

STATUS OF FOOD SECURITY IN KHULNA CITY CORPORATION



A Thesis

Submitted By

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Examination Roll No. MS 090716

Session: 2008-2009



Submitted to

**Biotechnology and Genetic Engineering Discipline, Life Science School,
Khulna University, Khulna, in partial fulfillment
of the requirements for the degree of Master of Science (MS) in Biotechnology and
Genetic Engineering**

Biotechnology and Genetic Engineering Discipline

Life Science School, Khulna University

Khulna-9208, Bangladesh.

September , 2011

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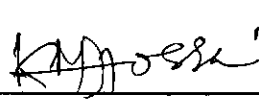
Session: 2008-2009

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DECLARATION

This thesis reports the original research work of the author, except as otherwise stated. The material presented has not been submitted either in whole or in part for a degree from this or any other university. The findings of the research has not been/will not be published anywhere without the concurrences of the concerned supervisor. Legal action would be taken in any case of infringement regarding the declaration.

Ayesha Ferdous.

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**Devoted To
My Beloved
Family**

Acknowledgement

At first, I would like to express my deepest gratitude to the supreme of the universe, the Almighty Allah, the Most Gracious and Most Merciful, who has given me the ability to perform this thesis work with sound condition. At the same time I would like to express my heart felt gratitude to our Holly Prophet Hazrat Mohammad (pbuh) who is the guide to knowledge and wisdom for mankind.

I would like to express my cordial gratitude and deepest appreciation to my thesis supervisor Dr. Sheikh Md. Enayetul Babar, Professor of Biotechnology and Genetic Engineering Discipline, Khulna University, Khulna, for his systematic and sincere supervision and valuable suggestions, advices and necessary guidance. It is an indeed a great honor and privilege for me to thank my honorable teacher.

Findings are based on a number of data sources, and to obtain these data I relied on the respondents of Khulna City Corporation, DAM and MAC Association in Khulna. Their cordial help and friendly contribution by responding to the queries, discussions and interviews during the time of survey that enables me to analyze findings and make all the ideas into a paper.

I would like to express my heartfelt thanks to all the teachers of Biotechnology and Genetic Engineering Discipline, Khulna University, Khulna.

The Author

ABSTRACT

This paper is presented to study food security situation in Khulna City Corporation areas. Here we provided an overview of successful community, research and policy initiatives that adopted this new policy paradigm and thus contributed to sustainable food security on the local, regional and sometimes even global level. This study belongs to 120 respondents of Khulna City Corporation areas those were randomly selected from 31 wards. From the empirical field survey to report presentation, the paper uses various statistical tools and method such as descriptive research design for designing the study, uses schedule method for collecting the data and uses SPSS 12, Sigmaplot 12 and MS Exel software for analyzing the data. From the study, age, educational status, gender of household head, number of family member, number of children, occupational pattern, monthly income, food status, storage of staple food, frequency of attack disease in a month, rice and soybean oil price, household size, per capita quantity consumed have been found to be the important variables affecting demand among households and therefore, their food security status. The causes behind the variation the price of rice and soybean oil differs to some extent but there exists similarity. People were unsatisfied in market price of rice and soybean oil. In Bangladesh food security could be substantially improved by increased investment and policy reforms. Biotechnology's ability to eliminate malnutrition and hunger through production of GM crops having longer shelf-lives, resistant to pests and diseases, refined textures and flavours, higher yields per units of land and time, tolerant to adverse weather and soil conditions, and employment opportunity cannot be over-emphasized. This technology can be applied to improve agriculture in order to improve food production for the population in an environmentally sustainable manner. However, there is need for government and public-private collaborations to invest in agricultural biotechnology-based companies, researches, or initiatives, in order to make the GM crops revolution beneficial to people of Khulna City Corporation areas.

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List of Acronyms

BBS	Bangladesh Bureau of Statistics
DAM	Department of Agricultural Marketing
FAO	Food and Agriculture Organisation of the United Nations
GM	Genetically Modified
H.S.C	Higher Secondary Certificate
MS Word	Micro Soft Word
NGO	Non-Government Organization
S.S.C	School Secondary Certificate
SPSS	Statistical Package for Social Science
UNICEF	United Nations Children's Fund
UNU	United Nations University
WHO	World Health Organization

CHAPTER 1

Introduction

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Food is most important human basic need. In this case, fulfilling of food is part of individual human right. The availability of sufficient food, safe, qualified, nutritious, healthy and lawful are basic principal which must be fulfilled by every household in realizing the quality of mankind.

Food security means access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: the ready availability of nutritionally adequate and safe foods, and an assured ability to acquire acceptable foods in socially acceptable ways.

Food security can be defined into three areas food availability, food access, and food utilization (World Bank, 1986).

Food availability is the sum of domestic production, imports (both commercial and food aid) and changes in national stock. Food availability in Bangladesh is derived from domestic agricultural production, net food imports at the national level (including food aid) and changes in the reserve stock (both private and public). Various factors can affect food availability such as production failures related to climatic conditions or labor constraints; low soil fertility resulting in lower yields and the gradual loss of productive assets needed to sustain household food production. On a macro-economic level, constraints to food availability may include inappropriate economic policies including pricing, marketing, tax and tariff policies, population growth rates that offset increased production or imports, market and transportation system and the inability to cope with emergency situations.

Food access is ensured when households and all individuals within them have adequate resources to obtain appropriate foods for a nutritious diet. Access depends upon income available to the household, on the distribution of income within the household and on the price of food. Two basic approaches are used in Bangladesh to improve poor people's access to food: the direct approach of public distribution of

subsidised food, and the indirect approach of developing and implementing poverty reduction strategies.

Food utilization relates to the capacity of an individual to absorb and utilise the nutrients in the food s/he consumes, and is determined by practices, beliefs, eating habits, hygiene, sanitation and health. Food utilization is determined by food safety and quality, how much a person eats and how well a person converts food to energy, all of which affect health, nutritional status and growth. Adequate food utilization requires a diet with sufficient energy and essential nutrients, potable water, adequate sanitation, access to health services, proper feeding practices and illness management. Food security of the country has been significantly and adversely affected by rising of food prices, and the amount of food insecure populations increased.

The market price is one of the prime considerations of public food management in Bangladesh. Price stabilization especially food grains price stabilization in the developing countries like Bangladesh is required to arrest instability arising from shocks in the domestic supply of food grains due to shortfall caused by natural calamities or ample supply of bumper production. The stabilization of price constitutes an important element to maintain production incentive to the growers and to provide consumers welfare. Rising food prices affect the poor directly, as producers and consumers, and indirectly, through the impact on their economies. During periods of lower global production of rice, soybean oil Bangladesh needs to import rice, soybean oil at a high price which may lead to inflationary pressure with negative impact on purchasing power of people with limited income. Severe hunger is where the children of a household also have their food intake reduced (Ohio Hunger Task Force, 2001).

Biotechnology has the potential to provide new opportunities for achieving enhanced crops and livestock productivity in a way that will ensure food security, alleviate poverty, ensure food security and nutrition, and promote sustainable use of natural resources. Biotechnology has been and will continue to be a vital tool for addressing the problems of hunger, malnutrition and disease in developing countries. Biotechnology can contribute to sustainable development through Green Revolution technologies. Biotechnology enhanced food security in several important

respects/approaches. The first is the breeding of new plant varieties; the second is the application of modern agricultural techniques in new areas; the third is the integrated into existing crop improvement programs biotechnology could increase agricultural productivity beyond what is possible with conventional breeding techniques alone. This would enhance the global food availability at affordable prices, while promoting environmentally sound production patterns; the fourth is the GM crop and transgenic crops production could raise the revenues in agricultural production, which is still the dominant source of income and employment for the rural poor in large parts of the world, increasing the availability of food at prices that poor people can afford, providing improved jobs and incomes that will give poor people the means to access food. A number of biotechnology applications are widespread in Bangladesh. These include biofertilizers and biopesticides, and products from tissue culture and micropropagation (banana, potato etc.) and also include diagnostics, vaccines, and embryo transfer for livestock.

1.2 Rationale of the study

Food insecurity is a burning issue in our country. Past data shows that the share of expenditure on rice in the total food expenditure increased from 54 percent in 2006 to 59 percent in 2007 in our country. The people of this country suffer from serious malnutrition. Food consumption pattern of low income people is not sufficient to their need. The middle income people are comparatively in better position regarding food consuming. The higher income people take proper nutritious food though they spend much for food but they have lack of awareness about nutrition and balanced meal.

Supply of food is not sufficient to meet up the demand of urban people. Not only that, the rising price level is also responsible for this incapability of fulfillment of demand. All of these factors attract me to conduct this research work.

1.3 Scope of the study

The scope of the study is mainly focusing on the rice and soybean market dynamics and market-based food insecurity and impact of present price of rice and soybean oil different socioeconomic classes of Khulna city. We have to remind that our population has doubled in the past 35 years. As a result the demand for the main food rice and soybean oil has also doubled. GM crops can maintain sustainable food

security in Khulna city. From this empirical analysis we can find out the general scenario of market-based food insecurity and impact of present price of rice and soybean oil. Therefore, the overall scope of study is surrounded in this city corporation with one hundred and twenty sample survey. And I believe that this study can bring a significant conclusion at the end of my research work.

1.4 Objectives of the study

The main objectives of this study are:

- To study food security status of Khulna city Corporation areas.
- To study the impact of rice and soybean oil on food security in this locality.
- To observe the role of Biotechnological product in the policy making process in food security.

CHAPTER 2

*Review of
Research*

CHAPTER TWO

REVIEW OF RESEARCH

The trends of food security and food management and biotechnological approaches to maintain food security were investigated by researchers from various countries. For example, Anderson and Cook (1999) suggested that current conceptual definitions of food security must include not only access by all people at all times to enough food for an active, healthy life but also access to secure, sustainable livelihoods.

Arber (2010) designed a road map that could be expected to lead, by a combination of genetic engineering and conventional plant breeding, to crops that can ensure food security and eliminate malnutrition and hunger for the entire human population on our planet.

Ariane *et al.* (2010) described three main changes to current risk analysis processes that were proposed to improve their transparency, openness, and accountability. First, the addition of a formal framing stage would allow interested parties, experts and officials to work together as needed to gain an initial shared understanding of the issue, the objectives of regulatory action, and alternative risk management measures. Second, the scope of the risk assessment is expanded to include the assessment of health and environmental benefits as well as risks, and the explicit consideration of economic- and social-impacts of risk management action and their distribution. Third, in an added evaluation stage, interested parties, experts, and officials may compare and weigh the risks, costs, and benefits and their distribution.

Arvind (2008) identified a series of proposals 1) short-run measures; 2) medium-run measures; 3) long-run measures that would make a difference in alleviating the plight of some of the most vulnerable people in the world.

Bart (2010) described that modern retail was emerge quickly, offering more labeled and branded food products and more choice than traditional markets and found that modern retail at its mere incipience in India sells basic foods mostly at the same or lower prices than traditional retail and might thus become an important contributor to improved urban food security.

Betty (2001) stated that participation in a series of nutrition education programs that teach basic nutrition, food resource management and basic cooking skills was related to a reduction in food insecurity.

Boles (1986) applied that a counter-veiling thought by arguing that “equality of opportunity” was insufficient to achieve “equality of outcome”, and included distributive equality and equality of access, both applicable towards the question of food security.

Burachik (2010) identified that four main causes that led to complex combination of circumstances of Argentina using high level of adoption of this new agricultural technology for production GM crops that lead to this: political support (from agriculture officials), ability to solve prevalent farmers’ needs, economic and environmental factors and an early implementation of effective regulations.

Chassy (2010) provided evidence that the new product was as safe as, or safer than, comparable varieties and concluded that the hyper-precautionary regulatory process applied to transgenic crops works to the extreme disadvantage of the hungry and the poor.

Christian (2010) stated that regression results showed that the connection between product quality and export performance depends on the product category (but not on the period) and differs (but not in all cases) according to the export destination. An implication arising from this analysis was that considering international marketing of quality food products in teaching and training programs could contribute to the enhancement of EU agribusiness competitiveness in increasingly liberalized and quality-conscious markets.

Chung (2008) reviewed that the new USAID/Food for Peace (FFP) new strategy that focuses on reducing food insecurity vs. increasing food security and suggests a number of food assistance activities for key countries and populations considering developing food assistance programming and interventions.

Chung *et al.* (1997) found that there is little correlation between a very large set of process indicators and measures of food security outcomes.

Cohen *et al.* (2009) argued that the disproportionate attention that policy solutions to the food price crisis give to rural dwellers is probably misplaced and gave the pathways of impact of food price rises on urban dwellers; highlight the evidence so far on how those impacts had played out during this crisis; and described current policy responses, suggesting how to improve them to better protect the urban poor in the short and longer term.

Cristina (1997) argued that the sharp increases in prices of rice, corn, and sugar have been caused largely by policy failures in terms of both the choice of policy instrument and management of that policy instrument.

Deaton (1997) stated that food consumption/expenditure data collection tools were usually designed together information at the household level on the consumption of (and expenditures on) foods over a predetermined period of time (often one or two weeks).

Fedoroff (2010) described that GM had contributed to unparalleled productivity increases but future increases were far from assured because of underinvestment in agricultural research, growing population pressure, decreasing fresh water availability, increasing temperatures and societal rejection of GM crops in many countries.

Flavell (2010) described that the recent discoveries and technical innovations that were revealing the full complement of genes in crops, the ability to define genetic variation and used DNA markers to follow chromosome segments with known functions through breeding programmes were leading to new efficiencies in breeding. Failure to invest adequately in innovative technologies would leave future decision-makers and citizens with fewer options and greatly enhance the risks for mankind and a healthy planet.

Francesco *et al.* (1995) studied of market integration had usually tried to characterize that the degree of co-movement of prices across spatially separated markets and understood how different measures of market integration may be used to derive conclusions about the structural determinants of market integration.

Frongillo (1999) described that food insecurity for individuals along the following spectrum: the least severe form was people who were uncertain of being able to obtain food in socially acceptable ways, to the most severe form where people simply did not eat enough due to insufficient resources and thus “experience the physical and psychological consequences of hunger.

Gardner *et al.* (2002) prompted that an evolving conceptualization of food security and of mechanisms to attain and maintain food security.

Gerard (2003) provided that a rapid overview of food security issues in relation to the Millennium Development Goals (MDGs) in seven Asian countries (Bangladesh, India, Nepal, China, Indonesia, Cambodia and Vietnam).

Gibson (2005) stated that dietary energy intake as a corresponding indicator was obtained mostly by 24-hour recalls, which are meant to assess the amounts of all foods an individual ate in the previous 24 hours.

Heather (2004) *et al.* described that food security comprises availability, accessibility, acceptability (by the population) and adequacy (for human health) of food and policy recommendations regarding meeting the four conditions of food security.

Jayne (1993) argued that the link between domestic stabilization policies and instability in world rice prices has been exaggerated.

John Hoddinott (1999) described that about household food security indicators and coping strategies.

Kendall and Pimentel (1994) described that green revolution enabled global food production to be increased at the rate of 2.8% per annum between 1966 and 1990 while the world's population increased at the rate of 2.2% per annum.

Kershen (2010) described that agricultural trade in transgenic crops faces extra complications due to the existence of domestic and international regimes that focus specifically on agricultural biotechnology. These specialized regimes created legal and commercial challenges for trade in transgenic crops that had significant implications for the food security and could either encourage or hinder the adoption of agricultural biotechnology as a sustainable intensive agriculture.

Leeming (2003) presented that estimates of price functions for beef, lamb and pork for the UK economy which allow for the effects of the 1996 BSE crisis.

Magdalena (2005) evaluated that the potential impact of the modern biotechnological revolution (genetic engineering) on food security in developing countries.

Mahabub *et al.* (2005) denoted that the assesses the trends in factors that affected food production, availability of food and their impact on nutrition outcomes. It also probed into the trends in poverty and distribution of income and access to food through markets.

Nira (2006) described that various aspects of the relationship between women and food security in South Asia, highlight the issues that require urgent focus and indicate emerging concerns in the region.

Norhasmah *et al.* (2010) described that household food insecurity is essential for better measurement and assessment of its nutritional, physical and psychological consequences and explored coping strategies and their perceived severity in relation to household food insecurity.

Philipp (2008) stated that public funding for crop improvements was cut back worldwide over the past two decades, while the private sector continued to invest

primarily in the improvement of high value cash crops designed for large-scale and capital intensive farms and harnessing the biotechnology revolution to address the solve problem of food and energy crisis.

Rasul *et al.* (2003) found that ecological agriculture is relatively more sustainable than industrial agriculture, both environmentally and economically.

Sandra (2010) stated that an overview of developments in food safety policy in major industrial countries and of economic analysis of this policy. It described that the elements of a risk-based, farm-to-fork food safety system as it was emerging in OECD countries guided by discussions through Codex Alimentarius and traces its roots in the development of risk management policy in the United State.

Tey (2010) stated that Malaysia weighted more on availability aspect in food security by introducing more short and long term policy measures for boosting paddy and rice production, particularly in Sabah and Sarawak under the National Food Security Policy.

Vasco (2006) described that preliminary assessment of the food security variation showed that improvements were, as expected, more concentrated among the richer Vietnamese households than the poor ones, although there was some improvement among poorer strata as well and also focused on the calorie/expenditure elasticity and compare results for the years 1993 and 1998 and confirmed that this linked was strong, and showed that calorie income elasticity changed in the expected direction.

William (2008) documented that the crisis and the way forward with new data on food prices, production and trade at the aggregate and household level, focusing particularly on the influence of Africa's own agricultural policies and the role of foreign aid.

Yong (2009) described that food safety management system and the information how implemented food safety management in enterprises.

CHAPTER 3

Methodology

CHAPTER THREE

METHODOLOGY

3.1 Research Design

The study design was a descriptive study. To test the study items data were collected by questionnaire. To fulfill the objectives, data were tested for all classes of people of Khulna city. Then collected data are analyzed with various mathematical and statistical methods.

Steps of the Research

Some basic steps have been followed to make the pathway for research. Each step involved with lot of works and thoughts.

3.2 Selection of the Study Area and Its Location

In very recent, the issue of food security and impact of market price becomes a major issue in the home and abroad because of its total dreadful conditions. There are a lot of internal and external causes of this problem and also created consequences which severely affected the area. People suffer constantly. The total situation affects the social, economic, cultural activities of the people of that area. My study area was 31 ward of Khulna City Corporation.

3.3 Questionnaire Preparation

After conducting the reconnaissance survey, a clear and structured questionnaire was prepared. The study was mainly based on primary sources. So, questionnaire preparation was an important part of this study; special attention was given to prepare the draft questionnaire. After preparation of the draft questionnaire, it was pre-tested in selected area and the perfectness of the questionnaire was reviewed. Then a final questionnaire was prepared with the help of the experience derived from the pre-tested of the draft questionnaires.

3.4 Sampling Technique and Sample Size Selection

Khulna city corporation area is the study area which I chose for my thesis work. Different classed people of the study area are the unit of this study. Data were

CHAPTER 4

*Results and
Discussion*

CHAPTER FOUR

RESULTS AND DISCUSSION

Khulna, the third largest metropolitan city of Bangladesh, is selected as the study area for this paper. It is located on the banks of the Rupsha and Bhairab rivers in Khulna district. Khulna City is located in the southwestern part of Bangladesh. Khulna attained the status of City Corporation in 1990. Khulna City Corporation is comprised of thirty-one (31) wards with an area of 45.65 Sq. Km. and a population of 7, 73, 216 (BBS, 2001).

In this research 120 respondents from Khulna city were chosen by random sampling because of time and resource constraints. Among these 120 respondents information from the respondents were analyzed and present in the subsequent sections.

4.1 Socio-economic Background of Respondents

In Khulna city there were different occupational people. Their educational background was also varied. All the people of this city do not possess same standard of living. It also varies significantly. Their choice and taste were not same as well.

TABLE 4.1 Socio-economic Background of Respondents

Parameter	Category	Frequency	Percent
Age	15-25	19	15.8
	25-35	43	35.8
	35-45	14	11.7
	45-60	30	25.0
	60+	14	11.7
Educational status	Illiterate	54	45.0
	Primary; Secondary, Higher secondary	52	43.3
	Degree/honors	14	11.7
Gender of household head	Female	55	45.8
	Male	65	54.2
Number of family member	One	22	18.3
	Two	49	40.8
	More	49	40.8
Occupational pattern of the Respondents	Day labourer/ Agriculture	50	41.7
	Business/ Service/ Teacher	50	41.7
	Others	20	16.7
Monthly Income Group (Tk)	Less than Tk 5000-10000	76	63.3
	10000-30,000	30	25.0
	Tk 30,000+	14	11.7

TABLE 4.2 Food Security Analysis

Category		Frequency	Percent
Parameter			
Women's perceptions of household food security	having three meals a day	6	5.0
	having sufficient budget to buy food for all members	22	18.3
	stored rice available	25	20.8
	having nutritious food for children	27	22.5
	able to budget properly the husband's income	16	13.3
	having cash savings	12	10.0
	having backyard garden and extra income from raising animals	12	10.0
Men's perceptions of household food security	having permanent job	3	2.5
	having a regular income	23	19.2
	adequate harvest of paddy rice; can pay debts and some paddy	24	20.0
	having adequate food everyday	26	21.7
	high wages	22	18.3
	having some assets, like animals and land	22	18.3
Food Status (meal) in the household	Poor	57	47.5
	Good	47	39.2
	Very good	16	13.3
Households which run out basic food items	Yes	93	77.5
	No	27	22.5
Best statements describes the food status in household	Enough of the kinds of food we want to eat	23	19.2
	Enough but not always the kinds of food we want	28	23.3
	Sometimes not enough to eat	32	26.7
	Often not enough	21	17.5
	No response	16	13.3

TABLE 4.2, continued

Parameter	Category	Frequency	Percent
Respondent attack disease in a month	One time	14	11.7
	Two times	42	35.0
	More	64	53.3
Name of Diseases attack by the respondent	Anemia	20	16.7
	Headache	25	20.8
	Weakness	25	20.8
	Fever	30	25.0
	Others Problems	20	16.7
Measurement quality of variety of food	Food Freshness and Palatability	48	40.0
	Meat tenderness	24	20.0
	Spoilt Food	35	29.2
	Rice quality e.g. of broken, crushed, immature and other substitute	13	10.8
Causes of food insecurity	Water availability in irrigation and lack of safe drinking water	9	7.5
	Rain patterns	21	17.5
	Soil conditions	57	47.5
	Low income levels	9	7.5
	Lack of government support to local producers	8	6.7
	Culture / education	8	6.7
	Others	8	6.7
Food Insecurity Severity level* (Percentage of Calorie Intake Per Capita)	Consistently above 2100 kcal (Food Secure)	19	15.8
	Between 1800kcal and 2100kcal (Marginally food insecure)	30	25.0
	Between 1500kcal and 1800 kcal (Moderately food insecure)	36	30.0
	Less than 1500 kcal (Severely food insecure)	35	29.2

*Calorie Consumption/person/Day

TABLE 4.3 Price of Rice and Soybean Oil

Category		Frequency	Percent
Parameter			
Causes of high prices	High production cost	41	34.2
	Low supply of food	25	20.8
	Administrative price controls, where prices are set	21	17.5
	High food taxes	11	9.2
	Taking direct action against 'hoarders and profiteers'	11	9.2
	High prices of fertilizer	11	9.2
Coping Mechanism with insecurity for high prices of rice and soybean Oil	Adult or children cut or skipped meals	3	2.5
	Adult or children were not eating enough	18	15.0
	Cut size of adult's or children's meals	12	10.0
	Adult or children not eat for whole day	25	20.8
	Low-cost food for adult or children	22	18.3
	Couldn't feed adult or children a balanced meal	22	18.3
	Adult or children were not eating enough	18	15.0

TABLE 4.4 Impact of price of rice and soybean oil on the respondent

Category		Frequency	Percent
Parameter			
Types of rice	Fine rice	20	16.7
	Coarse rice	37	30.8
	Middle rice	63	52.5
Types of Soybean Oil	Super oil	54	45.0
	Loose soybean oil	2	1.7
	Palm oil	47	39.2
	Bottled soybean oil	17	14.2
Frequency of the number of respondents who have savings (yearly)	Upto Tk 1,00,000	45	37.5
	Tk1,00,000- 5,00,000	21	16.67
	Tk 5,00,000+	13	10.83
Respondent's measure to reduce price hike of rice and soybean oil	Targeted food production, transfers, distribution and sales	23	19.2
	Food price management	26	21.7
	Reduce production costs	35	29.2
	Reducing import tariffs and duties	23	19.2
	Cash transfers	13	10.8

TABLE 4.5 General Information of Genetically Modified (GM) Crops

Category		Frequency	Percent
Parameter			
Perceptions of GM Crops	Give much yield	13	10.8
	Less crop damage	19	15.8
	Beneficial for health	17	14.2
	Encourages use of environmentally friendly herbicides	13	10.8
	Less soil erosion	13	10.8
	Lower input costs	13	10.8
	Less chemical pesticides used	17	14.2
	Less impact on non-target organisms	15	12.5
Name of GM Crops	Golden Rice	47	39.2
	Bt Soybean	9	7.5
	Bt Eggplant	34	28.3
	Bt Maize	12	10.0
	Bt Cotton	12	10.0
	Others	6	5.0
Consumer acceptance of GM foods based on general information	Will buy	38	31.7
	Will not buy	15	12.5
	Follow majority	40	33.3
	Do not know	27	22.5
Current consumer attitudes toward GM crops	Safe	17	14.2
	Unsafe	57	47.5
	Do not know	46	38.3
Current consumer awareness toward GM crops	Just heard	87	72.5
	know something	33	27.5
Types of benefits from accepting GM rice and soybean oil	Improving food production and hence attaining food security	7	5.8
	Improving economic growth and alleviating poverty	19	15.8
	Providing food with improved nutritional value	23	19.2
	Providing environmentally safe and sustainable agriculture	19	15.8
	Economic benefits for farmers	13	10.8
	Empowerment of farmers	10	8.3
	May promote water conservation	15	12.5
	Less use of pesticides and herbicides	14	11.7

TABLE 4.6 Summary of Pearson's Correlation on Expenditure of Food by Selected Socio-economic Variables

Variable	Socio-economic Variables		
	Income	Savings	Satisfaction
Expenditure of Food	0.978(**)	0.986(**)	0.091(**)
N=120	N=120	N=79	N=120

**** Correlation is significant at the 0.01 level (2-tailed).**

The socioeconomic status of 120 respondents was described below in various steps in respect of their age, education, family size, gender of household head, income and occupational pattern.

4.1.1 Age

It was shown from the table 4.1 that about 11.7 % of the respondents were between the age class intervals of 35-45 years, about 25.0 % felt between the age class intervals of 45-60 years. About 35.8 % respondent's age was between 25-35 years, about 15.8 % respondents age was between 15-35 years, only 11.7 % were 60+. It was expected that they were more likely to play crucial roles as caretakers of the household's food and nutrition security.

4.1.2 Educational status

Analyzing the data it was shown from the table 4.1 that about 45.0% was illiterate. Among the literate people about 43.3% was primary, secondary and higher secondary; about 11.7% was degree/honors. Education is the basic factor for any kinds of development, and education indicates the income level and social status of a society. A better educated man is likely to acquire skills needed to participate in new knowledge and intensive economic productive activities which invariably would enable the households to acquire an adequate food supply. Extensive empirical evidences such as Quisumbing and Meinzen-Dick (2001), King and Alderman (2001) demonstrated that increasing women's education was a key ingredient for women's empowerment and household food security. A better educated woman is likely to acquire skills needed to participate in new knowledge and intensive economic productive activities which invariably would enable the households to acquire an adequate food supply.

4.1.3 Gender of household head

Analyzing the questionnaire it was shown from the table 4.1 that about 45.8% of the household heads was female and about 54.2 % household heads was male.

4.1.4 Number of family member

From the table 4.1 it was shown that about 40.8% of the respondents had two family members. About 40.8 percent of the respondents reportedly had more family members. About 18.3 percent had one family member. This indicates that the respondents in the study area had high family members which could have a negative impact on household food security. Generally family size affects household's demand for food since household food requirement and size were positively correlated (Hoddinot, 1999). People that had many children were faced with the challenge that places heavy demands on their labour and energy to ensure household food security. This was corroborated by Davis (1982) findings who observed that household food expenditures increase with the addition of children to the household and continue to increase as children get older, peaking when they were teenagers. A similar finding by Nwez Nnakwe (2002) study showed that food insecurity prevalence among households with preschool children was about 57 percent and among households without preschool children was 44 percent. Another study carried out by Bruce Furness showed that the living of children (under 18 years) in the family increase the risk of households' food insecurity by 1.8 times (Furness *et al.* 2004).

4.1.5 Occupational pattern of the Respondents

It was shown from the table 4.1 that a large number of the respondents were employed. Only about 41.7 percent were day labourers/ agriculture; 41.7 percent were business/ service/teacher; 16.7 percent were others. A large number of the respondents were employed in a single occupation. They have no extra income which can be used to argument total household income. This may have serious consequences on the household if the respondents are the heads of their various households or if their spouses have no sustainable livelihoods. Sustainable livelihoods have continued to receive attention in food security analysis. For instance, studies by Chambers (1987), Anderson and Cook, (1999) posited that livelihood security was an appropriate concept encompassing both food security and freedom from all

dimensions of poverty at the household level as well as the ability to survive crisis and shocks, such as sickness, accidents natural disaster, financial crisis and household food insecurity. It was unanimously agreed that for households to enjoy livelihood security which invariably would ensure household food security, it was necessary that they have reserves which can be used to meet contingencies. Absence of sustainable livelihoods exposes members of the household in the study area to food insecurity.

4.1.6 Monthly Income Group

Analyzing the data it was shown from the table 4.1 that a significant proportion of the respondents' (63.3%) income was 5000-10000 per month which was the minimum wage in the country. About 25.0 percent of the respondent's income was 10000-30000Tk per month. Only about 11.7 percent of the respondent's income was 30000+. This was worrisome considering the recent hike in food prices in recent times. Several studies have shown a strong correlation between women's income and improved nutritional status. Empirical evidence supports the view that women show a higher propensity towards acquiring food out of incremental units of income under their control in order to ensure household food security. Family income is also one of the most important factors on household food security. The relationship among gender of household head and monthly Income Group and occupation of the respondent was given in Chi Square table 4.7 and 4.8.

TABLE 4.7 Result chi-square analysis depicting the relationship between Gender of household head and monthly Income Group

Monthly Income Group(Tk)	Gender of Household Head		Total
	Female	Male	
Less than Tk			
5000-10000	27	49	76
10000-30,000	22	8	30
Tk 30,000+	6	8	14
Total	55	65	120

From the table 4.7 it was shown that there was a relationship between gender of household head and monthly Income Group which was more likely to have significant impact on household food security. The calculated chi-square was 12.441 with 2 as degrees of freedom and it was significant at $P < 0.005$.

TABLE 4.8 Identified Relationship within the Data from analysis 4.7

Variable x Variable	Calculated Chi Square	Tabulated Chi Square	p	Degree of freedom (df)
Gender of household head and monthly Income Group	12.441	10.6	0.005	2

Analyzing the sections 4.7 the sum up of the major findings from them was the calculated value of chi-square was 12.441 at 2 degree of freedom where the table value at 0.005 level of significance was 10.6 which are lower than the calculated value. It was evident that there was a relationship above variable.

4.2 Food Security Analysis

Concepts of food security have evolved in the last thirty years to reflect changes in official policy thinking (Clay, 2002; Heidhues *et al*, 2004). The term first originated in the mid-1970s, when the World Food Conference (1974) defined food security in terms of food supply - assuring the availability and price stability of basic foodstuffs at the international and national level: "Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices". The definition was revised to include the individual and household level, in addition to the regional and national level of aggregation, in food security analysis. These were given below.

4.2.1 People's perceptions about food security

The scientific concept of food security does not necessarily tally with people's perception of it. People's experience in a continuously changing environment shapes up their understanding and interpretation of food security. People's perceptions and ideas are affected by their condition in life (Ardales and David, 1986). An overview

of the perceptions of women and men about household food security in the Study area was presented from 4.2.2 to 4.2.3.

4.2.2 Women's perceptions of household food security

Analyzing the data it was shown from the table 4.2 that women's perceptions associated food security was with food availability or 'having three meals a day (5%), stored rice available (20.8%), able to budget properly the husband's income (13.3%), having cash savings (10%), having backyard garden and extra income from raising animals (10%), having nutritious food for children (22.5%), having sufficient budget to buy food for all members (18.3%). Some women also have ideas on the sufficiency of available food for the household's members, which were relevant, particularly from a nutrition point of view. These ideas were parallel with some definitions of food security (UNICEF, 1990). The importance of adequacy (the household's members getting enough nutritious food) in the ideas of some women illustrates the overlap between food and nutrition security, an observation that was consistent with some literature (Swaminathan, 1986). In the household women were involved in food preparation and childcare, for which they need resources (Jaffry, 2000; Moser, 1993).

4.2.3 Men's perceptions of household food security

From the table 4.2 it was shown that about 21.67% men claimed associated food security was that having adequate food every day. About 20% men thought that adequate harvest of paddy rice and could pay debts and some paddy rice stored for consumption; about 18.33% men's thought having some assets, like animals and land, high wages (18.33%). About 2.5 % thought having a permanent job and about 19.17 % having a regular income. Food security was perceived in terms of economic status and one's living environment by men. Men appear to experience hunger different than women in a more specific physical way. A similar result has been argued by Monello and Mayer (1967).

4.2.4 Food Status (balanced meal) in the household

Analyzing the questionnaire it was shown from the table 4.2 that a large number of the respondents were poor status (47.5 percent) in food. About 39.2 percent were good status and 13.3 percent were very good status in a balanced meal. As most of respondents were poor status, this indicates that the respondents in the study area had household food insecurity. In one study (Nord *et al*, 2005); poor households had three

times more probability than other households for food insecurity. The relationship among educational status, food Status (condition) in the household, gender of household head, number of family member was given in Chi Square table 4.9, 4.10 and 4.11.

TABLE 4.9 Result chi-square analysis depicting the relationship between educational status and food Status (condition) in the household

Educational status	Food Status (meal) in the household			Total
	Good	Poor	Very good	
Illiterate	24	27	3	54
primary; secondary , Higher secondary	15	30	7	52
degree/honors	8	0	6	14
Total	47.0	57.0	16.0	120.0

From the table 4.9 it was found that there was a relationship between educational status and food Status (condition) in the household. The calculated chi-square was 22.415 with 4 as degrees of freedom and it was significant at $P < 0.001$. The findings in this study have confirmed the fact that improving women's education is a salient ingredient for ensuring household food security. Studies by Quisumbing and Meinzen-Dick (2001) corroborated this fact. Evidences also abound that investment in the education of women increases their earning potential and employment opportunities; hence, efforts to raise women's incomes are of utmost importance to the provision of high quality foods for members of their household, particularly, infants and children.

TABLE 4.10 Result chi-square analysis depicting the relationship between gender of household head and food status (balanced meals) in the household

Gender of Household Head	Food Status (meal) in the household			Total
	Poor	Good	Very good	
Female	37	13	5	55
Male	20	34	11	65
Total	57	47	16	120

Analyzing the questionnaire it was shown from the table 4.10 that there was a relationship between gender of household head and food Status (balanced meals) in the household. The calculated chi-square was 15.981 with 2 as degrees of freedom and it was significant at $P < 0.001$. Studies by Owotoki (2005) also corroborated this fact that within gender comparisons, female-headed households were not more food secure than male-headed households. Godfrey (1999) disagreed these findings. The poor female headed households were the most affected of any price increase of the staple food though a few net producing households may get benefit in the short run. This was collaborated by Reza *et al.*, 2010.

TABLE 4.11 Result chi-square analysis depicting the relationship between number of family member and food Status (balanced meals) in the household

Number of family member	Food Status (meal) in the household			Total
	Poor	Good	Very good	
One	8	13	1	22
Two	34	12	3	49
More	15	22	12	49
Total	57	47	16	120

Analyzing the data it was shown from the table 4.11 that there was a significant relation between the numbers of family member and food Status (balanced meals) in the household. The calculated chi-square was 21.553 with 4 as degrees of freedom and it was significant at $P < 0.001$. Sharafkhani *et al.* (2010) found that in comparison with white household without child and elderly, households with children (under five) 1.4 times had more chance of food insecurity ($P < 0.05$).

4.2.5 Households which run out basic food items

It was shown from table 4.1 that about 77.5% people was related with households run out of basic food items. Only 22.5 % was not related with households run out of basic food items. The relationship between households which run out of basic food items and educational status was given in Chi Square table 4.12.

TABLE 4.12 Result chi-square analysis depicting the relationship between households which run out of basic food items and educational status

Educational status	Households which run out of basic food items		Total
	Yes	No	
Illiterate	45	9	54
Primary, Secondary , Higher secondary	46	6	52
Degree/honors	2	12	14
Total	93	27	120

From the table 4.12 it was shown that there was a significant relation between households which run out of basic food items and educational status. The calculated chi-square was 36.720 with 2 as degrees of freedom and it was significant at $P < 0.001$.

4.2. 6 Best statements describes the food status in the household

Analyzing the questionnaire it was shown from the table 4.2 that about 26.7 percent had gotten sometimes not enough to eat food and 23.33 percent had gotten enough but not always the kinds of food they want. About 17.5 percent had often got not enough. This indicates that the respondents in the study area had remained in food insecurity.

4.2.7 Respondent attack the disease in a month

From the table 4.2 it was shown that about 53.3% respondent attacked disease more time; about 35% respondent attacked disease two times and only about 11.7% suffered disease one time. According to Skold (1998), poverty was both the cause of ill health and vulnerability in people, and an obstacle for delivering effective health care. The relationship between food status (meal) in household and respondent attack the disease in a month was given in Chi Square table 4.13.

TABLE 4.13 Result of chi-square analysis showing the association between food status (meal) in household and respondent attack the disease in a month

Food Status (meal) in the household	Respondent attack the disease in a month			Total
	One time	Two times	More	
Poor	10	24	23	57
Good	4	8	35	47
Very good	0	10	6	16
Total	14	42	64	120

Analyzing the data it was shown from the table 4.13 that there was a relationship between food status (condition) in household and respondent attack the disease in a month. The calculated chi-square was 19.065 with 4 as degrees of freedom and it is significant at $P < 0.01$. Poor food status was an indicator of socioeconomic classes in the society. It was agreed that for poor food status households never enjoy livelihood security which invariably would ensure household food security as they had low income they did not take better opportunity of treatment. In other words higher usage levels of doctors and hospital services by the rich, relative to their levels of reported illness. A similar result was observed by Zere *et al.* (2003).

4.2.8 Name of Diseases attack by the respondent

It was shown from the table 4.1 that most of the respondents (25%) were attacked fever, headache, (20.8%), weakness (20.83%), other problems (16.7%), anemia (16.7%). Karim *et al.* (2006) described the prevalence of diarrhoea and general illnesses were also highest among extreme poor group.

4.2.9 Measurement quality of a variety of food

Analyzing the questionnaire it was shown from the table 4.2 that about 40% respondent measured quality of food by food freshness and palatability; meat tenderness (20%), measured quality of spoilt food (29.2%); about 10.8% respondent measured quality by rice quality e.g. of broken, crushed, immature and other substitute. But for high prices they majority of people did not maintain quality. Similar findings were observed by ACF/MSF (2008).

4.2.10 Causes of food insecurity

Analyzing the questionnaire it was shown from the table 4.2 that it was shown that most of the respondents (47.5%) argued on soil conditions; about 17.5% respondents argued on rain pattern as the major causes of victimization of food security. Besides, about 7.5% respondents claimed low income level, water availability in irrigation and lack of safe drinking water (7.5%); about 6.7% thought the cause of food insecurity was due to lack of government support to local producers, as the root causes of this victimization and culture/education (6.7%) and others had been claimed by 6.7% respondents.

4.2.11 Food Insecurity Severity level (Percentage of Calorie Intake Per Capita)

Based on calorie consumption per capita, it was shown from table 4.1 that about 15.8 percent of the people affected households in our sample were food insecure, 25% marginally food insecure, 30% moderately food insecure, 29.2% severely food insecure. The food security status was done according to Stephen Devereux (2006). Benson (2007) measured food security in urban Slum areas where food insecurity (<1,805 kcal/person/day) and food secure (>2,122 kcal/person/day). BBS (2003) used in the analysis of the 2000 Bangladesh Household Income and Expenditure Survey (HIES) – the direct calorie intake poverty line (2,122 kcal/person/day) and the hard-core direct calorie intake poverty line (1,805 kcal/person/day). FAO (1973) recommended for the daily energy intake for adult males are 2558 kcal and for adult females 1719 kcal. In Bangladesh males consume more calories than females, depending on seasonal variation (Abdullah, 1983). Urban and semi-urban elites have an adequate energy and protein intake compared to most of the rural people (Edib, 1979).

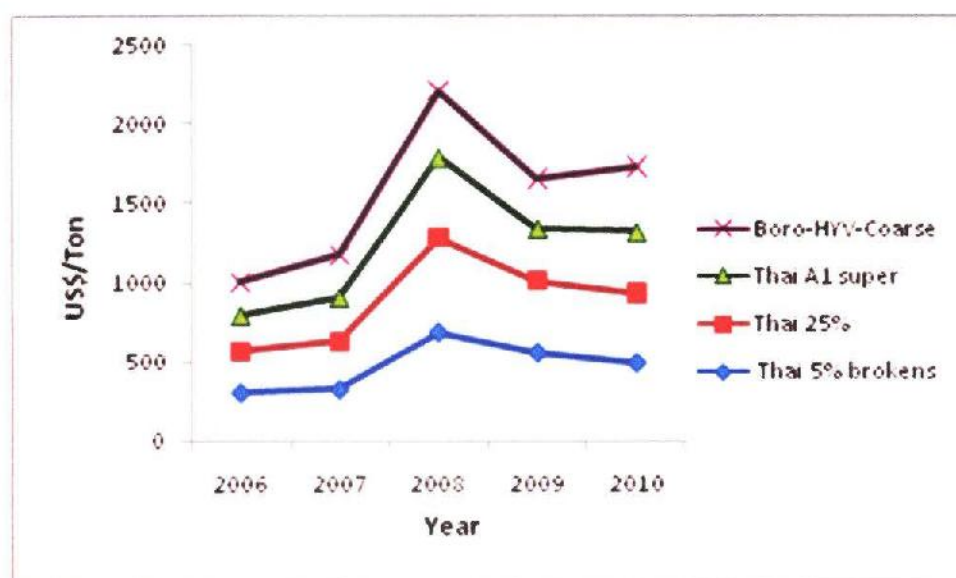
TABLE 4.14 Identified Relationship within the Data from analysis 4.9, 4.10, 4.11, 4.12 and 4.13.

Variable x Variable	Calculated Chi Square	Tabulated Chi Square	p	Degree of freedom (df)
Educational status and food Status (condition) in the household	22.415	18.5	0.001	4
Gender of household head and food status (meals) in the household	15.981	13.8	0.001	2
Number of family member and food Status (meals) in the household	21.553	18.5	0.001	4
Households which run out of basic food items and educational status	36.720	13.8	0.001	2
Food status (condition) in household and respondent attack the disease in a month	19.065	18.5	0.001	4

Analyzing the table 4.9, 4.10, 4.11, 4.12 and 4.13 the sum up of the major findings from them was the calculated value of chi-square was 22.415 at 4 degree of freedom, 15.981 at 2 degree of freedom, 21.553 at 4 degree of freedom, 36.720 at 2 degree of freedom, 19.065 at 4 degree of freedom where the table value at 0.001 level of significance was 18.5, 13.8, 18.5, 13.8 and 18.5 respectively which was lower than the calculated value. It was evident that there was a significant relationship above variable.

4.3 Price of Rice and Soybean Oil

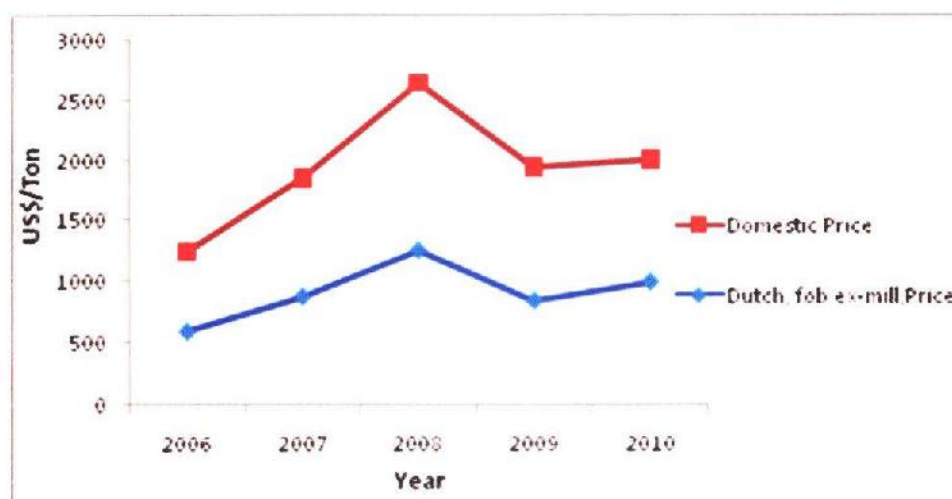
Rice and Soybean Oil prices in Bangladesh were highly volatile between 2006 and 2010. They all share one thing in common -both prices move together. In other words domestic price movements were very strongly influenced by international price movements. The trends of global market price and domestic market price of rice and soybean oil were shown in the figures below.



Source: Computed using FAO, DAM data

Figure 4.1 Comparison of yearly national and the international price of rice from 2006-2010

The above figure shows that in early 2007, rice prices began to increase rapidly. There were no major hikes or declines except until 2008. One point was clear: rice markets were notoriously volatile, not stabilizing.



Source: Computed using Oil World, DAM data

Figure 4.2 Comparison of yearly national and the international price of soybean oil from 2006-2010

It was shown from the figure 4.2 that the price has climbed in 2007. There were major price hikes in 2008 and declined in 2010. Soybean Oil markets were notoriously volatile and not stabilizing.

4.3.1 Causes of high prices

Analyzing the questionnaire it was shown from the table 4.3 that about 34.2% people thought that cost of high prices was high production cost; about 20.83% respondent thought low supply of food; administration price controls where prices are set (17.5%); about 9.2 % respondent thought high food taxes, taking direct action against 'hoarders and profiteers' (9.2%) and high prices of fertilizer (9.2%). All classes of the respondent suffered for a high price and they were in food insecurity. It was noted that natural calamity, increased demand for food and feed, low stocks for cereals and oilseeds, government policies, higher energy prices which increased cultivation costs and the price of inputs such as fertilizers seizing warehouse of larger food dealers and importers as the main reasons for hindering food supply to the market, which ultimately created the food crisis in Bangladesh. Similar findings also observed by Hulme (2007). Food availability was a function of the combination of domestic food stocks, commercial food imports, food aid and domestic food production as well as underlying determinants of each of these factors. Similar findings also observed by Riely *et al.* (1999). The 2008 price peak was a response to strong demand for competing crops that were used as biofuel feedstock (mainly maize for ethanol in the US and rapeseed for biodiesel in the EU) and a poor soybean crop in South America's key suppliers. Bangladesh has made a considerable progress in production and per capita availability of food during last decades, but the 2008 food price hike resulted in a sharp fall in rice wages measured in terms of quantity of coarse rice that can be bought with a daily cash wage (Hussain 2008).

4.3.2 Coping Mechanism with insecurity for high prices of rice and soybean Oil

Before, households were asked if they or any of their household members applied any coping strategy. The question was asked generally, not specifically in relation to the increasing food prices. It was shown from the table 4.3 that the most commonly applied strategy was reliance on not eat whole day (20.8percent), low cost food for adult or children (18.3 percent), could not feed adult or children a balanced meal (18.3percent), adult or children were not eating enough (15%), reducing the number of meals (2.5 percent). Most food-insecure individuals therefore consciously adopt a

graduated sequence of coping strategies that are successively less flexible and potentially more injurious (Corbett,1988).

4.4 Impact of price of rice and soybean oil on the respondent

Due to the sharp rise of the rice and soybean oil prices beginning 2006, it can be expected that higher food prices will have a serious impact on household food security levels, which eventually could lead to an increase in poverty rates. These impacts were given below.

4.4.1 Types of rice

Analyzing the data it was shown from the table 4.4 that about 52.5% respondents consumed middle rice (Nazirshail, Balam etc.), about 30.8% respondents consumed coarse rice (Swarna, Boro hybrid course etc.) and about 16.7% respondent consumed fine rice (Minicate). For high prices of rice people did not consume satisfied types of rice as a result they felt sick of changing food habit and their status became very low and their expenditure became very high.

4.4.2 Types of Soybean Oil

From the table 4.4 it was depicted that respondents consumed super oil (45 %), palm oil (39.2%), loose soybean oil (1.7%), bottled soybean oil (14.2%). For the high price of loose soybean oil people consumed bottled soybean oil in the pace of loose soybean oil as a result the demand of bottled soybean oil was increased in the market.

4.4.3 Frequency of the number of respondents who have savings (yearly)

Analyzing the questionnaire it was shown from the table 4.4 that about 37.5% household had up to Tk 1, 00,000 savings and 16.67% people had Tk1, 00,000-5, 00,000 savings. 10.83% households have Tk 5, 00,000+. Most of the people did not have any savings or they could not save more money for high prices of rice and soybean oil because they spend a maximum of their income for food expenditure especially rice.

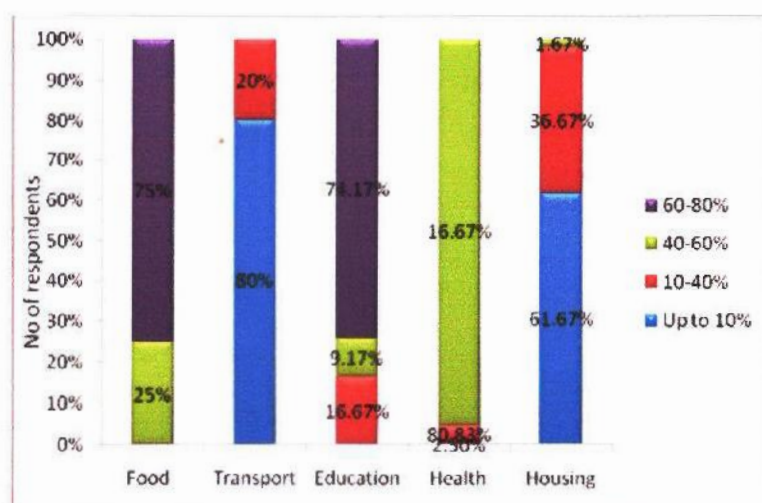


Figure 4.3 Pattern of expenditure for all respondents

The figure 4.3 shown that for food expenditures, about 75% people spent 60-80% , 25% people spent 40-60% of food; 80% people spent up to 10% ,20% people spent 10-40% of transport; 74.17% people spent 60-80%, 16.67% spent 10-40%, 9.17% people spent 40-60% on education. About 16.67% people spent 40-60%, 80.83% people spent 10-40%,2.50% people spent up to 10% on health; 61.67% people spent up to 10%, 36.67% people spent 10-40% ,1.67% people spent 40-60% on housing. From this figure it was clear that most of the people spent 60-80 % of their income for food consumption. It was clear that most of the people spent of their income for food consumption. This indicates that due to increase of prices in basic food commodities as well as soybean oil costs, rice costs households were forced to reduce expenditures on higher quality food commodities as well other basic needs such as education, health and housing. Rising food prices may decrease the ability of households to purchase food. A similar result was observed by Ashley *et al.*2009.

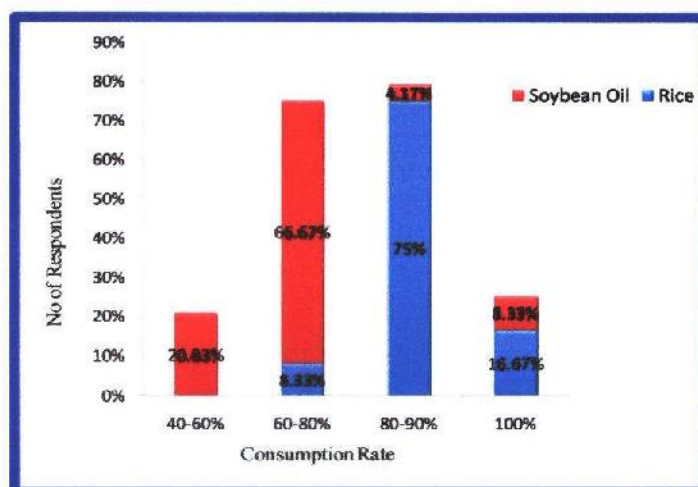


Figure 4.4 Change in rice and soybean oil consumption for high market price of rice and Soybean oil

From the figure 4.4 it was shown that about 8.83% people in our study consumed up to 60-80 % of rice and 66.67% people consumed up to 60-80% of soybean oil. About 75% respondents of this group consumed 80-90 % of rice and 4.17% people in our study consumed up to 80-90% of soybean oil; 16.67% people in our study consumed upto 100 % of rice and 8.33% people consumed up to 100% of soybean oil. Only about 20.83% people consumed up to 40-60% of soybean oil. Previous studies have shown that changes in weekly expenditure on rice reflect changes in rice prices and when food prices increase, the amount of rice consumed per capita does not change, but there is a proportionate increase in household expenditure on rice. This was collaborated by Torlesse *et al.* 2003.

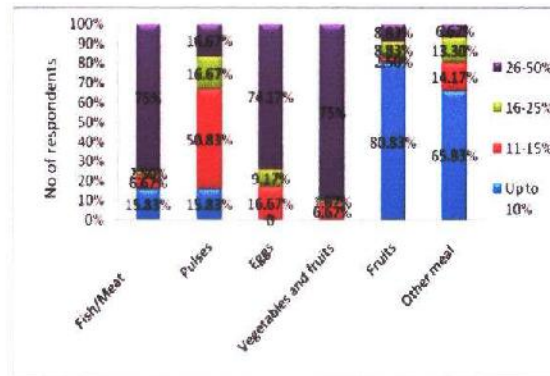


Figure 4.5 Pattern of expenditure for other food items for high market price of rice and Soybean oil.

Analyzing the questionnaire it was shown from the the figure 4.5 that the actual average change in consumption by food item. Here about 75% people in our study spent up to 26-50%, 2.50% people spent up to 16-25 %; 6.67% people spent 11-15%, 15.83% people spent up to 10 % of fish/meat. About 50.83% respondents in this group consumed 11-15%, 16.67% people in our study spent up to 16-25%, 16.67% people in our study spent up to 26-50 %, 15.83% people spent up to 10% of pulses. About 74.17% respondents in this group consumed 26-50%, 16.67% people in our study spent up to 11-15%, 9.17% people in our study spent up to 16-25% of eggs. About 75% respondents in this group consumed 26-50%, 1.17% people in our study spent up to 16-25%, 6.67% people in our study spent up to 11-15% in vegetables. About 80.83% people in our study spent up to 10%, 8.83% people spent up to 26-50 %, 8.83% people spent up to 16-25 %, 2.50% people spent 11-15% of fruits. About 65.83% people in our study spent up to 10%, 6.67% people spent up to 26-50%, 13.30% people spent up to 16-25%, 14.17% people spent 11-15% of another meal of their income. A household exhibits higher welfare losses from the increase in rice and soybean oil prices in the society. While households in Khulna City Corporation were consuming more rice, the consumption of all protein sources as well as fruits, vegetables and other meal has been reduced. These results strongly indicate that increasing commodity prices do have a negative impact on the consumption behavior of urban households. A similar result was observed by Tofazzal *et al.* 2010.

4.4.4 It was shown from the table 4.6 that there was a high degree of correlation between the two variables—expenditure of food and income. Major portions of income

was spent in food as result overall expenditure (e.g. housing, education, health etc.) were forced to reduced. If income was increased, people spent more not only the food but also other items (e.g. health, education, transport, housing etc.) although the food prices (rice and soybean oil) go high. Rising food prices (rice costs, soybean oil costs) may decrease the ability of households to purchase balanced food. Satisfaction depended on expenditure of food. People were not satisfied for high expenditure of food. For high expenditure of food they could not maintain food status in their household. High expenditure of food was an indicator of food insecurity. People was not satisfied present market price although price was much high in 2008. There was a high degree of correlation between the two variables—expenditure of food and savings. It shows from the results that expenditure of food influenced savings. People could not save much money because high expenditure on food which was the effect of high prices of rice and soybean oil.

4.4.5 OLS (ordinary least squares) Model Establishment and Interpretation of Regression Result

Linear regression models are extremely powerful, and have the power to empirically tease out very complicated relationships between variables.

OLS Regression model on food expenditure

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2$$

Where

Y=Total expenditure on food

X_1 = expenditure of rice

X_2 = expenditure of soybean oil

α , β_1 , β_2 were coefficients of correlation. Y dependent variable and X_1 , X_2 were explanatory variables.

Null Hypothesis (H_0): Total food expenditure is not correlated with expenditure of rice and expenditure of soybean oil.

Alternative Hypothesis (H_1): Total food expenditure is correlated with expenditure of rice and expenditure of soybean oil.

Applying the expenditure on food, expenditure of rice, expenditure of soybean oil and market price of rice and soybean oil data let us first present the regression results of the model.

$$Y = 1448.897 + 0.993X_1 + 1.628X_2$$

$$SE = (203.880) \quad (0.030) \quad (0.576)$$

$$t = (7.107) \quad (33.347) \quad (2.827) \quad R^2 = 0.976$$

Using the method, a significant model emerged ($F_{2, 117} = 2309.683$, $p < 0.01$). So H_0 hypothesis was rejected.

Here calculated t value $>$ tabulated value, $P < 0.01$. So H_0 hypothesis was rejected.

Here coefficients $>$ Std. Error of estimate (SE). So H_0 hypothesis was rejected.

It was evident from the results an OLS regression of total expenditure on food on the change in the expenditure of rice and expenditure of soybean oil explained 97 percent of the variation in total expenditure of food, with highly significant coefficients. The result implied that 1 percent increase in the expenditure of food from constant or indicator of total expenditure of food from people would result in an increase in average annual expenditure of rice by 0.920, expenditure of soybean oil 0.078.

4.4.6 Respondents measure to reduce price hike of rice and soybean oil

From the table 4.4 it was shown that about 29.2% respondent thought that reduce production costs mitigate high price. Another respondent (21.7%) thought that food price management, reducing import tariffs and duties (19.2%), targeted food production, transfers, distribution and sales (19.2%), cash transfers (10.8%) mitigate high price of rice and soybean oil. Domestic markets are not very competitive, it may be difficult to ensure that changes in wholesale costs resulting from tariff or tax cuts are transmitted to poor consumers, and don't simply leave the wholesalers better off (Staatz *et al.* 2008).

4.5 Genetically Modified (GM) Crops

The term genetically modified refers to a plant (or animal) that has had its genetic make-up altered through GE techniques. Transgenic crops, often referred to as GM crops, represent promising technologies that can make a vital contribution to global

food, feed and fibre security (James, 2003). The General discussion of GM Crops was given below.

4.5.1 General Information of GM Crops

Analyzing the data it was shown from the table 4.5 that respondents perceptions associated with GM crops were less damage crops (15.8%), beneficial for health (14.2%), give much yield (10.8%), less soil erosion (10.8%), encourages use of environmentally friendly herbicides (10.8%), lower input cost (10.83%), less chemical pesticides used (14.2%), less impacts on target organisms (12.5%). Most of the respondent known name golden rice (39.2%), Bt Eggplant (28.3%), Bt Maize (10%), Bt Cotton (10%), Bt Soybean (7.5%), Others (5%). Most of the respondent will buy GM based food (31.7 %), will not buy (12.5 %), follow majority (33.3 %), do not know (22.5%). Most of the respondent attitudes toward GM crops were safe (14.2%), unsafe (47.5%), do not know (38.3%). Most of the respondent awareness toward GM were just heard (72.5%), know something (27.5%).

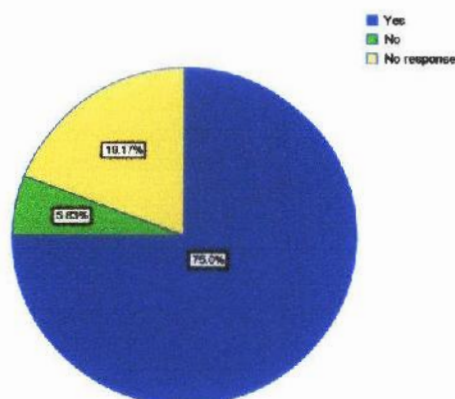


Figure 4.6 Biosafety and issues of potential risks associated with biotechnology (GM food)

From the above figure it was shown that most of the respondent (75%) has been known about biosafety and issues of potential risks associated with biotechnology (GM food), only 5.83% has not been known about biosafety and issues of potential risks associated with biotechnology (GM food). About 19.17% has no response. a recent UK government report reviewed available evidence and found no adverse health effects anywhere in the world (King 2003).

4.5.2 Types of benefits from accepting GM rice and soybean oil

It was shown from the table 4.5 that most of the respondent (19.2%) argued benefits from GM crops was provide food with improved nutritional quality, 15.8% respondent people argued improve economic growth and alleviating poverty (15.8%). Few respondents (5.8%) argued that improve food production and hence attaining food security, less use of pesticides and herbicides (11.7%), may promote water conservation (12.5%), economic benefits for farmers (10.8%), empowerment of farmers (8.3%) and provide environmentally safe and sustainable agriculture (15.8%). It was shown that most of the respondent got benefits from GM crops were provide environmentally safe and sustainable agriculture etc. A similar finding was observed by Lorraine (2001). Transgenic crops, often referred to as GM crops, represent promising technologies that can make a vital contribution to global food, feed and fibre security (James, 2003). The tools of plant biotechnology were increasingly used to improve crops and they can facilitate the provision of enough food to satisfy the growing world population (Borlaug, 2004). The relationship between consumer acceptances of GM foods based on general information and food Status (meal) in the household was given in Chi Square table 4.15.

TABLE 4.15 Result chi-square analysis depicting the relationship between consumer acceptances of GM foods based on general information and food Status (balanced meals) in the household

Consumer acceptance of GM foods based on general information	Food Status (meal) in household			Total
	Poor	Good	Very good	
Will buy	19	17	2	42
Will not buy	14	1	0	14
Follow majority	16	14	10	37
Do not know	8	15	4	27
Total	57	47	16	120

From the table 4.15 it was shown that there was a relationship between consumer acceptance of GM foods based on general information and food Status (balanced meals) in the household. The calculated chi-square was 23.332 with 6 as degrees of freedom and it is significant at $P < 0.001$. It was revealed that consumer acceptance of GM foods based on general information was more likely to have significant impact on

household food security. The experience of China, Argentina and South Africa, that are already deriving significant benefits from GM crops, can be shared with other developing countries in the three continents of the South who face similar challenges (James, 2003). The relationship between consumer acceptance of GM foods based on general information and current consumer attitudes toward GM crops was given in Chi Square table 4.16.

TABLE 4.16 Result chi-square analysis depicting the relationship between consumer acceptance of GM foods based on general information and current consumer attitudes toward GM crops

Consumer acceptance of GM foods based on general information	Current consumer attitudes toward GM crops			Total
	Safe	Unsafe	Do not know	
Will buy	8	19	11	42
Will not buy	5	2	8	14
Follow majority	3	16	21	37
Do not know	1	20	6	27
Total	17	57	46	120

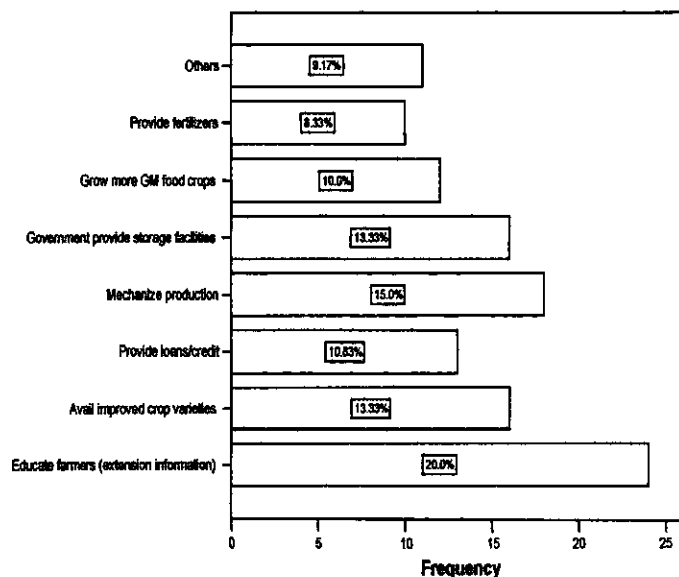
Analyzing the questionnaire it was shown from the table 4.16 that there was a relationship between consumer acceptance of GM foods based on general information and current consumer attitudes toward GM crops. The calculated chi-square was 22.403 with 6 as degrees of freedom and it is significant at $P < 0.005$. The relationship between consumer acceptance of GM foods based on general information and current consumer awareness toward GM crops was given in Chi Square table 4.17.

TABLE 4.17 Result chi-square analysis depicting the relationship between consumer acceptance of GM foods based on general information and current consumer awareness toward GM crops

Consumer acceptance of GM foods based on general information	Current consumer awareness toward GM crops		Total
	Just heard	know something	
Will buy	31	7	42
Will not buy	13	2	14
Follow majority	32	8	37
Do not know	11	16	27
Total	87	33	120

Analyzing the data it was shown from the table 4.17 that there was a relationship between consumer acceptances of GM foods based on general information and current consumer attitudes toward GM crops. The calculated chi-square was 17.869 with 3 as degrees of freedom and it is significant at $P < 0.001$.

Figure 4.7 Strategies to ensure that Khulna City Corporation is food secure



It was shown from the figure 4.8 that strategies that was educate farmer (20%), provide fertilizer (8.33%), mechanize production (15%), provide loans/credit (10.83%), grow more GM crops (10%), avail improved crop varieties (13.33%), others (9.17%). It was important to note that household strategies for ensuring food security were production-based and not income-based, at least not directly. This was perhaps because their incomes were derived from production. The most critical factors for ensuring both household and national food security can be summarized as extension, improved technology, access to credit and markets.

TABLE 4.18 Identified Relationship within the Data from analysis, 4.15, 4.16 and 4.17

Variable x Variable	Calculated Chi Square	Tabulated Chi Square	p	Degree of freedom (df)
Consumer acceptances of GM foods based on general information and food Status (meal) in the household	23.332	22.5	0.00	6
Consumer acceptance of GM foods based on general information and current consumer attitudes toward GM crops	22.403	18.5	0.005	6
Consumer acceptance of GM foods based on general information and current consumer awareness toward GM crops	17.869	16.3	0.001	3

Analyzing the table 4.18, 4.19, 4.20 and 4.21 the sum up of the major findings from them was the calculated value of chi-square was 23.332 at 6 degree of freedom, 17.869 at 3 degree of freedom, 22.403 at 6 degree of freedom, 17.869 at 3 degree of freedom, where the table value at 0.005 level of significance was 18.5, the table value at 0.001 level of significance was 22.5 and 16.3 respectively which were lower than the calculated value. It was evident that there was a significant relationship above variable.

CHAPTER 5

Conclusion

CHAPTER FIVE

CONCLUSION

The objective was to determine the food security status of urban households, rice and soybean oil market dynamics and analysis of price behavior and to know the potential impact of the modern biotechnological revolution (GM Crops) on food security in Khulna city Corporation areas.

The study finds that about 47.5 percent and about 39.2 percent of households in Khulna were under poor food status and good food status, respectively. The socio-economic characteristics of households and price of rice and soybean oil have been found to affect their food security level. The food security status does not necessarily affect the demand pattern of household for livestock products. From the study, age, educational status, gender of household head, number of family member, number of children, occupational pattern, monthly income, food status, storage of staple food, frequency of attack disease in a month, rice and soybean oil price, household size, per capita quantity consumed have been found to be the important variables affecting demand among households and ultimately, their food security status. The price of rice and soybean oil began to increase rapidly early 2007, much increased in 2008. In general, the main causes of household food insecurity were natural calamity, increased demand for food and feed, government policies, corruption, complex kin, lineage and caste structures which underpin a pervasive system of patron-clientelism, higher energy prices which increased cultivation costs and the price of inputs such as fertilizers seizing warehouse of larger food dealers and importers as the main reasons for hindering food supply to the market, which ultimately created the food crisis in Khulna. Existence of patron-client relationship reinforced corrupt practices in public dealing. Changes in food prices can have a significant impact on households' food security, especially for the most vulnerable segments of the population. Households can still suffer food security impacts due to domestic price movements caused by biofuel policies being implemented elsewhere. People were not satisfied for high expenditure of food. Expenditure of rice and expenditure of soybean oil was increased then total expenditure of food did increase. For high expenditure of food they could not maintain food status in their household. People could not save much money,

changed consumption pattern (consuming rice, the consumption of all protein sources as well as fruits, vegetables and other meal has been reduced), consumed unsatisfied types of rice and bottled soybean oil in place of loose soybean oil as a result the demand of bottled soybean oil was increased in the market because high expenditure of food which was the effect of high prices of rice and soybean oil. They felt uneasy for changing food habit and their status became very low and their expenditure became very high. Reducing production cost, food price management, targeted food production, transfers, distribution and sales reducing import tariffs and duties, targeted food production, transfers, distribution and sales, cash transfer mitigated high prices of rice and soybean oil. To ensure household food security, the household owners did to provide three main roles from the local government: providing information through extension and seminars and loans/credit, improving access to credit, and supply of improved seed. These results almost tally with those household suggestions for ensuring Khulna City Corporation food security. Farmer education (extension/information), availability of improved seed, and access to loans were given as the most important interventions, in that order. GM crops could maintain food security. The more the consumers accept the GM Crops, the more they will get remedy from food insecurity. These results are expected to help policy makers in selecting interventions that will lead to improved household sustainable food security in Khulna city. The full and beneficial effects of agricultural research and technological change will materialize only if government policies are conducive to and supportive of poverty alleviation and sustainable management of natural resources. Public investment in agricultural research is of particular importance for achieving food security in developing countries (Pinstup-Andersen and Cohen, 2000). Expanded enlightened adaptive research on agricultural biotechnology (GM Crops) can contribute to food security in Khulna, provided that it focuses on the needs of farmers and consumers in those areas, identified in consultation with poor people themselves.

Recommendations

Based on the outcomes of this study, the following recommendations can be formulated for program interventions and policy measures to improve the food security status of households and therefore, the regional and national food security status.

1. Since food insecurity incidence increases with increase in household size, efforts should be made at improving programmes and policies that will ensure a proper family planning which will reduce the number of children.

2. Nutrition-oriented programmes should be organized in an attempt to improve the food substitution knowledge of households as educational status affect food security.

The concern of a government should be management and policy options relevant to country/international level actions to maintain food security.

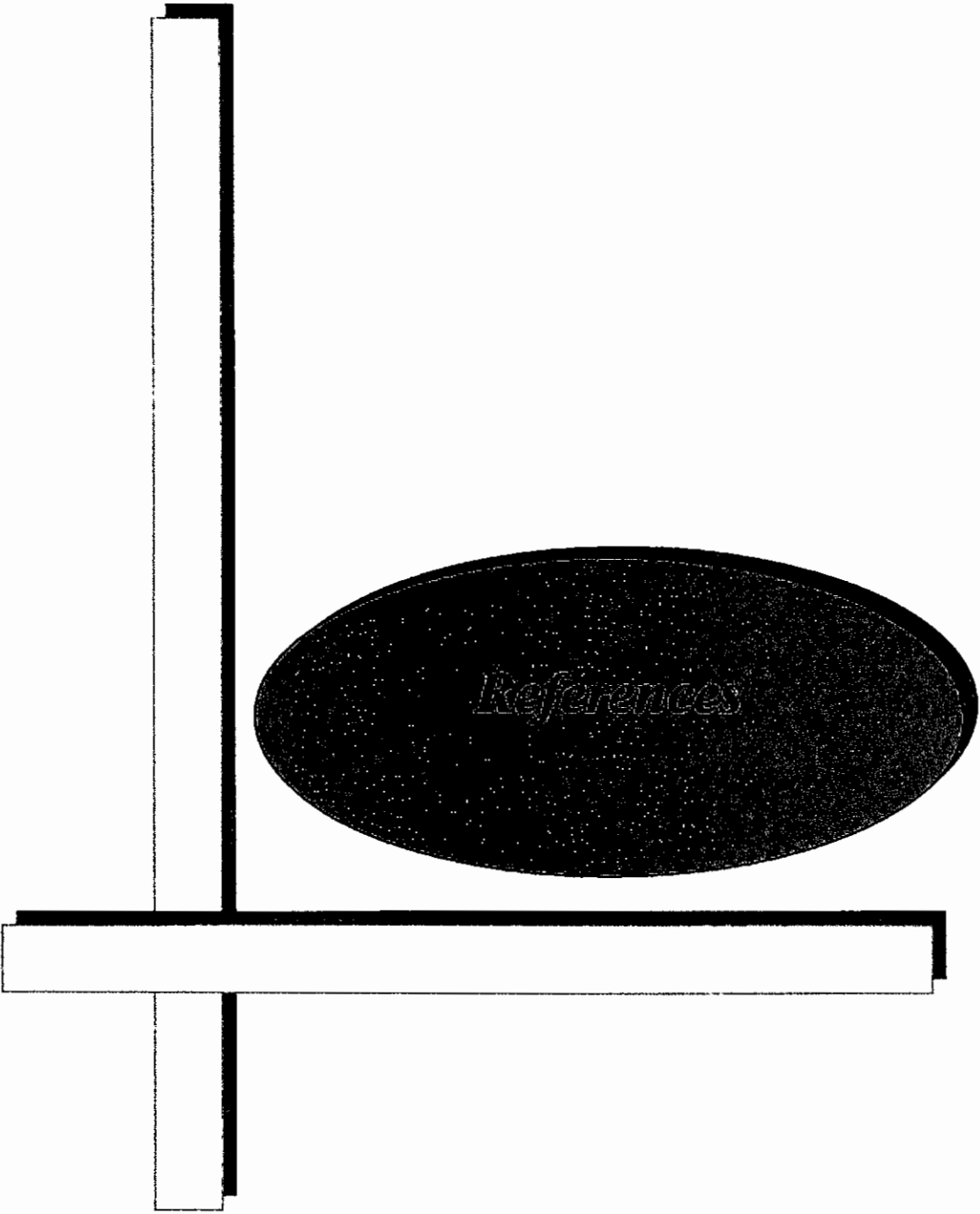
3. As population is increasing, demand of food is also increasing. Therefore, Govt. should keep watch on GM crops for much production. The government must impose a moratorium on the production, importation, distribution, and sale of GM food until questions regarding consumer acceptance, human health, environmental implications, technology ownership, and farmer profitability are answered to the satisfaction of the majority of Bangladeshi. Government should approve for commercial cultivation of GM crop and must differentiate between GM or non-GM agricultural commodities. Food products which contain GM ingredients must be subject to clear, consistent, mandatory labeling.

4. A number of recommendations were formulated for cost effective action in terms of direct food and nutrition interventions and indirect support actions to achieve household food and nutrition security. Increased investments and political support for implementation of food and nutrition interventions and support programs, operations research, a cadre of trained manpower, among others, are some critical inputs to the effective delivery of nutrition food production programs. Farmers' organizations and cooperatives, NGOs to be encouraged to organize internal control systems for small farmer's group certification and to strengthen links and cooperation between government and NGO's from organic sector at national level. To promote training and capacity building for GM Crops by setting up GM crops farmers field schools that take farmers' knowledge of agriculture practices as the basis and improve on it. In selecting priority intervention areas, the plan for modernization of agriculture might

consider agricultural extension, urban and rural credit and access to improved technologies for Khulna City Corporation areas. Monthly information bulletin for organic farmers on local prices of the most common food items should be available. Funding for 3 years initially, after which this service would be paid for by subscriptions. The same bulletin could cover information about the preferable mix of crops for own consumption and for the market, relating to specific agro-ecological zones and market demand.

5. Effective food-control programs would be able to monitor the quality and safety of the nation's food supply. It is government's responsibility to ensure that mechanisms are put in place to make sure food is safe before it is marketed.

6. The food-control management authority should establish quality assurance (proficiency) criteria for the operation of laboratories and should monitor their performance.



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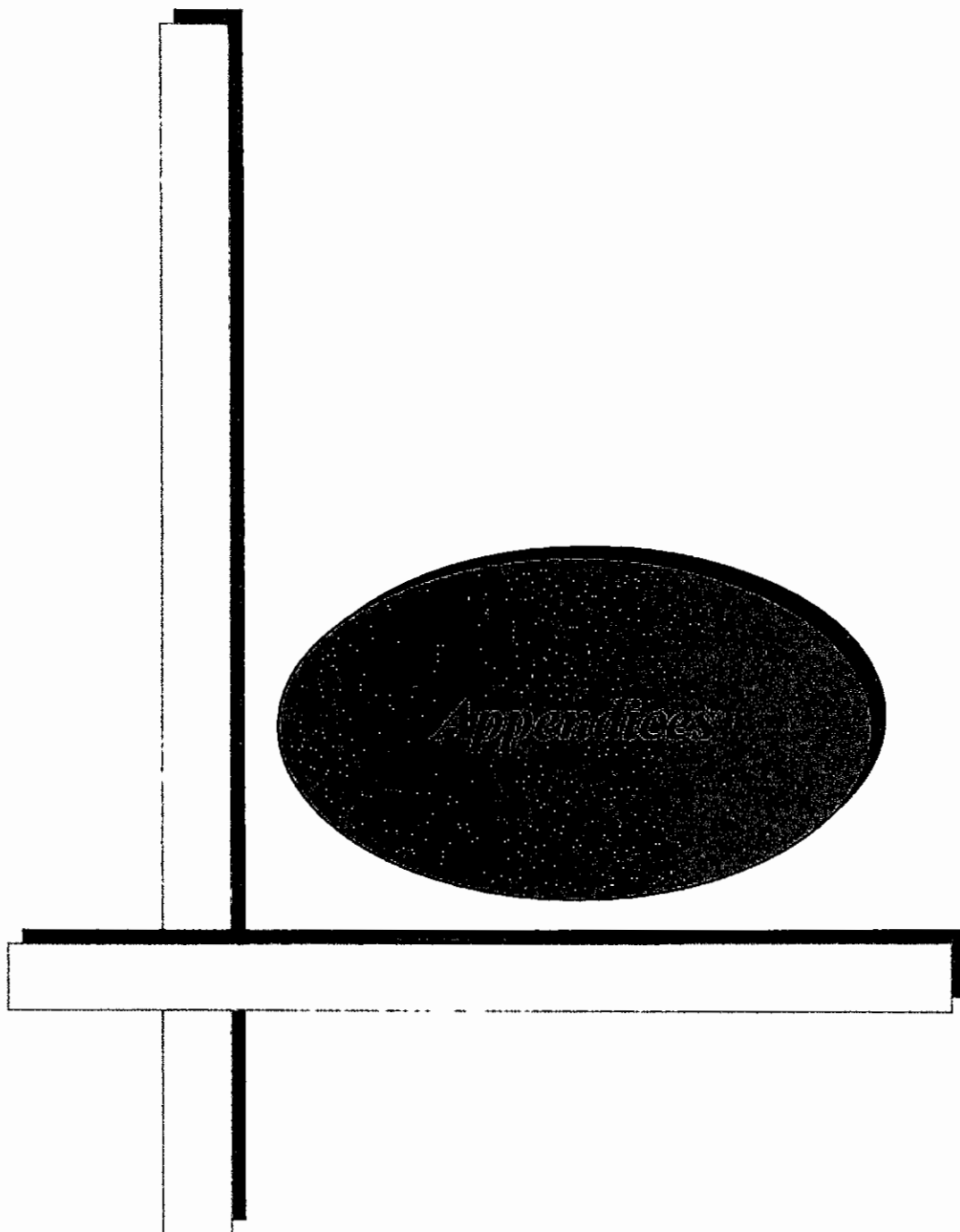
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Appendices

Appendix 1

Questionnaire for survey

(For the research purpose only)

Biotechnology and Genetic Engineering Discipline

Khulna University, Khulna

Date.....

Part One: Socio-economic Background of Respondents

1. Age: (1)15-25; (2) 25-35; (3) 35-45; (4) 45-60 (5) 60+
2. Educational status:
(1) Illiterate (2) Primary (3) Secondary (4) Higher secondary (5) Degree/honors
3. Gender of Household Head
(1) Male (2) Female
4. Number of family member
(1) One (2) Two (3) More
5. Number of children
(1) One (2) Two (3) More
6. Occupational pattern of the Respondents
(1) Day labourer/ Agriculture (2) Business/ Service/ Teacher (3) Others
7. Monthly Income of the Family
(1) 5000 (2) 10000 (3) 20000 (4) 30000 (5) 50000

Part Two: Food (balanced meals) Security measurement

8. Do you know about food security?
(1) Yes (2) No (3) No response

If yes what's your perceptions about food security?

.....

9. Sources of Getting Knowledge Regarding Food Security

- | | |
|------------------------|--------------------|
| (1) NGO | (2) Radio, TV |
| (3) Newspaper/Internet | (4) Others Sources |

10. What types of food do you take generally?

Name of food	Unit of consumption(daily)	Unit of consumption(monthly)

11. Food Status (balanced meals) in your household

(1) Poor (2) Good (3) Very good

12. Which of these statements best describes the food status in your household?

(1) Enough of the kinds of food we want to eat (2) Enough but not always the kinds of food we want (3) Sometimes not enough to eat (4) Often not enough (5) No response

13. Do you get available food in your area?

(1) Yes (2) No

If No then how often did this happen?

(1) Almost every month (2) Some months but not every month (3) Only 1 or 2 months (4) No response

14. Do your households run out of balanced meals items?

(1) Yes (2) No

15. Causes of food insecurity in your locality

(1) Water availability (2) Rain patterns (3) Soil conditions
(4) Low income levels (5) Lack of government support to local producers
(6) Culture / education (7) Others

Part Three: Market price of rice or soybean

16. What types of rice you take/buy?

(1) Fine rice (2) Coarse rice (3) Middle rice

17. What types of soybean oil take/buy?

(1) Super oil (2) Loose soybean oil (3) Palm oil (4) Refined soybean oil

18. Market price of rice and soybean oil (yearly)

	2006	2007	2008	2009	2010
Rice					
Fine rice					
Coarse rice					
Middle rice					
Soybean oil					
Super oil					
Loose soybean oil					
Palm oil					

19. Market price of rice and soybean oil (July to December 2010)

	July	August	September	October	November	December
Rice						
Soybean oil						

20. Do you think the prices of rice and soybean oil is high?

(1) Yes (2) No

If yes then what are the causes of high prices?

.....

21. If rice and soybean oil market prices are raised then there have any impacts on your rice and soybean oil consumption

(1) Yes (2) No

If yes then what quantity

Name	Actual quantity	Essential quantity
Rice		
Soybean oil		

22. Do you think this insufficient food will attack disease?

(1) Yes (2) No

If yes then what types of health hazards suffered by the respondents?

Ans.....

23. How much time respondent attack disease in a month?

(1) One time (2) Two times (3) More

24. Do you aware about the quality or variety of food?

- (1) Yes (2) No

If yes how you measure quality or variety of food?

(1)

(2).....

(3).....

If No why you cannot measure quality or variety of food?

(1) Not enough money for food (2) Kinds of food we want not available

(3) High price (4) Others

25. When rice or soybean market prices are rising then how you can adjust the situation?

(1) Adult or children cut or skipped meals (2) Adult or children were not eating enough

(3) Cut size of adult's or children's meals (4) Adult or children not eat for whole day

(5) Low-cost food for adult or children (6) Couldn't feed adult or children a balanced meal

(7) Adult or children were not eating enough

26. People couldn't afford to eat/buy balanced meals for high prices in a day

(1) Once (2) 2 times (3) 3 times (4) No response

27. Do you think that rice or soybean price decreases food security?

(1) Yes (2) No

28. Pattern of your expenditure

Heads of expenditure	Amount (Tk)Daily	Amount Monthly	Amount Yearly
Food			
Transport			
Education			
Health			
Housing			

29. Change in others food consumption for high market price of rice and Soybean oil

Name	Essential Amount(Tk)	Actual Amount (Tk)
Fish/Meat		
Pulses		
Eggs		
Vegetables		
Fruits		
Other meal		

30. Are you satisfied present market price of rice and soybean oil?

(1) Yes

(2) No

31. What do you think to reduce rising price of rice and soybean oil?

.....

Part Four: Genetically Modified (GM) crops

32. Do you know about GM crops?

(1) Yes

(2) No

(3) No response

If yes what're your perceptions about GM crops?

.....

33. What are your sources of information about GM crops ?

(1) Academic workshop (2) Friend /Colleagues (3) Library/Book (4) Newspaper/Internet (5) Radio, TV (6) Others

34. Current consumer awareness toward GM crops

(1) Just heard

(2) know something

35. Current consumer attitudes toward GM crops

(1) Safe and buy (2) Unsafe and not buy (3) Follow majority (4) Do not know

36. Do you think that GM crops give much yield?

(1) Yes

(2) No

(3) No response

37. Do you think that GM crops production reduces market price and increases food security?

(1) Yes

(2) No

(3) No response

38. Do you know biosafety and issues of potential risks associated with biotechnology (GM food)?

(1) Yes

(2) No

(3) No response

IF YES

(1) Knowingly eat GM food (2) Safe to grow (3) Safe to eat (4) Willing to eat GM food

39. Do you know any name of GM crops?

.....

40. Do you think any benefits get from accepting GM rice and soybean oil?

(1) Yes (2) No (3) No response

If yes, then what type of benefit you get

41. Which household long-term strategies should be taken for ensuring food security?

- | | | |
|------------------------------------|---|-------------------|
| (1) Grow more food | (2) Expand acreage | (3) Buy more land |
| (4) Use pesticides | (5) Grow disease/pest resistant crops/GM crop | |
| (6) Rear improved livestock breeds | (7) Rely on the market | |
| (8) Hire out labor | (9) others | |

42. Which Strategies should be taken to ensure food security in Khulna?

- | | |
|---|--|
| (1) Educate farmers (extension information) | (2) Avail improved crop varieties |
| (3) Provide loans/credit | (4) Mechanize production |
| (5) Government provide storage facilities | (6) Control pests and diseases |
| (7) Grow more GM food crops | (8) Resettle people to places with productive land |
| (9) Provide fertilizers | (10) Others |