positive but it is insignificant (0.194) which does not necessarily address that age of household head significantly affect household consumption although there is a positive dependency of age of household head on food consumption, which is observed from the value of regression coefficient.

(iii) **Operational holding :** It is also observed from the table 53 that values of regression co-efficient is 0.027, which is positive but insignificant (0.254). The value of positive coefficient states that operational holding affects food consumption to some extent but it is not at a significant level.

(iv) **Net yearly income :** It is also observed from the estimation of multiple regression model (table 53) that coefficient for net yearly income is positive and it is 0.085. The relationship is also highly significant (0.004). The relationship states that, if per unit of net yearly income is increased by one (1) percent, total food consumption will be increased at a level of .085%. Thus the relationship is indicative that there is a probability of increasing household food consumption if the net yearly income increases in household level.

(v) **Income from agriculture :** It is also observed from the estimation of multiple regression model (table – 53) that regression coefficient for income from agriculture is positive and it is 0.007. Although the relationship is positive but it is insignificant (0.787) which states that agricultural income is one part of total yearly income which might not be significantly affect total consumption of

households. But from the value of positive co-efficient of regression it is indicative that agricultural income affects food consumption to some extent.

(vi) **Yearly expenditure :** Finally it is observed from the estimation of multiple regression model (table – 53) that regression co-efficient of yearly expenditure is positive and it is 0.147. The relationship is also highly significant which states that if per unit of yearly expenditure is increased by one (1) percent, total food consumption is also increased by 0.147%. Thus the relationship is indicative that yearly expenditure has a positive impact on total food consumption in household level.

(vii) **Value of R^2 and F-value :** The co-efficient of multiple determination (adjusted R-square) and value of F is also shown in table – 53. However, the value of multiple determination for the contributory relationship is 0.459 at 6 degrees of freedom. The value of F is 146.08 which is highly significant. The value of R-square states that there is 45.9% reflection of interdependence of the explanatory variables mentioned in the model. The F-value also states strong significant factorial relationship among the explanatory variables used in the regression model.

9.7 Conclusion

In the conclusion, it can be said that consumption pattern of household may vary from households to households depending up on the availability of food and affordablity of the households. But food consumption is certainly depends up on some socio-economic variables which are discussed earlier and analyzed in this chapter. The findings remarks that there are some important socio-economic variables which have more or less significant relationship with household total food consumption as well as individual consumption of different food items. Thus these variables should be considered to make a balanced consumption pattern of the study households and also to reduce malnutrition, and poverty from the rural Bangladesh.

However the effectiveness of the multiple linear regression model incase of six explanatory variables namely family sizes, Age of household head, operational holding, net yearly income, income from agriculture and yearly expenditure is more or less better which is reflected from the value of regression co-efficient, level of significance, adjusted R-square and also from the value of F. Thus the findings of the explanatory variables remarks that these variables positively affect the household food consumption which has also been reflected from the R-square value and also from the value F.

Chapter X

Impact of Diversified Agriculture on Socio-economic Variables : Some Statistical Interpretations

10.1 Introduction

Diversified agriculture generally means cultivation of more crops interms of crop-frequency. It is an assumption that if a farmer can cultivate more crops depending up on his cultivable land with maximum utilization of resources, he can earn more from his crop cultivation than those of other farmers who cultivates only a few crops. And in this way, a farmer can optimize his production through his available socio-economic resources. But how a farmer can achieve it is a matter of search. To what extent a farmer can diversify his crop-agriculture. There may be certain relationships with diversified agriculture interms of crop frequency and some other socio-economic variables related to the farmers livelihood. In search of this assumption, some relationships are trying to draw with crop frequency and socio-economic variables of the farming households in this chapter.

However, before gone through the relationship between crop-frequency and socio-economic variables an exercise has been made to find out the crop-production statistics in different study areas. An attempt is also made to calculate the maximum, minimum and average picture of crop-production in the respective study areas like Comilla, Rangpur, Patuakhali and Narayangonj. It is observed from the table that among all the study areas like Comila, Rangpur, Patuakhali and Narayangonj, highest individual crop production varies from 11 to 1 while average crop production varies from 5 (4.67) to 4 (3.70). Of the total households (1031), significant proportion (25.70%) of the households produced 4 crops followed by 3 crops (22.89%), 5 crops (19.10%) 6 crops (11.63%) and so on respectively. However, the distribution of crop statistics in different study areas can be observed from the following table – 54.

Table - 54: Distribution of Crop-frequency in Different Study Areas

Crop- frequency	Study Areas				Total
	Comilla	Rangpur	Patuakhali	Narayangonj	
1	4	4	3	18	29 (2.81)
2	12	43	14	38	107 (10.37)
3	88	39	44	65	236 (22.89)
4	93	59	58	55	265 (25.70)
5	74	32	48	43	197 (19.10)
6	38	24	47	11	120 (11.63)
7	12	9	25	7	53 (5..41)
8	6	1	5	4	16 (1.55)
9	1	-	-	4	5 (0.48)
10	-	-	3	-	3 (0.29)
11	328	211	247	245	1030 (100.0)
Total	9	8	11	9	9.25
Maximum Crop Production	1	1	1	1	1
Minimum Crop-Production	4.28	3.88	4.67	3.70	390
Average Crop Production					

Source : Field Survey 2003-04.

10.2 Diversified Agriculture and Socio-economic Variables : Some Inter-relationships

10.2.1 Co-relationship Between Categorical Family Size and Crop Frequency

Bangladesh is an agrarian country. Still most of the rural households directly depend on agriculture. It is also a country of population density. But these population is engaged mostly in agriculture. It is also observed from the study findings that the farmers in rural areas who have enough family members can contribute more in agricultural activities. Thus an

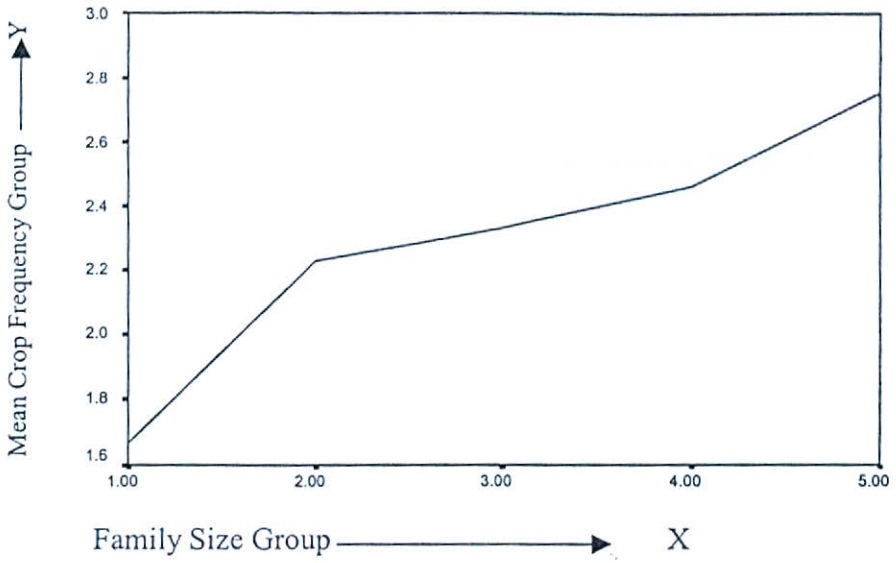
interrelationship between average family size and crop frequency is made in table-55. It is observed from the table that crop frequency increases with the increase of family size and then decreases. From the table it is also observed that maximum respondent 238 can raise their production only by producing (3-4) crops with available family size consisting of 5 to 6 members. The table also indicates that these households can also raise its production by producing 5 to 6 crops with the available family members. The value of the chi-square is 96.94 which is significant 1 (one) percent level of significant indicates a strong positive relationship between family size and crop-frequency.

Table – 55 : Categorical Family Size and Crop – frequency

Family Size	Crop-frequency					Average
	1-2	3-4	5-6	7-8	9 & above	
1-2	18	17	1	-	-	36
3-4	43	15.1	88	13	1	296
5-6	51	238	143	24	1	457
7-8	15	80	53	15	1	164
9 & above	9	22	28	16	3	78
Total	136	1508	313	68	6	1031

*Chi-square = 96.940 at 1 percent level of significant, degree of freedom = 16.

The representation of the group-data between family size and crop-frequency can also be seen from the following graph, which also reflects a positive trend of correlation between family size and crop frequency.



Graph- V : correlation between family size and crop frequency group.

Note : For graphical representation, family size is shown in X-axis and crop frequency in Y-axis. The family size group and crop-frequency group are as follows :

Family size Group	Crop-frequency Group
Family size (1-2) = Group-1	Crop-frequency (1-2)= Group -1
Family size (3-4) = Group -2	Crop-frequency (3-4)= Group -2
Family size (5-6) = Group -3	Crop-frequency (5-6)= Group -3
Family size (7-8) = Group -4	Crop-frequency (7-8)= Group -4
Family size (9 & above) = Group -5	Crop-frequency (9 & above)= Group -5

10.2.2 Co-relation Between Categorical Age of Household Head and Crop-frequency

Age of household head can be considered as an important variable, which can accelerate housel _ricultural production. Age also means experience of a person. In agricultural practices experience in cultivation practices is an important ingredient, which can raise farmer's production. With this view, a relationship between age of household head and crop frequency is tried to drawn. The table – 56 indicates that higher crop frequency occurs in higher age group of households while lower crop-frequency occurs in lower age group, which indicates that higher age groups have higher experience in cultivation while lower age groups have inadequate experience in cultivation. Thus it is observed from table – 56 that the

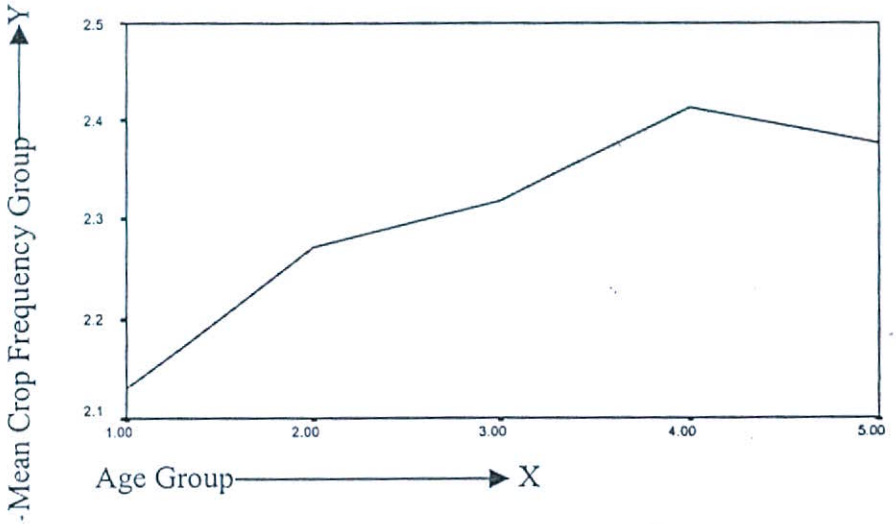
households belongs to (40-49) age group is the dominant group (143) in cultivation who can maximize its production by producing (3-4) crops and also raise up to (5-6) crops followed by the age group (30-39) and (50-59) and above Thus it can be concluded that middle age grouped (40-49) household can contribute more in cultivation of diversified crops.

Table – 56 : Relationship Between Categorical Crop-frequency and Age of Household Head

Age Classification	Crop-frequency					Average
	1-2	3-4	5-6	7-8	9 & above	
<29	13	37	16	7	2	75
30-39	33	111	58	15	2	219
40-49	40	143	94	17	1	295
50-59	21	95	67	15	-	198
60+	29	115	82	18	-	244
Total	136	501	317	72	5	1031

*Chi-square = 11.324 degree of freedom = 16. (Significance level=.789).

The relationship between age of household head and crop frequency can also be seen from the value of chi-square (=11.324) and also from the graph which also shows a positive trend of relationship a between the age of household head and crop-frequency.



Graph- VI : Correlation between age group and crop frequency group.

Note : Age of household head is shown in X-axis while crop frequency is shown in Y axis shown similar group both incase of age of household and crop frequency. The groups are :

Age less than 29 = group-1
Age less than 30 to 39 = group-2
Age less than 40 to 49 = group-3
Age less than 50 to 59 = group-4
Age 60 and above = group-5

Crop frequency (1-2) = group-1
Crop frequency (3-4) = group-2
Crop frequency (40-49) = group-3
Crop frequency (50-59) = group-4
Crop frequency(9 & above) = group-5

10.2.3 Co-relation Between Categorical Education of Family Head and Crop-frequency

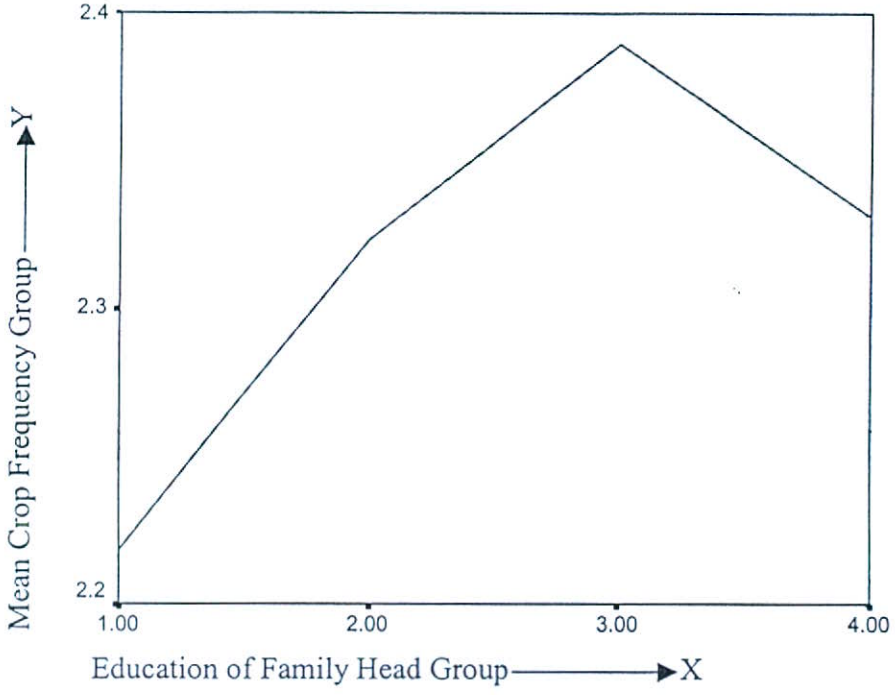
Education is an important socio-economic variable which accelerates farmer's knowledge about cultivation. An educated farmer can contribute more in cultivation than an illiterate farmer. To make such a Judgment a relationship between education and crop-frequency is drawn. The table – 57 indicates that literate farmers can cultivate more crops than the illiterate. The table also shows that the household's head who have education up to class IV are the majority (233) who can cultivate (3-4) crops for their livelihood followed by the households who have education upto class V to IX (101). The findings indicates that agricultural practices of Bangladeshi farmers are practiced by indigenous knowledge rather than higher education. Thus the farmers who have only primary education are the dominant in our agriculture, who can contribute more in crop-production.

Table – 57 : Relationship Between Categorical Education of Family Head and Crop-frequency

Education	1-2	3-4	5-6	7-8	9 & above	Average
Illiterate	15	75	27	5	-	122
1-4	76	233	179	34	1	534
5-9	23	101	65	18	1	208
10+	22	81	46	23	6	178
Total	136	490	317	80	8	1031

*Chi-square = 6.756 degree of freedom = 12. (Significance level= 0.873).

The value of chi-square (=6.756) and the graphical representation of group data between education of family head and crop frequency also shows a positive trend of correlation between these two groups of data.



Graph- VII Correlation between education of family head and crop frequency group.

Note : Education of family head is distributed in X-axis while crop frequency is distributed in Y-axis considering the classification of education of family head and crop-frequency which is as follows :

Illiterate =group -1	Crop-frequency (1-2) = group 1
Class ((I-IV) = group -2	Crop-frequency (3-4) = group 2
Class ((V-IX) = group -3	Crop-frequency (5-6) = group 3
Class (X and above)= group-4	Crop frequency (7-8) = group 4
	Crop frequency ((9 & above)= group 5

10.2.4 Co-relation Between Categorical Land Ownership and Crop-frequency

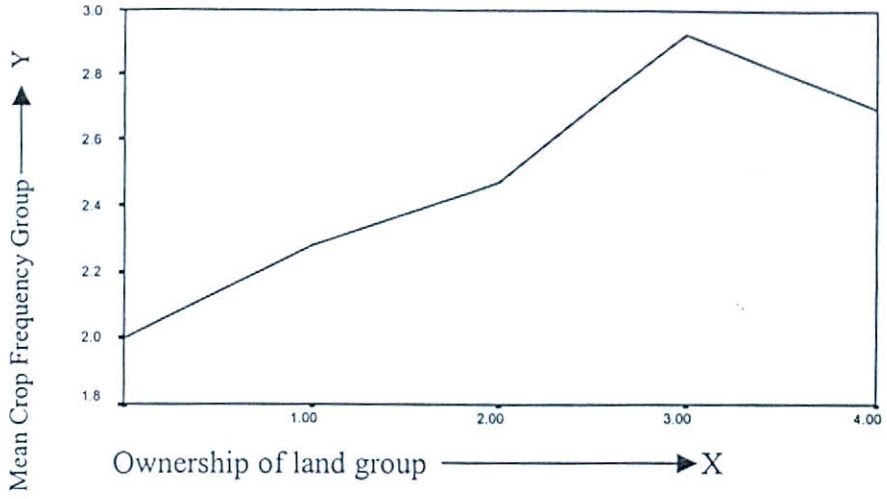
Land is the important factor of production. The household who have land can cultivate more than who have not. Although there is a practice of share cropping or land out who have enough land. It is assumed that the land owners can cultivate more crops than the landless. In order to make such a relationship a cross table between land ownership and crop-frequency is drawn. The table – 58 indicates that maximum households (187) belong to the land categories (0.50-1.49 acres) followed by the land categories (<0.49 acre) who are 157 in number and can optimize their cultivation practices by cultivating 3 – 4 crops. They can also raise their production up to 5-6. The findings indicate that small farmers and functionally landless groups still are the majority of our cultivators than the medium and large farmers. While large and medium farmers shared out, small farmers, and landless group produces for them. The findings also remarks that small farm size groups are better than the large farm groups in raising agricultural production.

Table – 58 : Relationship Between Categorical Land Ownership of Study Households and Crop-frequency

Land Ownership	1-2	3-4	5-6	7-8	9 & above	Average
<0.49 acre	51	157	62	10	-	282
0.50-1.49	47	187	127	22	1	383
1.50-2.49	21	92	72	19	1	205
2.50-4.99	14	47	49	7	-	118
5.00-7.49	8	8	4	2		22
7.50 and above	10	9	2	-	-	21
Total	151	500	316	60	4	1031

*Chi-square = 54.58 at 1 percent level of significant. Degree of freedom = 6.

The value of chi-square (=54.58) which is significant at 1 (one) percent level of significant also supports the relationship between ownership of land and crop frequency. The group data can also be represented in the following graph, which also shows a positive trend co-relationship between ownership of land and crop-frequency.



Graph- VIII : Correlation between Ownership of land and crop frequency group.

Note : Ownership of land group is distributed in X-axis while crop-frequency group is distributed in Y-axis. The groups are classified in the following way :

Ownership of Land Group	Crop-frequency Groups
<0.49 acre = group 1	
0.50-1.49 acre = group 2	Crop-frequency (1-2) = group 1
1.50-2.49 acre = group 3	Crop-frequency (3-4) = group 2
2.50-4.99 acre = group 4	Crop-frequency (5-6) = group 3
5.00-7.49 acre= group 5	Crop-frequency (7-8) = group 4
7.50- and above acre = group 6	Crop-frequency(9 & above) = group 5

10.2.5 Co-relation Between Categorical Land Under Operation and Crop-frequency

Cultivable land is an important factor for production. The households who have cultivable land or who can shared in land, can cultivate for crop production. So it is assumed that there is relationship between cultivable land and crop-frequency. As resource is constraints, so to what extent size of cultivable land is suitable for raising-crop production is also a matter of search. Relationship between cultivable land and crop-frequency is drawn to

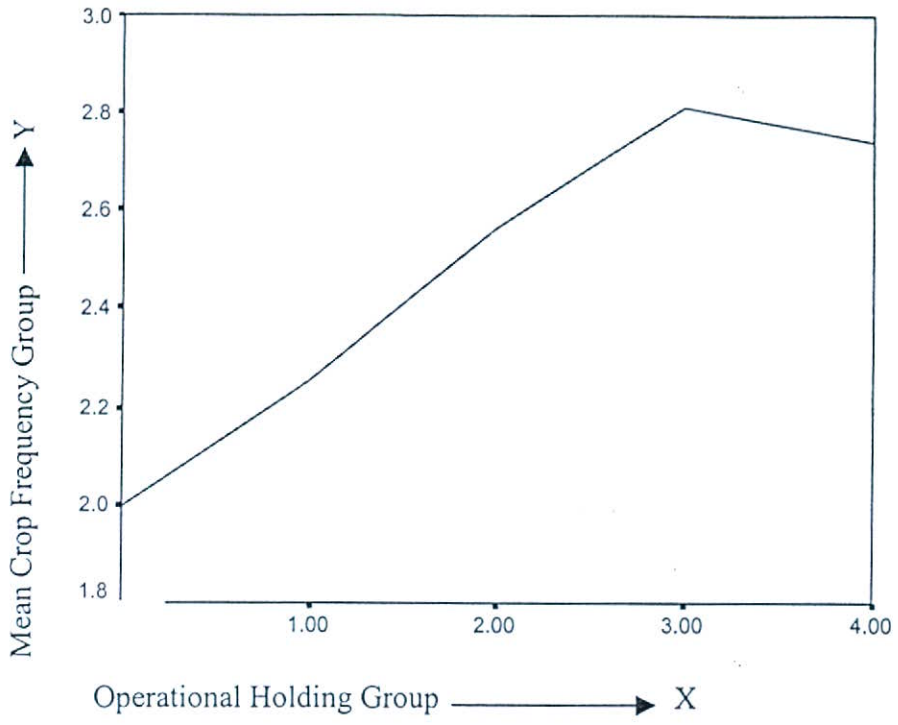
make such an interference. The table – 59 indicates that majority of the households (232) belong to (0.50-1.49 acre) cultivable land categories who can cultivate 3-4 crops through his available land resources followed by the cultivable land categories (1.50-2.49 acres) who are 104 in number. The farmers also can increase its crop frequency up to 5-6 with his available land resources. The findings of the table-5 remarks that in agricultural production there is a concern of effective farm management. It needs plantation, fertilization, irrigation, drainage, weeding, threasing and above all harvesting. So there needs both human and material resources. As such resource is limited to the agricultural households, if the cultivable land size remains small, it also needs smallest amount of resources to manage it properly and also for raising its productivity. Thus the findings of the Table, supports that smaller farm size is better than the larger farm size in terms of crop-frequency.

Table – 59 : Relationship Between Categorical Land under Operation and Crop-frequency

Land Ownership	1-2	3-4	5-6	7-8	9 & above	Average
<0.49 acre	26	94	30	6	-	156
0.50-1.49	72	232	132	25 z	1	462
1.50-2.49	24	104	71	17	2	218
2.50-4.99	9	58	57	10	3	137
5.00-7.49	3	8	19	7		37
7.50 and above	2	7	8	4	-	21
Total	136	503	317	69	6	1031

*Chi-square = 52.22 at 1 percent level of significant. Degree of freedom = 16.

The value of chi-square (=52.22) at 1(one) percent level of significant also supports the relationship. The relationship between land under operation and crop-frequency can also be observed from the following graph, which also reflects a positive trend relationship between operational holding and crop frequency.



Graph- $\overline{IX}$: Correlation between operational holding and crop frequency group.

Note : Land under operation group is distributed in X-axis while crop-frequency group is distributed in Y-axis. The categories of land under operation and crop-frequency are as follows :

Land under Operation Group	Crop-frequency Group
Less than 0.49 acre = group-1	Crop-frequency (1-2)= group 1
0.50-1.49 acre = group 2	Crop-frequency (3-4) = group 2
1.50-2.49 acre = group 3	Crop-frequency (5-6) = group 3
2.50-4.99 acre = group 4	Crop-frequency (7-8) = group 4
5.00-7.49 acre= group 5	Crop-frequency(9 & above) = group 5
7.50- and above acre = group 6	

10.2.6 Co-relation Between Categorical Income From Agriculture and Crop-frequency

Agricultural income is a major income of the rural households from its crop production. But to what extent a farmer can optimize his agricultural income from his agricultural production through raising its crop frequency is also a matter of Judgment. In search of this judgment, relationship between income from agriculture and crop frequency is drawn from table-60.

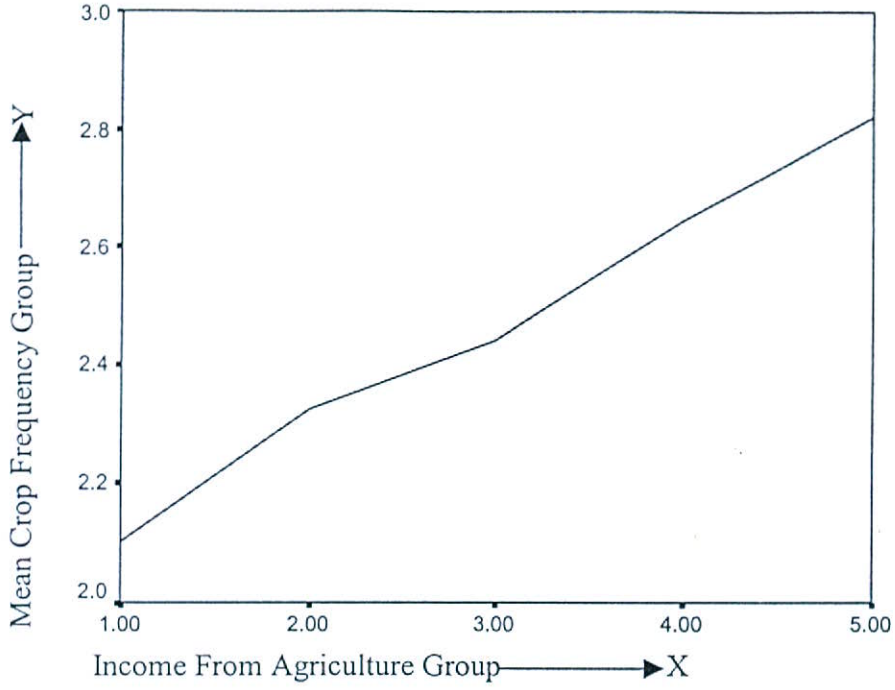
The table indicates that majority (208) of the farmers can earn a net income less than 25000 Tk. followed by a household no of (163) who can earn a net agricultural incomes of 25001-50,000 Tk. by producing 3-4 crops. The households also earn such a net income by increasing its production from 5-6 crops. There are also few households who can earn more than this income. From the table – 60 it also remarks that although majority of the households net agricultural income is below Tk. 50,000 but there is a scope of raising net agricultural income by cultivating more crops if available investment can be ensured through its income.

Table –60 : Relationship Between Categorical Income from Agriculture and Crop-frequency

Income from Agriculture and Crop-frequency	Crop-frequency					Average
	1-2	3-4	5-6	7-8	9 & above	
<25000	83	208	84	18	1	394
25001-50000	38	163	105	18	1	325
50001-75000	81	71	18	7	2	136
75001-100000	2	27	33	7	1	70
100000 and above	-	37	45	23	1	106
Total	131	506	315	73	6	1031

*Chi-square = 107.18 at 1 percent level of significant. Degree of freedom = 16.

The value of chi-square (=107.18) at 1 (one) percent level of significant also supports the interpretations. The graphical representation between income from agriculture and crop-frequency also shows a positive trend of colinearity between income from agriculture and crop-frequency.



Graph $\overline{X}$: Correlation between Income From Agriculture and crop frequency group.

Note : Income from agriculture group is distributed in X-axis while crop-frequency group is distributed in Y-axis. The income from agriculture and crop-frequency group are as follows :

Income from Agriculture	Crop-frequency Group
<Tk. 25000= group-1	Crop-frequency (1-2) = group-1
25001-50000=group-2	Crop-frequency (3-4) = group-2
50001-75000=group– 3	Crop-frequency (5-6) = group-3
75001-1,00,000=group-4	Crop-frequency (7-8) = group-4
1,00,000 and above = group-5	Crop-frequency(9 & above) = group-5

10.3 Diversified Agriculture and Socio-economic Variables : A Comparative Study in Different Study Areas

In the previous section relationship between categorical crop – frequency and socio-economic variables is analyzed. In this section comparism of relationship between crop frequency and average of socio-economic variables in different study areas will be discussed.

10.3.1 Co-relation Between Crop-frequency and Average Family Size in Different Study Areas

From table-60, it is observed that highest average crops with a number of 4.67 can be produced by an average family size of 5.37 followed by average crop production of (4.28) with a family size 5.69. Average crop production is the lowest in Rangpur (3.88) and Narayangonj 3.70) with an average family size of 4.33 and 5.84 respectively.

However, in Comilla it is observed that highest respondents can produce (3-4) crops with an average family size of 5.27 followed by (5-6) crops with an average family size of 6.29. In Rangpur maximum respondents can also produce (3-4) crops with an average family size of 4.17 followed by (5-6) crops with an average family size of 4.66. In Patuakhali, maximum number of respondents can produce (3-4) crops with an average family size of 5.03 followed by the production of (5-6) crops with an average family size of 5.41. Finally in Narayangonj maximum number of respondents can produce (3-4) crops with an average family size of 5.69 followed by the production of (5-6) crops with an average family size of 6.02 which can be observed from table –61.

Table – 61 : Relationship Between Crop-frequency and Average Family Size in Different Study Areas

Crop-frequency	Family Size (Average)			
	Comilla	Rangpur	Patuakhali	Narayangonj
1-2	4.88 (16)	4.06 (47)	3.88 (17)	5.77 (56)
3-4	5.27 (181)	4.17 (98)	5.03 (102)	5.69 (120)
5-6	6.29 (112)	4.66 (56)	5.41 (95)	6.02 (54)
7-8	6.72 (18)	5.20 (10)	7.13 (30)	6:36 (11)
9 & above	9.00 (1)	-	8.00 (3)	7.5 (4)
Average Family size	5.69 (328)	4.33 (211)	5.37 (247)	5.84 (245)
Average Crop-frequency	4.28	3.88	4.67	3.70

Note : Figures in the Parenthesis Indicate Number of Respondents in Individual Study Areas

However, the findings remarks that in Comilla and Narayangonj, farmers can produce their crops with more average family-size while farmers can produce their crops with less average family size in Rangpur & Patuakhali indicating higher population pressure and more involvement of family labour in Comilla and Narayangonj compare to Rangpur & Patuakhali as observed from the average family size in different study areas. The findings on the other-hand also remarks that there is a tendency of more crop-production with higher average family size irrespective of all the study areas as observed from the categorical crop and family size relationship.

10.3.2 Relationship Between Crop-frequency and Average Age of Household Heads in Different Areas

From table-62 it is observed that among the four study areas like Comilla, Rangpur, Patuakhali and Narayangonj highest average number of crops (4.67) can be produced by the farmers of Patuakhali with a highest average age of 50.46 followed by Comilla at a number of 4.28 crops production with an average age of 46.99. In Rangpur on an average 3.88 crops can be produced with an average age of 43.92. The lowest average crops can be produced in Narayangonj (3.70) with an average age of 48.09. However, if the relationship between categorical crop frequency and average age of the farmers is analyzed, it is observed that, in Comilla, highest number of respondents can contribute in producing (3-4) crops with an average age of 46.34 followed by the production of (5-6) crops with an average of age 48.40. There is also a trend of more crop production with higher average age of the household head. The same trend is also reflected in other study areas, which indicates that higher average age is the indication of higher experience which can contribute in higher average crop production.

Table – 62 : Relationship Between Crop-frequency and Average Age of Household-head in Different Study Areas

Crop-frequency	Age of Household (Average)			
	Comilla	Rangpur	Patuakhali	Narayangonj
1-2	46.75 (16)	44.36 (47)	44.06 (17)	46.27 (56)
3-4	46.34 (181)	43.79 (98)	49.42 (102)	48.22 (120)
5-6	48.40 (112)	43.89 (56)	51.54 (95)	49.61 (54)
7-8	46.0 (18)	43.40 (10)	53.10 (30)	46.82 (11)
9 & above	30.0 (1)	-	61.33 (3)	52.50 (4)
Average Age of Household Head	46.99 (328)	43.92 (211)	50.46 (247)	48.09 (245)
Average Crop-frequency	4.28	3.88	4.67	3.70

Note : Figures in the Parenthesis Indicate Number of Respondents Individual District.

10.3.3 Relationship Between Crop-frequency and Average Years of Schooling in Different Study Areas

From table – 63, it is reflected that average crop-production is the highest in Patuakhali (4.67) with an average years of schooling of 4.90 followed by the average crop production of 4.28 in Comilla with an average level of education of 5.99. The average crop production is 3.88 in Rangpur with average years of schooling of 4.12 while average crop production is 3,70 with average years of schooling of 4.54. Thus the findings indicate that study farmers average crop production is very much associated with average years of schooling of primary education.

Table – 63 : Relationship Between Crop-frequency and Education of Family-head in Different Study Areas

Crop-frequency	Years of Schooling (Average)			
	Comilla	Rangpur	Patuakhali	Narayangonj
1-2	5.75 (16)	4.13 (47)	4.88 (17)	4:32 (56)
3-4	5.05 (181)	4.13 (98)	4.81 (102)	4.41 (120)
5-6	5.00 (112)	4.07 (56)	4.91 (95)	4.39 (54)
7-8	5.72 (18)	3.60 (10)	5.30 (30)	6.64 (11)
9 & above	1.00 (1)	-	3.67 (3)	8.00 (4)
Average Years of schooling	5.09 (328)	4.12 (211)	4.90 (247)	4.54 (245)
Average Crop-frequency	4.28	3.88	4.67	3.70

Note : Figure in the Parenthesis Indicate Number of Respondent.

If the contribution of education in crop-production in Comilla is observed it reflects from table-63 that most of the farmers can produce up to (7-8) crops with average years of schooling of (V-VI). In Rangpur farmers can contribute in crop production upto (5-6) crops with minimum average years of schooling of class IV. In Patuakhali, most of the farmers can produce up to (7-8) crops with primary level education. In Narayangong, the same trend is also observed. The findings of the table thus remarks that average crop production in the respective study areas is very much associated with primary level average years of schooling and thus there exists less significant association with higher level average education & increasing crop production.

10.3.4 Relationship Between Crop-frequency and Average Ownership of Land in Different Study Areas

From table- 64 it is observed that average highest crop ie 4.67 in number is cultivated by the farmers of Patuakhali with an average ownership of land of 2.51 acres followed by 4.28 average number of crop production with an average ownership of land of 1.23 acres in Comilla. In Rangpur average number of 3.88 crops are produced by average ownership of land of 1.95 while in Narayangonj a number of 3.7 crops are produced by 1.01 average acres of land.

Table – 64 : Relationship Between Crop-frequency and Average Ownership of Land in Different Study Areas

Crop-frequency	Ownership of Land (Average)			
	Comilla	Rangpur	Patuakhali	Narayangonj
1-2	1.28 (16)	1.70 (47)	0.72 (17)	0.39 (56)
3-4	1.46 (181)	1.90 (98)	1.95 (102)	1.07 (120)
5-6	1.25 (111)	2.36 (56)	2.17 (95)	1:31 (54)
7-8	1.78 (18)	1.17 (10)	3.50 (30)	1.22 (11)
9 & above	2.80 (1)	-	2.72 (3)	3.32 (4)
Average ownership of land	1.23 (328)	1.95 (211)	2.51 (247)	1.08 (245)
Average Crop-frequency	4.28	3.88	4.67	3.70

However, if the relationship between average ownership of land and categorical crop frequency in different study areas is analyzed it is observed that, in Comilla maximum number of respondents can produce (3-4) crops with an average ownership of 1.16 acres of land followed by (5-6) crops with an average ownership of land of 1.25 acres. In Rangpur, Maximum number of respondents can produce (3-4) crops with an average ownership of land of 1.90 acres followed by (5-6) crops with an average ownership of land of 2.36 acre. In

Patuakhali, maximum no of respondents can produce (3-4) crops with an average ownership of land of 1.95 followed by (5-6) crops with an average ownership of land of 2.17 acre. Finally in Narayangonj, maximum number of respondents can produce (3-4) crops with an average of 1.07 ownership of land followed by (5-6) crops with an average ownership of land of 1.31 acres. Thus the findings remarks that there is a tendency of producing up to 6 crops with available ownership of land in all the study areas although in Comilla & Narayangonj ownership of land is less compare to Rangpur and Patuakhali in producing the same average number of crops which indicates the heterogeneity of ownership pattern in the study areas. However, the findings also remarks that there is less tendency of maximizing crop production with higher average ownership of land irrespective of all the study areas which indicates that although ownership of land is a also prederminant of agricultural production, but the farmers who have higher ownership of land are not so much interested to utilize their land rather they are more interested to share out their land and engage themselves in cultivation less because of their higher opportunities of earning from other sources.

10.3.5 Relationship Between Crop-frequency and Average Operated Land in Different Study Areas

From table – 65 it is observed that average highest crop i.e. 4.67 is cultivated by the farmers of Patuakhali with an average operated land of 2.41 acres followed by production of 4.28 average crops with an average operated land of 1.23 acres in Comilla. In Rangpur on an average 3.88 crops is produced by 1.95 acres of average operated land followed by 3.70 average crops production with an average operated land of 1.015 acres in Narayangonj.

Table – 65 : Relationship Between Crop-frequency and Average Operated Land in Different Study Areas

Crop-frequency	Family Size (Average)			
	Comilla	Rangpur	Patuakhali	Dhaka
1-2	1.297 (16)	1.794 (47)	1.327 (17)	0.592 (56)
3-4	1.203 (181)	1.728 (98)	1.715 (102)	1.016 (120)
5-6	1.225 (111)	2.31 (56)	2.506 (95)	2.138 (54)
7-8	1.338 (18)	2.899 (10)	2.816 (30)	1.862 (11)
9 & above	2.3 (1)	-	3.320 (3)	3.45 (4)
All	1.230 (328)	1.950 (211)	2.41 (247)	1.015 (245)
Average Crop-frequency	4.28	3.88	4.67	3:70

However, if the relationship between different categories of crop frequency and average operated land is analyzed, it is observed that in Comilla maximum farmers can produce (3-4) crops with an average operated land of 1.203 acre followed by (5-6) crops with an average operated land of 1.225 acre. In Rangpur farmers can produce (3-4) crops with an average operated land of 1.715 acres followed by (5-6) crops with an average operated land of 2.31 acre. In Patuakhali farmers can also produce (3-4) crops with an average operated land of 1.715 followed by production of (5-6) crops with an average operated land of 2.506 acres. In Narayangonj maximum farmers can produce (3-4) crops with an average operated land of 1.016 acre followed by (5-6) crops with an average operated land of 2.138 acre. However farmers in the four study areas like Comilla, Rangpur, Patuakhali and Narayangonj also can raise its production by increasing its average operated land resources. The findings of the table-65 remarks that farmers of Comilla & Narayangonj can produce same number of crops with less amount of operated land compare to Rangpur and Patuakhali which indicates the maximum and minimum utilization of land resources in crop production in different study areas.

10.3.6 Relationship Between Crop-frequency and Average Income from Agriculture in Different Study Areas

From table - 66 it is observed that average income from agriculture is the highest in Comilla (Tk. 61972.80) with an average crop production of 4.28 followed by Tk. 48232.42 in Rangpur (Tk. 48232.42) with an average crop production of 3.88. The average income from agriculture is Tk. 40340.44 in Patuakhali with an average crop production of 4.67 crops followed by Narayangonj (Tk. 28586.48) with a average crop production of 3.70.

Table – 66 : Relationship Between Crop-frequency and Income from Agriculture in Different Study Areas

Crop-frequency	Income from Agriculture (Average)			
	Comilla	Rangpur	Patuakhali	Dhaka
1-2	49241.25 (16)	30625.10 (47)	23506.17 (17)	20072.14 (56)
3-4	47814.09 (181)	44509.91 (98)	31797.98 (102)	24577.55 (120)
5-6	80966.08 (111)	61239.11 (56)	47363.16 (95)	36121.54 (54)
7-8	97025.94 (18)	94630.00 (10)	54153.33 (30)	64755.45 (11)
9 & above	70200.00 (1)	-	65663.33 (3)	66867.50 (4)
All	61972.08 (328)	48232.42 (211)	40340.44 (247)	28586.48 (245)
Average Crop-frequency	4.28	3.88	4.67	3.70

Note : Figure in the parenthesis indicate no of respondent.

However if the categorical crop-frequency and income from agriculture is analyzed from table – 66, it is reflected that in Comilla highest number of respondents can earn Tk. 47814.09 from the production of (3-4) crops followed by (5-6) crops with an income of Tk. 80966.08.

In Rangpur, maximum farmers can earn Tk. 44509.91 from (3-4) crops followed by Tk. 61239.11 with the production fo (5-6) crops. In Patuakhali, highest number of farmers can earn Tk. 31797.98 from the production of (3-4) crops followed by Tk. 4736.16 followed by

(5-6) crops. In Narayangonj maximum farmers can produce Tk. 24577.55 from the production of (3-4) crops followed by Tk. 47363.16 from the production of (5-6) crops. The findings remarks that farmers can also increase its earning from agriculture by increasing its production. The findings also remarks that although average crop production is the highest in Patuakhali, average income earned from agriculture is less than that of Comilla, and Rangpur there the reason may be due to the fact that in Patuakhali although there are some minor diversification for oil seed and pulses production but these crops are less profitable than vegetables which are produced in Comilla and Rangpur is a result of which income is less in Patuakhali. But categorical crop frequency and income earned from agriculture indicates that increase in crop production has been associated with higher income from agriculture in all the study areas.

10.4 Relationship Between Crop-frequency and Other Socio-economic Variables : A Summarization

In the above sections relationship between crop frequency and different socio-economic variables are analyzed from individual point of view where a positive trend of relationship between crop frequency and socio-economic variables is observed. But if the relationship between crop frequency and other socio economic variables is analyzed in a summary from it is observed from table-67 that there is also positive trend of relationship exist crop frequency and all other socio-economic variables which supports that diversified agriculture has positive impact on socio-economic variables.

Table – 67 : Relationship Between Crop-frequency and Socio-economic Variables

Crop frequency	Family size (Average)	Age of Household head (Average)	Education of Household Head	Ownership of Land (Average)	Operational Holding (Average)	Income from Agriculture (Average)	Yearly Income (Average)
1-2	4.84 (136)	45.39 (136)	4.49 (136)	1.09 (136)	1.03 (136)	27580.03 (136)	65317.30 (136)
3-4	5.11 (501)	46.92 (501)	4.68 (501)	1.37 (501)	1.35 (501)	38341.36 (501)	73496.78 (501)
5-6	5.69 (317)	48.75 (317)	4.70 (317)	1.91 (317)	1.97 (317)	59771.18 (317)	87219.73 (317)
7-8	6.62 (69)	48.84 (69)	5.38 (69)	2.01 (69)	2.03 (69)	72893.87 (69)	101229.38 (69)
9 & above	7.83 (8)	53.0 (8)	5.50 (8)	2.03 (8)	2.53 (8)	66832.50 (8)	91901.25 (8)
All	5.37	47.46	4.72	1.449	1.45	46044.51	78636.28

Source : Field Survey 2004-05.

10.5 Diversified Agriculture and Socio-economic Variables : Some Statistical Interpretations :

The relationship between socio-economic variables and crop-frequency in case of non-group data also shows a positive trend of colinearity.

The relationship is also seen from Karl Pearson correlation co-efficient which is shown in table – 68. The table reflects that crop frequency has a strong correlation with family size ($r=0.218^{**}$). This relationship is significant at 1 (one) percent level of significant which proofs the assumption that the higher family size can contribute to higher crop-frequency. There is also positive relationship between crop frequency and age of the household head ($r=0.085^{**}$). The relationship is also significant at 1 (one) percent level of significant which indicates that the household head who are more aged have better knowledge and experience in agricultural practices and thus can contribute better in diversified agriculture interms of crop frequency than an low-aged household head. There is also positive correlation between crop frequency and education of household head ($r=0.072^{*}$) which is significant at 5% level of significant which also proofs that education can enrich farmers knowledge and can contribute positively in raising crop-frequency. There implies a negative correlation between crop frequency and land ownership ($r=0.001$) which indicates that the although land is a dominant

factor of production but the farmers who have enough land are not eager and efficient in raising more crop cultivation. They usually shared out their lands and use to cultivate only for their household consumption. The negative also correlation indicates an inverse-relationship between crop-frequency and land ownership which also judges the hypothesis that small-farm size can contribute more in raising crop-frequency than the large-farm size because of optimum utilization of available land resources. There is also positive and strong correlation between crop-frequency and operational holding ($r=0.198^{**}$) which proofs the assumption that the farmers who have enough cultivable land can contribute positively in diversified agriculture. In Bangladesh majority of the farmers are small and landless, but if they have enough cultivable lands contribute more than the medium and large farmers. Finally there is also positive correlation between crop frequency and income from agriculture ($r=0.226^{**}$). The relationship is also significant at 1% level of significant, which indicates that the farmers who are more engaged in diversified agriculture have better income than those who are les involved in diversified agriculture. Thus the above statistical results of correlations consider the results of both group and non-group data and confirm the hypothesizes that there are significant positive relationship between diversified agriculture with that of the socio-economic variables.

Table – 68 : Correlation Between Family size, Age of Household head, Education of family head, ownership of land, operational holding, and Income from agriculture

Criterion Variable	Correlated Variables	Pearson Correlation	Significant
Crop frequency	Family size	0.218**	.000
	Age of household head	0.085**	.006
	Education of family head	0.072*	.020
	Land ownership	-0.001	0.967
	Operational holding	0.198**	0.000
	Income from agriculture	0.226**	0.000

N= 1031

** indicates correlation is significant at 0.01 level (2-tailed)

* indicates correlation is significant at .05 level (2 – tailed)

10.6 Factors Contributing Diversified Agriculture in the Study Villages

Searching out contributing significant factors and their contribution to crop frequency can be considered as an important aspect of formulating new policy for the development of diversified agriculture. As diversified agriculture is the possible out come of crop frequency, it is expected that several factors like family size, age of household head, operational holding, income from agriculture, and yearly expenditure are contributing to a significant extent for the increase of crop frequency as well as for the overall development of diversified agriculture. However in this section, an attempt has been made to make a contributory Judgment about the related independent factors on diversified agriculture through multiple regression model.

10.6.1 Methods of Estimation of the Multiple Regression Model:

To determine the related significant contribution of socio-economic variables on diversified agriculture, crop frequency is considered as dependent variable while socio economic variables like family size, age of household head, operational holding, income from agriculture, and yearly expenditure are considered as independent variables. In order to make the judgment regarding to what extent the independent variables are contributing to dependent variables, the following multiple regression model is used for estimating the relationship :

$$Y = b_0 + b_0x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+b_6x_6+u_i$$

$$= b_0 + \sum_{i=1}^{6} b_iX_i + u_i \qquad \text{(i)}$$

Where Y = Crop-frequency interms of number of crops produced by a farmer over the whole year.

X_1 = Family size
X_2 = Age of household head
X_3 = Operational holding per household
X_4 = Net yearly income per household
X_5 = Income from agriculture per household
X_6 = Yearly expenditure per household
b_0 = Intercept value
B_i = Regression co-efficient
b_i = Error-term.

10.6.2 Description of the Explanatory or Independent Variables:

i) **Family size :** Family size is considered as an important independent variable which has been included in the multiple regression model. In agriculture, labour is one of the factor of production. Thus it assumed that the households who have enough number of family members can contribute to a significant extent for raising the productivity of diversified agriculture interms of crop frequency.

ii) **Education of family head :** Education has been considered as an important indicator of human capital which provides knowledge, skills and experience for performing economic activities. It also provides sufficient knowledge and experience to agricultural farming. Thus education of household head is considered another important independent variable. It is the assumption that education of household head will contribute significantly in diversified agriculture interms of crop frequency.

iii) **Age of household head :** Age of household head is considered another important independent variable which can contribute positively to diversified agriculture. As age indicates the experience of a person. It is assumed that higher aged personnel can contribute more in raising crop frequency than a low aged personnel in agriculture.

iv) **Operational holding :** Land under operation is considered another important independent variable in the regression model. Land is the most important factors of production, which can contribute significantly in crop cultivation. In Bangladesh, land is scarce, so its optimum utilization is very much essential for raising crop frequency. Thus it is the assumption that the farmers who have enough land under operation can contribute more in diversified agriculture interms of crop frequency.

v) **Yearly expenditure :** Yearly expenditure is also considered another important independent variable which has been included in the multiple regression model. It is also hypothesized that yearly expenditure can contribute significantly in raising crop frequency.

vi) **Income from agriculture :** Income from agriculture is also considered another important independent variable which is incorporated in the regression model. As most of the farmers of Bangladesh depends directly on agricultural income for their livelihood, so it is assumed that if crop frequency can be raised significantly, it will enhance households agricultural income and contributes positively in diversified agriculture.

10.6.3 Interpretations of the Results :

In table-69 value of co-efficient and related statistic of the multiple regression function for six independent variable namely family size, age of household head, education of family head, operational holding, income from agriculture and yearly expenditure is presented. The following interpretations can be given from the table-69.

(i) **Family size :** It is observed from the estimation of multiple regression that regression co-efficient for family size is positive and it is 0.150. Although the relationship is poorly significant but the relationship states that if per unit of family size is increased by 1(one) percent, there is a probability of increasing crop frequency by 0.15%, which implies that number of household members is an important independent variable, which can contribute in raising diversified agriculture interms of crop frequency.

Table – 69 : Estimated Value of Co-efficient and Related Statistic (Beta value) of Multiple Regression Model

Explanatory Variables	Value of standardized co-efficient (Beta : S value)	Value of Significance
Constant	-	0.000
Family size	0.150	0.001
Education of family head	0.005	0.092
Age of household head	0.020	0.520
Operational holding	0.161	0.000
Yearly expenditure	0.051	0.266
Income from agriculture	0.192	0.000
R^2	0.120	-
D.f	6	-
F value	24.25	0.000

Source Field Survey, 2003-04.

(ii) **Education of household head :** It is also observed form the estimation of multiple regression model that regression co-efficient for education of household head is positive and it is 0.050. The relationship is significant and the value of significance is 0.092 which indicates that if per unit of education of the household head can be increased by 1%, crop-frequency can be increased by 0.05% which indicates that education of family head contributes significantly in diversified agriculture.

(iii) **Age of household head :** It is observed from the estimation of multiple regression that regression co-efficient for age of household head is also positive and it is 0.020. Although the contributory impact of age of household head on crop-frequency is positive but it is not significant which indicates that although age indicates person's individual experience but it has less impact on diversified agriculture interms of crop frequency.

(iv) **Operational holding :** It is also observed from the estimation of multiple regression model that regression co-efficient for operational holding is positive and it is 0.161. The relationship is also highly significant. The relationship explains that if per unit of operational holding is increased by 1%, there is a high probability of increasing crop-

frequency by 0.16%. Thus it is indicative that land under operation has a significant contribution in diversified agriculture interms of crop-frequency.

(v) **Yearly expenditure :** It is also observed from the estimation of multiple regression model that regression co-efficient for yearly expenditure is 0.051. Although the relationship is positive but it is not significant (value=0.266) which implies that although yearly expenditure is assumed to be contributed highly in the development of diversified agriculture the sample households did not contribute the yearly expenditure significantly for the development of diversified agriculture.

(vi) **Income from agriculture :** It is also observed from the estimation of multiple regression model that regression co-efficient for income from agriculture is positive and it is 0.192 which is also highly significant. The estimation of co-efficient and level of significance indicates that if per unit of income from agriculture is increased by one percent, crop frequency can be increased by 0.19% which implies that still now in rural Bangladesh, agriculture is the main source of income and if it is properly invested for the development of diversified agriculture, it will significantly contribute in raising crop frequency.

Value R^2 and F-value : The co-efficient of multiple determination and F value is also shown in table 65. The value of multiple determination (adjusted R-square) for the contributory relationships is 0.120 at 6 degrees of freedom. The value of F=24.25 which in highly significant. However from the adjusted R-square and F-value, although it is indicative that the relationship is highly significant but their is inadequate reflection (12.2%) of the cumulative impact of the mentioned independent variables.

10.7 Conclusion

In the conclusion, it can be said that there is a positive and linear relationship between family size, age of the household head, education of household head, land ownership, operational holding and also income from agriculture etc. with that of crop-frequency. The relationships both interms of group and non-group data are mutually supportive from the matrix of group-data, chi-square value and also from correlation co-efficient. The trend of colinearity between crop frequency and socio-economic variables also has been reflected from the graph. So if effective diversification is expected to be increased through optimum utilization of socio-economic resources, relationship between crop-frequency and such socio-economic variables also needs to be optimized to a significant level. However, the overall performance of multiple linear regression model incase of six explanatory variables namely family size, age of household head, education of household head, operational holding, yearly expenditure and income from agriculture is not at all poor. It is also reflected from the value of R^2 and F value. It is observed from the co-efficient and significant value of the explanatory variables that the explanatory variables have been contributing positively in the development of diversified agriculture interms of crop frequency. The insignificant values indicates that other explanatory variables can not contribute in raising crop frequency as per expectation.

Chapter XI

Marketing Problems of Diversified Crops in Bangladesh: Some Opinions and Remedies from Grass-root Level

11.1 Introduction

A principle according to which farm produce and income are distributed is followed by a look into the problems of agricultural marketing. A self-sufficient farm does not need bother about marketing of its produce because it has subsistence production. But the modern system of surplus farming has commercial aspects too. Surplus cropping operations necessitate the emergence of marketing problems in the agricultural spare : (Alam Md. J : 2002). In a broad sense, marketing function is to provide the time, place and form utilities which are a part of production. The characteristic feature about agricultural production is that it is spreaded over time and place. On the other hand, production is concentrated at two or three points of time. Compared to demand, the supply is concentrated in regard to place also. With increasing specialization and commercialization of agriculture, the problem of marketing become more important.

Actually "Marketing is the crux of the whole food and agricultural problem. It would be useless to increase the output of food, it would be equally futile to set up optimum standard of nutrition, unless means could be found to move the food from producer to consumer at a price which represents a fair remuneration to the producer and is within the consumer's ability to pay". Although producing more crops remain one of the main issues of the less developed countries & there are other problems in such sphere which is related to marketing and distribution, many less developed countries like Bangladesh need improvements in their agricultural marketing system to keep pace with the expansion in agriculture (Gupta, R,P : 1973).

Marketing is called the most important multiplier in economic development. Its improvement makes possible the economic integration and utilization of assets and productive capacity of an economy. In many less developed counties, like Bangladesh, 40-65% of consumer's budget may be spent on food. Thus modest improvement in efficiency of marketing can make possible larger gains in real income, and possibly reduce the price of food commodities (Rahman, M: 1973).

Price is an important factor of commercial production and a problem of marketing. A small farmer has to devote himself a major portion for his own consumption. On the remaining portion, he is free to plan his production as per market indication. A large farmer can afford to take the risk in regard to variation in price or in income from his land after his consumption but a small farmer can not do so. By meeting his food demand, a small farmer wants to commercialize his remaining portion of land for maximizing his profit . But if price fluctuates; he can not take the risk. So price-fluctuation and getting higher price is a major problem of cultivating diversified crops by the small farmers. Regarding competitive crops, farmer's decisions are not only influenced by the post harvest prices of that crop in the preceding year, but also by the post harvest prices of crops which can substitute for that particular crop (Ibid : 1973). Thus price is the important consideration for a farmer to allocate his land for commercial cultivation which is regarded as an important marketing problem for the farmer in the grass root level.

Market intelligence provides information relating to market forces i.e. the factors which have a bearing on marketing problems like demand, supply, prices, transportation, storage etc. Dissemination to market information is a useful tool for making competition among producers and traders. Transportation is the life blood of modern economy. In the developing economics, greater specialization, diversification

and commercialization depends upon the timely movement of agricultural inputs and finished product. Storage is necessary to reduce the seasonal and regional fluctuations of prices. The storage facilities are very inadequate and insufficient in Bangladesh, which is also perceived as an important marketing problem at the grass root level (Ibid 1973).

Price support is another problem of agricultural production which is also an effective tool for raising output at the farm level. It depends on several factors. Firstly, output response depends on whether the support price is set at a level that provides farmers the incentive to invest in modern inputs: secondly, a majority of the farmers would respond to the potential benefit from the price support only if the price is announced well a head of the harvesting season, if the farmers know it and if the government buys all that is offered at the reasonable price (Tolley, G.S. & et al; 1982).

High rate of participation of the market participants is another agricultural marketing problem who consume a significant share of consumer's share in the form of marketing cost for delivering their produces from primary market to retail market which indicates functional in-efficiently of marketing in Bangladesh (Alam Md. J : 2002). Short comings of imposing regulations in the whole sale market by the government are also another problem of agricultural marketing in Bangladesh. Higher charges of market commission by the artdar is a part of profit which might be incur by the producer. Thus there is a strong need for imposing market regulations for not only in wholesale market but also in primary markets (Ibid : 2002) export is another agricultural marketing and also diversification problem in Bangladesh. There is no coordinated product policy and programmes in government sector regarding export. There is no export village in commercial areas of Bangladesh. So there is a strong need for coordinated effort for export village for producing and exporting diversified

crops for the overall development of Bangladesh agriculture. Policies related to input distribution, withdrawal of subsidies, absence of complementary measures are several problems of agricultural marketing in the micro level which hinder as a strong bottleneck for optimum production of diversified crops in Bangladesh. Thus policies regarding input subsidy, contact growing system in village level, establishment of export village is a strong need and a part of agricultural policy demand by the farmers at grassroots level (Ibid 2002). On the other hand, as farmers in the developing countries become more sophisticated and commercialized in agriculture there should be arrangement of both backward and forward linkage institutions like processing & export firms for the wider scope of diversified agriculture (Moyer & Hollander : 1968).

However in this chapter, marketing problems of diversified crops will be analyzed. At the same time, solution of these problems and suggestions from farmer's point of view for the overall development of diversified agriculture through agricultural marketing opportunities will be discussed in brief :

11.2 Marketing Problems of Diversified Crops :

Actually several problems of marketing of diversified crops are identified by the farmer's of the study areas. The categorical marketing problems are (a) Problems regarding price deprivation in primary markets by market participants; (b) Problems of oversupply of diversified crops during peak-season; (c) Problems of marketing infrastructure for diversified crops and finally, comprehensive problems of marketing for diversified crops in the study areas. Now these problems are discussed below:

11.2.1 Price-deprivation of Study Farmers in Primary Markets :

Primary markets are village markets which are generally held once or twice in a week and deals with commodities which are generally required by the people in the rural areas. In these markets, producers in the rural areas used to sell their agricultural commodities to market participants like Faria or Bepari or agent of the aratdars. However, farmers are deprived for the price of produces by the market participants in these markets. Actually, farmers are very simple in their livelihood. They does not know what is deprivation in price. In the rural areas, price deprivation is arises out from the very beginning of selling. However, to measure the price – deprivation of farmers in primary markets, two parameters or variables are used through farmers opinion. These are deprivation through bargaining with market participants and deprivation through price fixation. To calculate the intensity of price deprivation both arithmetic mean and weighted arithmetic mean of the farmers opinion in different study areas are measured which is as follows :

$$X_w = \frac{\Sigma WX}{\Sigma W}$$

$$= \frac{\Sigma(w_1 x_1 + w_2 x_2)}{\Sigma(w_1 + w_2)}$$

Where, X_w = Weighted arithmetic mean of price deprivation

X_1 = Price-deprivation through bargaining

X_2 = Price-deprivation in fixing profitable price

W_1 = 2 (weight given to first variable)

W_2 = 1(weight given to second variable)

Table – 70 : Price-deprivation of Farmers in Selling their Produces at Primary Markets

Variables	Comilla	Rangpur	Patuakhalil	Narayangonj.	Total
a) Price-deprivation through bargaining with market participants in primary market	209 (37.75)	133 (20.84)	147 (23.04)	149 (23.35)	638 (100.0)
b) Price-deprivation in case of determining price with profitable margin	119 (30.28)	78 (19.84)	100 (25.44)	96 (24.43)	393 (100.0)
Weighted arithmetic mean (X_w)	179	114.67	131.33	131.33	556.33

Note : Total number of respondent is 1031. The respondent response on only one specific variable.

Source : Field Survey, 2003-04.

From table-70, if price –deprivation of study farmers is analyzed categorically, it is observed from arithmetic mean of individual variable that price deprivation through barganing with market participants is the highest in Comilla (23.75%) followed by Narayangonj (23.35%), Patuakhali (23.04%) and Rangpur (20.84%). The reason behind such a findings may be due to concentration and variation of market participants in the primary markets of the respective study areas. On the other hand, if price deprivation in fixing price with profitable margin is analyzed in different study areas, it is observed that price deprivation in fixing price with profitable margin is also highest in Comilla (30.28%) followed by Patuakhali (25.44%) Narayangonj (24.43%) and Rangpur (19.84%). The reason behind such a findings may be due to lack of awareness about proper market information's, cost of production and also may be due to lack of capacity to fix price of the respective diversified commodities by the respective farmers of the study areas.

However, if weighted arithmetic mean of opinions of farmers in different study areas is analyzed, it is observed that price deprivation in primary-markets is the highest in Comilla (Xw=179) and lowest in Rangpur (Xw=114.67) while it is equal in Patuakhali

(Xw=131.33) and Narayangonj (Xw = 131.33). The highest deprivation of price in primary markets is the highest in Comilla because of the fact that Comilla village is more diversified and heterogeneous perishable products are produced and marketed in the primary markets. Due to well-communication facilities, concentration of market participants are quite high who used to come from different central markets from Dhaka and Chittagong as a result of which farmers fail to bargain with the market participants for getting higher price and thus price deprivation may be highest in Comilla. On the contrary, price-deprivation through bargaining is the lowest in Rangpur (xw=114.67) due to the fact that although Rangpur is diversified but it deals with few products. Due to wide communication net work from central market of Dhaka through Jamuna multi-purpose bridge, farmers are getting better price for their specific commodities because the can sell their produces directly to the Baparies of Dhaka and malpractice of market-participants is less than that of Comilla. The deprivation of price is moderate in Patuakhali (Xw=131.33) and Narayangonj (Xw=131.33) due to the fact that these two village are less diversified, farmers also deal with few products and the villages are very near to district level secondary and central markets respectively as a result of which price deprivation in the two-study areas is comparatively moderate there.

11.2.2 Over-Supply Problem of Diversified Crops During Peak – Season of Harvesting

Diversified crops are mainly seasonal and perishable products. Because of seasonality nature of the commodities, these produces are over supplied in the primary markets which might be considered another agricultural marketing problem of diversified crops in the grass-root level. Over-supply problem of agricultural commodities generates several inherent problem of the farmers. These are : (a) imposement of

farmers to sell their produces whatever the market price is or asusual price; (b) imposement of farmers to deliver their produces less than present market price; (c) imposement of farmers to remain their produces as unseal and wastage. However, to measure the intensity of over-supply problem both arithmetic mean and weighted arithmetic mean of oversupply problem on the categorical problem of over-supply is calculated on the basis of responses taken from each of the variable. However, weighted arithmetic mean is calculated by applying the following formula :

$$X_w = \frac{\Sigma WX}{\Sigma W}$$

$$= \frac{\Sigma(w_1x_1 + w_2 x_2 + w_3 x_3)}{\Sigma(w_1 + w_2 + w_3)}$$

Where, X_w = Weighted arithmetic mean of over-supply problem during peak-season

X_1 = Imposement of farmers to sell their produces whatever the market price or asusual price

X_2 = Imposement of farmers to sell their produces less than market price

X_3 = Imposement of farmers to keep their produces as wastage or remain unsell

W_1 = 3 (weight given to first variable)

W_2 = 2(weight given to second variable)

W_3 = 1(weight given to 3rd variable)

Table - 71 Over-supply Problem of Diversified Crops During Peak-season

Variables under Over-supply	Comilla	Rangpur	Patuakhali	Narayangonj	Total
a) Imposement of farmers to sell their produces whatever the market price might be / as usual price	57 (13.13)	95 (21.89)	104 (23.96)	178 (41.01)	434 (100.0)
b) Imposement of farmers to sell their produces less than prevailing market price	239 (61.60)	56 (14.43)	84 (21.65)	9 (2.32)	388 (100.0)
c) Imposement of farmers to keep their produces wastage or remain unsell	32 (15.31)	60 (28.71)	59 (28.23)	58 (27.75)	209 (100.0)
Weighted Average (Xw)	113.50	76.17	89.83	101.67	381.17

Source : Field Survey, 2003-04.

If problem of over-supply of diversified crops during peak-season in different study areas is analyzed by categorical response it is observed that imposement of market participants to sell their products whatever the market price might be or asusual price is the highest in Narayangonj (41.01%) followed by Patuakhali (23.96%), Rangpur (21.89%) and Comilla (13.13%). The reason behind such a findings may be due to urgent need of capital of the respondent farmers. Regarding imposement of farmers to sell their produces less than prevailing market price is the highest in Comilla (60.05%) followed by Patuakhali (21.10%) Rangpur (16.58%), Narayangonj (2.21%). The cause of such findings in different study areas is due to non-availability of market information's regarding the market price of distant and central markets by the respondent farmers of the study areas. Regarding imposement of farmers to keep their produces as wastage or remain unsell, farmers opinion is the highest in Rangpur (28.71%) followed by Patuakhali (28.23%) Narayangonj (27.75%) and Comilla

(15.31%). However the reason behind such opinions is due to lower price of the marketed products send by the individual farmers of the respective study areas to their primary markets.

However, if intensity of oversupply problem in different study areas is analyzed, it is observed that highest oversupply problem during peak-season occurs in Comilla (Xw=113.50) followed by Narayangonj (Xw=101.67), Patuakhali (Xw= 89.83) and Rangpur (Xw=76.17). The reason behind such a different picture of weighted arithmetic mean occurs due to the fact that Comilla village is more diversified and commercial production of diversified crops is more prominent here. So oversupply problem is also perceived to be highest by the cumulative opinions of the farmers here. Over-supply problem during the peak-season in Rangpur is the lowest (Xw=76.17) by the opinions of the farmers in Rangpur due to the fact that although Rangpur is diversified but not like as Comilla. Farmers of Rangpur is commercialized and specialized with few products. So volume of marketed surplus is less here and oversupply problems remain less. The moderate intensity of oversupply problem is in Narayangonj (Xw=101.67) and Patuakhali (Xw=89.83) which indicates that these two villages are less diversified and commercialized. Although Narayangonj is commercialized with few crops but very near to district town and central markets of the capital. On the other hand, Patuakhali village is also less diversified and commercialized with only the mono-crop like traditional amon rice cultivation, cultivation of winter-crops like pulses and oilseeds, but very near to district secondary market. So oversupply problem in these two areas is perceived to be moderate by the opinions of the respondents.

11.2.3 Problems Related to Marketing Infrastructure :

Lack of marketing infrastructure is another most important agricultural marketing problem faced by the farmers in different study areas. Marketing infrastructure problem can be analyzed from three point of view. These are problems of transportation and storage of diversified crops; problems of processing and problems of selling to government-institutions/ agents. However, to observe the intensity of marketing-infrustructural problem in the four study areas, both arithmetic-mean and weighted arithmetic mean is calculated. However to calculate weighted arithmetic mean, the following method is used,

$$X_w = \frac{\Sigma WX}{\Sigma W}$$

$$= \frac{\Sigma(W_1X_1 + W_2X_2 + W_3X_3)}{(W_1 + W_2 + W_3)}$$

Where, X_w = Weighted arithmetic mean of marketing infrastructure problem

X1 = Problem of transportation and storage

X2 = Problem of selling to government institution

X3 = Problem of processing

W1 = 3 (weight given to 1st problem)

W2 = 2 (weight given to 2nd problem)

W1 = 1 (weight given to 3rd problem)

However, the weighted arithmetic mean of marketing infrastructure problem in different study areas can be observed from the following table – 72.

Table – 72: Problems of Marketing Infrastructure

Problems of Marketing Infrastructure	Comilla	Rangpur	Patuakhali	Narayangonj	Total
Problem of transportation and storage	239 (38.86)	74 (12.03)	124 (20.16)	178 (28.94)	615 (100.0)
Problem of selling to government institution/ government agent/ other association	32 (12.90)	111 (44.75)	95 (38.30)	10 (4.03)	248 (100.0)
Problem of processing	57 (33.93)	26 (15.48)	28 (16.67)	57 (33.93)	168 (100.0)
Weighted arithmetic mean (Xw)	139	78.33	98.33	101.83	418.16

From the findings, it is observed that problems of transportation and storage is the highest in Comilla (38.66%) followed by Narayangonj (28.94%), Patuakhali (20.16%) and Rangpur (12.03%). The reason behind such findings of higher intensity of problem of storage in Comilla lies due to the fact that Comilla village is very far away from district town or places where storage facilities are available than the study village of Rangpur which is very near to Upazilla Sadar or places of cold storage. The other two study areas like Narayangonj (28.94%) and Patuakhali (20.6%) has the moderate intensity of opinions regarding problem of storage which are very near to district town and urban areas. However problem of selling to government institution or agent is the highest in Rangpur (44.75%) followed by Patuakhali (38.30%) Comilla (12.90%) and Narayangonj (4.03%). Actually as Comilla and Narayangonj are very near to capital city, the two-villages have better opportunity of contacting with export firm for both producing and selling their diversified crops as a result of which intensity of problems regarding selling to government institution/agent association interms of farmers opinion is less than that of Patuakhali and Rangpur. Because of localizational constraint, Patuakhali & Rangpur villages is faraway from the capital city and opportunities of contacting with export firm for selling their produces is less than that

of Comilla and Narayangonj. Thus farmers opinions regarding the problems of selling to government institution/government agent/ other association is higher in Rangur & Patuakhali. However, incase of problem of processing, it is also observed from the table – 72 that problem of processing is observed equally in Comilla (33.93%), and Narayangonj (33.93%). But it is less in Rangpur (15.58%) and Patuakhali (16.67%). The variation of the perceived problem may be due variation of facilities of processing available to respective study villages.

However, if cumulative picture of marketing infrastructure problem is analyzed from weighted arithmetic mean, it is observed that it is highest in Comilla (Xw = 139) followed by Narayangonj (Xw=101.83) Patuakhali (Xw = 98.33) and Rangpur (Xw=78.33). The reason behind such findings might be due to the fact that Comilla village is more diversified and commercialized in production. A though there have opportunities of some transportation or storage facilities, non-government purchase centre, contact-farmings, export opportunities, or processing facilities, but these facilities might not be adequate for encouraging commercial production of diversified crops thus the problem of marketing infrastructure is highest in Comilla which is found from the value of the weighted arithmetic mean. On the other hand, weighted arithmetic mean is the lowest in Rangpur (Xw=78.33). The reason behind such a lowest intensity of the value of weighted arithmetic mean is due to the fact that although Rangpur village is more diversified but it is commercialized with few specific products. Thus the intensity of the problems regarding marketing infrastructure cumulatively less in the study village. The moderate weighted average of marketing infrastructure problem is in Narayangonj (Xw=101.83) and Patuakhali (Xw=98.33) indicates the lower cumulative impact of the problems regarding

marketing infrastructure in the respective study areas like Patuakhali and Narayangonj due to facilities available in the respective areas.

11.2.3 Overall Agricultural Marketing Problems Interms of Importance

If overall agricultural marketing problems are analyzed in a comprehensive view, it is observed that important agricultural marketing problems are : inadequate initiative of planned production and export of diversified crops, not getting fair price or reasonable price at harvesting period; bargaining with market participants for better price, inadequate marketing infrastructure like transportation, storage and processing centres, in-effective marketing system, lack of organized farmers association, in-adequacy of bank loan for production and marketing, in availability of marketing institutions between village and town, inadequate government institutions or other agencies for marketing diversified crops are the prominent. Among these problems, three important agricultural marketing problems as ranked by the researcher are : Inadequate initiative of planned production and export of diversified crops as the first problem; poor infrastructure of marketing as the second prioritize problem of agricultural marketing and inadequate government initiative for marketing diversified crops as the third agricultural marketing problem. To observe the strength of the mentioned three ranked problems, farmers opinions are observed in different study areas which can be seen from the following table – 73.

Table – 73: Agricultural Marketing Problems Interms of Importance in different Study Areas

Categories of Problems	Comilla	Rangpur	Patuakhali	Narayan-gonj	All
Inadequate initiative of planned production and export of diversified crops (first problem)	134 (26.22)	95 (18.59)	129 (25.24)	153 (29.94)	511 (100.0)
Poor infrastructure of marketing regarding communication, storage and processing (2nd problem)	110 (40.44)	82 (30.15)	65 (23.90)	15 (5.51)	272 (100.0)
Inadequate government initiative for marketing diversified crops (3rd problem)	84 (33.87)	34 (13.71)	53 (21.37)	77 (31.05)	248 (100.0)

Note : Number of respondents is 1031 and the farmers ranked their opinions specifically on one of the specific problems.

From table-73, it is observed that inadequate initiative for planned production and export of diversified crops is the highest in Narayangonj (29.94) followed by Comilla (26.22%), Patuakhali (25.24%) and Rangpur (18.59%). Actually this problem of agricultural marketing is observed as the most prioritize problem in all the study villages although there is some initiative of planned production and export in Comilla village by export association and non-government organizations like BRAC but such kind of planned production and export is very much essential to raise the productivity and marketing opportunities in all the study villages. Incase of second prioritize problem of agricultural marketing like facilities of communication, storage and processing, highest opinions are obtained from Comilla (40.44%), followed by

Rangpur (30.15%), Patuakhali (23.90%) and Narayangonj (5.51%). As Comilla and Rangpur are more diversified, the opportunities of communication network, processing and storage facilities are more essential than that of Patuakhali and Narayangonj as these two villages are less diversified.

Finally government initiative like government purchase centre, govt. cooperative marketing organization is very much essential to augment diversified agriculture its production and marketing. The study findings indicate that 33.87% of the households in Comilla opined that there is lack of government initiative for marketing diversified crops followed by Narayangonj (31.05%), Patuakhali (21.37%), and Rangpur (13.71%). The variation of responses on opinions of government initiative is due to variation of facilities available in the respective areas under study.

From the above analysis, it is observed that intensity of agricultural marketing problems differ according to intensity of production of diversified crops in the four study areas. But if these problems can be solved properly, diversified agriculture is survey be uplifted in the respective study areas and thus rural agricultural economy will be developed gradually.

11.3 Solutions of the Agricultural Marketing Problems Regarding Diversified Agriculture

In this section, how agricultural marketing problems can be solved is analyzed in two ways. Firstly by establishing linkage intuitions in the village level. Secondly by taking opinions regarding what should be government initiatives in the grass root level to solve the agricultural marketing problems. Now these two solutions are discussed separately.

11.3.1 Linkage Institutions to be Formed at Study Areas for Diversified Crops

To solve the problems of agricultural marketing of diversified crops linkage institutions should be established in grass root level. To obtain opinions of the study households on linkage institutions, forms of linkage institutions were classified into four categories. These are (a) contract farming and joint cultivation system, (b) sell of produces through government contact / agents, (c) establishment of credit organisation at village level, (d) establishment of marketing organisations at village level. However to observe the opinions of the study households regarding linkage institutions both averages and weighted arithmetic mean was calculated to observe the intensity of linkage institutions at the grass root level. To calculate the weighted arithmetic mean the following method is used.

$$X_w = \frac{\Sigma WX}{\Sigma W}$$

$$= \frac{\Sigma(W_1X_1 + W_2X_2 + W_3X_3 + W_4X_4)}{W_1 + W_2 + W_3 + W_4)}$$

Where, X_w = Weighted arithmetic mean of linkage institution

X1 = contact farming and joint cultivation system

X2 = Sell of produces through govt. contact/agents/association

X3 = Establishment of credit organisations at village level

X4 = Establishment of marketing organisations at village level

W1 = 4 (weight attached to first variable)

W2 = 3 (weight attached to 2nd variable)

W3 = 2 (weight attached to 3rd variable)

W4 = 1 (weight attached to 4th variable)

However, the averages and weighted arithmetic mean of opinions of farmers regarding linkage institution at grass root is given below :

Table – 74 : Linkage Institutions to be formed at Grass-root Level for Diversified Crops

Forms of Linkage Institutions	Comilla	Rangpur	Patuakhali	Narayangonj	All
Contact farming and joint cultivation system	37 (10.16)	109 (29.94)	109 (29.94)	109 (29.94)	364 (100.0)
Selling of produces through govt. contact/ agent	151 (52.06)	58 (20.00)	51 (17.58)	30 (10.34)	290 (100.0)
Establishment of credit organisations at village level	114 (53.27)	22 (10.28)	30 (14.09)	48 (22.43)	214 (100.0)
Establishment of marketing organisations at village level	26 (15.95)	22 (13.50)	57 (34.97)	58 (35.58)	163 (100.0)
Weighted arithmetic mean	85.5	67.60	70.6	68.0	329.40

Note : Total number of respondent is 1031. Respondents response on one specific variable.

However, if average opinions on individual form of linkage institutions is analyzed, it is observed that contact farming and joint cultivation system is equally given importance by the farmers of Rangpur (29.94%), Patuakhali (29.94%), Narayangonj (29.94%) except Comilla (10.16%). The reason behind such findings is that farmers of Comilla are very progressive and due to the impact of privatization, individual farming is very much prominent in Chandina village because of higher profit of diversified crops. Regarding purchase of produces through government purchase centre/association/agent is observed dominantly in Comilla (52.06%) followed by Rangpur (20.00%), Patuakhali (17.58%) and Narayangonj (10.34%). The reason

behind such a higher intensity of observation in Comilla and Rangpur is due to the higher diversification of the respective areas where farmers expect to sell their produces directly to government agent for ensuring higher price. The other two areas like Patuakhali and Narayangonj is less diversified and intensity and volume of production of diversified crops is less, as a result of which problem of selling through govt. contact / agent/ association is percieved to be less in these two areas. Regarding establishment of credit organizations at village level is observed to be highest in Comilla (53.27%) followed by Narayangonj (22.43%), Patuakhali (14.09%) and Rangpur (10.28%) whereas establishment of marketing organizations at village level is observed to be highest in Narayangonj (35.58%), followed by Patuakhali (34.99%), Comilla (15.95%) and Rangpur (13.50%). The reason behind such observation in the specific two variable like credit and marketing organisations is due to the lack of the specific opportunities available in the specific areas. In Comilla, although there is credit cooperative organizations but there is no credit cooperative organizations in the study village of Comilla while in other areas there also needs for credit cooperatives, which has been also reflected from the opinions of the farmers in the respective study areas. However due to absence of marketing organizations at study villages, importance of marketing organizations has also been given as a priority linkage institutions to be observed by the opinions of the farmers of the respective study areas.

However, if we observe the comparative necessity of linkage institutions to be formed at village level in four study areas it is also observed from the weighted arithmetic mean that Comilla villagers have the highest importance on linkage institutions (Xw=85.5) followed by Patuakhali (Xw=70.6), Narayangonj (Xw=68.0), and Rangpur Xw=67.6). The importance of linkage institutions varies due to variation in diversification, volume of production, and present availability of opportunities of

contact and joint farming, availability of govt. purchase centres / association, opportunities of government contact/agent and also opportunities of credit and marketing organisations.

11.4 Necessary Government Initiatives to Improve Diversified Agriculture and Agricultural Marketing Opportunities in the Grass-root Level

Development of agricultural marketing opportunities is very much essential for overall development of diversified agriculture in rural Bangladesh. However to overcome the problem of agricultural marketing to have a better opportunity in crop diversification, the following government initiatives are observed categorically in different five aspects. Study farmers opined differently in these five aspects which are summarized below :

11.4.1 Continuation of Crop-Diversification Programme (CDP) at Grass Root Level

Continuation of crop-diversification programme is very much importantly observed by the farmers of different study areas. Through this programme farmers at grass-root level have the opportunity to get government support, services and intelligence for developing their agriculture. However, in the study areas farmers opined in favour of such govt. effort differently. Of the total 1031 farmers, 266 (25.80%) responded regarding continuation of CDP Programme. Of the 266 farmers, 42.85% of the respondent farmers from Comilla village opined that the crop diversification programme should be continued for the betterment of diversified agriculture. Farmers of other areas like Narayangonj (29.70%) Patuakhali (19.92%) and Rangpur (7.51%) also mentioned that this programme should be continued by the present government in their respective study areas.

Table – 75 : Necessary Govt. Initiative for Diversified Agriculture through Agricultural Marketing In Study Areas

Necessary Govt. Initiatives	Comilla	Rangpur	Patuakhali	Narayan-gonj	All
Continuation of CDP in the Study Areas	114 (42.85)	20 (7.51)	53 (19.92)	79 (29.70)	266 (100.0)
Supply of fertilizers and insecticides at fair price	151 (45.07)	97 (28.95)	57 (17.01)	30 (8.96)	335 (100.0)
Supply of quality seed at the time of production	26 (13.68)	60 (31.58)	56 (29.47)	48 (25.26)	190 (100.0)
Providing irrigation facilities	11 (8.33)	12 (0.09)	51 (38.64)	58 (43.94)	132 (100.0)
More monitoring by block supervisors	26 (24.07)	22 (20.37)	30 (27.78)	30 (27.78)	108 (100.0)

Note : Total number of respondent is 1031. Farmers gave their response in one specific variable.

11.4.2 Supply of Fertilizers and Insecticides at Fair Price :

For the development of diversified agriculture, supply of fertilizers and insecticides is an important agricultural marketing aspect to be observed by the respondent farmers in different study areas. Of the total 1031 respondent, 335 (32.49%) of the respondent opined in this aspect. However among the 335 respondents, 45.07% of respondents who are from Comilla village observed that proper supply of fertilizer, and insecticides at fair price should be ensured by the government for the development of diversified agriculture as well as proper agricultural marketing initiative at the grass-root level. The respondent of other areas also opined in this aspect positively which is interms of importance of response in different study areas are 28.95% in Rangpur, 17.01% in Patuakhali and 8.96% in Narayangonj.

11.4.3 Supply of Quality Seeds at the Time of Production

Another aspect of agricultural marketing for augmenting diversified agriculture in the rural areas of Bangladesh is the timely supply of quality seeds for the farmers at grass-root level. Of the total 1031 household farmers 190 (18.42%) opined in this aspect.

However, out of 190 respondents highest percentage of respondents are observed in Rangpur (31.58%), followed by Patuakhali (29.47%), Narayangonj (25.26 %)and Comilla (13.68%).

11.4.4 Providing Irrigation Facilities for Development of Diversified Agriculture

Irrigation facilities is one of the agricultural input which is very much necessary for development of diversified agriculture. It is also an aspect of agricultural marketing which can accelerate agricultural development in grass-root level. However of 1031 respondent, 132 (12.80%) respondent opined in this aspect. Of the total 132 respondent, highest percentage of respondents is from Narayangonj (43.94%) followed by Patuakhali (38.64%), Rangpur (9.09%) and Comilla (8.33%). As Narayangonj and Patuakhali is low lying in agro-ecological pattern, irrigation facilities is less there. So the respondent farmers opined prominently in Patuakhali and Narayangonj to provide irrigation facilities for their areas to develop diversified agriculture. Comilla and Rangpur are more diversified and also proper irrigation facilities are also available there, so the intensity of percentage is less there. But for the overall development of diversified agriculture through proper initiative of agricultural marketing supply of such inputs like irrigation facilities also should be given importance by the government as it has been reflected by the opinions of the respondent households.

11.4.5 Ensuring More Monitoring by Block Supervisors

Finally ensuring more monitoring by the block supervisors is also an important aspect observed by the farmers of different study areas to develop diversified agriculture. Of the total 1031 respondent 108 (10.74%) opined that monitoring of the block-supervisors should be ensured for the overall development of diversified agriculture. On the other hand, of the total 108 respondents, highest proportion of respondents of Patuakhali (27.78%) and Narayangonj (27.78%) are observed to be opined equally for

more monitoring of block supervisors for the development of diversified agriculture as a matter of fact that government initiative of agricultural extensions is less in these two areas. However in Comilla (24.07%) and Rangpur (20.37%), farmers also have given their importance for more monitoring of block supervisor for a better development of diversified agriculture in the respective study areas.

11.5 Conclusion :

In the conclusion, it can be said that problems of agricultural marketing are also diversified and varied in different study villages of Comilla, Rangpur, Patuakhali and Narayangonj, which is observed from the arithmetic mean and weighted arithmetic mean of opinions of the study households. At the same time, means and ways to solve these problems from farmer's point of view are also discussed to improve diversified agriculture and to solve agricultural marketing problems. If the above mentioned agricultural marketing problems can be solved through the suggested measures given by the farmers, it can surely be said that diversified agriculture will be enhanced in a reasonable extent in all the study areas of Bangladesh.

Chapter XII

Test of Research Hypothesis

12.1 Introduction :

In order to draw inference based on factual data as well as relationship of quantitative variables, test of hypothesis is a very effective and useful means. In the present study, hypothesises have been formulated reviewing the findings of different studies as well as field level observations. For testing the hypothesis, quantitative measurement of field level data, co-relation-coefficient, multiple-regression and chi-square test have been performed in the respective chapters.

12.2 Test o Research Hypothesis Based on Findings :

In this section, important findings related to assumed research hypotheses have been summarized and described in order to make conclusions whether assumed research hypotheses could be accepted or not. A summary of findings against the research hypotheses is presented in the following Table 76

Table –76 : Test of Research Hypothesis

Research Hypotheses	Relevant Findings	Conclusion
i) Diversified agriculture is better than that of rice cultivation interms of yield per acre and interms of profit per acre by categories of farmers	• Yield per acre of diversified crops like potato,& bitter-gourd, are imuch more higher than all categories of rice crops. • Both gross and net return per acre of diversified crops like potato, bitter gourd, & chilly, are much more higher than all categories of rice-crops. • Benefit cost ratio also indicates that diversified crops like potato, bitter gourd, &, chilly are more profitable than all categories of	The hypothesis may be accepted.

Research Hypotheses	Relevant Findings	Conclusion
	rice crops.	
ii) Diversified crops production is more helpful for small farmers than large and medium farmers interms of yield, and net return net return.	• Yield of all the selected diversified crops like potato, bitter gourd, chilly, lentil, kheshari are more incase of small farmers than medium and large farmers. • Net return incase of all the diversified crops is higher incase of small farmers than medium and large farmers. • Benefit cost ratio of the selected diversified crops is also higher incase of small farmers than medium and large farmers.	The findings of the study support the hypothesis.
iii) Diversified crops production is helpful for changing consumption pattern and reducing poverty of the farmers under study.	• Livelihood status interms of average calorie- intake of the study households is very near to the national average calorie consumption conducted by household expenditure survey 2000. • Livelihood status interms incidence of both absolute and hard core poverty is found to be slightly less in all the study areas like Comilla, Rangpur, Patuakhali and Narayangonj than the national average of poverty status conducted by both 1995-96 and 2000-01 Household Expenditure Survey. • The correlation between total as well as individual food consumption and socio economic variables indicates that there is	The hypothesis may be accepted.

Research Hypotheses	Relevant Findings	Conclusion
	positive and significant correlation between these two correlated variables. The multiple regression states that socio-economic variables has positive impact of food consumption that is households food consumption can be increased to some extent significantly with the contribution of socio-economic variables.	
iv. Diversified agriculture can be promoted through the contribution of socio-economic variables.	• Diversified agriculture in the crop sector is measured interms of crop-frequency. The findings indicates that there is a significant & positive trend of relationship between crop frequency and socio-economic variables like family size, household head, education of family head, operational holding, ownership of land, and income from agriculture incase of group data which has been reflected from the value of chi-square and also from the graphical representation. • Incase of non-group data there also reflects positive and significant correlation between crop frequency and socio-economic variables. • Family size has a positive correlation with crop frequency at one percent level of significance observed by correlation analysis. • Multiple regression analysis also states that if per unit of family size is increased by 1(one) percent,	The hypothesis may be accepted.

Research Hypotheses	Relevant Findings	Conclusion
	there is a probability of increasing crop frequency by 0.15 percent. • Age of household head is positively and significantly correlated with crop frequency. The relationship is also supported by the multiple regression analysis. • Education of household head is positively correlated with crop frequency which is significant at 5 percent level of probability. Multiple regression analysis states that if per unit of education of household head is increased by one percent there is a probability of increasing crop-frequency by 0.05 percent. • Operational holding has a positive correlation with crop-frequency which is significant at one percent level of probability. Multiple regression analysis states that if per unit of operational holding is increased by one percent, crop frequency can be raised by 0.16 percent. • Income from agriculture has also a positive correlation with crop-frequency which is significant at one percent level of probability. Multiple regression states that if per unit of income from agriculture is increased by one percent, crop frequency can be increased by 0.19 percent.	

Research Hypotheses	Relevant Findings	Conclusion
v) Diversified agriculture can not be uplifted sufficiently due to marketing problems in the study areas.	• Marketing problems are observed from different view points. Respondents opinions were pooled on the basis of averages and weighted averages. The relevant findings indicates that marketing problem deprived regarding price deprivation in the primary markets is acute in all the study areas. Farmers are for getting fair price due to bargaining with market participants and also due to capacity of determining profitable price which is also more or less acute in all the study areas. • Oversupply of diversified crops during peak season is another important marketing problem which is also observed significantly in all the study areas. Due to over supply, farmers of the study areas were found to sell their produces at as usual price, less than prevailing market price, and keep the produces unsell or wastage. The frequency of opinions of the study households in favour of over supply problems also perceived acutely in all the study areas. • Marketing problems regarding marketing infrastructure were also observed dominantly in all the study areas. Marketing infrastructure problems were perceived from the view point of	The findings of the households opinion in the study areas support the hypothesis.

Research Hypotheses	Relevant Findings	Conclusion
	categorical problems like problems of transportation and storage; problems of selling to government institution or government agent or association, and problems of processing. The categorical problems also found acutely from the opinions of study households in all the study areas. • Overall marketing problems were also observed through respondent's opinion. Respondent ranked three important problems in order of importance from different sub-problems. These are : Inadequate initiative of planned production and export of diversified crops as the first problem; poor infrastructure of marketing regarding communication, storage and processing as the second problem and inadequate government initiative for marketing diversified crops as the third problem. The intensity of these problems also observed variedly in different study areas. The mentioned marketing problems are viewed by respondent households as major obstacles of diversification as a result of which crop agriculture could not be promoted sufficiently.	
vi) Establishment of more linkage institutions is necessary	• Forms of linkage institutions like contact farming and joint	The findings of the household's

Research Hypotheses	Relevant Findings	Conclusion
for promoting diversified agriculture.	cultivation system, selling of produces through government contact or agents, establishment of credit organisations at village level, and establishment of marketing organisations or marketing cooperatives at village level also perceived by respondent's opinion. The study households demanded to form these four forms of linkage institutions for promoting production and marketing of diversified crops in their respective areas although respondent's opinion for establishing individual linking institution varies in the four respective study areas.	opinions support the hypothesis.

In the first hypothesis, it is argued that diversified agriculture is better than rice crops interms of yield and profit by categories of farmers. The findings of the table – 30 (Chapter – 7) on cost and return analysis of selected diversified crops proofs the hypothesis. The findings of the table indicates that yield of potato & bitter gourd, is much more higher than all rice crops by all categories of farmers although some crops like kheshari, lentil, mustard and chilly has lower yield. Yield of potato,& bitter gourd was 193,&193 respectively while yield of Aus (Local) Aus (HYV), Amon (Local) Amon (HYV), Boro (Local) and Boro (HYV) were 26, 39, 23, 40, 24 and 42 respectively. Gross return for potato,& bitter gourd and chilly were Tk. 38600, 38600, & 18000 respectively while gross return for Aus (Local), Aus (HYV), Amon (Local) Amon (HYV), Boro (Local) and Boro (HYV) were Tk. 7280, Tk.11775, Tk.7280, Tk.12640, Tk.7520 and Tk.13280 respectively. Net return for potato, bitter gourd, & chilly were Tk. 25234.50, Tk.22005, and Tk. 13364.45 respectively while net return for Aus

(Local), Aus (HYV), Amon (Local), Amon (HYV), Boro (Local) and Boro (HYV) were Tk. 1319.38, Tk.3943.87, Tk.2515.06, Tk.4982.70, Tk.2163.88, and Tk. 5432.19 respectively. The benefit cost ratio for all crops indicates that benefit cost ratio interms of net return for potato, bitter gourd, and Chilly were 1.88, 4.03, & 2.86 respectively while incase of rice crops it was 0.22, 0.50, 0.52, 0.65, 0.40, 0.69 respectively (Chapter 7, Table 32). Thus the findings supports that diversified crops are much more better than rice crops interms of yield per acre, gross and net return incase of all categories of farmers and thus confirm the first hypothesis.

The second hypothesis states that small farmers are more benefited from diversified crops cultivation than medium and large farmers interms of yield, gross and net return. The findings of the table 30 (Chapter 7) reflects that yield of selected diversified crops like potato, bitter gourd, chilly, lentil, kheshari and mustard incase of small farmer were 200, 200, 16, 10, 10 and 10 respectively while incase large farmers. Yield of potato, bitter gourd, chilly, lentil, kheshari, and mustard were 185, 180, 14, 8, 8 & 8 respectively which is very close to the average yield obtained by the medium farmers. Net return incase of small farmers for potato, bitter gourd, chilly, lentil, khashari and mustard were Tk. 27437.50, Tk.32913.00, Tk.15045.00, Tk.5650.00, Tk.4475.00 and Tk. 3110.00 respectively while incase of medium II farmers it was Tk.25900.00, Tk.32629.67, Tk.13542.00, Tk.5556.00, Tk.4175.00 and Tk. 2835.00 respectively. In case of large farmers net return for potato, bitter gourd, chilly, lentil, kheshari, and mustard was Tk. 22700.00, Tk.28079.16, Tk.11700.00, Tk.3600.00, Tk.2335.00 and Tk. 1437.50 respectively which are much less than that of small farmers. Benefit cost ratio interms of net return incase of small farmers for potato, bitter gourd, chilly, lentil, khashari and mustard was 2.18, 4.64, 3.62, 2.40, 2.20 and 0.91 respectively while incase of large farmers in case of potato, bitter gourd, chilly, lentil, khashari and mustard was 1.58, 3.54, 0.69, 1.28, 0.80 and 0.38 respectively (Chapter 7, table 31) which confirms that small farmers were more benefited incase of diversified crop-cultivation than those of other

The correlation between socio-economic variables like family size, education of household head, education of mother, age of household head number of earning member, operational holding, income from agriculture, income from other sources and net yearly income etc with total as well as individual food consumption states that there is positive correlation among these two sets of variables which are significant both 1% and 5% level of significance (Chapter 9, table -52). The regression analysis between total food consumption and socio economic variables like family size, age of household head, operational holding, net yearly income, income from agriculture, yearly expenditure states that if number of family members per unit is increased by 1% there is a probability to increase consumption of households by 0.526%. If net yearly income is increased by 1%, there is a probability to increase consumption of households by 0.085%. If yearly expenditure is increased by 1%, there is a probability of increasing family consumption by 0.147%. If income from agriculture is increased by 1% there is a probability of increasing family consumption by 0.007% (Chapter 9, table -53). Thus the findings indicate that consumption pattern of the household can also be changed through the positive contribution of selected socio economic variables thus the mentioned findings support the hypothesis. Thus the findings support the hypothesis three.

The fourth hypothesis is that diversified agriculture can be promoted through the contribution of socio-economic variables like family size, education of household head, age of household head, ownership of land, operational holding, and income from agriculture. Diversified agriculture in the crop sector can be defined in terms of crop frequency. Crop frequency indicates summation of all crops produced by a farmer in different farms during a specific period of time generally one year. The findings of the study (Chapter X Table –55-67), indicates that there is a positive trend of relationship between crop frequency and selected socio-economic variables which is statistically significant observed both from non-

group and grouped cross tabulation between crop frequency and socio-economic variables. The judgment is also perceived from the value of chi-square and also from the graphical representation. However incase of non-group data there also reflects positive and significant correlation between crop frequency and socio-economic variables . The table-68 indicates that there is positive correlation between family size and crop frequency. The relationship is significant at one percent level of significance which states that family size can contribute to higher crop frequency. The multiple regression analysis (Chapter X, Table -69) also states that if per unit of family size is increased by 1 (one) percent, there is a probability of increasing crop frequency by 0.15 percent. Age of household head is also positively correlated at 1 (one) percent level of probability which also states that age or experience of family head in the field of agriculture can contribute positively in raising crop frequency. The regression analysis also observes that if per unit of age of household head is increased by 1 (one) percent, there is a probability of increasing crop frequency by 0.02 percent. Education of household head is also positively correlated with crop frequency at 5 percent level of significance which indicates that higher education of the household head can contribute more in raising crop frequency in the field of crop sector. The regression analysis also supports that if per unit of education of household head is increased by one percent, crop frequency can be increased by 0.05 percent. Operational holding has also positive correlation with crop frequency which is reflected to be significant at 1(one) percent level of probability which also states that enough cultivable land can contribute positively in raising crop production. The findings of regression analysis also states that if per unit of operational holding is increased by 1 (one) percent, there is a probability of raising crop-frequency by 0.16 percent. Finally income from agriculture also shows a significant and positive relationship with crop frequency which also states that agricultural income can contribute positively in crop agriculture. The multiple regression analysis also supports the results which states that if income of agriculture can be increased by 1 (one) percent per unit, crop frequency can be raised by 0.19 percent. Thus the hypothesis is

proofed from the findings that diversified agriculture can be promoted through the contribution of socio-economic variables. So the fourth hypothesis may be accepted.

The fifth hypothesis states that diversified agriculture can not be uplifted sufficiently due to marketing problems in the study areas. The findings of Chapter XI indicates the intensity of marketing problems from the opinions of the study households. The intensity of marketing problems is measured by taking means and weighted arithmetic means of the respondent households. However the intensity of opinions of marketing problems regarding price deprivation in primary market (Table - 70), oversupply problems of diversified crops during peak season (Table -71) problems of marketing infrastructure (Table-72) and overall marketing problems interms of importance (Table - 73) are observed acutely in all the study areas. Although all these marketing problems are very much acute in all the study areas like Comilla, Rangpur, Narayangonj and Patuakhali, but due to lack of opportunities of marketing diversified crops, marketing problems are observed very much intensively in Comilla from the weighted average mean (Price deprivation problem $x_w = 179$, over-supply problem during peak season $x_w = 113.50$, problem of marketing infrastructure $x_w = 139$). However, the categorical problems of marketing are also observed intensity and acutely in all the study areas. Thus the findings regarding marketing problems support the statement of hypothesis five (v).

Finally the hypothesis VI states that more linkage institutions is necessary for promoting diversified agriculture. The findings of table – 74 (Chapter -11) states that four forms of linkage organisations should be established for the development of diversified agriculture as opined by the respondent households. First form of linkage organisation as demandable by the respondent household is the introduction of contact farming and joint cultivation system. The second form of linkage organisation is selling of produces through government contact or agent. The third form of linkage organisation is the establishment of

credit organisation at village level and the fourth form of linkage organisation is the establishment of marketing organisation like cooperative marketing organisation at village level. Although opinions varied in individual linkage organisations, but cumulatively it was suggested most prominently in Comilla village (x_w = 85.5) followed by Patuakhali (x_w = 70.6), Narayangonj (x_w = 68.0) and Rangpur (x_w = 67.60). Thus the findings is indicative that linkage organisations can accelerate diversified agriculture and support the statement of the hypothesis VI.

Chapter XIII

Discussions on Findings of the Study

13.1 Introduction

Scarcity of land is a common phenomenon of Bangladesh agriculture. Land is degrading and fragmenting day by day because of tremendous population pressure and scope of bringing more lands for food production remains acute in rural Bangladesh. More ever, there has been observed gradual decline of cultivable land for agriculture. Because of subsistence economy, mono crop particularly rice cultivation has become a tradition. Although in recent years, Bangladesh has become self sufficient in rice cultivation, but it is still far away from required production and consumption of diversified crops like pulses, oilseeds, vegetables, and other peripheral crops which are the main source of nutrition. So researchers and policy planners emphasized that only rice cultivation can not able to bring positive change in the structure of the agricultural economy and the best alternative to uphold and modernize the agricultural economy is to diversify the crop sector interms of yield as well as products.

However, over the past two or three decades a volume of researches have been conducted on the field of diversified agriculture which suggests that crop diversification is a better alternative to improve the agricultural economy of the farming households by shifting the cultivation practices from single crop to multiple crops, changing the cropping pattern, uplifting the crop productivity of per unit of land, and creating the marketing opportunities at the grass roots level. But there were a very few studies which acknowledged that diversification in the crop sector can help the farmers in uplifting the socio-economic condition as well as poverty of the rural households.

In Bangladesh, poverty is recognized as a dynamic phenomenon in the rural society. Still a significant proportion of the rural people are living in both absolute and hard core poverty. Gradual reduction of poverty may occur through a number of path ways. Now both government and non-government organisations are promoting agriculture with greater emphasize on crop diversification as an effective means of poverty reduction. It is assumed by the researchers that diversification in the crop sector can directly benefit the rural poor through improving the socio economic condition of the rural poor by offering better market facilities and incentive price to the farmers. In search of this pertinent issues on crop diversification and poverty, research questions arise : to what extent diversified agriculture in the crop sector has benefited the rural poor so far profitability and consumption of diversified crops is concerned; to what extent diversified agriculture is acceptable so far cost and return of diversified crops is concerned; to what extent diversified agriculture can be promoted so far socio-economic variables is concerned; to what extent diversified agriculture is helping the rural households in case of reducing poverty through consuming diversified nutritional crops; and finally to what extent diversified agriculture is acceptable so far possible forward and backward linkage institutions, incentive price to the farmers and other marketing opportunities are concerned. In search of solution of these basic research questions the present study on "Impact of Diversified agriculture on the socio-economic upliftment of the rural people of Bangladesh" has been undertaken in four villages under four districts of Bangladesh in order to make an elaborate assessment on the objective about to what extent diversified agriculture is contributing the rural economy as well as to eradicate poverty of the rural people under four villages of Bangladesh.

13.2 Discussions on the Findings of the Study

Four specific districts namely Comilla, Rangpur, Patuakhali and Narayangonj have been selected purposively based on different agro-ecological zone and land category for final selection of diversified zone. The district Comilla was taken from Middle Meghna River Flood Plain (Region 16) agro – ecological zone, district Rangpur was taken from Northern Eastern Brained Tract agro-ecological zone (Region – 27), district Patuakhali was taken from Ganges Tidal Flood plain agro-ecological zone (Region 13), ad district Narayangonj was taken from Arial bill agro-ecological zone (Region 15). Based on land category, Rangpur was taken as high land category, Comilla was taken as medium high land category, Narayangonj was taken as low-land category and Patuakhali was taken as very low land category. The studied four villages were selected purposively on the basis of intensity of diversification in crop-agriculture. The specific four villages were namely village Srimantapur under Chandina Upazilla of Comilla district, village Jadabpur under Mithapukur Upazilla of Rangpur district, village Sammanthe under Sonargaon Upazilla of Narayangonj district and village Dhaukhali under Patuakhali Sadar Upazila of Patuakhali district. Village Srimantapur under Chandina Upazila and village Jadabpur under Mithapukur Upazilla were selected as more diversified village while village Sammanthe under Sonargaon Upazilla and village Daukhali under Patuakhali Sadar Upazila were taken as less diversified village depending up on commercial cultivation of diversified crops. A respondent was considered for the study as a household head who cultivate land for agriculture. The share-croppers and other marginal farmers were also considered as respondent household as they cultivate others land for their livelihood. Thus all the four villages were taken under full enumeration for the study. A total of 1031 farming household were finally enumerated as respondent for the study. The farmers in the study areas like Comilla, Rangpur, Patuakhali and Narayangonj were classified on the basis of ownership of land like (0.05-2.49) acre as small farmer, (2.50-4.99) acre as medium 1 farmer,

(5.00-7.49 acre) as medium II farmer and 7.50 acre ad above as large farmer. The study was carried out during the period of January 2004 to June 2004. The reference period of the study was from January 2003 to December 2003. Data were collected through pre-tested structured questionnaire. Field observations were also used to supplement the findings of the study. Thus the study was both an empirical as well as descriptive study.

The findings regarding socio-economic and demographic variables in the four study areas like Comilla, Rangpur, Patuakhali and Narayangonj observes family size, educational status of the household head, age structure of the household head, occupational status of the household head, and yearly income of the households. The findings indicate that highest family size observed in narayangonj (5.84) followed by Comilla (5.69), Patuakhali (5.37) and Rangpur (4.33) and Narayangonj (5.68) which indicates the economic pressure on respective families of the different study villages. Regarding educational status of the household head, the findings indicate that most of household heads education belong to primary level (57.52%) followed by class VI – X (26.58%). A significant number of household head (9.74%) are illiterate and the rest 6.11% had education from secondary to graduation level. The average years of schooling is the highest in Comilla which is 5.09, followed by Patuakhali (4.90), Narayangonj (4.54) and Rangpur (4.12). The findings remarks that as education develops individual skills and knowledge's for maximum utilization of resources in agriculture, there is a scope of providing education to the illiterate households head to make them literate for better performing in the agricultural sector. Regarding the age structure of the household head, the findings indicate that highest proportion (71.74%) of the household head belongs to the age group (40 and above) while the vest 28.26% belongs to the age group below 40. Proportion of household head in (40 and above) age group in Comilla is 71.34% Rangpur is 63.50%, Patuakhali is 80.16% and Narayangonj is 71.02% which reflects that majority of the household head are very matured, skilled and active in their economic and

social life. The age group below 29 and (30-39) combined is the highest in Rangpur (36.49%) followed by Comilla (28.65%) Narayangonj (28.97%) and Patuakhali (19.83%) indicates that there is a tendency of entrance of households head in social and economic activities in the early stage of life. Regarding occupational status, the findings indicate that majority of the household head's occupation is agriculture (64.45%) followed by service (10.08%), wage earners (8.35%) NGO workers and others (8.35%) and small trade (6.69%) which indicates that still today farmers of rural Bangladesh depends mostly on agriculture as a prime source of income earning for maintaining their livelihood. Regarding yearly income, the findings indicate that most (50.4%) of the households yearly income belong to (Tk. 50,000 to 1,00,000), followed by Tk. less than 50,000 who are 28.2% of the total study households. About 13.6% of the households have yearly income of Tk. 1,00,001 to Tk. 1,50,000 and rest (7.8%) the households have yearly income more than Tk. 1,50,000. The study also indicates that average highest yearly income is observed in Comilla (Tk. 96195.43), followed by Patuakhali (Tk. 73,701.82), Narayangonj (Tk. 72,682.75) and Rangpur (Tk. 64029.77). The average yearly income variation in the four study areas is insignificant which indicates that all the study villages are more or less diversified and thus there is ample opportunity of income generation from diversified agriculture.

The study has made an attempt to find out the extent of diversification in twenty districts under four old divisions of Bangladesh during the past twenty years from 1980-81 to 1988-99. The periods of diversification were classified into three stages : (i) from 1980-81 to 1998-99 (ii) from 1980-81 to 1990-91 and (iii) from 1990-91 to 1998-99 to observe the periodical difference of extent of diversification in the respective twenty old districts of Bangladesh. Herfindhal index was calculated to find out the extent of diversification. The findings indicates that during the past twenty years of diversification, there was a positive trend of diversification in all the districts of Bangladesh. During the past ten years of

diversification from 1990 to 1998-98, 50% of the districts has positive trend of diversification while other 50% of the districts has negative trend of diversification. The negative impact of diversification was due to winding up of crop diversification programme from the grass root level, impact of structural adjustment policies in the name of withdrawal of subsidies for fertilizers, insecticides and irrigation equipments. The unplanned development and ignorance of government policies, higher price of fertilizer, impact of privatization of delivery system of agriculture inputs might be the causes of negative diversification in Bangladesh agriculture more specifically for the crop agriculture.

Land ownership pattern of the study areas indicates that per household ownership of land for large farmers (7.50 acre and above) is 10.74 acre followed by medium – II (5.00 acre – 7.49 acre) farmer which is 5.72 acre. Per acre ownership of land for medium – I (2.50-4.99 acre) and small farmer (0.05-2.49 acre) is 3.39 acre ad 0.97 acre respectively. However per acre operational holding for large farmer is 7.67 acre followed by medium – II farmer (5.78 acre), medium – I farmer (3.08 acre) and small farmer (1.09 acre) which indicates that although large farmers possessed highest per acre ownership of land, they operate less land compared to their ownership and generally use to shared out their lands to small and medium farmers for agricultural purposes. However, land utilization pattern of the indicates a discouraging picture for the improvement of diversified agriculture in the study areas. The study observed that still in the study areas major proportion (61.09%) of cultivable land is utilized for rice cultivation, cultivation of wheat (0.92%), potato (12.87%) oilseeds (10.28%), pulses (10.28%), vegetables (7.65%), Chilly, onion, garlic (3.52%) are next to rice in order of importance by different categories of farmers. Among the different categories of farmers, small farmer's contribution is the highest (64.58%) to the total land under utilization. Crop wise land utilization is also highest for small farmers where contribution of rice is 65.% wheat (50.32%), pulses (58.49%), oilseeds (71.61%), potato (69.83%), vegetables (79.15%), onion

garlic & chilly (71.88%) followed by medium and large farmers. The study thus remarks that there is still a possibility of more proportionate land for diversified crop cultivation by different categories of farmers for the sake of maximum utilization of land in the study areas.

The comparative cost and return analysis of diversified crops indicate that compare to rice almost all the crops are more or less profitable by categories of farmers which can be observed from the findings (Table –30). The findings reveals that small farmers who are the most prominent cultivators can earn more profit irrespective of crop cultivation than medium-I, medium II and large farmers because of higher labour involvement and indigenous knowledge practiced by the farmers in their cultivation than those of other farmers. The highest net return enjoyed by the small farmers in case of better gourd (Tk. 32913.00), potato (Tk. 27437.50), chilly (Tk. 15045), lentil (Tk. 5650.00), kheshari (Tk. 4475.00), HYV Boro (Tk. 4166.67), mustard (Tk. 3,110), local Amon (Tk. 3,257.75), HYV Aus (Tk. 3075), HYV Amon (Tk. 3020.50), local Boro (2667.50) and local Aus (Tk. 2015.00) respectively. The comparative picture of return on different crops can also be reflected from benefit cost ratio (BCR) analysis. Benefit cost ratio (BCR) signifies differently incase of different categories of farmers like small medium – I, medium – II and large farmers because of variation of cost incurred in the production process and variation in yield. But benefit cost ratio is observed to be the highest incase of small farmers among other farmers irrespective of all crops under measurement. Benefit cost ratio is the highest incase of small farmers for bitter gourd (4.64), Chilly (3.62), lentil (2.40), Kheshari (2.20), Potato (2.20), Mustard (0.91), Local Amon (0.74), HYV Boro (0,59), Local Boro (0.53), HYV Amon (0.43), HYV Aus (0.41), local Aus (0.36) among other farmers which indicates that small farmers are more benefited than other farmers like medium –I, medium – II and large farmers.

Diversified agriculture can be defined interms of crop-frequency. To measure how diversified agriculture is influenced by socio economic variables, statistical methods like

correlation, chi-square test, and multiple linear regression models are used. The findings indicate that there is a positive and significant correlation with crop frequency and socio economic variables. The cross tabulation incase of non group and group data between socio economic variables and crop frequency also indicates maximization of crop frequency with utilization of available socio-economic variables. The findings also remarks that there is a tendency of producing 5-6 crops by the contribution of available socio – economic resources like number of family members, age of household head, education of the household head, ownership of land, land under operation, and income from agriculture. The relationship is also observed to be justified from the value of chi-square, which is positive with probable level of significance. Incase of non-group data there also reflects strong positive and significant correlation between crop frequency and socio-economic variables. However, in the linear regression model where crop frequency was considered as dependent variable and socio-economic variables were considered as explanatory or independent variables also reflects a positive extent of relationship. That is explanatory variables have been contributing positively for the development of diversified agriculture interms of crop frequency which is confirmed from the value of co-efficient (Value of Beta), adjusted R-square and also from the value of F.

Consumption pattern is an indication of households livelihood. The findings of the consumption pattern of the study households indicate that average calorie-intake in the four study areas like Comilla, Rangpur, Narayangonj and Patuakhali are 2207.74 kcal, 2125.42 kcal, 2254.60 kcal, and 2274.47 kcal respectively which is above the poverty line calorie intake (<2122 kcal), although there is a significant proportion of poor lying below the poverty line both interms of absolute (<2122 kcal) and hard core (<1805 kcal) poverty. The findings indicate that interms of direct calorie-intake (DCI), method, among the four study areas like Comilla, Rangpur, Patuakhali and Narayangonj absolute poverty (<2122 kcal) is the highest in Narayangonj (39.6%) followed by Rangpur (34.5%), Patuakhali (34.3%) and Comilla

(32.7%) while hard core poverty (<1805 Kcal) is the highest in Narayangonj (15.9%) followed by Patuakhali (131%) Rangpur (11.8%) and Comilla (10.9%). The study indicates that on an average 35.79% of the population while living below absolute poverty about 12.7% are living below hard core poverty which is below than the national average conducted by the household expenditure survey (HES : 2000) indicating that poverty is less in the diversified study villages. The relationship between level of diversification and incidence of poverty indicates that poverty is less than the previous survey corresponding to individual strata of level of diversification.

The relationship between incidence of poverty and socio-economic variables like family size, age of household head, education of household head, & land ownership pattern indicates that both absolute and hard core poverty have a positive relationship with family size. Poverty has a inverse relationship with age of household heads & education of household head. Thus it indicates that poverty of the households increases with the increase of family size, while it decreases when education and age of the household head increases. Poverty has also inverse relationship with land ownership of the households which indicates that as land ownership increases poverty decreases and while land ownership decreases poverty increases. The relationship between level of diversification and incidence of poverty within the poverty stricken people indicates that from some extent of level of diversification it is inversely related with the poverty. That is if level of diversification increases poverty decrease with corresponding level of diversification.

The correlation between socio-economic variables like family size, education of household head, education of mother, age of household head number of earning member, operational holding, income from agriculture, income from other sources and net yearly income etc with total as well as individual food consumption states that there is positive correlation among these two sets of variables which are significant both 1% and 5% level of

significance. The regression analysis between total food consumption and socio economic variables like family size, age of household head, operational holding, net yearly income, income from agriculture, yearly expenditure states that if number of family members per unit is increased by 1% there is a probability to increase consumption of households by 0.526%. If net yearly income is increased by 1%, there is a probability to increase consumption of households by 0.085%. If yearly expenditure is increased by 1%, there is a probability of increasing family consumption by 0.147%. If income from agriculture is increased by 1% there is a probability of increasing family consumption by 0.007%. Thus the findings indicate that consumption pattern of the household can also be changed through the positive contribution of selected socio economic variables.

Regarding the existing problems of marketing, the study observes it from four points of view. These are problems regarding price deprivation, over supply problems of agricultural produces, problems of marketing infrastructure, and overall marketing problems. From these four categories of agricultural marketing problems, sub-problems of each of the main problems are also categorized and analyzed from farmer's opinions on the basis of both arithmetic and weighted arithmetic mean. The findings of the study indicates that price deprivation is the highest in Comilla (X_w=179) and lowest is in Rangpur (X_w=114.67) and it is equal in Patuakhali (X_w=131.33) and Narayangonj (X_w=131.33). The reason behind such findings may be due to over and less concentration of market participants in the primary markets & inadequate facilities of communication in primary markets with secondary and central markets. The findings also indicate that over supply problem is the highest in Comilla (X_w=113.50), followed by Narayangonj (X_w=101.67), Patuakhali (X_w=89.83) and Rangpur (X_w=76.17). The reason behind such result may be due to commercialization and specialization of diversified crop production in the respective study areas. Regarding the problem of marketing infrastructure, the present study also reflects that marketing

infrastructure problem is the highest in Comilla (X_w=139), followed by Narayangonj (X_w=101.83), Patuakhali (X_w=98.33) and Rangpur (X_w=78.33). The reason behind such findings may be due to availability of opportunities of transportation, storage facilities in availability of government agents/ associations to sell the produces directly from the farmers, and also due to the problems of processing as indicated by the cumulative opinions of the respective study villagers. Regarding overall marketing problems, the study households in order of importance rank three important marketing problems. These are inadequate initiative of planned production and export of diversified crops which was recognized by the study households as the first problem; poor infrastructure of marketing regarding communication, storage and processing was recognized as the second marketing problem and inadequate government initiatives for marketing diversified crops as recognized by the study households as the third marketing problem. The study households also suggested some ways and means to solve the marketing problems. These are establishment of linking institution at village level, like, introduction of contact farming and joint cultivation system, sell of produces through government contact or agents, or association, establishment of credit organizations at village level and finally establishment of marketing organisations like cooperative marketing associations at village level.

Chapter XIV

Conclusions and Policy Recommendations

14.1 Introduction

This chapter contains concluding remarks and policy suggestions. The study was carried out in four agro-ecological zones of Bangladesh like Comilla, Rangpur, Patuakhali, and Narayangonj. Each study location has specific and individual problems. By analyzing the problems and the findings the following conclusions and policy recommendations can be made for the overall development of diversified agriculture in the individual areas of Bangladesh.

14.2 Conclusions

1. Agricultural production system and cropping pattern in four different study areas are heterogeneous. In Comilla, because of land suitability, diversified crop cultivation is much more prominent than other locations as observed from the study findings. Rangpur is diversified but not like Comilla, Patuakhali is a low lying area and less diversified but prominent for local varieties of rice cultivation. Narayangonj is also low lying but some vegetables are also cultivated there
2. Land utilization pattern of the four study areas indicated a discouraging picture for the improvement of diversified crop cultivation. The study findings indicated that major proportion of the cultivable land was utilized for rice while potato, wheat, oilseeds, pulses, vegetables, chilly, onion, garlic etc. were cultivated next to rice in order of importance.
3. The comparative analysis of cost and return is an important consideration for a farmer to make a plan for its coming year production. As the study show, diversified crops

are more profitable than cultivation of rice. It has also been observed from Benefit Cost Ratio (BCR) analysis. So far farmer's individual profitability is concerned, the study also indicated that small farmers were more benefited than medium land large farmers.

4. Crop damage is a common phenomenon in Bangladesh agriculture. The present study reveals that because of natural calamities like flood and draught and lack of irrigation facilities in Narayangong, Patuakhali and also in Rangpur, average yield of rice (local and also HYV) was less than that of the yield of diversified crops.

5. Regarding the extent of diversification, the study marks that due to winding up of the crop-diversification programme from the grass roots level, on an average about 50% of the greater districts of Bangladesh have negative extent of diversification. The negative trend of diversification was due to impact of structural adjustment policies in the name of withdrawal of subsidies from fertilizers, insecticides, and irrigation equipments, ignorance of government policies, and also might be due to negative impact of privatization of delivery system of agricultural inputs and support services.

6. Consumption pattern is an indication of household's livelihood and poverty reduction because it provides all sorts of nutritional food to the rural households. The study findings reveal that consumption pattern of the study households was more or less similar among the four study areas as the measurement of calorie intake indicated. The study also observed that there was a significant proportion of poor who were lying below the poverty level both in terms of absolute and hard core poverty which was less than the national average of poverty conducted by household expenditure survey. The findings mark that as the study villages was diversified where numerous diversified crops were produced, consumption of all items like rice, potato,

vegetables, pulses, oilseeds, onion etc were better which enhanced the reduction of poverty in the study villages. The study also observed that there was also positive relationship with some socio-economic variables like family size, age of household head, education of household head with poverty while there-wise inverse relationship with poverty and land ownership of the study households. The relationship between level of diversification and incidence of poverty also indicates that poverty was decreasing with the increase of the level of diversification to a reasonable extent from a specific level of diversification.

7. Consumption pattern of the study households is very much influenced by specific and important socio-economic variables- like family size, education of family head, education of matter, age of household had, income from agriculture, income from other sources & yearly income of households. These variables have positive and significant correlation with the total as well as individual food consumption with some exception which was observed from the value of correlation co-efficient. Regarding the extent of influence of the independent socio-economic variables on households total food consumption it has been observed that there was also strong positive and significant extent of influence of the specific independent variables like family size, net yearly income & yearly expenditure on household food consumption, while other independent variables also had positive influence with total food consumption. Thus it is indicative that these socio-economic variables might have contributed positively in households food consumption which had been observed from the estimated value of regression co-efficient, adjusted R-Square, and also from the value of F.

8. Diversified agriculture indicates the increase in number of crops cultivated by a farmer in his available cultivable land throughout the whole year. The summation of all crops produced by a farmer throughout the year is termed as crop – frequency. The findings of the study reveal that diversified agriculture in terms of crop frequency can be increased by socio-economic variables like family size, age of household head, education of family head, ownership of land, operational holding and also income from agriculture. This relationship in case of both group data and non-group data for crop frequency and socio-economic variables was observed to be positive & significant which has been proved from the value of chi-square & correlation co-efficient. The study observes all tendency of producing (5-6) crops by the contribution of socio economic variables which has also been observed to be significant both from the value of chi-square & correlation co-efficient. The relationship was also supported by non-group data of crop frequency and socio economic variables which was also observed to be significant. Regarding the extent of influence of the independent socio-economic variables on crop frequency, the study observed that independent socio-economic variables were contributing positively for the development of diversified agriculture in terms of crop frequency which was proved from the value of co-efficient of multiple regression, adjusted R-square and also from the value of F.

9. Diversified crops are mainly seasonal and perishable products. The findings indicated that due to seasonability nature of the commodities, farmers were bound to harvest all the crops within a very short period of time. The farmers of the study locations indicated that because of oversupply of the commodities, they were bound to sell all the crops at an usual price because of urgent need of capital. At the same time, they

could not set fair price for their commodities because of higher concentration of market participants. The study also observed that sometimes cost of production could not be met up from the revenue earned because of higher cost of imputs. Moreover, the study reveals that the farmers used to keep their idle wastage or unsold during the peak season of harvest.

10. Marketing problems are the important barriers for up-grading diversified agriculture in rural Bangladesh. Marketing problems are categorized into four points of view : these are : Problems regarding price deprivation in primary markets by market participants; Problems of oversupply of diversified crops during peak season; Problems of marketing infrastructure for diversified crops, and finally comprehensive problems of marketing for diversified crops.

All the four main problems of marketing were categorized into sub-problems. The study observed the intensity of marketing problems of diversified crops for each study areas like Comilla, Rangpur, Patuakhali and Dhaka which has been calculated from the arithmetic mean and weighted arithmetic mean taken opinions of study villagers. The first problems of marketing regarding price deprivation in primary market was categorized into two ways: Price deprivation through bargaining and price deprivation in fixing profitable price. The second problem of marketing regarding oversupply problem of diversified crops during peak season was categorized into three problems: Imposement of farmers to see whatever the market price or as usual price; Imposement of farmers to sell their produces at less than market price; Imposement of farmers to keep their produces as wastage or remain unsell. The third problem of marketing regarding marketing infrastructure was categorized into three ways:

Problem of transportation and storage, problem of selling to government institution / agent / association; problem of processing. The overall marketing problems in terms of importance were : Inadequate initiative of planned production and export of diversified crops as the first problem; Poor infrastructure of marketing regarding communication, storage and processing as the second problem and Inadequate government initiative for getting fair price during the period of harvesting as the third problem. However, all the categorical problems are very much acute as observed from the intensity of opinions of the farmers in all the study areas due to which diversified agriculture could not be encouraged and improved significantly in the study areas.

14.3 Policy Recommendations :

Based on the conclusions, the following policy recommendations can be suggested for the overall development of diversified agriculture in specific study areas of Bangladesh.

1. As agricultural production system and cropping pattern is different in different study areas, specific diversified crops should be cultivated in different study areas depending upon land quality & suitability, opportunities of market facilities, and also considering the export potentialities of the diversified crops. As Patuakhali and Sonargaon are flood prone areas, embankment should be established there, so that all varieties of diversified crops can be produced throughout the whole year.
2. As major proportion of the land under cultivation was utilized for rice cultivation where still a very insignificant proportion of land is utilized for diversified crops like potato, vegetables, oilseeds, pulses, chilly, onion, garlic etc., more proportionate land should be utilized for each of the diversified crops for the sake of more production of

these crops in order to meet up the requirement of per capita food consumption of diversified nutritional crops. Although Bangladesh is about to be self-suffioient in rice production but very much deficit in diversified crop production, so more programme on diversified crop cultivation should be implemented by the government for optimum utilization of scarce land resources of Bangladesh.

3. As diversified crops are more profitable than production of local varieties of rice, so farmers should be more judicious in cultivating rice and diversified crops considering the comparative advantage of production cost and net return earned from the competitive crops. Since small farmers are more benefited than medium and large farmers in cultivating diversified crops as the former groups of farmers are more indigenous in their cultivation practices but own small proportion of cultivable land, and also since they are vulnerable and poverty stricken, specific and export oriented programme on diversified crops production for small farmers should be implemented by the government in order to reduce poverty of the small farmers. At the same time, medium and large farmers should also be encouraged to cultivate diversified crops commercially to contribute in domestic supply of these crops in a macro perspective.

4. As Bangladesh is a country of flood and natural calamities which is a common phenomenon of crop damage as observed from the study findings, so there should be the policy of crop insurance for all agricultural crops so that farmers would be saved from danger of losing their capital for the cause of crop damage and they would be encouraged to engage themselves in diversified crop production.

5. Crop diversification programme implemented by the Agricultural Extension Department of the Ministry of Agriculture has been implemented since 1980s in 55 districts of Bangladesh. This programme exclusively encouraged the production of

diversified crops like pulses, oilseeds, vegetables and spices which are the main source of protein, vitamins, irons and minerals. But due to gradual winding up of the programme from the grass roots level at the early 90's, there prevails negative impact of diversification in different districts. So for the sake of domestic consumption of nutritional crops as well as to reduce import, crop diversification programme should be continued at the grass roots level. At the same time, proper facilities on production like supply of quality seeds, supply of fertilizers and insecticides and also irrigation equipment should be provided with reasonable subsidy by the relevant organizations of the government so that farmers would be encouraged to cultivate diversified crops to make a balanced agriculture for Bangladesh economy.

6. Consumption of diversified crops contributed significantly in reducing poverty of the households in different study areas like Comilla, Rangpur, Patuakhali and Narayangonj as it was observed both from direct calorie intake (DCI) method and also from income method of poverty measurement. The level of poverty was less than the earlier period as reflected from household expenditure survey. So diversified crop cultivation should be practiced by the farmers of other villages as a strategy of changing their livelihood through balanced food consumption for mitigating nutritional deficiency and poverty of the rural households. Higher level of diversification encouraged lower incidence of poverty of the study villagers which also suggests that crop diversification should be the priority sector of Bangladesh agriculture as a ladder of reducing poverty of the rural households.

7. Some specific socio-economic variables like family size, education of family head, education of mother, age of household head, number of earning members, operational holding, income from agriculture, income from other sources, and yearly income etc.

have positive and significant correlation with total as well as individual food consumption. These variables also significantly influence the households total food consumption to a reasonable extent. Thus it can be suggested that proper attention should be given to these specific socio-economic variables to make a effective and pragmatic nutritional plan for the study households as well as for the rural households of Bangladesh.

8. Diversified agriculture in terms of crop-frequency is positively and significantly correlated and influenced by some specific socio economic variables like family size, age of household head, education of household head, ownership of land, operational holding, and income from agriculture. These significant relationships are observed from the correlation co-efficient, chi-square test and also from the value of co-efficient of multiple regression adjusted R-square and value of F. Thus to increase and uplift diversified agriculture, sufficient attention and importance should be given to these specific socio-economic variables for attaining a reasonable extent of improvement in the crop sector more specifically in the field of crop diversification.

9. As diversified crops are seasonal and perishable to some extent, so government should establish cold storage in the diversified zones so that farmers can keep their produces as fresh and intact for the time being in the cold storage and can get higher price while demand raises. Farmers should be provided with enough credit from Commercial Bank or Bangladesh Krishi Bank so that farmers can run their production for the next seasons. Government should declare the price of diversified crops just after harvest and there should be enough arrangement to purchase surplus production through government agent or institution directly from the farmer: There should be

regulations in all the markets from primary to central level so that malpractices will eliminate and farmers will get reasonable price for their diversified crops.

10. To improve the condition of marketing infrastructure, possible transportation and communication facilities should be improved in the study areas. As there is no cooperative marketing organization or credit organization in the study villages, government should establish cooperative marketing organization or credit organization for organized cultivation practices and should provide credit and marketing facilities to the farmers. At the same time, contact farming and joint cultivation system should be introduced for encouraging diversified crop production in the study areas. As diversified crops are the main source of export earning from agricultural sector, so government should take initiative for planned production and export of diversified crops. All sorts of production facilities like supply of quality seeds, supply of fertilizers and insecticides at fair price, provision of irrigation facilities and also proper supervisions of the agricultural extension officials should be ensured for the sake of developed and encouragable diversification in the crop sector of Bangladesh Agriculture.

11. Last but not the least, it is proved that Bangladesh is a country of land scarcity. As land is limited while the country is basically an agrarian subsistence farming for own consumption is very much common in Bangladesh. But subsistence farming should be discouraged for the sake of commercial or capitalistic agriculture. If farmers of Bangladesh will have to become capitalistic farmers, they should be motivate to cultivated commercially and government should provide all sorts of benefits like availability of inputs at reasonable price, assurance of higher market price, assurance of crop insurance, assurance of crop subsidy, assurance of storage

and packaging facilities at the grass-roots level etc. at reasonable time so that farmers will be encouraged to produce commercially for the sake of capitalistic agriculture. Eventually comparative advantage of crop cultivation should be judged by the farmers i.e, per unit land production, crop suitability, profitability, comparative market price and consumer demand should be considered by individual farmer. Similarly for the greater sake of farmer's sustainability in agriculture, farmer's cooperative organization, joint cultivation system, contract growing system, export oriented diversified crop – cultivation system should be introduced for commercial as well as capitalistic agriculture in rural Bangladesh.

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Appendix – A1

Per Acre Cost of Production, Aus (Local)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	507.50	1225.00	1125.00	750.00	1300.00	1475.00	6382.50
Medium-I	465.00	1062.50	1075.00	612.50	1462.50	1450.00	6127.50
Medium-II	475.00	1012.50	1000.00	584.50	1312.50	1400.00	5787.50
Small	445.00	1012.00	925.00	562.50	1287.50	1312.50	5545.00

Appendix A2

Per Acre Cost of Production, Aus (HYV)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	780.00	1500.00	1137.50	937.50	2250.00	1750.00	8355.00
Medium-I	737.50	1487.50	1112.50	800.00	2137.50	1637.50	7912.50
Medium-II	717.50	1462.50	1062.50	800.00	2037.50	1550.00	7630.00
Small	737.50	1362.50	1062.50	687.50	2037.50	1537.50	7425.00

Appendix A3

Per Acre Cost of Production, Aus (HYV)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	625.00	625.00	775.00	0.00	1612.50	1462.50	5100
Medium-I	584.50	600.00	637.50	0.00	1512.50	1500.00	4837.50
Medium-II	550.00	600.00	637.50	0.00	1462.50	1450.00	4700.00
Small	622.50	525.00	462.50	0.00	1412.50	1400.00	4422.25

Appendix A4

Per Acre Cost of Production, Amon (HYV)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	850.00	862.50	1100	950	2162.50	2250.00	8175
Medium-I	866.67	962.50	1100	787.50	2125.00	2037.50	7879.17
Medium-II	750.00	862.50	1100	787.50	2100.00	1937.50	7537.50
Small	700.00	712.50	1050	637.50	2087.50	1850.00	7037.50

Appendix A5

Per Acre Cost of Production, Boro (Local)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	425	875	787.50	450.00	1650	1462.50	5650
Medium-I	412.50	850	800.00	450.00	1450	1500.00	5462.50
Medium-II	375	837	737.50	400.00	1500	1450.00	5299.50
Small	362.50	775	700.00	350.00	1425	1400.00	5012.50

Appendix A6

Per Acre Cost of Production, Boro (HYV)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	750	1275	1200	750	2225	2250	8450
Medium-I	700	1187.50	1200	650	2162.50	2037.50	7937.50
Medium-II	633.33	1162.50	1450	625	2162.50	1937.50	7970.83
Small	583.33	1062.50	912.50	525	2100	1850	7033.33

Appendix A7

Per Acre Cost of Production (Potato)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	2150	1812.50	3187.50	1212.50	2375.00	3562.50	14,300
Medium-I	2075	1800.00	3062.50	1187.50	2175	3200	13499.50
Medium-II	2075	1775.00	2800.00	1037.50	2200	3212.50	13100.00
Small	2000	1675.00	2675.00	950.00	2075	3187.50	12562.50

Appendix A8

Per Acre Cost of Production (Bitter gourd)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	966.67	716.67	1762.50	1050	1750	1650	7920.84
Medium-I	950.00	616.67	1625.00	1000	1725	1650	7566.67
Medium-II	833.33	600.00	1625.00	950	1712	1650	7370.33
Small	800.00	600.00	1525.00	850	1687	1625	7087

Appendix A9

Per Acre Cost of Production (Kheshari)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	0.00	375	650	0.00	1000	850	2875
Medium-I	0.00	325	600	0.00	900	750	2575
Medium-II	0.00	325	550	0.00	800	650	2325
Small	0.00	275	500	0.00	700	550	2025

Appendix A10

Per Acre Cost of Production (Lentil)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	300	300	700	0.00	700	800	2800
Medium-I	350	325	800	0.00	675	690	2840
Medium-II	300	300	690	0.00	500	645	2435
Small	300	300	625	0.00	500	625	2350

Appendix- A11

Per Acre Cost of Production (Chilli)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	625	600	1062.50	750.00	1162.50	900.00	5100
Medium-I	612.50	716.67	1050.00	650.00	062.50	837.50	4929.19
Medium-II	600	500	1025	600	950.50	782.50	4458.00
Small	600	425	950.00	550.00	925.00	705.00	4155.00

Appendix- A12

Per Acre Cost of Production (Musturd)

Farmers Category	Land Preparation Cost	Seed & Seedling Cost	Fertilizer Cost	Irrigation Cost	Concentrated Cost (weeding, drainage & fencing)	Harvesting Cost	Total Cost
Large	600	600	1062.50	0.00	750.00	750	3762.50
Medium-I	610.25	680	1050.00	0.00	750.00	750	3840.25
Medium-II	590	500	1025	0.00	725.00	725	3565.00
Small	590	425	950	0.00	700.00	725	3390.00

Appendix –A13

Yield Per Acre of Diversified Crops

Farmers Categories	Aus (L)	Aus (HYV)	Aman (L)	Amon (HYV)	Boro (L)	Boro (HYV)	Wheat	Potato	Kheshari	Musari	Sharisha	Karalla	Potal	Spices
Large	25	38	22	39	23	41	12	185	8	8	8	180	200	14
Medium-I	26	39	22	39	23	41	12	190	8	8	8	190	200	15
Medium-II	26	40	23	40	24	42	13	195	10	10	10	200	210	15
Small	27	40	24	40	24	44	15	200	10	10	10	200	220	16

Appendix -A14

Price per Maund (Tk.)

Farmers Categories	Aus (L)	Aus (HYV)	Aman (L)	Amon (HYV)	Boro (L)	Boro (HYV)	Wheat	Potato	Kheshari	Musari	Sharisha	Karalla	Potal	Spices
Price (Tk.)	280	300	320	320	320	320	400	320	650	800	650	300	300	1200

Appendix- A15

Gross Return by Categories of Farmers

Farmers Categories	Aus (L)	Aus (HYV)	Aman (L)	Amon (HYV)	Boro (L)	Boro (HYV)	Potato	Kheshari	Musari	Sharisha	Karalla	Potal	Spices
Large	25X280 =7000	38X300 =11400	22X320 =7040	39X300 =12480	23X320 =7360	41X320 =13120	185X320 =59200	8X650 =5200	8X800 =6400	8X650 =5200	180X300 =54000	200X300 =60000	14X1200 =16800
Medium-I	26X280 =7280	39X300 =11700	22X320 =7040	39X320 =12480	23X320 =7360	41X320 =13120	190X320 =60800	8X650 =5200	8X800 =6400	8X650 =5200	190X300 =5700	200X300 =60000	15X1200 =18000
Medium-II	26X280 =7280	40X300 =12000	23X320 =7360	40X320 =12800	24X320 =7680	42X320 =134400	195X320 =62400	10X650 =6500	10X800 =8000	10X650 =6500	200X300 =60000	210X300 =63000	15X1200 =18000
Small	27X280 =1560	40X300 =12000	24X320 =7680	40X320 12800	24X320 7680	44X320 =14080	200X320 =64000	10X650 =6500	10X800 =8000	10X650 =6500	200X300 =60000	220X300 66000	16X1200 =19200

Appendix-B1 Statistics of Per Capita Total Consumption in Comilla (gram)

VAR 00002

N	Valid	328
	Missing	0
Mean		891.24

Appendix-B2 Statistics of Per Capita Total Consumption in Rangpur (gram)

VAR 00002

N	Valid	211
	Missing	0
Mean		889.21

Appendix-B3 Statistics of Per Capita Total Consumption in Patuakhali (gram)

VAR 00002

N	Valid	247
	Missing	0
Mean		890.05

Appendix-B4 Statistics of Per Capita Total Consumption in Narayangonj (gram)

VAR 00002

N	Valid	245
	Missing	0
Mean		880.81

Appendix-B5 Statistics of Average Per Capita Food Items Consumption (gram) for Comilla

	N		Mean
	Valid	Missing	
Per capita rice	328	0	492.25
Per capita potato	328	0	69.19
Per capita vegetables	328	0	158.19
Per capita pulses	328	0	25.10
Per capita oils	328	0	15.42
Per capita fish	328	0	48.02
Per capita onion garlic etc	328	0	20.47
Others (milk, meat, sugar etc.)	328	0	62.60

Appendix-B6 Statistics of Average Per Capita Food Items Consumption (gram) for Rangpur

	N		Mean
	Valid	Missing	
Per capita rice	211	0	492.01
Per capita potato	211	0	88.88
Per capita vegetables	211	0	145.35
Per capita pulses	211	0	5.10
Per capita oils	211	0	11.32
Per capita fish	211	0	42.12
Per capita onion garlic etc	211	0	19.83
Others (milk, meat, sugar etc.)	211	0	84.60

Appendix-B7 Statistics of Average Per Capita Food Items Consumption (gram) for Patuakhali

	N		Mean
	Valid	Missing	
Per capita rice	247	0	502.40
Per capita potato	247	0	70.56
Per capita vegetables	247	0	121.07
Per capita pulses	247	0	31.16
Per capita oils	247	0	14.97
Per capita fish	247	0	46.75
Per capita onion garlic etc	247	0	20.14
Others (milk, meat, sugar etc.)	247	0	82.99

Appendix-B8 Statistics of Average Per Capita Food Items Consumption (gram) for Narayangonj

	N		Mean
	Valid	Missing	
Per capita rice	245	0	501.96
Per capita potato	245	0	64.90
Per capita vegetables	245	0	149.46
Per capita pulses	245	0	28.80
Per capita oils	245	0	17.52
Per capita fish	245	0	44.18
Per capita onion garlic etc	245	0	20.16
Others (milk, meat, sugar etc.)	245	0	53.83

Appendix-B9 Statistics of Average Per Capita Total Consumption in Comilla (Kcal)

VAR 00002

N	Valid	328
	Missing	0
Mean		2207.74

Appendix-B10 Statistics of Average Per Capita Total Consumption in Rangpur(Kcal)

VAR 00002

N	Valid	211
	Missing	0
Mean		2125.42

Appendix-B11 Statistics of Average Per Capita Total Consumption in Patuakhali (Kcal)

VAR 00002

N	Valid	247
	Missing	0
Mean		2274.47

Appendix-B12 Statistics of Average Per Capita Total Consumption in Narayangonj (Kcal)

VAR 00002

N	Valid	245
	Missing	0
Mean		2254.60

Appendix-B13 Statistics of Average Per Capita Food Items Consumption (Kcal) for Comilla

	N		Mean
	Valid	Missing	
Per capita rice	328	0	1717.95
Per capita potato	328	0	66.63
Per capita vegetables	328	0	37.96
Per capita pulses	328	0	96.00
Per capita oils	328	0	138.78
Per capita fish	328	0	50.90
Per capita onion garlic etc	328	0	33.16
Others (milk, meat, sugar etc.)	328	0	66.36

Appendix-B14 Statistics of Average Per Capita Food Items Consumption (Kcal) for Rangpur

	N		Mean
	Valid	Missing	
Per capita rice	211	0	1717.11
Per capita potato	211	0	85.59
Per capita vegetables	211	0	34.88
Per capita pulses	211	0	19.51
Per capita oils	211	0	101.88
Per capita fish	211	0	44.65
Per capita onion garlic etc	211	0	32.12
Others (milk, meat, sugar etc.)	211	0	89.68

Appendix-B15 Statistics of Average Per Capita Food Items Consumption in Patuakhali (Kcal)

	N		Mean
	Valid	Missing	
Per capita rice	247	0	1753.38
Per capita potato	247	0	67.95
Per capita vegetables	247	0	29.06
Per capita pulses	247	0	119.19
Per capita oils	247	0	134.73
Per capita fish	247	0	49.56
Per capita onion garlic etc	247	0	32.63
Others (milk, meat, sugar etc.)	247	0	87.97

Appendix-B16 Statistics of Average Per Capita Food Items Consumption in Narayangonj (Kcal)

	N		Mean
	Valid	Missing	
Per capita rice	245	0	1751.84
Per capita potato	245	0	62.50
Per capita vegetables	245	0	35.87
Per capita pulses	245	0	110.16
Per capita oils	245	0	157.68
Per capita fish	245	0	46.83
Per capita onion garlic etc	245	0	32.66
Others (milk, meat, sugar etc.)	245	0	57.06

Appendix-B17 Statistics of Absolute Poverty (Average Per Capita Calorie Intake below 2122 Kcal) in Different Study Areas

Code No.	Categories of Total Per Capita Kilocalorie		Total (%)
	Below 2122 (%)	Upper 2122(%)	
1	32.7	67.3	100
2	34.5	65.5	100
3	34.3	65.7	100
4	39.6	60.4	100
	35.79	64.21	100

Appendix-B18 Statistics of Hardcore Poverty (Average Per Capita Calorie Intake below 1805 Kcal) in Different Study Areas

Code No.	Categories of Total Per Capita Kilocalorie		Total (%)
	Below 2122 (%)	Upper 2122(%)	
1	10.9	89.1	100
2	11.8	88.7	100
3	13.1	86.9	100
4	15.9	84.1	100
	12.7	87.3	100

Appendix-B19 Statistics of Poverty Gap Both for Absolute (<2122 Kcal) and Hardcore (<1805 Kcal) Poverty

Code No.	Categories of Total Per Capita Kilocalorie		Total (%)
	Below 2122 (%)	Upper 2122(%)	
1	14.03	15.46	100
2	14.06	16.29	100
3	17.24	20.24	100
4	17.09	24.12	100
	15.63	19.44	100

Appendix-B20 Statistics for Incidence of Poverty and Family Size in Case of Absolute Poverty

Family size	Below 2122 (%)	Upper 2122(%)
1-2	8(22.22)	77.78
3-4	69(23.31)	76.69
5-6	178(38.95)	61.05
7-8	78(47.56)	52.44
9 and above	36(46.15)	53.85
Total	369(35.79)	64.21

Appendix-B21 Statistics for Incidence of Poverty and Family Size in Case of Hardcore

Family size	Below 2122 (%)	Upper 2122(%)
1-2	3(8.33)	91.67
3-4	20(6.75)	93.25
5-6	67(14.67)	85.33
7-8	30(18.29)	81.71
9 and above	11(14.10)	85.90
Total	131(12.7)	87.30

Appendix-B22 Statistics for Incidence of Poverty and Age of Household Head in Case of Absolute Poverty

Age classification	Below 2122 (%)	Upper 2122(%)
Below 29	31(43.66)	56.34
30-39	104(47.70)	52.30
40-49	98(33.11)	66.89
50-59	70(34.82)	65.18
60+	66(26.94)	73.06
Total	369(35.79)	64.21

Appendix-B23 Statistics for Incidence of Poverty and Age of Household Head in Case of Hardcore Poverty

Age classification	Below 1805 (%)	Upper 1805(%)
Below 29	7(9.86)	92.14
30-39	43(19.72)	80.28
40-49	40(13.51)	86.49
50-59	27(13.43)	86.57
60+	14(5.71)	94.29
Total	131(12.7)	87.30

Appendix-B24 Statistics for Incidence of Poverty and Education of Household Head in Case of Absolute Poverty

Education of household head	Below 2122 (%)	Upper 2122(%)
Illiterate	37(30.32)	69.68
Class I-IV	210(39.69)	60.31
Class V-X	77(37.19)	62.81
SSC +	45(26.01)	73.99
Total	369(35.79)	64.21

Appendix-B25 Statistics for Incidence of Poverty and Education of Household Head in Case of Absolute Poverty

Education of household head	Below 1805 (%)	Upper 1805(%)
Illiterate	13(10.65)	89.35
Class I-IV	75(14.18)	85.82
Class V-X	25(12.07)	87.93
SSC +	18(10.40)	89.60
Total	131(12.7)	87.30

Appendix-B26 Statistics for Incidence of Poverty and Ownership of Land in Case of Absolute Poverty

Categories of farmers	Below 2122 (%)	Upper 2122(%)
Small (0.01-2.49)	331(38.05)	61.50
Medium I (2.50-4.99)	30(25.42)	74.58
Medium II (5.00-7.49)	6(27.27)	72.73
Large (7.50 and above)	2(9.52)	90.48
Total	369(35.79)	64.21

Appendix-B27 Statistics for Incidence of Poverty and Ownership of Land in Case of Hardcore Poverty

Categories of farmers	Below 2122 (%)	Upper 2122(%)
Small (0.01-2.49)	117(13.44)	86.56
Medium I (2.50-4.99)	11(9.32)	90..68
Medium II (5.00-7.49)	2(9.09)	90.91
Large (7.50 and above)	1(4.76)	95.24
Total	131(12.7)	87.30

Appendix-B28 Level of Diversification and Incidence of Poverty Both Interms of Absolute and Hardcore Poverty

Level of Diversification	No. of Households below Absolute Poverty (<2122 Kcal)	Average Operational Holding	% of Population below Absolute Poverty	No. of Households below Hardcore Poverty	Average Operational Holding	% of Population below Hard Core Poverty
1	13	0.938	44.82	5	0.852	17.24
2	36	1.033	33.60	9	1.133	8.41
3	73	1.342	30.90	26	1.568	11.0
4	90	1.616	34.0	31	1.501	11.7
5	71	1.933	36.0	27	1.834	13.7
6	52	1.774	43	18	1.473	15.0
7 and above	34	2.512	43.58	15	2.90	19.48
All	369	1.628	35.79	131	1.669	12.7

Appendix-B29 Level of Diversification and Extent of Poverty Both Interms of Absolute and Hardcore Poverty Among the Poverty Stricken Poor Households

Level of Diversification	Absolute Poverty (<2122 Kcal)			Hardcore Poverty (<1805 Kcal)		
	Households	Average Operated Holding	% of Poverty Stricken People	Households	Average Operated Holding	% of Poverty Stricken People
1	13	0.938	3.52	5	0.852	3.82
2	26	1.033	9.76	9	1.133	6.87
3	73	1.342	19.78	26	1.568	19.84
4	90	1.616	24.39	31	1.501	23.66
5	71	1.933	19.24	27	1.834	20.61
6	52	1.774	14.09	18	1.473	13.71
7	22	1.95	5.96	10	2.257	7.63
8	7	3.257	1.90	2	4.80	1.53
9	5	2.975	1.08	3	3.90	1.53
Total	369	1.628	35.79	131	1.669	12.7

Correlations

		Total level of consumption	Age of HH	No of E-M	ED_OF_FH
Total level of consumption	Pearson Correlation	1	.163**	.132**	.033
	Sig. (2-tailed)	.	.000	.001	.393
	N	660	660	660	660
Age of HH	Pearson Correlation	.163**	1	.114**	-.044
	Sig. (2-tailed)	.000	.	.000	.156
	N	660	1031	1031	1031
No of E-M	Pearson Correlation	.132**	.114**	1	.018
	Sig. (2-tailed)	.001	.000	.	.558
	N	660	1031	1031	1031
ED_OF_FH	Pearson Correlation	.033	-.044	.018	1
	Sig. (2-tailed)	.393	.156	.558	.
	N	660	1031	1031	1031
Ed of Mother	Pearson Correlation	-.020	-.158**	-.008	.649**
	Sig. (2-tailed)	.601	.000	.789	.000
	N	660	1031	1031	1031
Own. of Land	Pearson Correlation	.029	.038	-.010	.073*
	Sig. (2-tailed)	.454	.224	.753	.019
	N	659	1030	1030	1030
Op.Holding	Pearson Correlation	.062	.185**	-.032	.090**
	Sig. (2-tailed)	.113	.000	.305	.004
	N	660	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.218**	.009	-.056	.010
	Sig. (2-tailed)	.000	.781	.072	.739
	N	660	1031	1031	1031
Family size	Pearson Correlation	.592**	.178**	.120**	.022
	Sig. (2-tailed)	.000	.000	.000	.472
	N	658	1029	1029	1029
Income from Other Source	Pearson Correlation	.192**	.138**	.104**	.009
	Sig. (2-tailed)	.000	.000	.001	.771
	N	660	1031	1031	1031
Yearly expenditure	Pearson Correlation	.519**	.198**	.106**	.053
	Sig. (2-tailed)	.000	.000	.001	.087
	N	658	1029	1029	1029
Income from agriculture	Pearson Correlation	.142**	.010	.017	.013
	Sig. (2-tailed)	.000	.739	.589	.683
	N	660	1031	1031	1031
Net income from agriculture	Pearson Correlation	.142**	.010	.017	.013
	Sig. (2-tailed)	.000	.739	.589	.683
	N	660	1031	1031	1031
Net yearly income	Pearson Correlation	.272**	.126**	.102**	.017
	Sig. (2-tailed)	.000	.000	.001	.588
	N	660	1031	1031	1031

		Ed of Mother	Own. of Land	Op.Holding	Monthly Exp.
Total level of consumption	Pearson Correlation	-.020	.029	.062	-.218**
	Sig. (2-tailed)	.601	.454	.113	.000
	N	660	659	660	660
Age of HH	Pearson Correlation	-.158**	.038	.185**	.009
	Sig. (2-tailed)	.000	.224	.000	.781
	N	1031	1030	1031	1031
No of E-M	Pearson Correlation	-.008	-.010	-.032	-.056
	Sig. (2-tailed)	.789	.753	.305	.072
	N	1031	1030	1031	1031
ED_OF_FH	Pearson Correlation	.649**	.073*	.090**	.010
	Sig. (2-tailed)	.000	.019	.004	.739
	N	1031	1030	1031	1031
Ed of Mother	Pearson Correlation	1	.014	.086**	.038
	Sig. (2-tailed)	.	.642	.006	.227
	N	1031	1030	1031	1031
Own. of Land	Pearson Correlation	.014	1	.145**	-.045
	Sig. (2-tailed)	.642	.	.000	.149
	N	1030	1030	1030	1030
Op.Holding	Pearson Correlation	.086**	.145**	1	-.056
	Sig. (2-tailed)	.006	.000	.	.071
	N	1031	1030	1031	1031
Monthly Exp.	Pearson Correlation	.038	-.045	-.056	1
	Sig. (2-tailed)	.227	.149	.071	.
	N	1031	1030	1031	1031
Family size	Pearson Correlation	-.025	.052	.090**	-.433**
	Sig. (2-tailed)	.427	.098	.004	.000
	N	1029	1028	1029	1029
Income from Other Source	Pearson Correlation	-.001	-.015	.014	-.009
	Sig. (2-tailed)	.972	.628	.648	.773
	N	1031	1030	1031	1031
Yearly expenditure	Pearson Correlation	-.001	.008	.054	.136**
	Sig. (2-tailed)	.977	.809	.081	.000
	N	1029	1028	1029	1029
Income from agriculture	Pearson Correlation	-.014	-.005	.067*	.133**
	Sig. (2-tailed)	.649	.880	.031	.000
	N	1031	1030	1031	1031
Net income from agriculture	Pearson Correlation	-.014	-.005	.067*	.133**
	Sig. (2-tailed)	.649	.880	.031	.000
	N	1031	1030	1031	1031
Net yearly income	Pearson Correlation	-.011	-.016	.060	.087**
	Sig. (2-tailed)	.724	.599	.054	.005
	N	1031	1030	1031	1031

Correlations

		Family size	Income from Other Source	Yearly expenditure	Income from agriculture
Total level of consumption	Pearson Correlation	.592**	.192**	.519**	.142**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	658	660	658	660
Age of HH	Pearson Correlation	.178**	.138**	.198**	.010
	Sig. (2-tailed)	.000	.000	.000	.739
	N	1029	1031	1029	1031
No of E-M	Pearson Correlation	.120**	.104**	.106**	.017
	Sig. (2-tailed)	.000	.001	.001	.589
	N	1029	1031	1029	1031
ED_OF_FH	Pearson Correlation	.022	.009	.053	.013
	Sig. (2-tailed)	.472	.771	.087	.683
	N	1029	1031	1029	1031
Ed of Mother	Pearson Correlation	-.025	-.001	-.001	-.014
	Sig. (2-tailed)	.427	.972	.977	.649
	N	1029	1031	1029	1031
Own. of Land	Pearson Correlation	.052	-.015	.008	-.005
	Sig. (2-tailed)	.098	.628	.809	.880
	N	1028	1030	1028	1030
Op.Holding	Pearson Correlation	.090**	.014	.054	.067*
	Sig. (2-tailed)	.004	.648	.081	.031
	N	1029	1031	1029	1031
Monthly Exp.	Pearson Correlation	-.433**	-.009	.136**	.133**
	Sig. (2-tailed)	.000	.773	.000	.000
	N	1029	1031	1029	1031
Family size	Pearson Correlation	1	.167**	.729**	.063*
	Sig. (2-tailed)	.	.000	.000	.042
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	.167**	1	.301**	-.204**
	Sig. (2-tailed)	.000	.	.000	.000
	N	1029	1031	1029	1031
Yearly expenditure	Pearson Correlation	.729**	.301**	1	.261**
	Sig. (2-tailed)	.000	.000	.	.000
	N	1029	1029	1029	1029
Income from agriculture	Pearson Correlation	.063*	-.204**	.261**	1
	Sig. (2-tailed)	.042	.000	.000	.
	N	1029	1031	1029	1031
Net income from agriculture	Pearson Correlation	.063*	-.204**	.261**	1.000**
	Sig. (2-tailed)	.042	.000	.000	.
	N	1029	1031	1029	1031
Net yearly income	Pearson Correlation	.190**	.718**	.445**	.534**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	1029	1031	1029	1031

Correlations

		Net income from agriculture	Net yearly income
Total level of consumption	Pearson Correlation	.142**	.272**
	Sig. (2-tailed)	.000	.000
	N	660	660
Age of HH	Pearson Correlation	.010	.126**
	Sig. (2-tailed)	.739	.000
	N	1031	1031
No of E-M	Pearson Correlation	.017	.102**
	Sig. (2-tailed)	.589	.001
	N	1031	1031
ED_OF_FH	Pearson Correlation	.013	.017
	Sig. (2-tailed)	.683	.588
	N	1031	1031
Ed of Mother	Pearson Correlation	-.014	-.011
	Sig. (2-tailed)	.649	.724
	N	1031	1031
Own. of Land	Pearson Correlation	-.005	-.016
	Sig. (2-tailed)	.880	.599
	N	1030	1030
Op.Holding	Pearson Correlation	.067*	.060
	Sig. (2-tailed)	.031	.054
	N	1031	1031
Monthly Exp.	Pearson Correlation	.133**	.087**
	Sig. (2-tailed)	.000	.005
	N	1031	1031
Family size	Pearson Correlation	.063*	.190**
	Sig. (2-tailed)	.042	.000
	N	1029	1029
Income from Other Source	Pearson Correlation	-.204**	.718**
	Sig. (2-tailed)	.000	.000
	N	1031	1031
Yearly expenditure	Pearson Correlation	.261**	.445**
	Sig. (2-tailed)	.000	.000
	N	1029	1029
Income from agriculture	Pearson Correlation	1.000**	.534**
	Sig. (2-tailed)	.	.000
	N	1031	1031
Net income from agriculture	Pearson Correlation	1	.534**
	Sig. (2-tailed)	.	.000
	N	1031	1031
Net yearly income	Pearson Correlation	.534**	1
	Sig. (2-tailed)	.000	.
	N	1031	1031

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		RICE	Age of HH	No of E-M	ED_OF_FH
RICE	Pearson Correlation	1	.163**	.111**	.010
	Sig. (2-tailed)	.	.000	.000	.740
	N	1031	1031	1031	1031
Age of HH	Pearson Correlation	.163**	1	.114**	-.044
	Sig. (2-tailed)	.000	.	.000	.156
	N	1031	1031	1031	1031
No of E-M	Pearson Correlation	.111**	.114**	1	.018
	Sig. (2-tailed)	.000	.000	.	.558
	N	1031	1031	1031	1031
ED_OF_FH	Pearson Correlation	.010	-.044	.018	1
	Sig. (2-tailed)	.740	.156	.558	.
	N	1031	1031	1031	1031
Ed of Mother	Pearson Correlation	-.042	-.158**	-.008	.649**
	Sig. (2-tailed)	.183	.000	.789	.000
	N	1031	1031	1031	1031
Op.Holding	Pearson Correlation	.086**	.185**	-.032	.090**
	Sig. (2-tailed)	.006	.000	.305	.004
	N	1031	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.339**	.009	-.056	.010
	Sig. (2-tailed)	.000	.781	.072	.739
	N	1031	1031	1031	1031
Family size	Pearson Correlation	.701**	.178**	.120**	.022
	Sig. (2-tailed)	.000	.000	.000	.472
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	.205**	.138**	.104**	.009
	Sig. (2-tailed)	.000	.000	.001	.771
	N	1031	1031	1031	1031
Income from agriculture	Pearson Correlation	.090**	.010	.017	.013
	Sig. (2-tailed)	.004	.739	.589	.683
	N	1031	1031	1031	1031
Net yearly income	Pearson Correlation	.241**	.126**	.102**	.017
	Sig. (2-tailed)	.000	.000	.001	.588
	N	1031	1031	1031	1031

Correlations

		Ed of Mother	Op.Holding	Monthly Exp.	Family size
RICE	Pearson Correlation	-.042	.086**	-.339**	.701**
	Sig. (2-tailed)	.183	.006	.000	.000
	N	1031	1031	1031	1029
Age of HH	Pearson Correlation	-.158**	.185**	.009	.178**
	Sig. (2-tailed)	.000	.000	.781	.000
	N	1031	1031	1031	1029
No of E-M	Pearson Correlation	-.008	-.032	-.056	.120**
	Sig. (2-tailed)	.789	.305	.072	.000
	N	1031	1031	1031	1029
ED_OF_FH	Pearson Correlation	.649**	.090**	.010	.022
	Sig. (2-tailed)	.000	.004	.739	.472
	N	1031	1031	1031	1029
Ed of Mother	Pearson Correlation	1	.086**	.038	-.025
	Sig. (2-tailed)	.	.006	.227	.427
	N	1031	1031	1031	1029
Op.Holding	Pearson Correlation	.086**	1	-.056	.090**
	Sig. (2-tailed)	.006	.	.071	.004
	N	1031	1031	1031	1029
Monthly Exp.	Pearson Correlation	.038	-.056	1	-.433**
	Sig. (2-tailed)	.227	.071	.	.000
	N	1031	1031	1031	1029
Family size	Pearson Correlation	-.025	.090**	-.433**	1
	Sig. (2-tailed)	.427	.004	.000	.
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	-.001	.014	-.009	.167**
	Sig. (2-tailed)	.972	.648	.773	.000
	N	1031	1031	1031	1029
Income from agriculture	Pearson Correlation	-.014	.067*	.133**	.063*
	Sig. (2-tailed)	.649	.031	.000	.042
	N	1031	1031	1031	1029
Net yearly income	Pearson Correlation	-.011	.060	.087**	.190**
	Sig. (2-tailed)	.724	.054	.005	.000
	N	1031	1031	1031	1029

Correlations

		Income from Other Source	Income from agriculture	Net yearly income
RICE	Pearson Correlation	.205**	.090**	.241**
	Sig. (2-tailed)	.000	.004	.000
	N	1031	1031	1031
Age of HH	Pearson Correlation	.138**	.010	.126**
	Sig. (2-tailed)	.000	.739	.000
	N	1031	1031	1031
No of E-M	Pearson Correlation	.104**	.017	.102**
	Sig. (2-tailed)	.001	.589	.001
	N	1031	1031	1031
ED_OF_FH	Pearson Correlation	.009	.013	.017
	Sig. (2-tailed)	.771	.683	.588
	N	1031	1031	1031
Ed of Mother	Pearson Correlation	-.001	-.014	-.011
	Sig. (2-tailed)	.972	.649	.724
	N	1031	1031	1031
Op.Holding	Pearson Correlation	.014	.067*	.060
	Sig. (2-tailed)	.648	.031	.054
	N	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.009	.133**	.087**
	Sig. (2-tailed)	.773	.000	.005
	N	1031	1031	1031
Family size	Pearson Correlation	.167**	.063*	.190**
	Sig. (2-tailed)	.000	.042	.000
	N	1029	1029	1029
Income from Other Source	Pearson Correlation	1	-.204**	.718**
	Sig. (2-tailed)	.	.000	.000
	N	1031	1031	1031
Income from agriculture	Pearson Correlation	-.204**	1	.534**
	Sig. (2-tailed)	.000	.	.000
	N	1031	1031	1031
Net yearly income	Pearson Correlation	.718**	.534**	1
	Sig. (2-tailed)	.000	.000	.
	N	1031	1031	1031

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

Correlations

		POTATO	Age of HH	No of E-M	ED_OF_FH
POTATO	Pearson Correlation	1	.005	-.024	.026
	Sig. (2-tailed)	.	.880	.453	.415
	N	1007	1007	1007	1007
Age of HH	Pearson Correlation	.005	1	.114**	-.044
	Sig. (2-tailed)	.880	.	.000	.156
	N	1007	1031	1031	1031
No of E-M	Pearson Correlation	-.024	.114**	1	.018
	Sig. (2-tailed)	.453	.000	.	.558
	N	1007	1031	1031	1031
ED_OF_FH	Pearson Correlation	.026	-.044	.018	1
	Sig. (2-tailed)	.415	.156	.558	.
	N	1007	1031	1031	1031
Ed of Mother	Pearson Correlation	.078*	-.158**	-.008	.649**
	Sig. (2-tailed)	.013	.000	.789	.000
	N	1007	1031	1031	1031
Op.Holding	Pearson Correlation	.105**	.185**	-.032	.090**
	Sig. (2-tailed)	.001	.000	.305	.004
	N	1007	1031	1031	1031
Monthly Exp.	Pearson Correlation	.043	.009	-.056	.010
	Sig. (2-tailed)	.168	.781	.072	.739
	N	1007	1031	1031	1031
Family size	Pearson Correlation	.028	.178**	.120**	.022
	Sig. (2-tailed)	.372	.000	.000	.472
	N	1005	1029	1029	1029
Income from Other Source	Pearson Correlation	-.037	.138**	.104**	.009
	Sig. (2-tailed)	.242	.000	.001	.771
	N	1007	1031	1031	1031
Income from agriculture	Pearson Correlation	.051	.010	.017	.013
	Sig. (2-tailed)	.109	.739	.589	.683
	N	1007	1031	1031	1031
Net yearly income	Pearson Correlation	.004	.126**	.102**	.017
	Sig. (2-tailed)	.898	.000	.001	.588
	N	1007	1031	1031	1031

		Ed of Mother	Op.Holding	Monthly Exp.	Family size
POTATO	Pearson Correlation	.078*	.105**	.043	.028
	Sig. (2-tailed)	.013	.001	.168	.372
	N	1007	1007	1007	1005
Age of HH	Pearson Correlation	-.158**	.185**	.009	.178**
	Sig. (2-tailed)	.000	.000	.781	.000
	N	1031	1031	1031	1029
No of E-M	Pearson Correlation	-.008	-.032	-.056	.120**
	Sig. (2-tailed)	.789	.305	.072	.000
	N	1031	1031	1031	1029
ED_OF_FH	Pearson Correlation	.649**	.090**	.010	.022
	Sig. (2-tailed)	.000	.004	.739	.472
	N	1031	1031	1031	1029
Ed of Mother	Pearson Correlation	1	.086**	.038	-.025
	Sig. (2-tailed)	.	.006	.227	.427
	N	1031	1031	1031	1029
Op.Holding	Pearson Correlation	.086**	1	-.056	.090**
	Sig. (2-tailed)	.006	.	.071	.004
	N	1031	1031	1031	1029
Monthly Exp.	Pearson Correlation	.038	-.056	1	-.433**
	Sig. (2-tailed)	.227	.071	.	.000
	N	1031	1031	1031	1029
Family size	Pearson Correlation	-.025	.090**	-.433**	1
	Sig. (2-tailed)	.427	.004	.000	.
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	-.001	.014	-.009	.167**
	Sig. (2-tailed)	.972	.648	.773	.000
	N	1031	1031	1031	1029
Income from agriculture	Pearson Correlation	-.014	.067*	.133**	.063*
	Sig. (2-tailed)	.649	.031	.000	.042
	N	1031	1031	1031	1029
Net yearly income	Pearson Correlation	-.011	.060	.087**	.190**
	Sig. (2-tailed)	.724	.054	.005	.000
	N	1031	1031	1031	1029

Correlations

		Income from Other Source	Income from agriculture	Net yearly income
POTATO	Pearson Correlation	-.037	.051	.004
	Sig. (2-tailed)	.242	.109	.898
	N	1007	1007	1007
Age of HH	Pearson Correlation	.138**	.010	.126**
	Sig. (2-tailed)	.000	.739	.000
	N	1031	1031	1031
No of E-M	Pearson Correlation	.104**	.017	.102**
	Sig. (2-tailed)	.001	.589	.001
	N	1031	1031	1031
ED_OF_FH	Pearson Correlation	.009	.013	.017
	Sig. (2-tailed)	.771	.683	.588
	N	1031	1031	1031
Ed of Mother	Pearson Correlation	-.001	-.014	-.011
	Sig. (2-tailed)	.972	.649	.724
	N	1031	1031	1031
Op.Holding	Pearson Correlation	.014	.067*	.060
	Sig. (2-tailed)	.648	.031	.054
	N	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.009	.133**	.087**
	Sig. (2-tailed)	.773	.000	.005
	N	1031	1031	1031
Family size	Pearson Correlation	.167**	.063*	.190**
	Sig. (2-tailed)	.000	.042	.000
	N	1029	1029	1029
Income from Other Source	Pearson Correlation	1	-.204**	.718**
	Sig. (2-tailed)	.	.000	.000
	N	1031	1031	1031
Income from agriculture	Pearson Correlation	-.204**	1	.534**
	Sig. (2-tailed)	.000	.	.000
	N	1031	1031	1031
Net yearly income	Pearson Correlation	.718**	.534**	1
	Sig. (2-tailed)	.000	.000	.
	N	1031	1031	1031

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

Correlations

		Vegetables	Age of HH	No of E-M	ED_OF_FH
Vegetables	Pearson Correlation	1	.081**	.058	.033
	Sig. (2-tailed)	.	.009	.062	.283
	N	1031	1031	1031	1031
Age of HH	Pearson Correlation	.081**	1	.114**	-.044
	Sig. (2-tailed)	.009	.	.000	.156
	N	1031	1031	1031	1031
No of E-M	Pearson Correlation	.058	.114**	1	.018
	Sig. (2-tailed)	.062	.000	.	.558
	N	1031	1031	1031	1031
ED_OF_FH	Pearson Correlation	.033	-.044	.018	1
	Sig. (2-tailed)	.283	.156	.558	.
	N	1031	1031	1031	1031
Ed of Mother	Pearson Correlation	-.038	-.158**	-.008	.649**
	Sig. (2-tailed)	.219	.000	.789	.000
	N	1031	1031	1031	1031
Op.Holding	Pearson Correlation	-.013	.185**	-.032	.090**
	Sig. (2-tailed)	.667	.000	.305	.004
	N	1031	1031	1031	1031
Monthly Exp.	Pearson Correlation	.087**	.009	-.056	.010
	Sig. (2-tailed)	.005	.781	.072	.739
	N	1031	1031	1031	1031
Family size	Pearson Correlation	.203**	.178**	.120**	.022
	Sig. (2-tailed)	.000	.000	.000	.472
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	.160**	.138**	.104**	.009
	Sig. (2-tailed)	.000	.000	.001	.771
	N	1031	1031	1031	1031
Income from agriculture	Pearson Correlation	.069*	.010	.017	.013
	Sig. (2-tailed)	.027	.739	.589	.683
	N	1031	1031	1031	1031
Net yearly income	Pearson Correlation	.187**	.126**	.102**	.017
	Sig. (2-tailed)	.000	.000	.001	.588
	N	1031	1031	1031	1031

		Ed of Mother	Op.Holding	Monthly Exp.	Family size
Vegetables	Pearson Correlation	-.038	-.013	.087**	.203**
	Sig. (2-tailed)	.219	.667	.005	.000
	N	1031	1031	1031	1029
Age of HH	Pearson Correlation	-.158**	.185**	.009	.178**
	Sig. (2-tailed)	.000	.000	.781	.000
	N	1031	1031	1031	1029
No of E-M	Pearson Correlation	-.008	-.032	-.056	.120**
	Sig. (2-tailed)	.789	.305	.072	.000
	N	1031	1031	1031	1029
ED_OF_FH	Pearson Correlation	.649**	.090**	.010	.022
	Sig. (2-tailed)	.000	.004	.739	.472
	N	1031	1031	1031	1029
Ed of Mother	Pearson Correlation	1	.086**	.038	-.025
	Sig. (2-tailed)	.	.006	.227	.427
	N	1031	1031	1031	1029
Op.Holding	Pearson Correlation	.086**	1	-.056	.090**
	Sig. (2-tailed)	.006	.	.071	.004
	N	1031	1031	1031	1029
Monthly Exp.	Pearson Correlation	.038	-.056	1	-.433**
	Sig. (2-tailed)	.227	.071	.	.000
	N	1031	1031	1031	1029
Family size	Pearson Correlation	-.025	.090**	-.433**	1
	Sig. (2-tailed)	.427	.004	.000	.
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	-.001	.014	-.009	.167**
	Sig. (2-tailed)	.972	.648	.773	.000
	N	1031	1031	1031	1029
Income from agriculture	Pearson Correlation	-.014	.067*	.133**	.063*
	Sig. (2-tailed)	.649	.031	.000	.042
	N	1031	1031	1031	1029
Net yearly income	Pearson Correlation	-.011	.060	.087**	.190**
	Sig. (2-tailed)	.724	.054	.005	.000
	N	1031	1031	1031	1029

		Income from Other Source	Income from agriculture	Net yearly income
Vegetables	Pearson Correlation	.160**	.069*	.187**
	Sig. (2-tailed)	.000	.027	.000
	N	1031	1031	1031
Age of HH	Pearson Correlation	.138**	.010	.126**
	Sig. (2-tailed)	.000	.739	.000
	N	1031	1031	1031
No of E-M	Pearson Correlation	.104**	.017	.102**
	Sig. (2-tailed)	.001	.589	.001
	N	1031	1031	1031
ED_OF_FH	Pearson Correlation	.009	.013	.017
	Sig. (2-tailed)	.771	.683	.588
	N	1031	1031	1031
Ed of Mother	Pearson Correlation	-.001	-.014	-.011
	Sig. (2-tailed)	.972	.649	.724
	N	1031	1031	1031
Op.Holding	Pearson Correlation	.014	.067*	.060
	Sig. (2-tailed)	.648	.031	.054
	N	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.009	.133**	.087**
	Sig. (2-tailed)	.773	.000	.005
	N	1031	1031	1031
Family size	Pearson Correlation	.167**	.063*	.190**
	Sig. (2-tailed)	.000	.042	.000
	N	1029	1029	1029
Income from Other Source	Pearson Correlation	1	-.204**	.718**
	Sig. (2-tailed)	.	.000	.000
	N	1031	1031	1031
Income from agriculture	Pearson Correlation	-.204**	1	.534**
	Sig. (2-tailed)	.000	.	.000
	N	1031	1031	1031
Net yearly income	Pearson Correlation	.718**	.534**	1
	Sig. (2-tailed)	.000	.000	.
	N	1031	1031	1031

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

Correlations

		PULSES	Age of HH	No of E-M	ED_OF_FH
PULSES	Pearson Correlation	1	.140**	.082**	.049
	Sig. (2-tailed)	.	.000	.008	.118
	N	1031	1031	1031	1031
Age of HH	Pearson Correlation	.140**	1	.114**	-.044
	Sig. (2-tailed)	.000	.	.000	.156
	N	1031	1031	1031	1031
No of E-M	Pearson Correlation	.082**	.114**	1	.018
	Sig. (2-tailed)	.008	.000	.	.558
	N	1031	1031	1031	1031
ED_OF_FH	Pearson Correlation	.049	-.044	.018	1
	Sig. (2-tailed)	.118	.156	.558	.
	N	1031	1031	1031	1031
Ed of Mother	Pearson Correlation	.013	-.158**	-.008	.649**
	Sig. (2-tailed)	.667	.000	.789	.000
	N	1031	1031	1031	1031
Op.Holding	Pearson Correlation	.057	.185**	-.032	.090**
	Sig. (2-tailed)	.065	.000	.305	.004
	N	1031	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.082**	.009	-.056	.010
	Sig. (2-tailed)	.008	.781	.072	.739
	N	1031	1031	1031	1031
Family size	Pearson Correlation	.344**	.178**	.120**	.022
	Sig. (2-tailed)	.000	.000	.000	.472
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	.273**	.138**	.104**	.009
	Sig. (2-tailed)	.000	.000	.001	.771
	N	1031	1031	1031	1031
Income from agriculture	Pearson Correlation	-.034	.010	.017	.013
	Sig. (2-tailed)	.269	.739	.589	.683
	N	1031	1031	1031	1031
Net yearly income	Pearson Correlation	.212**	.126**	.102**	.017
	Sig. (2-tailed)	.000	.000	.001	.588
	N	1031	1031	1031	1031

Correlations

		Ed of Mother	Op.Holding	Monthly Exp.	Family size
PULSES	Pearson Correlation	.013	.057	-.082**	.344
	Sig. (2-tailed)	.667	.065	.008	.000
	N	1031	1031	1031	1029
Age of HH	Pearson Correlation	-.158**	.185**	.009	.178
	Sig. (2-tailed)	.000	.000	.781	.000
	N	1031	1031	1031	1029
No of E-M	Pearson Correlation	-.008	-.032	-.056	.120
	Sig. (2-tailed)	.789	.305	.072	.000
	N	1031	1031	1031	1029
ED_OF_FH	Pearson Correlation	.649**	.090**	.010	.022
	Sig. (2-tailed)	.000	.004	.739	.472
	N	1031	1031	1031	1029
Ed of Mother	Pearson Correlation	1	.086**	.038	-.025
	Sig. (2-tailed)	.	.006	.227	.427
	N	1031	1031	1031	1029
Op.Holding	Pearson Correlation	.086**	1	-.056	.090
	Sig. (2-tailed)	.006	.	.071	.004
	N	1031	1031	1031	1029
Monthly Exp.	Pearson Correlation	.038	-.056	1	-.433
	Sig. (2-tailed)	.227	.071	.	.000
	N	1031	1031	1031	1029
Family size	Pearson Correlation	-.025	.090**	-.433**	1
	Sig. (2-tailed)	.427	.004	.000	
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	-.001	.014	-.009	.167
	Sig. (2-tailed)	.972	.648	.773	.000
	N	1031	1031	1031	1029
Income from agriculture	Pearson Correlation	-.014	.067*	.133**	.063
	Sig. (2-tailed)	.649	.031	.000	.042
	N	1031	1031	1031	1029
Net yearly income	Pearson Correlation	-.011	.060	.087**	.190
	Sig. (2-tailed)	.724	.054	.005	.000
	N	1031	1031	1031	1029

		Income from Other Source	Income from agriculture	Net yearly income
PULSES	Pearson Correlation	.273**	-.034	.212**
	Sig. (2-tailed)	.000	.269	.000
	N	1031	1031	1031
Age of HH	Pearson Correlation	.138**	.010	.126**
	Sig. (2-tailed)	.000	.739	.000
	N	1031	1031	1031
No of E-M	Pearson Correlation	.104**	.017	.102**
	Sig. (2-tailed)	.001	.589	.001
	N	1031	1031	1031
ED_OF_FH	Pearson Correlation	.009	.013	.017
	Sig. (2-tailed)	.771	.683	.588
	N	1031	1031	1031
Ed of Mother	Pearson Correlation	-.001	-.014	-.011
	Sig. (2-tailed)	.972	.649	.724
	N	1031	1031	1031
Op.Holding	Pearson Correlation	.014	.067*	.060
	Sig. (2-tailed)	.648	.031	.054
	N	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.009	.133**	.087**
	Sig. (2-tailed)	.773	.000	.005
	N	1031	1031	1031
Family size	Pearson Correlation	.167**	.063*	.190**
	Sig. (2-tailed)	.000	.042	.000
	N	1029	1029	1029
Income from Other Source	Pearson Correlation	1	-.204**	.718**
	Sig. (2-tailed)	.	.000	.000
	N	1031	1031	1031
Income from agriculture	Pearson Correlation	-.204**	1	.534**
	Sig. (2-tailed)	.000	.	.000
	N	1031	1031	1031
Net yearly income	Pearson Correlation	.718**	.534**	1
	Sig. (2-tailed)	.000	.000	.
	N	1031	1031	1031

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

Correlations

		OIL	Age of HH	No of E-M	ED_OF_FH
OIL	Pearson Correlation	1	.130**	-.020	.029
	Sig. (2-tailed)	.	.000	.512	.358
	N	1031	1031	1031	1031
Age of HH	Pearson Correlation	.130**	1	.114**	-.044
	Sig. (2-tailed)	.000	.	.000	.156
	N	1031	1031	1031	1031
No of E-M	Pearson Correlation	-.020	.114**	1	.018
	Sig. (2-tailed)	.512	.000	.	.558
	N	1031	1031	1031	1031
ED_OF_FH	Pearson Correlation	.029	-.044	.018	1
	Sig. (2-tailed)	.358	.156	.558	.
	N	1031	1031	1031	1031
Ed of Mother	Pearson Correlation	.007	-.158**	-.008	.649**
	Sig. (2-tailed)	.834	.000	.789	.000
	N	1031	1031	1031	1031
Op.Holding	Pearson Correlation	.026	.185**	-.032	.090**
	Sig. (2-tailed)	.410	.000	.305	.004
	N	1031	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.102**	.009	-.056	.010
	Sig. (2-tailed)	.001	.781	.072	.739
	N	1031	1031	1031	1031
Family size	Pearson Correlation	.328**	.178**	.120**	.022
	Sig. (2-tailed)	.000	.000	.000	.472
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	.130**	.138**	.104**	.009
	Sig. (2-tailed)	.000	.000	.001	.771
	N	1031	1031	1031	1031
Income from agriculture	Pearson Correlation	-.048	.010	.017	.013
	Sig. (2-tailed)	.123	.739	.589	.683
	N	1031	1031	1031	1031
Net yearly income	Pearson Correlation	.078*	.126**	.102**	.017
	Sig. (2-tailed)	.012	.000	.001	.588
	N	1031	1031	1031	1031

Correlations

		Ed of Mother	Op.Holding	Monthly Exp.	Family size
OIL	Pearson Correlation	.007	.026	-.102**	.328
	Sig. (2-tailed)	.834	.410	.001	.000
	N	1031	1031	1031	1029
Age of HH	Pearson Correlation	-.158**	.185**	.009	.178
	Sig. (2-tailed)	.000	.000	.781	.000
	N	1031	1031	1031	1029
No of E-M	Pearson Correlation	-.008	-.032	-.056	.120
	Sig. (2-tailed)	.789	.305	.072	.000
	N	1031	1031	1031	1029
ED_OF_FH	Pearson Correlation	.649**	.090**	.010	.022
	Sig. (2-tailed)	.000	.004	.739	.472
	N	1031	1031	1031	1029
Ed of Mother	Pearson Correlation	1	.086**	.038	-.025
	Sig. (2-tailed)	.	.006	.227	.427
	N	1031	1031	1031	1029
Op.Holding	Pearson Correlation	.086**	1	-.056	.090
	Sig. (2-tailed)	.006	.	.071	.004
	N	1031	1031	1031	1029
Monthly Exp.	Pearson Correlation	.038	-.056	1	-.433
	Sig. (2-tailed)	.227	.071	.	.000
	N	1031	1031	1031	1029
Family size	Pearson Correlation	-.025	.090**	-.433**	1
	Sig. (2-tailed)	.427	.004	.000	.
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	-.001	.014	-.009	.167
	Sig. (2-tailed)	.972	.648	.773	.000
	N	1031	1031	1031	1029
Income from agriculture	Pearson Correlation	-.014	.067*	.133**	.063
	Sig. (2-tailed)	.649	.031	.000	.042
	N	1031	1031	1031	1029
Net yearly income	Pearson Correlation	-.011	.060	.087**	.190
	Sig. (2-tailed)	.724	.054	.005	.000
	N	1031	1031	1031	1029

Correlations

		Income from Other Source	Income from agriculture	Net yearly income
OIL	Pearson Correlation	.130**	-.048	.078*
	Sig. (2-tailed)	.000	.123	.012
	N	1031	1031	1031
Age of HH	Pearson Correlation	.138**	.010	.126**
	Sig. (2-tailed)	.000	.739	.000
	N	1031	1031	1031
No of E-M	Pearson Correlation	.104**	.017	.102**
	Sig. (2-tailed)	.001	.589	.001
	N	1031	1031	1031
ED_OF_FH	Pearson Correlation	.009	.013	.017
	Sig. (2-tailed)	.771	.683	.588
	N	1031	1031	1031
Ed of Mother	Pearson Correlation	-.001	-.014	-.011
	Sig. (2-tailed)	.972	.649	.724
	N	1031	1031	1031
Op.Holding	Pearson Correlation	.014	.067*	.060
	Sig. (2-tailed)	.648	.031	.054
	N	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.009	.133**	.087**
	Sig. (2-tailed)	.773	.000	.005
	N	1031	1031	1031
Family size	Pearson Correlation	.167**	.063*	.190**
	Sig. (2-tailed)	.000	.042	.000
	N	1029	1029	1029
Income from Other Source	Pearson Correlation	1	-.204**	.718**
	Sig. (2-tailed)	.	.000	.000
	N	1031	1031	1031
Income from agriculture	Pearson Correlation	-.204**	1	.534**
	Sig. (2-tailed)	.000	.	.000
	N	1031	1031	1031
Net yearly income	Pearson Correlation	.718**	.534**	1
	Sig. (2-tailed)	.000	.000	.
	N	1031	1031	1031

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

Correlations

		FISH	Age of HH	No of E-M	ED_OF_FH
FISH	Pearson Correlation	1	.080*	.047	-.023
	Sig. (2-tailed)	.	.010	.131	.457
	N	1031	1031	1031	1031
Age of HH	Pearson Correlation	.080*	1	.114**	-.044
	Sig. (2-tailed)	.010	.	.000	.156
	N	1031	1031	1031	1031
No of E-M	Pearson Correlation	.047	.114**	1	.018
	Sig. (2-tailed)	.131	.000	.	.558
	N	1031	1031	1031	1031
ED_OF_FH	Pearson Correlation	-.023	-.044	.018	1
	Sig. (2-tailed)	.457	.156	.558	.
	N	1031	1031	1031	1031
Ed of Mother	Pearson Correlation	-.046	-.158**	-.008	.649**
	Sig. (2-tailed)	.137	.000	.789	.000
	N	1031	1031	1031	1031
Op.Holding	Pearson Correlation	.017	.185**	-.032	.090**
	Sig. (2-tailed)	.577	.000	.305	.004
	N	1031	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.020	.009	-.056	.010
	Sig. (2-tailed)	.517	.781	.072	.739
	N	1031	1031	1031	1031
Family size	Pearson Correlation	.339**	.178**	.120**	.022
	Sig. (2-tailed)	.000	.000	.000	.472
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	.050	.138**	.104**	.009
	Sig. (2-tailed)	.109	.000	.001	.771
	N	1031	1031	1031	1031
Income from agriculture	Pearson Correlation	.154**	.010	.017	.013
	Sig. (2-tailed)	.000	.739	.589	.683
	N	1031	1031	1031	1031
Net yearly income	Pearson Correlation	.153**	.126**	.102**	.017
	Sig. (2-tailed)	.000	.000	.001	.588
	N	1031	1031	1031	1031

Correlations

		Ed of Mother	Op.Holding	Monthly Exp.	Family size
FISH	Pearson Correlation	-.046	.017	-.020	.339**
	Sig. (2-tailed)	.137	.577	.517	.000
	N	1031	1031	1031	1029
Age of HH	Pearson Correlation	-.158**	.185**	.009	.178**
	Sig. (2-tailed)	.000	.000	.781	.000
	N	1031	1031	1031	1029
No of E-M	Pearson Correlation	-.008	-.032	-.056	.120**
	Sig. (2-tailed)	.789	.305	.072	.000
	N	1031	1031	1031	1029
ED_OF_FH	Pearson Correlation	.649**	.090**	.010	.022
	Sig. (2-tailed)	.000	.004	.739	.472
	N	1031	1031	1031	1029
Ed of Mother	Pearson Correlation	1	.086**	.038	-.025
	Sig. (2-tailed)	.	.006	.227	.427
	N	1031	1031	1031	1029
Op.Holding	Pearson Correlation	.086**	1	-.056	.090**
	Sig. (2-tailed)	.006	.	.071	.004
	N	1031	1031	1031	1029
Monthly Exp.	Pearson Correlation	.038	-.056	1	-.433**
	Sig. (2-tailed)	.227	.071	.	.000
	N	1031	1031	1031	1029
Family size	Pearson Correlation	-.025	.090**	-.433**	1
	Sig. (2-tailed)	.427	.004	.000	.
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	-.001	.014	-.009	.167**
	Sig. (2-tailed)	.972	.648	.773	.000
	N	1031	1031	1031	1029
Income from agriculture	Pearson Correlation	-.014	.067*	.133**	.063*
	Sig. (2-tailed)	.649	.031	.000	.042
	N	1031	1031	1031	1029
Net yearly income	Pearson Correlation	-.011	.060	.087**	.190*
	Sig. (2-tailed)	.724	.054	.005	.000
	N	1031	1031	1031	1029

		Income from Other Source	Income from agriculture	Net yearly income
FISH	Pearson Correlation	.050	.154**	.153**
	Sig. (2-tailed)	.109	.000	.000
	N	1031	1031	1031
Age of HH	Pearson Correlation	.138**	.010	.126**
	Sig. (2-tailed)	.000	.739	.000
	N	1031	1031	1031
No of E-M	Pearson Correlation	.104**	.017	.102**
	Sig. (2-tailed)	.001	.589	.001
	N	1031	1031	1031
ED_OF_FH	Pearson Correlation	.009	.013	.017
	Sig. (2-tailed)	.771	.683	.588
	N	1031	1031	1031
Ed of Mother	Pearson Correlation	-.001	-.014	-.011
	Sig. (2-tailed)	.972	.649	.724
	N	1031	1031	1031
Op.Holding	Pearson Correlation	.014	.067*	.060
	Sig. (2-tailed)	.648	.031	.054
	N	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.009	.133**	.087**
	Sig. (2-tailed)	.773	.000	.005
	N	1031	1031	1031
Family size	Pearson Correlation	.167**	.063*	.190**
	Sig. (2-tailed)	.000	.042	.000
	N	1029	1029	1029
Income from Other Source	Pearson Correlation	1	-.204**	.718**
	Sig. (2-tailed)	.	.000	.000
	N	1031	1031	1031
Income from agriculture	Pearson Correlation	-.204**	1	.534**
	Sig. (2-tailed)	.000	.	.000
	N	1031	1031	1031
Net yearly income	Pearson Correlation	.718**	.534**	1
	Sig. (2-tailed)	.000	.000	.
	N	1031	1031	1031

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

Correlations

		Onion/Garlic	Age of HH	No of E-M	ED_OF_FH
Onion/Garlic	Pearson Correlation	1	.100**	-.018	.006
	Sig. (2-tailed)	.	.001	.568	.843
	N	1031	1031	1031	1031
Age of HH	Pearson Correlation	.100**	1	.114**	-.044
	Sig. (2-tailed)	.001	.	.000	.156
	N	1031	1031	1031	1031
No of E-M	Pearson Correlation	-.018	.114**	1	.018
	Sig. (2-tailed)	.568	.000	.	.558
	N	1031	1031	1031	1031
ED_OF_FH	Pearson Correlation	.006	-.044	.018	1
	Sig. (2-tailed)	.843	.156	.558	.
	N	1031	1031	1031	1031
Ed of Mother	Pearson Correlation	.008	-.158**	-.008	.649**
	Sig. (2-tailed)	.808	.000	.789	.000
	N	1031	1031	1031	1031
Op.Holding	Pearson Correlation	.098**	.185**	-.032	.090**
	Sig. (2-tailed)	.002	.000	.305	.004
	N	1031	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.214**	.009	-.056	.010
	Sig. (2-tailed)	.000	.781	.072	.739
	N	1031	1031	1031	1031
Family size	Pearson Correlation	.340**	.178**	.120**	.022
	Sig. (2-tailed)	.000	.000	.000	.472
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	.093**	.138**	.104**	.009
	Sig. (2-tailed)	.003	.000	.001	.771
	N	1031	1031	1031	1031
Income from agriculture	Pearson Correlation	-.057	.010	.017	.013
	Sig. (2-tailed)	.069	.739	.589	.683
	N	1031	1031	1031	1031
Net yearly income	Pearson Correlation	.040	.126**	.102**	.017
	Sig. (2-tailed)	.203	.000	.001	.588
	N	1031	1031	1031	1031

Correlations

		Ed of Mother	Op.Holding	Monthly Exp.	Family size
Onion/Garlic	Pearson Correlation	.008	.098**	-.214**	.340**
	Sig. (2-tailed)	.808	.002	.000	.000
	N	1031	1031	1031	1029
Age of HH	Pearson Correlation	-.158**	.185**	.009	.178**
	Sig. (2-tailed)	.000	.000	.781	.000
	N	1031	1031	1031	1029
No of E-M	Pearson Correlation	-.008	-.032	-.056	.120**
	Sig. (2-tailed)	.789	.305	.072	.000
	N	1031	1031	1031	1029
ED_OF_FH	Pearson Correlation	.649**	.090**	.010	.022
	Sig. (2-tailed)	.000	.004	.739	.472
	N	1031	1031	1031	1029
Ed of Mother	Pearson Correlation	1	.086**	.038	-.025
	Sig. (2-tailed)	.	.006	.227	.427
	N	1031	1031	1031	1029
Op.Holding	Pearson Correlation	.086**	1	-.056	.090**
	Sig. (2-tailed)	.006	.	.071	.004
	N	1031	1031	1031	1029
Monthly Exp.	Pearson Correlation	.038	-.056	1	-.433**
	Sig. (2-tailed)	.227	.071	.	.000
	N	1031	1031	1031	1029
Family size	Pearson Correlation	-.025	.090**	-.433**	1
	Sig. (2-tailed)	.427	.004	.000	.
	N	1029	1029	1029	1029
Income from Other Source	Pearson Correlation	-.001	.014	-.009	.167**
	Sig. (2-tailed)	.972	.648	.773	.000
	N	1031	1031	1031	1029
Income from agriculture	Pearson Correlation	-.014	.067*	.133**	.063*
	Sig. (2-tailed)	.649	.031	.000	.042
	N	1031	1031	1031	1029
Net yearly income	Pearson Correlation	-.011	.060	.087**	.190**
	Sig. (2-tailed)	.724	.054	.005	.000
	N	1031	1031	1031	1029

Correlations

		Income from Other Source	Income from agriculture	Net yearly income
Onion/Garlic	Pearson Correlation	.093**	-.057	.040
	Sig. (2-tailed)	.003	.069	.203
	N	1031	1031	1031
Age of HH	Pearson Correlation	.138**	.010	.126**
	Sig. (2-tailed)	.000	.739	.000
	N	1031	1031	1031
No of E-M	Pearson Correlation	.104**	.017	.102**
	Sig. (2-tailed)	.001	.589	.001
	N	1031	1031	1031
ED_OF_FH	Pearson Correlation	.009	.013	.017
	Sig. (2-tailed)	.771	.683	.588
	N	1031	1031	1031
Ed of Mother	Pearson Correlation	-.001	-.014	-.011
	Sig. (2-tailed)	.972	.649	.724
	N	1031	1031	1031
Op.Holding	Pearson Correlation	.014	.067*	.060
	Sig. (2-tailed)	.648	.031	.054
	N	1031	1031	1031
Monthly Exp.	Pearson Correlation	-.009	.133**	.087**
	Sig. (2-tailed)	.773	.000	.005
	N	1031	1031	1031
Family size	Pearson Correlation	.167**	.063*	.190**
	Sig. (2-tailed)	.000	.042	.000
	N	1029	1029	1029
Income from Other Source	Pearson Correlation	1	-.204**	.718**
	Sig. (2-tailed)	.	.000	.000
	N	1031	1031	1031
Income from agriculture	Pearson Correlation	-.204**	1	.534**
	Sig. (2-tailed)	.000	.	.000
	N	1031	1031	1031
Net yearly income	Pearson Correlation	.718**	.534**	1
	Sig. (2-tailed)	.000	.000	.
	N	1031	1031	1031

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Yearly expenditure, Op.Holding, Age of HH, Income from agriculture, Net yearly income, Family size[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: TOTALCON

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.679[a]	.462	.459	977.3419

a. Predictors: (Constant), Yearly expenditure, Op.Holding, Age of HH, Income from agriculture, Net yearly income, Family size

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.37E+08	6	139537249.3	146.082	.000[a]
	Residual	9.76E+08	1022	955197.164		
	Total	1.81E+09	1028			

a. Predictors: (Constant), Yearly expenditure, Op.Holding, Age of HH, Income from agriculture, Net yearly income, Family size

b. Dependent Variable: TOTALCON

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1679.430	134.671		12.471	.000
	Op.Holding	17.755	15.553	.027	1.142	.254
	Income from agriculture	1.591E-04	.001	.007	.270	.787
	Family size	351.194	23.177	.526	15.153	.000
	Age of HH	3.052	2.350	.031	1.299	.194
	Net yearly income	2.890E-03	.001	.085	2.862	.004
	Yearly expenditure	1.292E-02	.003	.147	3.861	.000

a. Dependent Variable: TOTALCON

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Age of HH, Income from agriculture, ED_OF_FH, Family size, Op.Holding, Yearly expenditure[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Crop Frequency

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.353[a]	.125	.120	1.46

a. Predictors: (Constant), Age of HH, Income from agriculture, ED_OF_FH, Family size, Op.Holding, Yearly expenditu

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	309.812	6	51.635	24.253	.000[a]
	Residual	2175.840	1022	2.129		
	Total	2485.652	1028			

a. Predictors: (Constant), Age of HH, Income from agriculture, ED_OF_FH, Family size, Op.Holding, Yearly expenditu

b. Dependent Variable: Crop Frequency

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.632	.210		12.555	.000
	Op.Holding	.125	.023	.161	5.346	.000
	Yearly expenditure	5.213E-06	.000	.051	1.112	.266
	Income from agriculture	4.833E-06	.000	.192	6.188	.000
	Family size	.117	.034	.150	3.432	.001
	ED_OF_FH	2.141E-02	.013	.050	1.685	.092
	Age of HH	2.257E-03	.004	.020	.644	.520

a. Dependent Variable: Crop Frequency

Appendix -E

Questionnaire

Title : "Impact of Diversified Agriculture on the Socio-economic Upliftment of the rural People of Bangladesh"

Name of the Respondent (Household) :
Name of Village :
Name of House :
Name of Union :
Name of Upazila :
Name of District :
Categories of Cultivation :

a) Only rice
b) Rice and diversified crops
c) Only diversified crops

PART A : Socio-economic and Demographic Information

2. General Information on Household Head & Members

Sl. No.	Name of the household members	Relation with household head	Age Sex	Marital status	Education	Main occupation
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Code on relation with household head :

Household head	=1
Husband/wife	=2
Son/Daughter	=3
Father/Mother	=4
Brother/Sister	=5
Others	=6

Code on marital status :

Married =1	Unmarried = 2
Widowed =3	Separated = 4
Divorce = 5	

Code on sex : Male – 1 Female-2

Code on occupation:

Agriculture (crop)-1	Agriculture (fish)-2
Agriculture (livestock, poultry) –3	Soil cutting – 4
Kumer – 5	Day labour – 6
NGO worker- 7	Service – 8
Homestead gardening-9	Carpenter – 10
Fishermen- 11	Boatman-12
Kamer-13	Muchi-14
Rickshaw driver-15	Car-driver-16
Small trade – 17	Small trade (production Orien.)-18
Business- 19	Business (Pro. oriented)-20
Imam – 21	Napit-22
Student-23	Unemployed –24
Retired person – 25	Contact labour-26
Begger-27	Disable – 28
Servant – 29	Artist – 30
Others free job – 31	Child (less than 12 yrs)-32
Agricultural labour – 33	Mechanics- 34
Village doctor – 35	Permanent labour-36
Temporary worker – 37	Dopa – 38
Dargi-39	Other-40

3. Total land ownership of the household head by categories of farmers (Large/ Medium-1/Medium-II/Small)

a.	Homestead	acre
b.	Own land cultivated	acre
c.	Own land cultivated by others	acre
d.	Others land cultivated by himself	acre
e.	Total ownership of land (a+b+c)	acre
f.	Total cultivable land (b+d)	acre
g.	Land under irrigation	acre

PART – B : Production Related Information :

4. Crop-wise Cultivable Land :

Crop Code	Cultivable Land

Crop code :

Aus (Local) - 1	Mug – 12	Potato – 23	Ladies finger-34
Aus (HYV) - 2	Other – 13	Barbati – 24	Shim- 35
Amon (Local)- 3	Til – 14	Pointed goard-25	Kachu lati-36
Amon (HYV) - 4	Sharisha-15	Sweet potato – 26	Kachu-37
Boro (Local) - 5	Tishi – 16	Bitter gourd-27	Jali-38
Boro (HYV) - 6	Sunflower-17	Usta – 28	Sweet Kumra- 39
Wheat- 7	Badam – 18	Brinjal – 29	Cucumber-40
Mushari (Lentil)-8	Onion – 19	Tomato – 30	Frach bean-41
Motor –9	Garlic – 20	Bottle goard-31	Boby bean-42
Maskali – 10	Chilly – 21	Chichinga -32	
Kheshari – 11	Condamin – 22	Raddis-33	

5. Mention Per Acre Yield of Crops fro Different Crops :

Code No of crops	Cultivable land (decimal)	Total production	Per acre production	Code No of crops	Cultivable land (decimal)	Total production	Per acre production
01				22			
02				23			
03				24			
04				25			
05				26			
06				27			
07				28			
08				29			
09				30			
10				31			
11				32			
12				33			
13				34			
14				35			
15				36			
16				37			
17				38			
18				39			
19				40			
20				41			
21				42			

6. Mention Market Price of Individual Crop (Production)

Crop code	Price per maund	Crop code	Price per maund
01		22	
02		23	
03		24	
04		25	
05		26	
06		27	
07		28	
08		29	
09		30	
10		31	
11		32	
12		33	
13		34	
14		35	
15		36	
16		37	
17		38	
18		39	
19		40	
20		41	
21		42	

7. Per Acre Production Cost of Crops

Crop code	Land preparation cost	Seed & seedling cost	Fertilizers cost	Irrigation cost	Weeding cost	--- cost	Drainage cost	Harvestir cost / Total cos

PART-C : Consumption Related Information

8. Mention Daily Household Consumption with Market Price

Name of Food Items	Daily Food Consumption		Total Price
	Gm	Market price (per kg)	
Rice			
Wheat			
Potato			
Vegetables : lal shak (Red spinach) Palong shak (Spinanch) Barbati Pointed gourd Brinjal Ladies finger Kachu lati Chichinga Tamato Cucumber Raddies Bottle gourd Kumra (gourd) Others			

PART-C

Name of food items	Daily food consumption		Total price
	gm	Market price (per kg)	
Pulses : Masur (Lentil)			
Keshari (Pegonpee)			
Maskalai (Pegonpe)			
Motor (Pegor pee)			
Mug			
Milk			
Edible oil			
Mustard			
Soabean			
Meat			
Muton			
Beaf			
Chicken			
Egg			
Fish Hilsha Shing Kai Katal Katchki Fali Mala			
Pulses : Masur (Lentil)			
Pangas shail Taki Boal Puti Tangra Shrimp Dry fish Others			
Condiments Onion Garlic Chily Condiments			
Total			

PART-D :

9. Please Mention Annual Income from Different Source

Sl. No.	Sources of Income	Gross Income	Production Cost	Net Income
1	Rice			
2	Jute			
3	Wheat			
4	Pulses			
5	Potato			
6	Til			
7	Mustard			
8	Tishi			
9	Lentil			
10	Maskalai			
11	Kheshari			
12	Vegetables			
13	Chilly			
14	Others			
15	Land ounted out			
16	Selling livestock			
17	Selling milk			
18	Selling goat			
19	Selling poultry			
20	Income from service			
21	Income from business			
22	Income from wage earning			
23	Handicraft			
24	Income from Abroad			
25	Income from Pension			
26	Income from Bank Text/Savings Certificates			
27	Interest from NGOs / Corporative Societies			
28	Income from the Projection of Fruits			
29	Others Income			
30	Total Income			

10. Please Mention Yearly Expenditure

Sl. No.	Items of Expenditure	Total Exenditure
1	Food expenditure	
2	Rice / Wheat	
3	Pulses	
4	Slat	
5	Fish	
6	Meat	
7	Egg	
8	Edible oil	
9	Sugar/Gur	
10	Vegetables	
11	Others	
12	Non-food Expenditure	
13	Education	
14	Health	
15	Clothing	
16	Relatives	
17	Entertainment	
18	Others	
	Total (a+b)	

PART : Information Regarding Marketing Problems for Diversified Crop Cultivation

Q.11. How farmers are deprived by market participants in selling their produces in the primary market

a) Price deprivation through bargaining with market participants;
b) Price deprivation in case of deterring price with profitable margin;
c) Others

Q.12. What are the over-supply problem of diversified crops during peak season of harvesting ?

a) Imposement of farmers to sell their produces less than prevailing or current market price;
b) Imposement of farmers to sell their produces what ever the market price / as usual price
c) Imposement of farmers to keep their produces storage/wastage/remain unseal.
d) Others.

Q.13. What are the Problems Related to Marketing Infrastructure for Diversified Crops that should be Solved for Encouraging Diversified Agriculture at the Grass Root Level ?

a) Problem of transportation & storage for perishable diversified crops at grass root level;
b) Problem of selling directly to government agent / institution / association;
c) Problem of processing ; and
d) Others

Q.14. Please give your opinion interms of importance on the following three important marketing problems of diversified crops

Sl. No.	Marketing Problems	Ranking		
		1	2	3
1	Inadequate government initiative (director purchase from farmers through govt. agent) getting actual or fair price for the produces for during the period of harvesting through government agent / association			
2	Poor marketing infrastructure, in rural areas like communication, storage & processing			
3.	Inadequate initiative for planned production and export of diversified crops			

Q.15 What should be the forms of linkage institutions at the grass root level to solve the problems of marketing of diversified crops ?

a) Establishment of marketing organizations (marketing cooperative) at village level ;
b) Establishment of joint cultivation or contact farming at village level;
c) Establishment of credit organisation or credit / loan facilities at village level;
d) Sell of produces through govt. contact / agents / association;
e) Others.

Q.16. What should be the government initiatives to improve diversified agriculture through agricultural marketing opportunities at the grass-roots level :

a) Contamination of Crop Diversification Programme (CDP) at village level
b) Supply of fertilizers and insecticides at fair price
c) Supply of quality seeds at the time of production
d) Providing irrigation facilities at the grass roots level
e) Ensuring more monitoring of block supervisors.

Q.17. Farmers are the foundation of Bangladesh Agriculture. so what should be your suggestions regarding farmers expectations for policy formulation to uplift diversified agriculture in rural Bangladesh.

i)

ii)

iii)

iv)

v)

(Thank you very much for your opinions)