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**ECO-FRIENDLY AND ORGANIC FARMING IN
BANGLADESH – INTERNATIONAL CLASSIFICATION AND
LOCAL PRACTICE**

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Dedicated to my parents

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Abbreviations and explanation of terminology

Abbreviations Acronyms

ADCs	Area Development Centres
AFSP	Agriculture and Food Security Project
AGÖL	Arbeitsgemeinschaft Oekologischer Landbau (League of Organic Agricultural Associations)
ANOG	Arbeitsgemeinschaft fuer naturnahen Obst-, Gemuese- und Feldfrucht-Anbau-(1962); At the beginning, its member farms are of vegetables, fruit, and crops, but now there are animal farms joining in it. Although the number of member farms grows slowly, the average area of member farms has increased most quickly
ASPS	Agricultural Sector Programme Support
BADC	Bangladesh Agricultural Development Corporation
BARC	Bangladesh Agricultural Research Council
BARCIK	Bangladesh Resource Center for Indigenous Knowledge
BARI	Bangladesh Agricultural Research Institute
BBS	Bangladesh Bureau of Statistics
BFA	Bangladesh Fertilizer Association
BPH	Brown Plant Hopper
BRRI	Bangladesh Rice Research Institute
BSFB	Brinjal Shoot and Fruit Borer
BWDB	Bangladesh Water Development Board
CAP	Common Agricultural Policy
CARE	Cooperative for American Relief Everywhere
CCPR	The Codex Committee on Pesticide Residues
CDA	Community Development Association
Codex Alimentarius	Developed as a common instrument of FAO und WHO in 1962 with the aim of protecting consumer health and ensuring honest practices in food international trading by working out international food standards.
DANIDA	Danish International Development Agency
DDT	Dichlorodiphenyltrichloroethane
DFID	Department for International Development
DoF	Department of Fisheries
EAP	Ecological Agricultural Program
ECRRP	The Emergency 2007 Cyclone Recovery and Restoration Project
EPA	Environmental Protection Agency
ETL	Economic Threshold Level
EU	European Union
FAO	Food and Agricultural Organization
FFS	Farmers' Field School
FFS	Farmers' Field Schools
FGD	Focus Group Discussion
FiBL	Forschungsinstitut für Biologischen Landbau (Research Institute of Organic Agriculture, Switzerland)
FTs	Farmer Trainers
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GDR	German Democratic Republic
GMO	Genetically-Modified Organisms
GNP	Gross National Product

Abbreviations	Acronyms
GoB	Government of Bangladesh
GTZ	German Society for Technical Cooperation and Development, Germany
GTZ	Gesellschaft für Technische Zusammenarbeit
Ha	Hectare
HACCP	Hazard Analysis Critical Control Point
HDRA	Henry Doubleday Research Association
HYV	High Yielding Variety
ICM	Integrated Crop Management
ICS	Internal Control System
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Centre
IFM	Integrated Farm management
IFOAM	International Federation of Organic Agriculture Movement
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
IMO	The Institute for Market ecology (IMO) is your specialist in quality assurance of eco-friendly products, organic agriculture and management systems.
IOAS	International Organic Accreditation Service
IPM	Integrated Pest Management
IROCB	International Requirements for Organic Certification Bodies of the ITF
IRRI	International Rice Research Institute
ISO	International Organization for Standardization
ISOFAR	International Society for Organic Farming Research
ITC	International Trade Centre, Geneva, Switzerland
ITF	International Task Force
JAS	Japan Agricultural Standard
KRAV	KRAV is a key player in the organic market in Sweden since 1985. We develop organic standards and promote the KRAV-label.
LEISA	Low-external-input and-sustainable-agriculture
MDG	Millennium Development Goal
MLE	Maximum Likelihood Estimator
MLIs	Multi Lateral Institutions
MoA	Ministry of Agriculture
MOAN	Mediterranean Organic Agriculture Network, Italy
MP	Murate of Potash
MPO	Master Plan Organisation
MRL	Maximum Residual Limit
NAP	National Agricultural Policy
NAP	National Agriculture Policy
NARC	National Agricultural Research Centers
NARS	National Agricultural Research System
NASAA	The National Association for Sustainable Agriculture Australia
NEAP	New Agricultural Extension Policy
NGO	Non-government organization
NOGAMU	National Organic Agricultural Movement of Uganda
NOP	National Organic Program of the United States
NORAD	Norwegian Agency for Development Cooperation
NORSOK	Norwegian Research Institute for Organic Agriculture
NOSB	US National Organic Standards Board (USA)

Abbreviations	Acronyms
OA	Organic Agriculture
OCIA	Crop Improvement Association
Oekosiegel	Oekosiege Although Oekosiegel has only 16 member farms in the Northern Germany; it is a well-organized organic agricultural association.
OFA	The Organic Federation of Australia
OMRI	organic materials Review Institute
PCCS	Producer- Consumers' Cooperative Society
PGR	Plant Genetic Resource
PGS	Participatory Guarantee System
PRSP	Poverty Reduction Strategy Paper
RFLDC	Regional Fisheries and Livestock Development Components
SARE	Sustainable Agricultural Research and Education
SGS	SGS S.A. (formerly Société Générale de Surveillance) is a multinational company headquartered in Geneva, Switzerland which provides inspection, verification, testing and certification services.
SOEL	Stiftung Oekologie und Landbau
SÖL	<i>Stiftung Ökologie & Landbau</i>
SPPS	Strengthening Plant Protection Services
sq km	Square kilometres
Standards	Controllable, binding minimum norms
TOT	Training of Trainers
TPC	Third Party Certification
TSP	Triple Super Phosphate
UBINIG	Policy Research for Development Alternatives
UNCTAD	United Nations Conference on Trade and Development
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
USDA	United States Department of Agriculture, Washington, US, www.usda.gov
WB	World Bank
WSDA	The Washington State Department of Agriculture
WTO	World Trade Organization

CHAPTER 1 INTRODUCTION

1.1 Background and problem statement

Bangladesh is officially known as the People's Republic of Bangladesh. The country is situated in the southern part of Asia, bordered on the west, north and east by India, on the southeast by Myanmar, on the south by the Bay of Bengal. Geographically the land of the country is an exceedingly flat, low-lying, alluvial plain where 230 rivers and rivulets have passed through (with a total length of 24,140) and has a coastline of about 580 km along the bank of the Bay of Bengal, 7% of its land which is permanently lies under water, (BBS, 2007; CIA, 2008 in Haque, 2011; Rahman and Schmitz, 2007). It occupies the eastern part of the former Bengal province of British-ruled Indian subcontinent (1757-1947) and was subsequently East Pakistan until 1971. It achieved independence from Pakistan in 1971 following a bloody liberation war, (Rossette, 2006; Islam, 2003 in Haque, 2011).

Bangladesh is one of the most densely populated countries in the world with more than 155 million people. Due to its very small territory (147,570 square kilometers), the amount of additional land available to be brought into cultivation is very limited (BBS, 2006). The country has 8.20 million hectare arable land against the huge population (Hassan, 2011). The land area is steadily decreasing due to its population growth, rapid industrialization and infrastructural development. As a result, the amount of per capita land declined from 0.13 hectare in 1960 to 0.06 hectare in 2000. However, agriculture plays a pivotal role in overall economic development of the country. More than 70% of the population depends on agriculture (Jensen, 2000). To ensure food for the giant population, 'green revolution' was appeared in 1960s with the concept of 'producing more food' and within very short period, it was implemented in Bangladesh like other Asian countries. It has created a terrible stress on limited land resources. New crop varieties (HYV), as well as chemical fertilizers, pesticides and groundwater irrigation were introduced. As a result, urgent need of more grain production has achieved, especially rice production has increased by many times and Bangladesh has achieved food self sufficiency within a very short period. A suicidal policy of just extraction of soil was followed, while soil fertility conservation issue was totally ignored (Charkarborty, 2008).

Before the introduction of chemicals, Bangladesh agriculture was fully dependent on the organic sources of fertilizers (animal manure, crop residues and domestic wastes) to fertile the land. In 1960s, with the introduction of green revolution, to follow former agricultural policy - to meet the demand of food for increasing population, some farmers started to use chemical fertilizers. Some of them used both chemical and organic fertilizers and some of them didn't adopt chemicals fertilizers due to conservativeness or lack of infrastructural facility (Hossain, 2001). Within a decade, farmers, scientists and environmentalists felt that though rice production has increased, but continuous application of synthetic fertilizers and other chemicals had

created many problems such as topsoil depletion and degradation, reduced soil microbial activities, groundwater contamination.

The use of chemicals is increasing over the years in Bangladesh but farmers are not getting as much production as they should have. In 1996, a total of \$16 million (U.S.) in pesticides and \$6 million in herbicides were sold in Bangladesh, and in 1999, a total of 13 million tons of chemical fertilizers were used (IRRI, 2007). During the green revolution, for example, 1 kg of added nitrogen fertilizer would produce 20 kg of grain, but now it only produces 8 to 10 kg (FAO, 2004). The recovery of nitrogenous fertilizers is only 50 to 60% and often as low as 15%. The unrecovered fertilizers and pesticides are often leached to groundwater supplies or transported in runoff to surface water. Declining productivity due to soil degradation is now a major constraint. It is said that a good soil should have an organic matter content of more than 3.5%, but in Bangladesh most soils have less than 1.7%, and some soils have even less than 1% organic matter (BARC, 1997). Thus, the indiscriminate uses of chemical inputs has been considered as the foremost reason for stagnating or declining crop productivity, loss of bio-diversity and have threatened the sustainability of agriculture, affecting the quality and safety of produce and health and well being of humanity.

Different scientific researches and developments in the field of conventional agriculture were initiated. The findings reveal that to cope with the ever-growing food demand, most of the farmers meet their immediate needs but at the expense of external costs (degradation of many kinds, environmental, social and economical). The unequal access to food and the whole system is falling on as vicious circle of food production (Fig. 1.1). At the same time, because of increased use and price of agricultural inputs, costs of production have increased and, agriculture becomes currently a non-profitable enterprise (Rasul and Thapa, 2004). As a result, the number of family farms is declining. It seems that the system of conventional agriculture is anti-nature and cannot sustain for long time.

Since 1990s, the issue of sustainability became an important concern in agriculture due to yield stagnant and many other negative effects. According to the Food and Agriculture Organization (FAO), "Sustainable agriculture is the successful management of agricultural resources to satisfy changing human needs while maintaining or enhancing the quality of environment and conserving natural resources". This concept emphasizes on the present needs without sacrificing the needs of future (Brundtland Commission, 1987). The sustainability of organic farming depends on the incorporation of the elements such as social, economic and environment (Lampkin, 1994; GOI, 2001; Michelsen, 2002 in Singh 2004). Bell and Morse (2003) defined sustainable development as a process which is respectful to the environment, technically appropriate, economically viable and socially acceptable to meet the need for present generations without compromising the ability of the future generations to meet their own needs (Fig. 1.2). If natural resources for instance, soil

nutrients, water etc. are used up at a rate faster than the stock, then farming system is unsustainable.

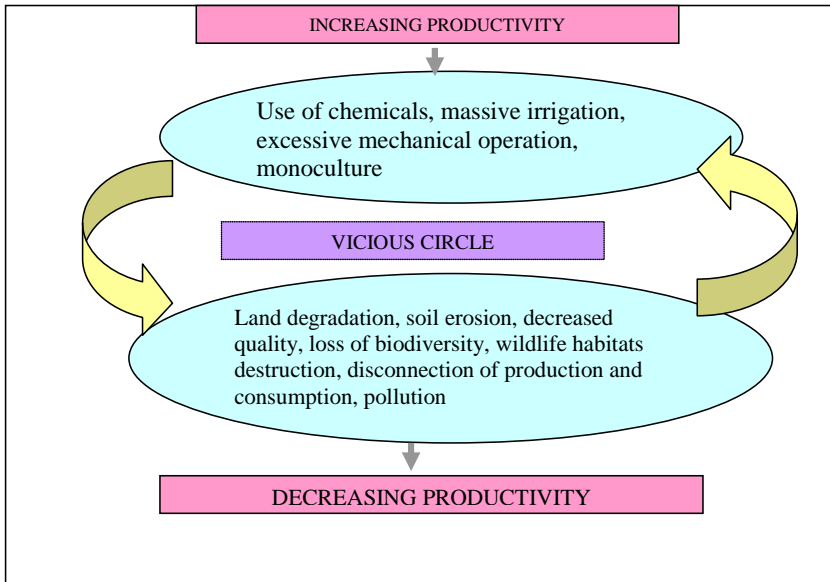


Figure 1.1 Vicious circle of food production in conventional system (Source: Aubree, 2006)

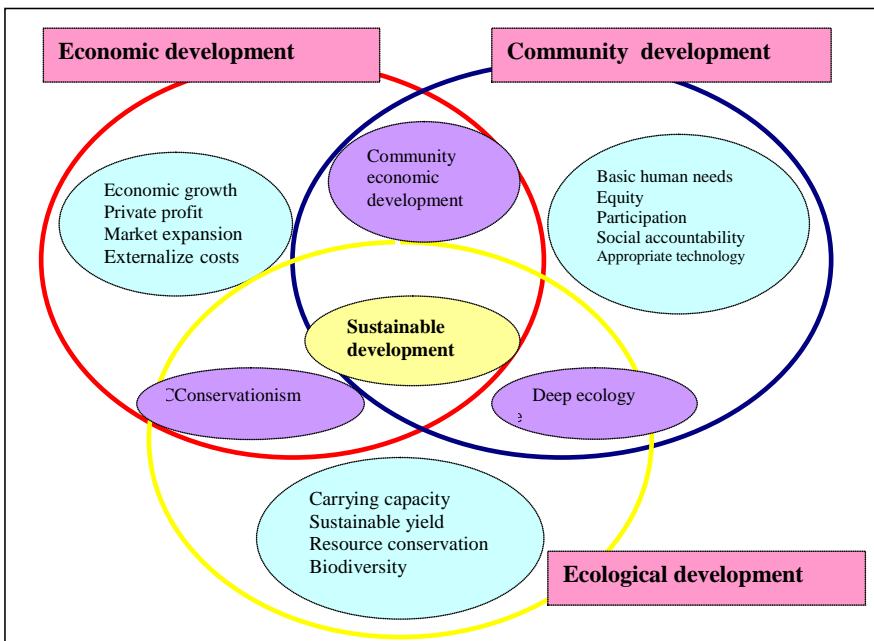


Figure 1.2 Systematically process of sustainable development (Source: Bell and Morse, 2003 in Aubree, 2006)

The people all over the world are expressing great concern over the indiscriminate use of chemicals. Therefore, emphasis is now focussed on the use of organic and other by products of agriculture and industries (Mishra, 2005). Scientific researches have proved that the reduction or non-use of synthetic chemicals can reduce environmental hazards and possible adverse effects. In contrast to synthetic fertilizers, organic fertilizers could improve the physical, chemical and biological properties of soil, and its use is important in sustaining soil productivity in the long term (Rahman, 2007; Banglapedia, 2004). Reflecting on excessive, unscientific and imbalance use of chemical inputs, agricultural scientists, environmentalists and policy makers are now advocating the introduction of low input sustainable agriculture, ecological farming, eco-friendly agriculture and integrated intensive farming system – those are mainly based on the-principle of integration of both organic and inorganic farming systems so as to acquire the target of agricultural production without causing severe environmental problems (Buddhibhuaneswari, 2005). Eco-friendly agriculture may be a good choice as cost-effective method that can trim down rural poverty and curb pollution. It is also the need in the present day context of serious threat to our ecology and environment (Patil *et al.*, 2010). The farming method is the best means to make sure air, water and soil unpolluted leaving the environment safe for the present and future generations (Peter, 2004). For a sound future, organic farming offers a dynamic interaction between soils, plants, humans, ecosystem and environment (IFOAM, 1996).

The objectives of the eco-friendly farming in Bangladesh are mainly to protect natural and agricultural resource bases from further degradation and to ensure long term sustainability in agricultural system. While there exists internationally recognised standard of organic farming in the developed countries of the north and in many developing countries, there is no such standard in Bangladesh. Therefore, the understanding of organic movement in Bangladesh from the part of international standard and classification is necessary to encourage any systematic development of the movement.

Local concepts of organic farming in Bangladesh

The meaning of organic farming to farmers of Bangladesh is a practice in which farmers manage their farm based on natural resources and avoiding synthetic compounds. In the organic management system to supply essential plant nutrients, farmers of Bangladesh usually use cow dung; different composts; legumes; green manure (GM); crop residues; bio-fertilizer (*Azolla*, *Rhizobium*, *Azotobacter*, *etc.*); ash; rice barn and husk; poultry litter; biogas-slurry; and slaughter house wastages etc. For weed management, farmers apply mechanical practices instead of herbicides. For controlling insects and diseases, they use different non-chemical measures such as: Integrated Pest Management (IPM); mechanical measures (e.g. hand net, light trap etc.); biological control (e.g. rearing of beneficial insects and pathogens); and bio-pesticides (e.g. *Nimidicide*, *Tobacco powder*, *Bishkanthali* (*Polygonum hydropiper*) *extract*, *chilli dust* etc). Organic farmers and consumers in Bangladesh rely on

different natural inputs rather than toxic hormones and preservatives for ripening fruits and storing their seeds and other harvested crops (Sarker, 2010).

1.2 Justification of the study

For climatic disasters and the change from subsistence to commercialization, farmers are now heavily dependent on input oriented agriculture. Many researchers also recommended that organic agriculture is effective in poorer countries and it can give socio-economic and ecologically sustainable development. It can overcome the harmful impacts of the green revolution (IFOAM, 2008).

As organic farming has recognized as sustainable farming method, this can perhaps give the best answer to provide sustainability in production. Farmers of Bangladesh are conscious about environment but they are illiterate, resource poor and highly dependent on purchased inputs. A small portion of farmers realise the importance of ecological agriculture and there are some farmers who never use synthetic fertilizer or pesticide. They are struggling for their survival and even don't know the meaning of organic farming. Some have adopted this approach on their homestead land. However, they are not practicing it on major farming land because of the unavailability of organic inputs, lack of getting proper price and consumers' trust. So, standards need to be followed for which local consumers can trust the products, farmers can sell their products domestically as well as earn foreign currency from exporting organic food items.

With the outcome of this research, it would be possible to find out what Bangladeshi farmers are practicing, what are their obstacles, how to convert their land into organic, how farmers and other stakeholders could be conscious about sustainable agricultural practices without trade-off between yield and profit. In one word, this study is a modest attempt to find a way of sustainability in agriculture. A number of undesirable costs of modern agriculture, in terms of loss of soil fertility, loss of biodiversity, increasing health hazards, environmental pollution and other socioeconomic problems have been identified and described by Rahman (2001). But, no study is available on what the farmers of Bangladesh are practicing in order to put forward to sustainable agriculture in the country.

1.3 Questions addressed in this research

‘..... We cannot find the answer until we formulate the question well, often we do not know what would be the question is until we know the answer’ (March and Olsen, 1989). So, research question is important. This study is trying to find out the answer of the following research questions:

- i) How the local eco-friendly practices are far from international organic standard?
- ii) What are constraints exist in the policy level and what kinds of problems farmers face?
- iii) What are the ways of supporting farmers to practice eco-friendly farming?

1.4 Objectives of the study

However, when we think about organic or ecofriendly farming in Bangladesh, question arises what Bangladeshi farmers are practicing guided by some government or non-government organizations. As a basis, it could be compared with international standard. Whether the standard followed or not, to save the farmers from conventional agriculture, we need to influence them to follow ecofriendly practices. Based on the above mentioned situation, the specific objectives of the study are:

- i) To study the standards of eco-friendly and organic farming in international perspective.
- ii) To identify the status of organic and eco-friendly farming in Bangladesh.
- iii) To look for the constraints and possibilities of eco-friendly farming in Bangladesh.
- iv) To assess the needs of farmers in relation to using eco-friendly practices and to find out the way of supporting farmers.

The study is based on the following hypotheses:

- i) Currently Bangladeshi farmers are not practicing organic farming but to some extent, they are following eco-friendly practices.
- ii) Farmers cannot produce organic product due to unavailability of inputs.
- iii) Government policy towards input is the obstacle to organic input availability.
- iv) Lack of farmer’s awareness is also the constraint to eco-friendly practices in Bangladesh.

1.5 Outline of the study

The outline of the thesis initiates the brief orientation about the contents of each chapter. The whole thesis is segregated into eight chapters. Each chapter of the thesis has several topics.

Chapter 1 of the thesis comments with the general issues of the dissertation. This chapter introduces background of this study. In this chapter, the researcher has given the highest priority on stating the research problems and setting the objectives of the study. Chapter 2 briefly introduces about a clear idea about the international standards of organic and eco-friendly farming. This chapter is also presenting the controversies about the role of organic agriculture on livelihood outcomes (household food security, household income and well-being). Chapter 3 describes agricultural policy and the extension systems of Bangladesh. This chapter covers both public and private extension services especially the NGO led extension services that are promoting organic agriculture in Bangladesh. The chapter also introduces the role of GO and NGOs to eco-friendly farming in Bangladesh. Chapter 4 briefly describes the general research design and methodologies that outlined the methodological approaches used in this study. The chapter also describe data collection and analytical procedure of the study. Chapter 5 and 6 are the result and discussion part. The earlier one is about analytical discussion of classification of organic and eco-Friendly Farming in international and local Perspective; while the later one illustrates the barriers, opportunities and suggested measures. Finally, chapter 7 summarizes all the findings. This chapter also draws some recommendations for policy implication as well as for further research work. Chapter 8, the final chapter, provides English and German summary of the major findings of the study. The references cited in the different chapters of the thesis are separately presented alphabetically in the reference section. Some important explanations and transcription of raw data have been presented in the appendix. Generally, each chapter of the study is projected to explain and fulfil the objectives of the study.

CHAPTER 2 DEVELOPMENT OF ORGANIC FARMING

Although organic or traditional farming is the older form of agriculture in the world, interest in these methods has appeared again in recent years. Post-war technologies in the 1940's organized agriculture in a way that made possible to produce large quantity of food. Unfortunately, environmental and social costs appeared with these technologies. In response to this kind of development and industrialization, importance was given on returning to more sustainable farming both in Europe and the United States. Rudolf Steiner was the pioneer of biodynamic farming while Lord Northbourn named the term 'organic' – that was used to express sustainable farming systems which were dynamic, balanced and relied little on external inputs (Tikofsky, 2005).

2.1 History of organic farming

Farming without the use of chemicals (fertilizers and pesticides) was the only option for farmers until post-World War II. The split between industrial and organic farming dates back to the start of the 19th century when it was discovered that mineral salts contained in humus and manure that plant absorbed, and not organic matter. Sir Humphrey Davy and Justus von Liebig were the key founders of this theory and published their ideas in *Elements of Agricultural Chemistry (Davy 1813)* and *Organic Chemistry in its Application to Agriculture and Physiology (von Liebig, 1840)*. Their argument was: inorganic mineral fertilisers could replace manures and bring agriculture into the scientific fold, with resulting increases in production and efficiency. The agriculture revolution began in the 1840 with producing commercial inorganic fertiliser. Like many revolutions, it was not without mistakes and significant uptake of fertilisers did not occur until the start of World War II (Kristiansen and Merfield, 2006; Grigg, 1989).

Organic farming is the outcome of theory and practice in the early 20th century involving combination of various production methods primarily in northern Europe. European Commission (2000) mentioned about 3 central movements: (i) Biodynamic agriculture, originated in Germany under the inspiration of Rudolf Steiner, (ii) Organic farming, initiated in England based on the theories developed by Albert Howard and (iii) Biological agriculture, which was build up in Switzerland by Hans-Peter Rusch and Hans Müller. Tate (1994) pointed out some giant personalities who inspired the movement: Rudolf Steiner from Austria, Hans Müller, the German-Swiss, Lady Eve Balfour in Britain; J.I Rodale in the United States; and Masanobu Fukuoka in Japan.

“In 1924, Rudolph Steiner, the founder of the Philosophy of ‘Anthroposophy’ gave his agricultural lecture. That lecture and other Steiner’s teachings were the foundation of ‘biodynamic agriculture’, which differs from ‘organic agriculture’ principally as it has spiritual, mystical and astrological aspect. But they were prophetic in their criticism of industrial agriculture and in plotting an alternative course. The first organic certification and labelling system ‘Demeter’ was established in 1928 because

of Steiner's actions" (Kristiansen and Merfield, 2006; Rundgren, 2002; Tate, 1994). In the 1920s, Sir Albert Howard, a highly proficient scientist, was working in India on an experimental agricultural research institute. He undertook many activities including a highly successful plant breeding program and observed the effects of how forage was grown on the health of farm animals. His beliefs and experiences on 'the linkages between the health of the soil and the health of the plants and animals' were distilled into his book 'The Waste Products of Agriculture' (Howard, 1931) and the message was spread across many continents (Kristiansen and Merfield, 2006).

Hans Müller (1891-1988) was farmers' leader. He wanted to end what he saw as the exploitation of farmers by middlemen, by forging a direct link between producers and consumers. Müller established BIO Gemüse AVG, a Swiss cooperative of small farmers using organic-biological methods in 1946. In 1971, German practitioner of the Müller-Rusch farming techniques founded Bioland, the organic-biological farming group. Bioland was the German organic group with the largest hectareage and the greatest number of certified organic producers by 1990. Lady Eve Balfour (1899-1990) was the moving force behind the foundation in 1946 of the Soil Association, Britain's leading organic organization. She published her best selling work, *The Living Soil*, in 1943. Her principle was: the health of the soil and the health of men are inseparable. She conducted Haughley Experiment into organic farming on her farm in Suffolk between 1938 and 1970 (Tate, 1994; Balfour, 1976).

In the late 1930s, in rural Pennsylvania, USA, J.I Rodale was keen to learn about and practice organic farming. He realised the importance of restoring and protecting the natural health of the soil to preserve and improve human health. He established the Soil and Health Foundation that later became 'The Rodale Institute' in 1947 (Kristiansen and Merfield, 2006). Rodale's work was continued by his son Robert Rodale, who coined the term 'regenerative' agriculture, until his death in Moscow in 1990 (Tate, 1994). "Masanobu Fukuoka developed a very different approach to organic farming, both philosophically and practices, and is best known to a western readership through his book *One Straw Revolution* in Japan" (Tate, 1994). Mokichi Okada began practicing 'Nature farming' includes spiritual and well as agronomic aspects with a view to improving humanity. He established the Sekai Kyusei Kyo organisation and continues to promote 'Kyusei nature farming' with experimental farms. Okada, Fukuoka's farming approach also had a spiritual underpinning (Kristiansen and Merfield, 2006; Fukuoka, 1978)

Though many researches on environment and modern organic farming would be quite alien, the paper of 'Silent Spring' by Rachel Carson (1962) was a key turning point for modern organic and eco-friendly movements. The paper opened the world's eyes to the spoil that pesticide and other toxins were doing to the global environment (Kristiansen and Merfield, 2006).

However, formal scientific research was begun in the 1970s. The International Federation of Organic Agriculture Movements was established in 1972. Some important research institutes were established within a very short period of time:

FiBL, Switzerland (1974), USA (1974), Austria (1980); England (1982); and the Norway (1987). In the 1980s, various farming and consumer groups world wide began pressing for government regulation of organic production. By the late 1980s, there were a variety of state and private certifying agencies that certified farms as organic, providing assurance to the consumers that the organic products were produced legally (Niggli and Willer, 2000). First standards for organic agriculture were started in the year 1989 in India (Raj and Sharma, 1996). The Organic Foods Production Act was enacted in 1990 to control fraud instances in the organic product marketing. This act directives the creation of the National Organic Program (NOP) and the creation of identical standards. The IFOAM Regional Group of German-speaking Countries (Austria, Germany, Luxembourg and Switzerland) was founded in 1991. Europe and the USA are leading in the movement of organic agriculture, but it has also found as a useful alternative to meet the difficult situation of agriculture in the developing countries (Niemeyer and Lombard, 2003; Amaditz, 1997).

2.2 Organic farming

Government, NGOs, speeches of leaders, columnists of newspaper as well as agricultural scientists - all are using the word organic farming. "The method of organic farming is not a new technology at all. Some principles of organic farming were followed since the cultivation of crops in most ancient civilizations. The origin of practices of such as shifting cultivation, crop rotation, mixed cropping, the use of manures, raw animal dung, oil cakes and many others farming practices can be traced to enrichment of soil fertility, which is the aim of organic farming" (Joshi and Prbhakarasetty, 2005).

Numerous concepts are interchangeably used to refer the concept of organic farming: 'ecological farming', regenerative agriculture, biodynamic farming, alternative farming, organic biological farming. Usually all of these terms are mentioned under the notion of organic farming (Chang et. al., 2003). Organic farming has been explained in a number of documents. Some of the important definitions are as follows:

"Organic Agriculture is an agricultural classification that promotes environmentally, socially and economically sound production of food, fibre, timber etc. In this system, maintenance of soil fertility is considered as the key to successful production.... "It avoids the use of chemo-synthetic fertilizers, pesticides and pharmaceuticals. It also includes social considerations" (IFOAM, 2005b).

The US Department of Agriculture defines organic farming as *"Organic farming is a production system which avoids or largely excludes the use of synthetically compounded fertilisers, pesticides, growth regulators and livestock feed additives. To the maximum extent feasible, organic farming systems rely on crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests" (Lampkin, 1990).*

The definition of Codex Alimentarius Commission is as follows: “Food described using the term organic are products of organic farming, which is a system of farm design and management practices that seek to create ecosystems, which achieve sustainable productivity and provide weed and pest control through a diverse mix of mutually dependent life forms, recycling plant residues, crop selection and rotation, water management, tillage and cultivation, which optimises soil biological activity as the means to supply a balanced nutrient for plant and animal in addition to conserve soil resources. Pest and disease management is attained by means of encouragement of a balanced host/ predator relationship, augmentation of beneficial and cultural control and mechanical removal of pests and affected plants” (FAO, 2001; European Commission, 2000).

Fukuoka (1984) indicated in his book ‘One-straw Revolution’ about four basic principles of natural farming. These are: no ploughing, no chemical fertilisers no weeding and no plant protection.

2.3 Current status of organic agriculture

According to the latest FiBL/IFOAM survey (2009) on certified organic agriculture, there are 37.2 million hectares of organic agricultural land (including in-conversion areas) in 160 countries. In terms of area, Oceania (12.2 million hectares) covers the highest amount of land, followed by, Europe (9.3 million hectares), and Latin America (8.6 million hectares). Development of the organic industries in Australia, New Zealand and the Pacific Islands has been strongly influenced by quick growing overseas demand. On the other hand, Australia, Argentina, and the United States have the most organic land area. At present, 0.9 percent of the world’s agricultural land is organic. Growth is strongest in Europe, where the area increased by almost one million hectares. The countries with the largest increases are Argentina, Turkey, and Spain (Willer and Kilcher, 2011). The land under organic management in the world has been shown in Map 2.1



Map 2.1: Land under organic management by region 2007

Source: FiBL/IFOAM

Table 2.1 Continent wise area, no. of producers and leading countries of organic farming

Continent	Area in million hectares (% of total agricultural land)	% of total world agricultural land	No. of producers	Leading countries
Europe	9.3 million hectares	1.9 percent	250,000 producers	Spain, Italy, Germany, Liechtenstein, Austria, Sweden, Switzerland, and Estonia
Asia	3.6 million hectares	10 percent	731,315 producers	China and India
Latin America	8.6 million hectares (23 percent)	1.4 percent	280,000 producers	Argentina, Brazil, and Uruguay
North America	0.7% of total area	7 percent		USA, Canada
Oceania	12.2 million hectares (2.8%)	33 percent	8'466 producers	Australia followed by New Zealand

Source: Willer and Kilcher, (2011)

Among all producers in the world, Forty percent of them live in Asia followed by Africa, and Latin America. The countries with the most producers are India (677,257), Uganda (187,893), and Mexico (128,862). Most of this category of land is used for cereals including rice, followed by green fodder from arable land and vegetables. Permanent crops account for approximately six percent (2.4 million hectares) of the organic agricultural land. The most important crops are coffee, followed by olives, cocoa, nuts and grapes (Willer and Kilcher, 2011).

International trade in organic products

The growing demand for organic produce has led to the development of international trade. Countries which have less internal demand, but a favourable climate, are producing to satisfy export markets. Europe is the world's leading market for organic produce, a considerable amount of which is imported from outside. Large volume of cereals and soya are exported from North America (USA and Canada) into Europe. Israel is also another important supplier. Other sources are Turkey (figs, nuts and dried fruits), Morocco (oranges), the West Indies and Canary Islands (bananas), India (tea) and Bangladesh (tea). Within Europe there is considerable cross-frontier trade in cereals, wine and fresh organic vegetables. The most important direction is from south to north because northern Europe needs Mediterranean citrus fruits, grapes and other delicate fruits and early vegetables. The countries with the largest deficit in fresh organic produce as a whole are Germany and the UK, while the two with the greatest surplus are France and the Netherlands (Tate, 1994).

2.4 Certification of organic product

Certification programme consists of standard, inspection and receiving certificate. Standards describe which products can be labelled and sold commercially as 'certified organic'. The system includes farm inspector who check the farm record). Certification is primarily an acknowledgement that the products have been produced according to organic rules. There are three main categories of certification systems: Third party certification (TPC), Group Certification and Participatory Guarantee Schemes (PGS) (Willer and Kilcher, 2009; Herberg, 2007).

TPC is the only accepted form of certification in most developed countries. Third party means the whole certification process is performed by an external and independent organisation, not by either the grower (first party) or the buyer (second party). The farmer's role is to comply with the set rules or standards of the certification body (IFOAM, 2006c; Herberg, 2007). They provide necessary information on their production techniques, e. g; land use patterns, management plans for future farming, field history etc. The skilled inspector checks every farm one time a year and inspects the entire production process and all farm records. The auditor's task is to ensure whether or not the farm is managed according to the relevant organic standards. In TPC, inspection and advice are strictly separated, which means the auditor is not allowed to give any advice to the farmers during the inspections. The records kept by the farmer and the auditor's report are then cross-checked by the certification body, which will then decide about the granting of the final certificate (IFOAM, 2000b).

Group Certification has been approved by some developed countries for the farmers of developing countries. In this system, farmers are certified as a group and export their products at a premium price. They share the costs for certification and the final certificate. The group is formed on the basis of geographical location and follow identical production method and markets their products together. Therefore, these

systems are well adapted to the local situation. The external certification body only inspects the efficiency of the internal control system (ICS) and carries out a few spot checks of individual smallholders (IFOAM, 2000a, 2003; Kalus, 2004; Fonseca, 2004). Unlike TPC, ICS schemes can be linked to the extension and advice system within the group (IFOAM, 2006a; Wilhelm and Fürst, 2002).

Participatory guarantee systems (PGS) are categorised as non-certified initiatives using their own standards, which are based on the IFOAM basic standards. The inspection of the organic standards is carried out by the farmers themselves in peer reviews and sometimes by appointed staff (Herberg, 2007). In the formation of a new PGS, people who will use the system have a crucial role. PGS are localized and diverse (different products and production systems) in their nature and often link to local and alternative marketing approaches (IFOAM, 2006b). The marketing of the products is not necessarily centralized for the group. The certificate does not belong to the group but to the individual farmers. Until now, it is legally accepted only for the local market. Similar to the Group Certification, inspections are based on peer reviews and social control (Khosla, 2006). Like Group Certification schemes, PGS have a strong focus on training everyone involved in the system: farmers, workers and consumers (Fonseca, 2004).

2.5 Standard and regulations of organic farming in the world

Organic agriculture can be separated from conventional, modern and other types of sustainable farming by standards, regulations and the certification (Stone, 2006). Regulation plays key role in Organic product marketing. Certification bodies maintain high ethical organic standards to uphold consumers' confidence and to encourage and support true organic farmers (Tate, 1994). Organic certification is mostly determined for consumers and therefore, producers have to follow their regulations. As majority of the consumers of the world live in EU countries, USA and Japan, so they are controlling the organic market and maintaining standards of organic farming (Willer *et al.*, 2008; Herberg, 2007). Most certification bodies are located in the EU, USA, Japan, South Korea, China, Canada and Brazil. Most of the listed certification organizations are based in developed countries, but also offer their certification services in developing countries. Very few operate in several developed countries. For example, no EU-based certification body offers its services in the US. Very small number of certifiers works on several or all continents. Seventy-four countries have home-based certification organization. Asia has 147 certification bodies; most are based in South Korea, China, India, and Japan While there are only eight certification bodies in Africa that are located in South Africa, Kenya, Uganda, Tanzania and Egypt (Willer *et al.*, 2008).

At the widest international level, organic regulations have been made initially by the International Federation of Organic Agricultural Movements (IFOAM) that was founded in 1972. All the major national European organic certifying associate and many European non-certifying organic associations and institutes belonged to IFOAM (Tate, 1994; IFOAM, 1992). The first governmental regulations were

introduced by some European countries, Austria and France, in the 1980s. In 1991, the EU approved the 'Organic Regulation 2092/91' and set standards with major propositions for international trade. Different countries in Europe, Latin America and Asia introduced legislation in the 1990s. In 1999, the Codex Alimentarius approved the first guiding principles for organic plant production. At present, 160 countries involved in the production of organic products and most major economies have established regulations for organic production (Willer and Kilcher, 2009). This section is an attempt to describe the important international organic rules and standards:

2.5.1 IFOAM Basic standards

IFOAM is 'the umbrella organization' of world agricultural movement. Basically, IFOAM set minimum production standards for primary organic produce to its members. The mission is to lead and assist the organic movement whole over the world; and works for the adoption of sustainable agriculture systems that will be based on 'principle of organic farming'. IFOAM maintains 'a basic standard' and 'an accreditation service' – together they constitute the IFOAM Norms, which symbolize a framework for certification bodies (Willer and Kilcher, 2009). The Basic Standards illustrate how organic products are produced, processed and handled. Four principles (health, ecology, fairness and care) have been followed to identify organic agriculture to protect the health and well-being of current and future generations and the environment (IFOAM, 2005a). The IFOAM Basic Production Standards are discussed under six major points. Those are as follows:

- Appropriate varieties and qualities of organic seed and/ or plant materials shall be used. Conventional materials could be used when these are not available, but to treat the seeds or seedlings with pesticides is not permitted.
- To be a farm truly organic, a farm needs to maintain conversion period to establish an organic management system through building soil fertility. For the production of annual crops, the farm must maintain a conversion period of at least 12 months, while in the case of perennial crops, the time period is at least 18 months.
- Diversity in plant production shall be assured by minimum crop rotation and/ or variety of plantings. Operators need to manage pressure from insects, weeds, diseases and other pests, while maintaining soil organic matter, fertility, microbial activity and soil health.
- Organic matter must be added or supplemented by crop rotations, planting green manure and nitrogen fixation plants etc. at the same time, nutrient losses from the farm to the natural environment should be reduced. Mineral fertilizers shall only be used in a program that address long-term fertility needs together with other techniques mentioned before.
- Pest, disease and weed should be managed with the products that will be prepared at the farm from local plants, animals and micro-organisms. Physical or

mechanical methods are permitted. In severe cases, only IFOAM approved ingredients can be applied. Recommended managements include physical barriers, use of different sound and light, temperature control etc.

- The operator must maintain buffer zones to avoid probable contamination. Tools used in conventional farming systems shall be carefully cleaned before using on organically managed plots.

Source: IFOAM (2005a)

2.5.2 EU regulation on organic agriculture

The history of organic movement clearly tells that the root of organic farming lie in Europe. From its origin time, Europe leads the movement. Austria was the first country in the world to set official rules for organic farming (Pohl, 2002). However, it was in 1991 when the Council of the European Communities published the EEC Regulation No. 2092/91. The common EU regulations are in principle similar, in line with IFOAM standard. The Regulation maintains that agricultural products may only be marked as organic, if they conforms the requirements of EU Regulation 2092/91 (Willer and Kilcher, 2009). The regulations protect both producers from unfair competition, and consumers from non-organic products. However, according to the common EU standards for organic plant production, (i) Seed or planting materials must be originated from organic sources. (ii) The farm unit must exceed a conversion period before marketing the products as organic. For annual or biennial crops, the period is 24 months before the sowing; and for perennial crops, 36 months before harvesting of the products. (iii) Soil fertility must be maintained through the cultivation of legumes or green manures or deep-rooted plants, along with crop rotation and fertilization with organic fertilizers. Inorganic or mineral Fertilizers and the substances that are mentioned on the positive list of EEC Regulation 2092/91 may be used, when the situation demand it. (iv) Pests, diseases and weeds must be controlled through the selection of appropriate varieties and species, adequate program of crop rotation, mechanical means of cultivation, protection and encouragement of the natural enemies of parasites and burning (Herberg, 2007).

The regulation was started to enact from 1 January 1993. It had a major impact on the number of approved certification bodies: in France and Italy the number was fallen to five, in Ireland it was risen to three and in Germany it has increased from six to over 50 (Tate, 1994).

In 2000, EC introduced an organic logo for the producers of the EU, who produced their products at the level of the EU regulation. Farmers or producers could use the logo only, if 95 percent of their inputs were from organic sources, originated in the EU, product processed in the EU or on imported from any country with an equivalent inspection system (Herberg, 2007, Kilcher et.al, 2006). In the conclusion of the 'European Action Plan' 2004, the European Council requested for the revision of 'the EU Regulation 2092/91' in order to achieve a simplified, more logical and less detailed regulation. In 2006, the EU published new regulations concerning import

procedures that introduced an approval system for inspection bodies operating in countries outside of the EU. The rules were amended in 2007. The new regulation was completely restructured and rephrased and came into force on January 1, 2009 (Willer and Kilcher, 2009).

The organic guidelines of EU Regulation set minimum standards concerning the production, processing, storage and trade of organically produced products for the whole of the European Union. But each country in Europe is responsible for its own enforcement, monitoring, inspection, to interpret the rules of organic production and to execute those rules in national context. Therefore, every country follows their own rules, established or approved by their ministry of Agriculture. For example, the organic farms in Germany are following Council Regulation (EEC) No. 2092/91. Standards for the processing of organically produced products have been developed by 'AGÖL' and 'the Federation of Producers of Organic Products'. In several respects, AGÖL standards are stricter than the EU regulation. Both private standards (AGÖL 1996) and state standards are inspected according to the inspection system as described in Council Regulation (EEC) No. 2092/91 (Haccius and Lünzer, 2000).

France developed Organic standards in the 1980s. France was the first European country to introduce an official label (AB) for organic cereals, fruit and vegetables. The state logo is AB-Logo (Agriculture Biologique). The logo can be used when they contain more than 95 percent organic components, are produced or processed within the EU, and is certified by one of the inspection bodies according to EN 45011. Consumers of organic products have been classified under three main categories: the politically or ideologically motivated who are aware about the environment; the health conscious; and the switchers, who are influenced by the media and premium price (Reynaud and Schmidt, 2001).

From the 1950s, conscious farmers, consumers, medical doctors, processors and traders were working very hard in the front for spreading organic farming in Italy (Santucci and Pignataro, 2002). In 1990, four certifying organizations were working in Italy. AIAB was the largest association, grouping together many local-regional grassroots associations. Suolo e Salute (1969) and the Biodynamic Association were the historical cultural/ producers' groups, while CCPB was a co-operative (1988) that was supported by processors and large cooperatives (Compagnoni *et. al.*, 2002). In 1993, more than 20 association, were evaluated as suitable for market produce under their logo in Italy (Tate, 1994). Some of the major organic producing and consuming countries have developed national standards for organic certification.

2.5.3 The Codex Alimentarius Guidelines

Food and Agriculture Organization (FAO) responded to the growth of the organic sector and the need for certification for international organic standards as part of the FAO's *Codex Alimentarius Commission* (FAO, 1991). It was commenced in 1963 to develop food standards, guidelines and related texts such as 'codes of practice' under the 'Joint FAO/ WHO Food Standard Program' (FAO/WHO, 2011). *The guidelines*

has drawn up a set of standard on EC and United States legislation, as well as national codes from Australia, Canada and Austria, and the IFOAM standards (Tate, 1994.p.19). It considers that the international rules are the great instruments for consumer protection and facilitating trade. Therefore, establishing the guidelines for the production, processing, labelling and marketing of organically produced foods is very important. From IFOAM's perspective, the Codex Guidelines are an important step towards the harmonization of international rules that serve to build consumer trust. In terms of developing market, these Guidelines provide guidance to governments in developing national regulations for organic food (Willer and Kilcher, 2009). The Commission approved crop production guidelines in 1999 and animal production guidelines in 2011. In many aspects, the rules of Codex guidelines are in line with the IFOAM basic standards and the EU regulation (EEC) 2092/91; but in some issues, there are differences (Kilcher, *et. al.*; 2011; Willer and Yussefi, 2006). However, these guidelines are shortly described here (FAO and WHO, 2001):

In CODEX rule, conversion period is not less than two years for annual crops, and no less than three years, in the case of perennial crops except grassland, before the first harvest of products. If whole farm is not converted, land must be divided into organic and conventional units. Seed or planting material should be collected from plants grown organically at least one generation for annual crops or, two growing seasons, in the case of perennial crops. If these are not available, seeds can be treated with the recommended materials.

Like IFOAM standards, soil fertility should be maintained by cultivation of deep-rooting plants, legumes, green manures or any appropriate multi-annual rotation programme. But it is mentioned that by-products from livestock farming may be used if they come from organic livestock holdings. The recommended substances may be applied only if adequate supply of nutrition is not possible by these methods” (FAO and WHO, 2001).

Diseases, pests, and weeds should be controlled by any one, or with the combination of the following events: selection of appropriate species and varieties; crop rotation programs; mechanical measures; protection of predators and natural enemies of pests, for instance hedges and nesting sites, ecological buffer zones that helps to maintain pest-predator ratio; diversified ecosystems. These techniques vary between geographical locations (Thai Agricultural Standard, 2008). In 2009, the discussion about deleting or restricting substances for pest control (in particular, Rotenone) and concerning the use of ethylene other than for bananas and kiwi fruits will continue (Kilcher, *et al.*; 2011).

2.5.4 National Organic Programme (NOP) of USDA

Legislation defining organic food production was introduced in the United States in 1990 with the approval of the organic food production Act (OFPA) at US Congress. OFPA mandated creation of the National Organic Program (NOP) under the umbrella of USDA's Agricultural marketing Service (AMC). The NOP rules include the National Organic Standard for production and processing that was approved and

implemented in 2002. It addresses what can or cannot be done or used in organic production and processing. It requires that certified organic farms must prepare and submit a farm plan that details all practices and inputs to show how they will comply with the national standard. Farmers must also keep records to prove that they are the following the approve plan. If anybody wants to be an organic producer and expect to sell more than \$5,000 of organic products, he/she needs to certify (Kuepper, 2007). Otherwise, it is considered as violation of the National organic Standard. Certification can only be conferred by USDA-accredited agents (Willer and Kilcher, 2011). The key issues in assessing whether any farm is organic include land use status, use of fertilizers, manure, compost and pesticides, seed selection, growing practices, and prevention of contamination (Kuepper, 2007). We will discuss very briefly in the following:

According to US standard, farmer needs to wait for three years to convert the farm organic, if he plants treated seed or a genetically engineered variety. Like other international standards, seed and seedling must come from organic sources including cover crops and transplants. Seeds coated with prohibited synthetic fungicides or insecticides are not allowed under any circumstances. Genetically engineered varieties are prohibited.

Farmers must use a wide selection of practices to maintain soil fertility, control insects, diseases and weeds; including cover cropping, using traps and barriers, proper crop rotation, and timing planting to outwit pests. It is not allowed to burn crop residues in the field. It could only be done to control disease and to stimulate seed germination if necessary. Organic growers can apply materials or fertilizers; those are listed in the USDA standard to improve their soil. If farmers use manure during the growing season, it must be thoroughly composted using a high temperature process (131- 170 degree F) for at least 3 days if they use it in static aerated piles; 15 days for, for using a frequently – turned window system. Application is not allowed within 90 days of harvest for fruits and vegetables whose edible portion does not touch the ground, while it is 120 days, whose edible portion touches the soil, applications may not be made within of harvest.

Like IFOAM standard, establishing buffer zone is necessary if neighbours use prohibited chemicals. If farmer spray conventional pesticides in his non-organic areas, he need to use a separate sprayer to use for organic production and clearly label it for organic use only. If he also uses any equipment for conventional production, he needs to be certain to clean it thoroughly before it is used on organic crops and soils (Kuepper, 2007).

2.5.5 Japanese Agricultural Standard

Japan is the largest organic market in Asia. Japanese Ministry of Agriculture, Forestry and Fisheries developed rules of standard for organic agricultural products in 2001. The standards were based on EU organic guidelines ” (MAFF, 2007). At the same time, organic logo (JAS) was introduced, although organic agriculture started much earlier. The purpose of these standards is to establish the criteria of production

methods for the organic agricultural products. The rules of ‘conversion period’ and ‘use of seed and planting materials’ are similar to EU guidelines. The productivity of the farmland shall be preserved and promoted only by applying the compost derived from the residue of the agricultural products produced in the same fields, and methods effectively utilizing biological functions of the organism inhabiting and growing in the fields. Where the productivity of the farmland cannot be preserved, the recommended fertilizers and soil improvement materials could be utilized. Noxious animal and plants must be controlled by appropriate selection of crops and varieties, adjusting cropping time, or by using physical method (using light, heat, sound) or manual or mechanical or, biological method or an appropriate combination of these methods (JAS, 2005). In cases of critical or seriously risky for the agricultural products and being impossible of effectively controlling, use of the recommended agricultural chemicals is allowed. In the post harvested activities, farmers must be careful from mixing organic and inorganic agricultural products. In case of emergency, one farmer can use the recommended agricultural chemicals” (MAFF, 2007)

Japan approved some countries whose organic rules and standards as equivalent with the JAS (As of March 2007). These are: Ireland, the United States of America, Argentina, Italy, the United Kingdom, Australia, Austria, Netherlands, Greece, Switzerland, Sweden, Denmark, Spain, Germany, New Zealand, Finland, France, Belgium, Portugal, and Luxembourg.

2.5.6 Organic standards of Australia

Although biodynamic farming was organized in the before 1980, the National Association for Sustainable Agriculture, Australia (NASAA) was formally inaugurated in 1986, and incorporated in early 1987. In the late 1990s, the Organic Federation of Australia (OFA) came into existence to unite all stakeholders in organic agriculture, who make policy decisions, lobbies government and other bodies on behalf of the organic sector, and represents the sector where appropriate (Wynen, 2008). According to the standard, “farmers should maximize the percentage of pasture, the use of legumes and deep rooted plants in the rotation, minimize tillage and maximize opportunities to preserve crop residues (NASAA organic standard, 2004, p.32). No annual crop of the same species shall be planted more than 2 years in a given field. Appropriate variety and quality must be selected. Seeds or plant material shall be propagated under organic management – one generation, in case of annual crops, and two growing periods, for perennials. Conventional materials may be treated with recommended substances, when materials from organic sources are not available (NASAA organic standard, 2004).

Fertilizers and nutrients, those are not threat to the soil and water quality as well as biodiversity – may be used. If farmer needs to use raw animal liquid waste, that must be collected from organic sources. Mulch materials from non-organic sources are not permitted as sometimes those are placed in touch with the edible segment of the crop. The use of gypsum produced as a manufacturing by-product, wood ashes from treated

timbers etc are prohibited. Mineral fertilizers can be applied in the form in which they are naturally composed and extracted and shall not be rendered more soluble by chemical treatment. Approved pest, disease and weed management methods include quarantine and hygiene, use of appropriate crop varieties, crop rotations, mulching, biological control, mowing and grazing, companion planting, competitive crops, and different mechanical means of cultivation. Recommended fertilizers and soil improvement materials, treatment with allowed substances can be used very limitedly only as a last resort (NASAA organic standard, 2004). Organic and non-organic products may not be transported together unless they are packaged and sealed (NASAA organic standard, 2004).

2.5.7 Organic standards of China and India

Although both China and India have a considerable amount of area and number of producers under organic agriculture, like most developing countries, their agricultural policies are not in favour of organic farming. However, the situation is quickly changing due to awareness at the government level (IFAD, 2005c).

The first organic tea was certified for export in 1990. At present, more than 200 organic products have been certified in China. As China is producing export-oriented organic products, they have to maintain the standards of USDA, JAS and EU regulations. It is estimated that 1100 companies and farms have been certified or going to be certified and about half are locally certified (IFAD, 2005b).

India has a rich history of agriculture and continues to adapt technologies like biodynamic and other systems of organic practices. India's organic farmers are also at the forefront of developing field-based technologies to improve soil fertility. In May 2001, the Indian Ministry of Commerce established the National Programme on Organic Production (NPOP) in line with IFOAM basic standards. Different regions or states of India also have established their own local or regional systems for ecological agriculture like *agnihotra* and *panchakavya*, those are now gathered under one umbrella '*Jaivik Krishi*' (IFAD, 2005). With the help of USAID, "zero-tillage," has been largely adopted across northern India. The method reduces the need for farmers to engage in high-priced and time-consuming tilling and ploughing, saves farmers' time and valuable natural resources. When planting, they use seeders to drop seeds directly into the soil (IFAD, 2005c).

Chand and Pabbi (2005) reported that people of India are telling eco-friendly farming practices as organic farming. Improved soil management, use of less chemicals, locally produced inputs, and harmonizing with nature – are the main practices of those farmers. Recognizing that India's rain-fed agriculture (that accounts for 60 percent of planted area and potentiality to good use of organic methods), the Government has taken a number of steps to promote and regulate organic production and marketing. Several state governments have also formulated their own organic policies and guidelines for programme implementation. For India, the primary destination of export markets is the USA, Europe and Japan (IFAD, 2005b).

2.6 When certification is important

Organic farming had developed long before certification developed by the farmers' movement in Europe. Standards, inspection and certification were introduced in order to enhance credibility and to protect consumers from abuse in the growing lucrative market. It is true that no certification is required to attain better soil fertility and yield stability with organic cultivation methods. Certification is a market instrument that only becomes interesting when new marketing channels can be opened up and higher selling prices are achieved. IFOAM President Rundgren (2001) stressed that "there is no incentive for certification, if production is for personal consumption. In this case, certification would be nonsense, useless and a waste of money and energy. It is not an issue when it comes to food security of hungry people and smallholders producing for their own consumption". It makes sense if an end-consumer is to be given convincing evidence of an organic product's special features, especially if this buyer is not in direct personal contact with the producer owing to great distances (Johansen, et. al; 2005).

The spatial and cultural distance between a banana-grower in Ecuador and a European banana buyer necessitates certification for both sides. The customer requires a safeguard that ecological and quality standards have been observed, which is guaranteed by the organic label and the banana-grower can protect his produce with labelling against free-riders seeking to enjoy the advantage of higher selling prices with a lower effort. But if no such distances are involved (as is the case, for example, in direct marketing), no certification is required to replace trust in organic farming and compliance with certain standards (Johansen, et. al; 2005).

In order to facilitate organic movement, all stakeholders for example, governments, standard setting and certification bodies should concentrate their focus on the crucial dissimilarity between organic and conventional, rather to struggling with 'differences within the movement'. It is the time to rethink that whether the accreditation and certification is really an instrument to strengthen the organic development. Considering the aforesaid factors, certification should be designed to support the reliability of the organic system, not to put it in danger by burdening it with more and more details. The organic movement is still trying to attain harmonized international basic standards acknowledging the reality of its practical restrictions (Willer and Youssefi, 2006).

2.7 Does organic agriculture provide lower yield and return?

There are many examples exist that due to conversion to organic farming, farmers have received better yield, on the other hand, many examples show that in conversion period, producers receive lower yield. Many studies have also shown that, in the long term, organic farming methods can work to increase farmers' yields. For instance, significant amount of yield increases in crops and fruits in the context of organic agriculture projects those have been found in many developing countries. Key to these achievements are different soil fertility management practices such as effective

composting systems, introduction of green manure, cover crops, legumes, crop rotation, use of organic fertilizers, ash and manure and other soil conservation methods (Zundel and Kilcher, 2007). According to reports from staple food projects, organic potato and maize production also increases income in mountain agro-ecosystems in Bolivia and Nepal (Zundel and Kilcher, 2007; Pretty, 2002).

In the Philippines, rice yields falld during the first years after conversion from conventional to organic agriculture. But after four years, production increased from 4.5 to 5 tonnes per hectare, about the same as conventional rice farms (Zundel and Kilcher, 2007; Lina, *et al.*, 1999). In some cases, farmers involved in organic methods received double yields per hectare (Scalabba and Hattam, 2002). Higher yields from organic farming not only bring higher incomes, but also receive premium prices, consequently reducing poverty and hunger pressures (Onduru *et al.*, 2002; Parrot *et al.*, 2006). Pretty, (2002) and Parsons (2002) attributed the higher organic yields to cautious management of weeds, pests and diseases. In addition, Parson (2002) noted that the small acreages typically managed by organic producers allow for more intensive monitoring of crops, resulting in implementation of management measures in a more timely fashion, thereby reducing yield losses. The findings of research reviewed by Vasilikiotis, (2000) and Setboonsarng (2006) also show that conversion to organic farming can lead to higher yields than conventional farming. The Farming Systems Trial at Rodale Institute likewise provides supporting evidence revealing that there was no difference in overall yields of corn, soy bean, and other crops (Pimentel, *et al.*, 2005a, 2005b; Setboonsarng, 2006).

Lyngbaek, *et al.* (2001) found, mean yield dropped 22 percent on organic coffee farms compared to the conventional farms. Pülschen and Lutzeyer (1993) also found mean yield reductions of 28 percent on an organic coffee farm compared to an adjacent conventional farm in Mexico. Yield reductions were recognized as the problem of replacing inorganic nitrogen fertilizers by organic nitrogen sources (Van der Vossen, 2005). Organic banana production in the Caribbean is said to have much lower yields at higher production costs than conventional production, mainly due to reduced nutrient input which has to be replaced with labour-intensive green manure (Polius, 2000; Lotter, 2003).

In Costa Rica, yield of organic cacao production decreased at more than 50 percent. The significant reason was the diseases monilia and witches' broom and black pod (Zundel and Kilcher, 2007; Slingerland and Gonzalez, 2006). However, diverse forest system with extensive cacao production may reduce cacao yields but simultaneously it will produce other food stuff and goods such as root crops, fruits, animals (protein), medicine, spices and timber/ building materials (Daniels, *et al.*, 1999; Rice and Greenberg, 2000).

In general, lower organic yields are compensated by relatively higher producer prices. Thus, farm gate prices are important determinants of organic farm profitability. On the other hand, price premiums tend to negatively affect organic consumer purchases (Misra *et al.*, 1991).

It has been found in California, the net financial returns (without premium prices) of organically grown tomatoes, beans and maize to be lower than conventionally grown crops, due to high costs in management of seedlings (tomatoes), weed control and cover crop management (Clark, *et al.*, 1999). Yields of organic agriculture do not exceed conventional yields if the comparisons are made in a systematic and controlled way, as is the case in the field experiments of the studies of Rasul and Thapa (2004) in Bangladesh, and Lyngbaek *et al.*, (2001) in Costa Rica.

In the Rodale trial, after two years of transition and learning, net returns were similar in both systems, with the conventional system spending more on fertilizers and pesticides and the organic system having higher machinery costs due to mechanical weed control and additional cover crop/ green manure planting. The net returns of the organic system were more stable over the years. However, when the transition period was included in the calculation and if family labour was remunerated, organic returns fell by 10 percent below the conventional returns (Pimentel, *et al.*, 2005a).

A case study conducted in the cotton belt of central India found that organic net returns on seed cotton were significantly higher than conventional net returns, because of 10-20 percent lower production costs (Eyhorn *et al.*, 2006).

The south Brazilian network EcoVida offers new sources of income and livelihoods for the growers. They sell directly to the consumers through cooperative shops and fairs. Organic products (produced according to the network standards) are given a special seal, certified by a participatory guarantee system (EcoVida, 2007). Eco-Vida is a good example of how producers have developed local markets by building strong relationships with consumers (Sahota, 2006).

Due to declining commodity prices, countries are choosing organic products. These products have export opportunity and at the same time, provide way to sustainable agriculture. Many Asian countries are now in the process of formulating national policies for organic farming. For example, Thailand announced the first organic agriculture policy in 2001. Bhutan declared its National Strategy on Organic Agriculture in 2006. In Cambodia and the Philippines, the promotion of organic agriculture is led by Ministry of Trade (Setboonsarng, 2006).

Many examples are also exist in the literature that the poor farmers of marginal areas are getting benefit from organic agriculture by improving productivity and incomes, and promoting environmental sustainability. In Thailand, contract organic rice farmers of marginal areas has gained significant livelihood improvements (Malhan

and Rao, 2007; Setboonsarng, 2006; Setboonsarng, *et al.*, 2005). In Kandy, Sri Lanka, an organic tea project for resource poor farmers has led to favourable environmental outcomes in an area where tea had almost been abandoned (Haldberg, *et al.*, 2006).

It has been argued that since organic farming is labor intensive, it could empower women by providing them more earning opportunities. IFAD's study (2005b) on organic farming in China shows, women's ability to earn from organic farming provided them a greater feeling of worth for their role. In many organic farming certification bodies in Asia, women are preferred as farm inspectors. But it is necessary to remember that though organic farming may increase women's income; this increase may not be sufficient to compensate for so many burdens that women have to carry. It is also possible that, women will shift some of the household burden on to other members of the family specially the children and other female household members who are already burdened with work (Dolan and Sorby, 2003). But Rosegrant *et al.*, (2005) expressed different view: "*due to increasing income, women are empowered, self-confident, and more likely to attain education and send their children to school. The more diversified diets bring better nutrition and reduce the risk of mortality and illness for themselves and their children*".

Overall, organic production systems offer lower yields compared to conventional system. Some literatures also inform that yield varies depending on the phase of conversion to organic production (Gad, 2008; Bonti-Ankomah and Yiridoe; 2006; FAO, 2002). Some studies report yield loss after changing from conventional to organic production, depending on factors such as the previous management under conventional system, features of the land, and experience of the farmer (FAO, 1999). In intensive areas, conversion to organic farming usually decreases yields in the first year, but by the third year, yields typically stabilize and can be almost identical to conventional yields (IFAD, 2005a).

A team of scientists led by Badgley *et al.*, (2007) at the University of Michigan has disproved the general fallacy about organic agriculture. Organic agriculture gives yield almost similar to conventional agriculture in developed countries and much higher in developing countries. It is possible to fix enough nitrogen in the soil by using legumes, green manure and cover crops. The research team compared yields from organic and conventional agriculture in 293 cases, and estimated the average yield ratio (organic: non-organic). With the average yield ratios, they modelled the global food supply. The results show that organic agriculture is able to produce adequate food to feed the whole world. The report concluded as: "These results indicate that organic agriculture has the potential to contribute quite substantially to the global food supply, while reducing the detrimental environmental impacts of conventional agriculture" (Catherine *et al.*, 2007). By nature, organic agriculture is an

adaptation policy that can be targeted to improve the livelihoods of rural people and vulnerable parts of the society societies who are expected to face the adverse effects of climate change and variability—for instance, the rural population in sub-Saharan Africa (Eyhorn 2007). Goal 1 (eradicate extreme poverty) and Goal 7 (ensure environmental sustainability) of the United Nations Millennium Development Goals could also be achieved by OA (Muller, 2009).

2.8 Who are the consumers of organic products?

Several Europe-based studies assessed the environmental and resource use impacts under different farming systems. Results have shown that organic farming performs better than conventional farming (Setboonsarng, 2006; ISP, 2003; Stolze, *et al.*, 2002; Shepherd, *et al.*, 2003). Some studies reported that younger consumers are more likely to purchase organic products due to their preference for chemical free products and interest in environmental quality (Hay, 1989; Buzby and Skees, 1994). For example, Hay (1989) reported that younger Canadian consumers tended to have higher preference for chemical free products and therefore showed a higher preference for organic products, whereas older consumers were less concerned about the complete removal of chemicals. In general, younger consumers tend to have a lower purchasing power than older consumers.

Some studies reported that women are more likely to purchase organic food more regularly than men (Groff *et al.*, 1993; Buzby and Skees, 1994; Byrne *et al.*, 1994; Davies *et al.*, 1995; Govindasamy and Italia, 1997; Menghi, 1997; O'Donovan and McCarthy, 2002), this may be partly because women are usually the primary grocery shoppers in most households, and consequently are more informed about nutrition and food safety. Other studies (Wandel and Bugge, 1997) suggest that men were more willing to pay a higher premium price for organic products than women. It is difficult to explain the contrasting result without controlling various economic (household income), demographic (number of children in family), and other (knowledge of organic) variables.

Consumer concerns with food safety is highlighted in a study comparing interest in organic products across four European countries (Germany, Denmark, Britain and France) (Wier and Calverley, 2002). The study found that German consumers were the most interested in organic food, followed by Danish, British and then French consumers. Wier and Calverley (2002) further reported that German consumers were also the most concerned about food safety among the four countries studied, followed by Danish and then British consumers, consistent with the previous conclusion.

Several studies also reported that high premium price, lack of knowledge and unavailability of organic product were the most important reasons that influence non-buyers not to purchase organic food (Gad, 2008). Davies *et al.* (1995) and

O'Donovan and McCarthy (2002) reported that product availability and price as key inhibitors to consumers' demand for organic foods in Ireland.

2.9 Relationship between natural disaster, biodiversity and organic farming

Organic farming can play important role in mitigating the impacts of land degradation and climate change. Organic farming increases the elasticity and stability of the production, decrease the risk of small producers resulted by natural disasters and others disturbances (Altieri, 2002). For example, after Hurricane Mitch hit the lands of Central America, farmers who used traditional cropping methods suffered less damage than their neighbours who use conventional techniques (Jimenez, 2007; Holt-Gimenez, 2002). In addition, organic farming also ensures environmental sustainability. The environmental benefits has broadly been documented (Hansen *et al.*, 2002; Stolze *et al.*, 2002; Scialabba and Hattam, 2002; Dabbert *et al.*, 2004) and include the provision of protection of ecology, lower resource use, environmental protection, landscape values, and reduced energy use.

Organic agriculture also contributes to ensuring biodiversity as in organic farms, weeds and pests are generally controlled through manual or mechanized removal, crop rotation, intercropping (Liebman, 1995), using competitor plants, relying on wild or domesticated animals to consume unwanted species (Altieri, 1999), and rotational grazing to prevent infestation and contagion. These practices limit the impact of pest outbreaks and the resulting loss of production. The contribution of natural predators like spiders and carabid beetles also helps reduce and mitigate the incidence and damage of insect pest-related problems (Lavelle and Spain, 2001).

In China, market-incentive processes have been the general catalyst for farmers converting to organic. Small farmers are often encouraged by export trade companies to convert to organic in order to take advantage of premium market prices on certain crops (e.g. tea). Farmers expand the land allocated to traditional methods of cultivation (organic), thus improving the environmental sustainability of the region (Haldberg *et al.*, 2006). This example highlights a clear and direct relationship between market incentive processes and environmental sustainability.

2.10 Conclusion

Though organic or traditional farming is the older form of agriculture, those concepts appeared as the outcome of theory and practice in the early 20th century involving combination of various production methods primarily in northern Europe. Formal scientific research was begun in the 1970s. In 1963, *Codex Alimentarius Commission* was established to develop standards, and guidelines for organic food under the 'Joint FAO/WHO Food Standard Program'. The International Federation of Organic Agriculture Movements was established in 1972. After that many international, regional as well as local standards, certification authorities, accreditation services evolved. Still the movement is continuing.

Numerous concepts are interchangeably used to refer the concept of organic farming: 'ecological farming', regenerative agriculture, biodynamic farming, alternative farming etc. But in all cases, the ultimate goal of farmers is sustainable agriculture – to maintain or improve the natural resource base, protect the environment, ensure profitability, conserve energy, increase productivity, improve food quality and safety, and create more viable socio-economic infrastructure for farms and rural communities.

Organic agriculture can be separated from conventional, modern and other types of sustainable farming by standards, regulations and the certification. Organic certification is mostly determined for consumers and therefore, producers have to follow their regulations. As majority of the consumers of the world located in the EU countries, USA and Japan; they are controlling the organic market and maintaining standards of organic farming.

There are many standards, but five important standards have been recognised as most important like IFOAM, CODEX guidelines, EU regulations, USDA NOP and Japanese standards. The regulations protect producers from unfair competition, and consumers from non-organic products. In all standards, there are some similar issues and also there are some dissimilar points. But the factors that influence to classify as organic, depend partly on local situation in terms of needs and availability of resources. For instance, conventional seed or seedlings may be used on temporary basis, in a position, where organic items are not available. There is no technology available that verify whether organic standards have been followed. Therefore, certification of the farm level production process is chosen to ensure that organic products are grown with following standards. But the certification process is also complicated.

On the basis of mentioned literatures, it is true that no study was carried out in Bangladesh to find out position of organic or eco-friendly farming, constraints or opportunities to launch eco-friendly farming practices and to involve relevant actors for promoting this practice. Thus, the present study is a modest attempt to find out the constraints and opportunities, and to engage all relevant actors for helping the farmers to adopt eco-friendly farming practices in Bangladesh.

CHAPTER 3 POLICIES AND ORGANIZATIONAL EFFORT TOWARDS ORGANIC MOVEMENT IN BANGLADESH

3.1 Agriculture in Bangladesh: at a glance

The agriculture sector is the largest contributor to GDP, income and employment generation and a vital factor in achieving food self-sufficiency that works as a tool to reduce rural poverty and promote sustainable economic development. The component of the sector includes crops, fisheries, livestock and forestry. The share of agriculture to the GDP was around 57% in the 1970s that was lessened to about 21 percent in 2007 (BBS, 2010). The contribution to GDP by agriculture is about 20% of which crops, fisheries, livestock and forestry account for 10, 4, 3 and 1.5%, respectively (BBS, 2010). The system of crop production is highly labor intensive and the country is, as well, labor abundant where about three fifths of the population engages in farming of which 57% of them is engaged in the crop sector (Haque, 2011, p.1). The sector also supplies raw materials for many of the industrial sectors. In a nutshell, agriculture is the main wheel of economic growth in Bangladesh. Therefore, increasing food and agriculture production have always been considered as major concerns of Bangladeshi policy-makers.

Bangladesh is a densely populated non-industrialised country in the world. Its economy is vulnerable and characterised by high population growth, low natural resource base and highly prone to natural disasters. As a result, a large number of people could not afford subsistence level of income for meeting their basic needs, thus living below the poverty line. Despite scarcity of resources and natural disasters, the situation of poverty has been improving significantly over the years. As the economy primarily dependent on agriculture, about 80 percent of the total population live in rural areas (Table 3.1) and are directly or indirectly engaged in a wide range of agriculture activities (BBS, 2010; Rahama and Schmitz, 2007).

As an agricultural country, Bangladesh produces major agricultural crops, such as rice, wheat, jute, potato, pulses, oilseed, sugarcane, tea, tobacco, spices etc. (Table 3.2). Though crop production system in Bangladesh is enriched by wide range of bio-diversity as well as favorable natural environment, but rice dominates the crop sector, that covers more than 70% of the total cropped area (Table 3.1). As a result, growth in the agricultural sector essentially mirrors the performance of rice production. The country's food production has increased from 11.0 million tons in 1971 to about 30 million tons in 2007. The country is, at present, about to achieve self sufficiency in cereal production (in terms of rice only) (Hossain, 2009). There is no other better option than to increase production per unit of land as well as cropping intensity. Thus, to increase production and cropping intensity, the most important gain will be the faster development of sustainable agricultural as well as variety development (Islam, 2010).

Table 3.1: Basic facts of Bangladesh Agriculture

Item	Data
Area of Bangladesh	147570 sq.km
Total population (2011)	155 million
GDP (2010-2011)	7875 Billion taka
GDP growth rate (2010-2011)	6.7%
Agricultural growth rate (2010-2011)	5%
No. of rural household	20.43 million
No. of farm household	14.40 million
No. of non farm household	6.03
Small household	80% (16 million)
Medium household	17.50 (3.7 million)
Large household	2.5% (0.3 million)
No. of Agriculture Labour household	14 million
Cultivation area	18815381 acres

Source: BBS, 2010

Table 3.2 Utilization of land in Bangladesh for the production of different crops and groups of crops in 2010-2011

Crops	Area (acres)	Percent of total cropped area
Rice	21756000	72.24
Wheat	635	2.11
Other cereals	131473	0.63
Pulses	1005396	4.85
Oil seeds	673436	3.25
Fibre crops	1079	3.58
Sugar Crops	216	0.72
Fruits	271425	1.30
Vegetables	295074	1.42
Potato	200483	0.96
Others	625853	2.61

Source: BBS, 2010

Bangladesh is the world's leading exporter of raw jute and jute products that accounts 24% of world jute production. Besides jute, the country exports fish and fish products, leather products, vegetables, fertilizers etc (Haque, 2011).

Due to dominance of rice production, the area under non-cereal crops has continued to diminish. Although the government has realized the need for agricultural diversification, but there exist so many obstacles. At present, the most important problems are the stagnating yields and declining productivity of crops due to HYV production, indiscriminate use of chemical fertilizers, pesticides and irrigation water, decreasing cultivable land, poverty, lack of capital, lack of appropriate technology,

uncertainty of fair price of agricultural commodities, perishability and high post harvest losses, lack of storage facility, poor transportation system, lack of knowledge of consumers about nutritional value of agricultural commodities including vegetables and fruits, appropriate technology, and lack of dynamic and active market system, etc. (Robbani *et al.*, 2007).

Existence of natural disasters is another threat to Bangladesh agriculture. The country is particularly at risk to sudden floods, cyclones, excessive rains and even droughts. Vulnerability to natural disasters and dependency on annual rains for the main crops are the foremost reasons of severe fluctuations in agricultural production. Farmers as well as the country losses both food and cash crops, which in turn reduces the availability of foreign exchange that is necessary to import of essential inputs for manufacturing and industry. Over the last three decades, it experienced more than 170 large-scale natural disasters, putting the country one of the most frequently hit prone area in the South East Region. These catastrophes are estimated to have killed half a million people and affected more than 40 million people (UNDP, 2001 in Rahman and Schmitz, 2007, p.12).

3.2 Brief review of agricultural policies in Bangladesh

Policy papers of Bangladesh agriculture can be classified into three categories: crops, non-crops (that includes livestock, fishery and forestry); and different cross cutting policies (related to land, water, food and rural development). Most of the documents deal with crop sector, where rice is the main focus. The other sectors have received less priority (Mandal, 2006). The following description gives an overview of major issues and objectives of various policies:

National Agriculture Policy (NAP), 1999

Ministry of Agriculture (MoA) prepared this policy statement in 1999. NAP has an overall objective, 18 supplementary objectives and 18 programme areas. The overall objective is: *“to make the nation self-sufficient in food through increasing production of all crops, including cereals, and ensure a dependable food security system for all”* (GMark Consulting Limited, 2007; Mandal, 2006; MOA, 1999). The 18 specific objectives are also articulated in general terms and provide general guidelines - how the crop sector could achieve the overall objective of food self-sufficiency and food security. NAP also identifies 18 programme areas for achieving these goals: *“crop production, seeds, fertilizer, minor irrigation, pest management, agricultural mechanization, agricultural research, agricultural marketing, land use, agricultural education and training, agricultural credit, government support for production and contingency plan, food-based nutrition, environmental protection, women in agriculture, coordination among government agencies, Non Governmental Organizations (NGOs) and the private sector and reliable database”*. NAP emphasizes that the goal of food self-sufficiency and food security can be achieved only through efficient delivery of inputs and support services. For example, to increase the production, farmers need to get adequate quantity of quality seeds

timely. Currently, Bangladesh Agricultural Development Corporation (BADC), NGOs and the private sector can supply only 5-6% of total national requirement (Mandal, 2006).

Actionable Policy Brief (APB)

As the NAP was not found implementable, therefore, an Actionable Policy Brief (APB) was prepared in 2004. The important policy areas addressed in the APB include production and distribution of seed; production, import, pricing and marketing of fertilizers, land use, minor irrigation, mechanization, marketing and agribusiness, agricultural research and agricultural extension. The team has identified that seed sector is facing the major constraints and made several recommendations. The most important ones relate to facilitating quality seed production in private sector, training farmers on quality seed production and preservation, strengthening seed certification, bolstering NSB, rationalizing seed subsidy and ensuring level playing field for private sector seed developer. APB emphasized three key issues in the fertilizer policy- timely and adequate supply, at fair prices. The team also points out four major issues to be addressed for the development of agricultural extension system. These issues include blueprint agriculture and ecological problems, participatory technology development and extension, addressing equity and ecological problems, and group approach in extension. APB recommends formation of 'Specialized Agricultural Service Centers' at the Upazila level and one stop extension service at the Union level', development of a comprehensive training program for the farmers, input dealers, seed producers and field technicians at the Upazila level, adoption of community or group based extension and training system to develop group farming, establishment of a permanent 'Advisory Committee on Agricultural Research and Extension', building soil-testing capacity at Upazila level and strengthening SRDI capacity (Mandal, 2006).

New agricultural extension policy (NAEP), 1996

The MOA approved the new agricultural extension policy (NAEP) in 1996 to set out agricultural policies for the fifteen-year perspective plan, 1995-2010. These policies and priorities include: attainment of self-sufficiency in food grain and increase production of other nutritional crops, ensuing sustainable agricultural growth through more efficient and balanced uses of land, water and other resources; increasing foreign exchange earnings through agricultural exports; introducing high value cash crops; improving the quality and availability of seeds; reducing environmental degradation etc. *“NAEP lists 11 policy components including efficient and demand-led extension services to all categories of farmers, decentralization, working with groups of all kinds, strengthened extension-research linkage, training of extension personnel, find appropriate extension methodology, integrated and coordinated extension activities, and integrated environmental support”* (Mandal, 2006).

National Seed Policy, 1993 and Seed Rules, 1998

Bangladesh Seed Board (NSB) approved the draft of National Seed Policy to increase production of improved seed both in the public and private sectors and for making best quality seeds available to the farmers on timely basis at competitive price. The seed policy has also provisions for liberalization of import of seed and seed processing machineries, strengthening of quality control and research system and maintaining a seed security arrangement. The major issue of the seed policy was the institutional arrangement of the seed sector, like, strengthening capacity of BADC, allowing the private sector to produce seeds locally and to import from abroad. The policies were conditioned by a number of factors: all seeds (either imported or domestic) must be registered by the NSB; seed importers and private dealers must be registered; and all varieties must be certified by the Seed Certification Agency (SCA). According to NSP, BADC and NARS will maintain small reserve of improved varieties of seeds to mitigate with natural disasters (Mandal, 2006).

National Food Policy

Ministry of Food approved National Food Policy (NFP) with the support of FAO that was based on three concepts: food security for all people; access to food depending on household income and food prices; and health care taking care of nutritious food and improvement of health care system. Given these basic concepts, the major objectives of the national food policy are: *“adequate and stable supply of safe and nutritious food at reasonable prices; increased physical, social and economic access and purchasing power of all people; and; sufficient nutrition for all individuals, especially children and women”* (National Food Policy, 2006).

National Agriculture Policy, 2010

The overall objective of National Agriculture Policy is to create an enabling environment for sustainable growth of agriculture to reduce poverty and ensure food security through increased crop production and employment opportunity (National Agriculture Policy, 2010). The important features of this policy are:

1. Government of Bangladesh has recognized that to increase farmers' productivity and income, access to new technology is essential. Therefore, the role of extension work is very important to deliver services to speed up farmers' access to and adoption of new technology. So, the Government will provide effort to provide efficient and need based extension services to farmers to help them to use their resource efficiently (National Food Policy, 2006). To make extension services more efficient and effective, NAP (2010) has suggested to adopt agricultural education system at the diploma level, effective extension-technology transfer and technology design and planning, training for farmers and officials at all levels, foster GO-NGO-private sector partnership, public- private partnership for production of agricultural commodities to deliver extension services in collaboration with local government at Union and Upazila levels (National Agriculture Policy, 2010).

2. In Bangladesh, only a small portion of the required quality seeds for different crops is made available mostly by the public sector. Few seed companies and NGOs have started supplying quality seeds of hybrid rice, maize and vegetables. A portion of the required quality seed is produced, preserved and used under private management especially at the farmers' level (National Food Policy, 2006). To meet the demand for quality seed, NAP (2010) suggested that breeding, development and maintenance of crop varieties would be done by private persons, companies and other agencies. Institutional credit will be provided those who are engaged (both public and private sector) in seed production and business at preferential rates of interest. Government will maintain seed stock to cope with the emergency situations (National Agriculture Policy, 2010).

3. As fertilizer is one of the vital inputs necessary for increasing crop production, government will work to ensure timely supply of balanced fertilizers to maintain soil fertility. The government will pursue procurement and distribution of fertilizers both in the private and the public sector. Steps would be taken to preserve a fertilizer buffer stock at the regional, district and upazila level. The Government will encourage farmers to use organic manure, compost, and bio-fertilizer; and to follow suitable cropping patterns for maintaining balance of soil nutrients. Necessary support will be provided to farmers to encourage use of balanced and organic fertilizer (National Agriculture Policy, 2010).

3.3 Agricultural extension services in Bangladesh

Extension services are part of a larger organization, normally a Ministry or Department of Agriculture. The organizational setting has considerable influence on the ways in which the extension service operates. Extension of agriculture is one of their main policy instruments and requires a good linkage with other policy instruments used for development work (Ban and Hawkins, 1985, pp.274). Though the history of Agricultural Extension Service (AES) in Bangladesh goes as long back to the ninetieth century, the role had become important with the introduction of green revolution in 1960s, because of proliferation of the knowledge of cultivation method of High Yielding Variety (HYV) rice. The present structure of extension service was reformed in the early 80s with a view to motivating and helping farmers to adopt improved production practices to increase their yield, meet national consumption requirements, maximize export and minimize import (MOA, 2006).

The Training and Visit (T&V) System has been one of the most significant extension organizational developments in recent years (Ban and Hawkins, 1985.p.278). The Training and Visit (T&V) system was introduced during the 1970s and 1980s by the World Bank in collaboration with FAO (Sobhan, 1995; Ban and Hawkins, 1985.p.278). The system gave emphasis on improving farm and agriculture management practices, better land preparation, use of good and quality seeds, need and use for seed treatment, etc. T & V system was a top down approach that begun with a view to introduce modern variety to the farmers (Haque, 2010). However, this system proved ineffective in Bangladesh by the Bank's own evaluations (Haque,

2010; UBINIG, 2008). The needs of the farmers were ignored and the participation of the poor and marginal farmers was overlooked (Haque, 2010). An effective agricultural extension organization is critically important in this situation especially in less industrialized countries like Bangladesh. There are many problems which decrease the effectiveness of the organizations in some, but not in all countries (Ban and Hawkins, 1985).

A numbers of government and non-government organizations (NGOs) are involved in agriculture extension services in Bangladesh. Department of Agriculture Extension (established in 1982) is the frontier department of the Ministry of Agriculture which provides extension services on crop sector to the farmers. This has large country wide network and operational staff to provide extension services to the farmers. In addition to DAE, other government institutes are also providing their own extension services (Table 3.3). Recently, DAE has approved Revised Extension Approach (REA) in order to overcome the shortcomings of the earlier T&V approach. The new approach consists of the primary elements of the T&V approach with the elements developed by local extension partners. This is largely demand driven and prefers to work within groups rather on individual basis in order to cut the cost of service (MOA, 2006).

Table 3.3 Public Sector Extension and Advisory Services

Extension Organization	Ministry	Major Responsibilities
Department of Agriculture Extension (DAE) and Bangladesh Agricultural Development Corporation (BADC)	Ministry of Agriculture	Crop Sector Extension Services
Department of Livestock (DLS)	Ministry of Livestock and Fisheries	Livestock and Poultry Extension Services
The Department of Fisheries (DoF)		Fisheries Extension Services
The Forest Department (FD)	Ministry of environment and forest	Forestry /agro forestry extension services
The Bangladesh Water Development Board (BWDB)	Ministry of Water Resource and Irrigation	Irrigation and drainage vis a vis agriculture extension
Bangladesh Academy for Rural Development (BARD) and Rural Development Academy (RDA)	Ministry of Local Governments, Rural Develop. and Cooperatives	Rural development vis a vis agriculture extension
Bangladesh Agriculture University (BAU)	Ministry of Education	Farming system vis a vis agriculture extension
Local Government Engineering Department	Ministry of Local Government and cooperative	Small scale irrigation and rural infrastructure development vis a vis agriculture extension
Bangladesh Rural Development Board (BRDB)		Farmers cooperative and one Household, one farm program of extension services
Bangladesh Academy of Rural Development		Rural development vis a vis agriculture extension
Rural Development Academy (RDA)		Rural development vis a vis agriculture extension

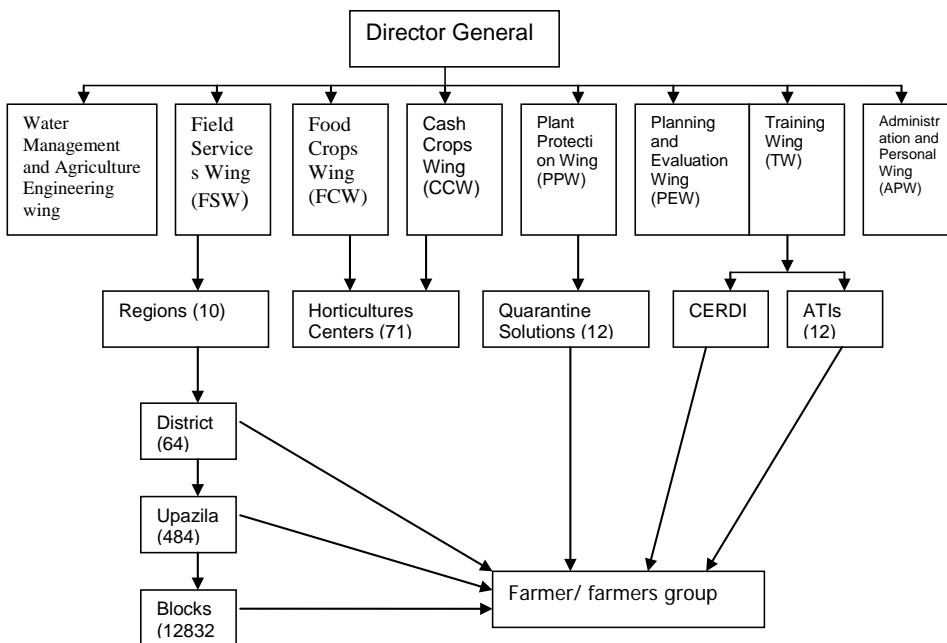
Source: Haque, 2010 in FAO Country Study in Bangladesh

DAE comprises eight wings (Figure 3.4). The largest wing of DAE is the ‘field service’ which provides the field level extension service and transfers knowledge to the farmers. The lowest operating area of DAE is called block which is being supervised by a block supervisor (recently, sub assistant agricultural officer). He is responsible for regular contact with the farmers at the field. The DAE has 12,832 extension workers and 2000 extension personnel throughout the country who are engaged in providing extension services to the farmers. According to the DAE guidelines, each EW has to provide services to around 1,200 farm households in his/her service area (DAE, 2010). Training wing provides training to large number of staffs including NGO personnel for human resources development. The plant protection wing is dedicated to monitor the pest and disease management. It also controls the pesticide production, sales, and supply through its pesticide administration (Haque, 2010).

Nearly, all extension work is done by members of extension organizations and not by individual extension agents. Therefore the management of the extension organization

will often have to decide how their extension agents should answer these questions regarding extension philosophy. Ministries of Agriculture use agricultural extension as one of their instruments to promote agricultural development. But what is agricultural development? Agricultural development is often seen as an increase in agricultural production or the productivity of land, labor and capital in agriculture (Ban and Hawkins, 1985).

Figure 3.1 Organizational structure of DAE



Source: DAE, Bangladesh (cited in Haque, 2010)

3.4 NGOs Participation in extension services

Besides Government organizations, NGOs and private sectors are engaged in providing extension services to their targeted groups. In the late 1970s, the NGOs started to provide their own extension services in order to disseminate knowledge among their targeted people. “About 400 NGOs are providing agricultural extension services. Initially, NGOs were dealing with the extension and small farm management such as small scale vegetable crops, poultry, fisheries, agro-forestry or social forestry” (Haque, 2010). Subsequently, NGOs are moving towards extension and farm advisory activities on some of the major crops like hybrid rice, maize, etc. The public sector extension agencies have relatively narrow focus, while NGOs have become used to providing multiple services to their beneficiaries. However, most of the NGOs are, handicapped by the limited land area. The considerable NGOs are: BRAC, PROSHIKA, CARE-Bangladesh, Mennonite Central Committee (MCC),

Helen Keller International, Christian Commission for Development Bangladesh (CCDB), Rangpur-Dinajpur Rural Services (RDRS), Gono Unnayan Prochesta, Gono-Kalyan Trust (GKT), World View International Foundation (WIF), Jagoroni Chakra, Thangamara Mohila Shobuj Sangho (TMSS) (Haque and Usami, 2008).

3.5 Participation of the private sectors

After 1993, the private sector received permission to carry out business of agricultural inputs and irrigation equipment in Bangladesh. The private companies in agricultural business include seed companies, fertilizer and pesticide dealers and companies involved in contract farming. Besides, there are small plant nurseries run by individuals. These private sector farms are involved in extension services to meet their targets and fulfil their clients' demand. Previously, the major production inputs such as seed, fertilizer and irrigation had been the responsibility of the BADC (BADC, 2009).

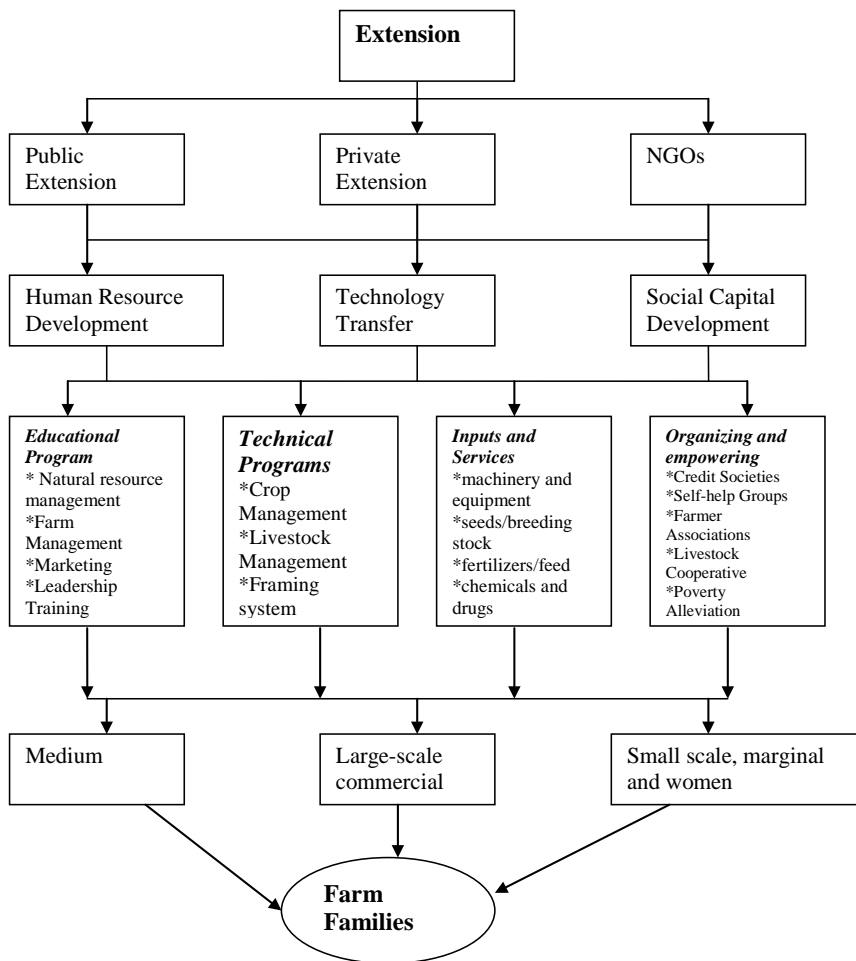
3.6 The problematic issues of extension services

There are many views on what constitutes development. Some has defined as an increase in the average per capita income, assuming that people will then be better off. However, this view has little acceptance nowadays. The reason is: although average incomes have risen in many countries, the differences between rich and poor have widened and a large part of the population is even worse off (Ban and Hawkins, 1985.p.13). Since 1960s, the agricultural extension services of Bangladesh have been dominated by the donors. This donor driven top down approach has resulted in increase of HYV rice and other crops substituting local varieties, and increase in the use of chemical fertilizers and pesticides. The use of fertilizers in Bangladesh has increased to 1,481 thousand metric tons in 2006-07 from 350 ? metric tons in 1980-81 whereas during this period total available land for cultivation has decreased. The use of pesticide has also increased to about 10,300 metric ton in 2003 from 4,809.22 in 1989 (Haque, 2010). In this top down approach, extension services were targeted the 'contact farmers' to transfer technology. In most cases, DAE targeted elite class farmers of rural Bangladesh as 'contact farmers' who had better access to resources and information. The marginal and poor farmers failed to have access to resources and information. Thus the marginal farmers were unable to receive any benefit of extension services. As DAE agents are hardly present in this service or communicate with the farmers, hence the assistance of NGOs and private sectors have been perceived as more helpful to the problem facing farmers (Haque, 2010 and Sobhan, 1995).

In the beginning, private companies were involved in selling agriculture inputs, such as vegetables seeds, fertilizers pesticides, etc. Later they expanded their arena to hybrid seeds, forestry, dairy, poultry and fisheries enterprises. Private sector doesn't participate with development motive rather; they are involved in the sales promotion of their products and to serve their clients. Some large corporate NGOs are now working for the promotion of hybrid seeds – that comes with more input necessities, which are marginalizing farmers by raising input cost (Haque, 2010). In many cases,

the private sectors do not disclose the limitations and drawbacks of their products. So, often marginal and poor farmers, who are illiterate, are being cheated by them. In recent years, private sector has been aggressively involved in the proliferation of hybrid seeds (Haque, 2010; Sobhan, 1995).

Figure 3.2 Framework depicting public, private and NGO partnership



Source: Swanson and Samy (2002), (cited in Haque, 2010, p.18)

3.7 Effort of GO, NGOs and private sectors towards organic farming

Several government, non-government and private organizations are working to introduce eco-friendly as well as organic farming from different level. Due to this reason, in 2006, Bangladesh was ranked second in Asia in terms of total hectares under organic management. The total land under organic cultivation was estimated to be about 177,700 hectares, approximately 2% of the total agricultural area. In 2002, 100 organic farms were operating in Bangladesh (IFOAM and FiBL, 2006).

3.7.1 Effort from government level

The government may use agricultural extension to achieve two different policy objectives. The first is to help farmers in reaching their goals as efficiently as possible, and the second is the change in farmer's behaviour in order to reach government goals (Ban and Hawkins, 1985.p.17). It is clear from the previous discussion that there is no policy that directly supports organic farming in Bangladesh. Neither the National Seed Policy (1993) nor the Agriculture Policy (1999) contains any specific clause or agenda related to organic farming. However, the New Agricultural Extension Policy (NEAP, 1997) defined strategies to attain the prime objective of integrated environmental support, and integrated environment into the overall agricultural policy to ensure a coherent policy for sustainable agricultural development. There is no regulatory framework to certify organic products in Bangladesh. Unfortunately, agricultural extension is sometimes used as a policy instrument in situation where other approaches should have been taken. The government wishes to increase production of export crops in order to earn more foreign exchange, although at current price levels it may be more profitable for farmers to grow food for consumption locally. To achieve the goal of the government, the Minister of Agriculture may order his extension agents to persuade farmers to grow more export crops without adjusting the price levels. In this situation it is likely the farmers would lose trust in their extension agents and hardly grow more export crops (Ban and Hawkins, 1985.p.18).

Integrated Pest Management of DAE-DANIDA SPPS Project

Integrated Pest Management (IPM) activities started in 1981 with the introduction of the first phase of FAO's Inter-Country Programme (ICP) on IPM in rice crop. IPM is a wide ecological approach to control pest using various tactics in a compatible way. The principles of IPM policy was to increase food production on a sustainable basis, as pests cause serious damages to crops; and dependency on chemical pesticides would lead to serious environmental and human health problems. In 1987, IPM activities started to expand and became a popular topic among people from all walks of life. This programme provided IPM training to build the training capacity of DAE and introduced Farmers' Field School (FFS) approach for training of farmers. A number of persons from the NGOs were also given IPM training. As a result, a number of IPM projects in rice and vegetables were in operation during 1989-2001 and executed by different government departments and NGOs. Nearly 440,000 farmers received training on IPM during that phase (MOA, 2012).

The National Agriculture Policy (NAP) stipulated that IPM will be the main policy for controlling pests and diseases in the Fifth Five-Year Plan (1997-2002). Under this programme, DANIDA funded and DAE implemented the first phase of Strengthening Plant Protection Services (SPPS) Project during 1997-2002. During this period, the project completed 14 Season long Training of Trainers (ToT) courses where a total of 626 DAE staff and 75 NGO staff have been trained as trainers for rice and vegetables. This IPM trained persons provided training to farmers through FFS on

rice and vegetables crops. From these FFSs, 113,239 farmers (male and female) have received practical, field oriented, season long IPM training (MOA, 2010). At FFS, farmers not only deal with pest management but also learn various aspects of crop husbandry such as seed selection, land preparation, raising nursery, fertilizer management, water management, pests and diseases management, developing additional income for farmers by culturing fish in rice fields, growing "ail" (Dike) crops, harvesting, storage, etc. The project has also helped to lay a solid foundation of IPM in Bangladesh and initiated community IPM through IPM clubs. The SPPS Phase-I in collaboration with UNDP/FAO IPM Project drafted the National IPM Policy and the Government has approved it in April 2002. From September 2002 to June 2006, the second Phase of the project was operated in 201 upazilas of 64 districts on rice and vegetables. A total of 8029 FFSs have been completed in rice and vegetables and 6938 IPM clubs were established up to February 2006 (MOA, 2012).

Integrated crop management (ICM)

Currently DANIDA has supported the up-scaling and further development of the Farmer Field School approach through its Agricultural Sector Programme Support phase 2 (ASPS-2). The present FFS on Integrated Crop Management (ICM) differs from the original IPM-FFS in being much broader and holistic. ASPS-2 is presently working to train the farmers on two components: i) Integrated Crop Management (ICM) in 328 *Upazillas* of Bangladesh and; ii) Regional Fisheries and Livestock Development Components (RFLDC) in Barisal and Noakhali districts (ICM, 2011). Most of the crop-based FFSs have been organized through the DAE, but also some NGOs (e.g. CARE and Aid Comilla) have organized this type of FFS (DAE, 2010).

Steps of BARI and other institutes

Research institutions have developed various new IPM package technologies particularly on bio-control and non-chemical bio-pesticides for several pest managements. Bangladesh Agricultural Research Institute has found that pheromone trap is very effective for the control of fruit flies in bitter melon, bitter melon, and cucumber and also for shoot and fruit borer of egg plant. Moreover, they have developed BARI eggplant-6 resistant to Jassid and eggplant-8 to bacterial wilt (FAO, 2011). The Bangladesh Rice Research Institute (BRRI) has developed BRRI rice 26, 31 and 35 resistant to Brown Plant Hopper (BPH), BRRI rice 28,33,43,44 and 45 to blast and BRRI rice 36, 37, 39 and 41 to Tungro virus (FAO, 2011). They have also developed several varieties resistant to other insects and diseases. Government of Bangladesh has started to think to introduce 'Good Agricultural Practice' especially for exporting fruits and vegetables (Anonymous, 2012).

Approval of production of organic fertilizers

Farmers of Bangladesh rarely follow any scientific methods to produce organic fertilizers. According to Razzak (2006) and Alam (2006), every year, about 7 million tons of organic fertilizers are produced from animal manure, household wastes, city wastes, crop wastes. Usually they place the animal dung in open pit at their farmyard

and keep at least three months before using in their crop fields (Islam, 2008). At present, many private organizations are coming forward to produce organic fertilizers commercially. Government has approved 28 types of organic fertilizers for commercial marketing. Another 20 companies have applied for approval of their nutrient-enriched organic fertilizers (Islam, 2008 cited in Babu, 2011).

3.7.2 Efforts on organic farm management from NGO level

The organic farming in Bangladesh emerged in 1978 when PROSHIKA started its ecological farming program. The other very active Non Governmental Organizations (NGOs) in this sector are: UBINIG (Unnayan Bikalper Niti-nirdharoni Gobeshona), CDA (Community Development Association), GUP (Gono Unnayan Prochesta), CARE Bangladesh, World Vision, Oxfam etc. Different NGOs are adopting different types of alternative agriculture in Bangladesh. For example, UBINIG is calling “Nayakrishi Andolon (New Agricultural Movement)”, CDA is calling it “Regenerative Agriculture” and PROSHIKA is calling “Ecological Agriculture”. All these practices are commonly known as “Organic Farming” in local context. All of these practices promote a natural system of farming which was previously practiced in Bangladesh before the “Green Revolution”. There are a number of separate initiatives by NGOs such as Hortex Foundation, Shapla Neer International, BARCIK and other local NGOs in research and extension related to organic farming (Akter-1997). The most important efforts have been mentioned here:

Ecological agriculture programme (EAP) of Proshika

Proshika started its ecological farming programme in 1976 with the basic principles – healthy soil, healthy plant and nature does not remit monoculture (Akter, 1997). Its objective was to save the environment from ecological disaster and restore a harmonious relationship between human beings and the bountiful nature (Akter, 1997). According to Proshika, “the use of green manure and other materials produced with local components helps to maintain ecological balance, regain the natural soil fertility damaged earlier by the use of agro-chemicals and ensure a steady increase in production. Moreover, production cost goes down gradually” (Activity Report, 1995-96).

The term “ecological agriculture” was based on modern ecological science that takes into account the whole ecology combined with indigenous knowledge. The programme began with the group members to grow several types of seasonal vegetables including useful trees in their homestead areas. Gradually it expanded its activities to two more areas: crop production and seed production. Now, the programme consists of 3 components: crop agriculture in farm land, homestead gardening and seed distribution. Crop agriculture in farm land is undertaken by ‘group members’ either individually or collectively. Homestead gardening enables people to produce vegetables and fruit organically in their homestead area. Proshika influences its clients for using local variety seeds (Akter, 1997). Proshika has 187 Area Development Centres (ADCs). In 2006-07, a total of 770,757 farmers were

practicing 'ecological agriculture' on 2228,896 acres of land. Proshika's EAP paid attention to a large number of national policy makers that reflected in the national policy (PROSHIKA, 2007).

Nayakrishi Andolon and UBINIG

In the flood plain areas of Bangladesh, community-based organic agriculture was the result from a rising awareness of the dangerous impacts of the Green Revolution (FAO, 2002, FAO, 2003a). Farmers found a major decline in crop yields despite a huge increase in application of chemicals. Groundwater was less available, livestock, poultry and fish populations were diminishing, the human health situation was worsening, pest attack were wide spreading, and exogenous varieties were gradually replacing traditional varieties. Farmers realized that due to the overwhelming promotion and practice of conventional agriculture, they were becoming powerless. Many poor farmers forced to sell their land and other productive assets, shifting from farming to non-farming occupations. After the terrible floods in 1988, farmers faced the severe crisis for seed. In that situation, some farmers of Tangail district, together with UBINIG, gathered to seek a community-based alternative method of farming, which is organic in nature. They named it Nayakrishi Andolon. *Nayakrishi* means the new way of agriculture related with nature and *Andolon* means movement. From this way of agriculture, farmers receive healthy food, healthy environment and happy life. The movement is against of privatization of natural resources and the resultant erosion of common property rights and, loss of seeds and genetic resources in Bangladesh (Nayakrishi Andolon, 2006).

At first, the peasant women took the leading to stop the use of pesticide. Soon a group of farmers organized and started to prepare green manure and compost. The compost was made of a water-hyacinth biomass as it is plentiful in the wet seasons. It was a turning point in the sense that the initial group of farmers became convinced that they did not need to depend on pesticide and chemical fertilizers. Actually Nayakrishi Andolon is a two way learning process from UBINIG workers to Nayakrishi farmers and vice versa. As an agricultural practice, Nayakrishi Andolon is based on 10 principles, which are developed through the experiences and knowledge of farmers which are as follows (UBINIG, 2010):

1. Nayakrishi farmers do not use any pesticides or poison, organic or inorganic. Pesticides not only eradicate pests, but also kill other living organisms, beneficial insects.
2. Nayakrishi farmers believe that land must be made healthy through crop mixing which gives natural nourishment to the soil and also to ensure the presence of living micro-organisms in the soil instead of applying chemical fertilizers.
3. Multi-cropping, inter-cropping, mixed-cropping, agro forestry and other familiar methods are used to retain and enhance soil fertility. More and more farmers are

convinced that the best method for pest management is conservation and constant regeneration of biodiversity.

4. Practice of agro-forestry and integration of fuel wood, fruit and various multipurpose trees along with rice and vegetable fields.
5. Farmers need to calculate the total yield of the farm and the material gains of the community as a whole through maintenance and enhancement of biodiversity, not the quantitative productivity of a single crop.
6. Livestock, poultry and semi-domesticated birds are part of the farming household. Nayakrishi farmers produce local variety of crops to ensure food and fodder for all domesticated animals and birds.
7. Local varieties of livestock, poultry and fish are given priority by the Nayakrishi farmers as these varieties are usually economically profitable, easy to raise and ecologically suitable.
8. Seeds must be conserved at the household and community level and genetic resources must never get out of the hands of the farmers, particularly women. Privatization of seeds and genetic resources are resisted.
9. Water resources must be conserved to conserve the biodiversity of plants and fish resources.
10. Use of deep tube-wells for irrigation should be avoided.

The cultural functions are an integral part of Nayakrishi activities. The main activities of Nayakrishi are conducted in the farmers' villages in their own land. Farmers cultivate their land and share knowledge with their fellow members. They also arrange meetings in their villages and create atmosphere for mutual friendship. They declare a village as a 'Nayakrishi village' if pesticide use can be stopped totally. The use of deep tube wells is also stopped once the majority of the farmers in the village follow Nayakrishi farming practices. Many researchers found that yield increases of up to 300 percent are reported for the organic system (Parrott and Marsden, 2002; Pretty, 2002 in Setboonsarng, 2006; Kilcher, 2007). The reason for this increase may not only be the outcome of organic agriculture techniques alone; but also the result of the farmers' motivation, the sharing of experience in peer groups and successive learning, or the introduction of new crops which are often the beginning of a whole chain of innovations.

It is found that poor farmers are mostly attracted to *Nayakrishi*. Those farmers had been forced to sell land because they were not able to cultivate anymore due to shortage of cash to buy chemical fertilizer and pesticides with increasing price and demand (Nayakrishi Andolon, 2006).

Seed and genetic resource conservation

Female members of *Nayakrishi* farm families started the movement by taking a strong position against all forms of pesticides. After their initial success, these

women organized around the seed issue. Peasant women felt that dependence of the farmers on the market for seeds also means the displacement of women from the control of a crucial technology, the heart of agriculture; the loss of seed resources from the household also mean the loss of power from women. In the agrarian culture, women used to conserve, preserve, and germinate seeds. The knowledge was transmitted from mothers to daughters, from sisters to sisters, from mothers-in-law to the daughters-in-law, or from one village sister to another. When these types of knowledge sharing started among women of the peasant communities, they decided to memorize their traditional effort and started to build 'seed-network'. They asked UBINIG workers to document their seed practices. Their concept strongly opposes the concept of 'seed banks' or 'gene banks'. They are against any centralization of seed resource. They feel; exotic seeds cannot be preserved at household level for long time. Their principles of seed conservation are as follows (Mazhar, 1997):

- a. Women must regain control over seeds and seeds should be preserved at the household level. Specialized women's networks should be organized in a way that will work as breeders generally work and conduct investigations to learn more about a particular variety. Communications will take place among the nearby seed network members that cannot be shared with any "unknown" persons or agencies.
- b. UBINIG will collect indigenous seeds from all over Bangladesh and activate a community seed wealth center to maintain biodiversity where *Nayakrishi* farmers can exchange seeds at no cost. The seed center will be based on the experience and popular knowledge of peasant women in seed preservation and germination.
- c. All village workers must maintain a nursery on a regular basis, from which a part of their income should come. Similarly, women, engaged with seed, should be supported by *Nayarkishi* farmers to sell their seeds so that they can have economic support to carry on their work.

Besides the community seed wealth center, more or less every farmer preserves seed in their household. An example of the procedure can be described as: farmers want to collect and preserve seeds. After collecting, the seeds are cleaned, dirt removed and dried under the sunlight for at least five to six days. To test if the seeds are properly dried, an experienced peasant woman may bite the seeds between her teeth. Dried seeds are then kept in a cool place. After that, these are poured into an earthen pot. Dry sands are placed in the upper portion of the pot and the mouth is sealed with clay. The prepared pots are kept in a shaded, dry and cool place. Vegetable seeds sometimes are kept in glass-bottles (Nayakrishi Andolon, 2003).



Picture: Community seed store of Nayakrishi farmers (Field visit, 2008)

Nayakrishi farmers are not against the 'high yield varieties', if they can collect and preserve the seed and, as long as they do not require pesticides, chemicals and irrigated water (Nayakrishi Andolon, 2001). But they are strongly against hybrid. Farmers, who rear livestock, need more biomass as fodder. Therefore, they prefer local variety and show interest in returning the old local variety-that may have disappeared from the area (UBINIG, 2003).

Regenerative agriculture programme of CDA

Community *Development Association (CDA)* was established to develop an *ecologically balanced society which would be, socially acceptable and democratic - where both the poor and rich farmers will enjoy an equitable environment*" (CDA, 2006 and Akter, 1997). Under "Regenerative Agriculture" programme, CDA is working on rice cultivation, homestead gardening, central and village nursery, and agro-forestry. CDA's main focus is on environment friendly land use and increasing farm management capacity by the marginal and landless farmers, which is quite different from other organizations. There are 150 farmers working under this project. Different types of fruits, fuel wood, timber, vegetable etc. are cultivated in central and village nursery, and homestead gardening. The central nursery is maintained and run by CDA, and other activities are performed and run by group members (Akter, 1997). Those farmers use different kinds of organic fertilizer, such as liquid fertilizer, different types of compost. They use ash, *neem*, tobacco, jute seed, garlic, mint, marigold, lemon grass, onion etc. as repellents for pests and quick growing plants are used as fences.etc. Farmers select surface rooting crops (ladies finger, eggplant, red spinach etc.) in one season; on the other hand, deep rooted crop (cabbage, radish etc.) in the next to maintain soil fertility. No fertilizer or pesticide is used in their crop

field. Normally there are no pests in their field; if pests appear, mechanical techniques such as light trapping, digging stick in the field to attract insect eating birds, netting etc are followed. Some farmer grows two crops per year, rice and wheat, and then keeps it fallow, even though they could grow pulses or other leguminous plant (CDA, 2007).

BARCIK

Bangladesh Resource Center for Indigenous Knowledge (BARCIK) is an NGO, established in 1997 (BARCIK Report, 2012). BARCIK is involved in exploring and incorporating indigenous knowledge and local practices into contemporary development programmes. Some of the key advocacy issues that BARCIK is engaged with are: seed rights and genetic resources, local rice cultivation, disaster management, water rights, climate change adaptation and local/indigenous knowledge, gender and access to natural resources wetland biodiversity, agrobiodiversity in Madhupur, climate change adaptation by traditional means etc. (Rahman, 2007).

GUP (Gono Unnayan Prochesta)

Gono Unnayan Prochesta (GUP) started its agriculture programs in the South-western part of Bangladesh in 1971. The objective was to increase agricultural production in order to reduce malnutrition and poverty (GUP Annual Report, 2011). GUP distributed seeds and seedlings and organized training for the farmers on the production of new crops and technology. Initially, GUP encouraged the farmers to cultivate HYV of crops and to use chemical fertilizers to grow more. GUP found that the mono crop practice originated from 'green revolution' not only failed to provide benefit to the small farmers, but also acted as an obstacle to the attainment of total socioeconomic development of the country. Bangladesh has lost about 7,000 different indigenous varieties of rice due to the promotion of mono crop those were developed by the farmers of Bangladesh for centuries. The use of chemical fertilizers and pesticides were increasing that reduced the soil fertility. Such modernization has marginalized the rural farmers, created dependency on the external inputs and it is also disrespectful to the land and nature. Having realized the adverse and severe effects of modern agriculture, GUP started 'regenerative agriculture' program for small and landless farmers in the late 1980s in its project area (Ahmed, 1995: p.4-5). Regenerative agriculture seeks friendly coexistence with the environment where local resources can be used effectively by farmers. Such initiatives discourage the use of chemical fertilizers and pesticides; and encourage the use of organic and botanical pesticides on their farmland. The extension workers of GUP work with the farmers on an equal level in developing a regenerative agriculture program within the villages. Dialogue was the key tool used to identify the problems and to generate relevant knowledge in order to discover an alternative to external dependency. Over the years, GUP has been able to create a unique environment of collective learning with the farmers. This process created significant change among the rural farmers in the project area (Barua, 1999).

3.7 Marketing status of organic products

Organic food is becoming popular among the consumers of city area. UBING-backed sales centre ‘Shashya Prabartana’ and Proshika have introduced an organic vegetable production and marketing project to promote the consumption of organic vegetable (Proshika, 2007). Some departmental stores have started selling organic food at different places. The sellers reported that the demand for such food is increasing rapidly, as number of conscious consumers is increasing. But the costs of organic foods are higher than the conventional products and are not affordable for the poor. “*Organic products still has limited customers, so production volume is very low, which eventually increases production cost.*” (The Daily Star -Report, 2010). Since couple of years, different private chain departmental stores (like Agora, Minabazar, Nandan etc.) are selling organic vegetables, at higher prices for the higher income people. Production and marketing system of organic agricultural products are mainly done by contract farming for private organizations/ companies / chain shops and does not ensure fair price for the producing farmers (Rita, 2007).

3.8 Previous relevant available literature in Bangladesh perspective

It is always beneficial for research to consult available literature to assess the stock of knowledge and receive future guidelines for conducting further research in the particular area. As the study is conducted in Bangladesh, therefore, it is necessary to mention the stock of present literatures. The available literatures are having been tried to mention below:

A study was conducted by a non-governmental organization on ‘comparing conventional and ecological agriculture regarding ecological, economic and social sustainability’. No differences were found in yields of rice, wheat, potato, jute, pulses and mustard after the conversion of 12 years into organic system (Zundel and Kilcher, 2007; Rasul and Thapa, 2004). Rasul and Thapa (2004) also found that sustainability of conventional agriculture in Bangladesh is under threat from the continuous degradation of land and water resources. Mandal (2007) opined that organic farming is an eco-friendly way to achieve sustainable agriculture where application of hazardous solids and substances are avoided.

Sarker (2010) identified four major factors influencing the extent of practice of organic farming technologies (OFTs) by the Bangladeshi farmers: knowledge and awareness regarding environmental issues, creation of health awareness, and simplicity of the OFTs and availability of basic production factors as the major influential factors which can increase the extent of practice of OFTs by the farmers.

Sarker and Itohara (2008) found that rice farming has become unprofitable as costs of production have increased, and farmers are seeking alternative, more profitable crops. Organic farming, with its ecological and social benefits, and premium prices, may offer a paramount alternative. Global sales of organic foods reached US\$25 billion in

2003 and we're predicted to exceed US\$30 billion by 2009. Already 90 developing countries, including 15 'Least Developing Countries' (LDCs) are benefiting significantly from the global organic market.

Kabir *et al.*, (2007) conducted a socio-economic study to determine the constraints of adopting eco-friendly rice farming practices in Bangladesh. They described that ecological agriculture is a natural process that recovers the fertility of the soil.

Rahman (2001) conducted a study on 'the influence of extension on the introduction of organic farming in Bangladesh'. He illustrated that among many reasons, the absence of an efficient extension system seemed to be a major barrier to the widespread introduction of organic farming in the country.

3.9 Conclusion

From the above discussion, it is clear that both governmental and non-governmental organizations are working for adoption of environment-friendly agriculture in Bangladesh. While NGOs and private sectors are giving their effort on 'whole organic approach', Government of Bangladesh (GOB) or Ministry of Agriculture (MoA) has given emphasis on a part of the whole approach (pest management). NGOs work at micro level and they have limited target members or beneficiaries; while government needs to think for national level. Considering the extent of working area, though NGOs are doing more, they need help from government as it regulates the policy. So, if GO and NGOs can collaborate and work together, that would be more successful.

Very few studies were carried out in Bangladesh to find out position of organic or eco-friendly farming, constraints or opportunities to launch eco-friendly farming practices, specially the impact of organic conversion to yield on large scale, has it any impact on food security, how to motivate the stakeholders specially at policy level etc. Thus, the present study is a modest attempt to find out the constraints and opportunities, and to engage all relevant actors for helping the farmers to adopt eco-friendly farming practices in Bangladesh.

CHAPTER 4 DATA AND METHODOLOGY

4.1 Research design and rationale

Few researches have been conducted on farmers' adoption, diffusion, knowledge and innovation of organic farming in Bangladesh (Sarker, 2007; Sarker and Itohara, 2007; Rahman, 2001). Though the country has started organic farming from 30 years ago but the farming practices are too far from international standard. We know that without achieving any standard, it is not judicious to identify a farm as true organic. So, these farming systems can be termed as eco-friendly farming which doesn't have any standard definition. Therefore, the research question was: what are the organic or eco-friendly practices in Bangladesh? And the hypothesis was: there are many eco-friendly principles or philosophies in Bangladesh. As organic farming and ecofriendly practices are guided by some NGOs, govt departments and research institutes, so this study would like to explore what standards they are suggesting farmers, how these can be compared with international standard, are the farms could be recognized as organic; if not, what are problems at farm as well as policy level, what are the fallacies about this farming system, from which points the farmers can think to practice organic etc. It is an attempt to in depth search to answer these questions. In that context, the researcher thinks that multiple interpretations of few qualitative data will help to emerge a new thing which will be helpful to find a clear way. Therefore, qualitative approach seems more appropriate and the study has been conducted on the basis of the information of the key informants.

It is already mentioned that organic farming has introduced in Bangladesh three decades ago, but progress is very little in true sense. On the other hand, the use of chemical fertilizers and poisonous pesticides are increasing day by day (Hasan and Bakshi, 2005). What are the reasons? In this research, the intention was to identify the problems to practice eco-friendly agriculture, why farmers are compelled to use so many chemicals, how it could be reduced, what will be the impact on food production as well on food security of reducing chemicals. The answers of those questions are explanatory in nature. In addition, very few respondents may answer elaborately. Literature says that eco-friendly farmers are motivated or guided by some government and non-government organizations. So, the intention is to find out detail answers of those questions which should come from the knowledgeable persons of the related fields. Due to exploratory nature of this research, qualitative research method has been followed and consequently, the key informants (mostly researchers in the respected field) were interviewed.

It is necessary to mention here that very few literatures are available on other stakeholders as well as other issues like economic or ecological or social aspects (Sarker, 2007; Saker and Itohara, 2008, Sarker and Itohara, 2009). More studies have also been conducted on 'Integrated Pest Management'. Now a day, many workshops and seminars are conducting on spreading the organic farming – a good symbol, that the issue has been emphasized from the policy level and the educated level are concerned, but the progress at farmers' level is questionable. Researchers have also

started to work on this issue. However, the present study is an attempt to find the role of other stakeholders and how their thinking is linked to farmers practice.

Strauss and Corbin (1990) stated that qualitative method is more appropriate in situations, where researcher needs to expand new outlook on things about which much is already known, or one need to first identify the variables which later could be tested quantitatively, or where the researcher has determined that quantitative measures cannot adequately describe or interpret a situation (Cimi, 2009; Hoepfl, 1997). For this study, data has been collected through interviewing the key informants to get a clear idea about the situation of organic farming. The study has focused on all relevant stakeholders like, researchers, influential farmers, community leaders etc. The researcher believes that after analysing the information, probable ways will be found out to implement eco-friendly farming.

4.2 Qualitative research method

The word ‘qualitative’ highlights on the process and meanings that are not measured in terms of quantity, amount, intensity or frequency (Denzin and Lincoln, 1994). Broadly defined, qualitative research means "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification" (Strauss and Corbin, 1990). There is a fairly wide consensus that qualitative research is a naturalistic, interpretative approach concerned with understanding the meanings which people attach to phenomena within their social world (Ritchie *et al.*, 2003).

The strength of qualitative research depends on its validity (closeness to the truth). In collecting data for good qualitative research, researcher really should touch the core of what is going on rather than just skimming the surface. The validity of this method is greatly improved by using a combination of research methods and by independent analysis of the data by more than one researcher (Greenhalgh and Taylor, 1997). *Qualitative research involves the studied use and collection of a variety of empirical materials- case study; personal experience; life story; interview; cultural texts and production; observational, historical, interaction, and visual text- that describe routine and problematic moments and meanings in individual lives* (Denzin and Lincoln, 2008).

Generally, qualitative methods are typically more flexible and mostly ask “open-ended” questions and participants are free to respond in their own words, rather than dictating them to select fixed responses (Mack, *et al*; 2005; Greenhalgh and Taylor, 1997). Five major types of qualitative research have been found in the literature: phenomenology, ethnography, case study, grounded theory, and historical research. All of the approaches are similar in the aspect they are qualitative.

One of the most used approaches in qualitative analysis is the grounded theory Approach, initially developed by Glaser and Straus (1967), and later further elaborated by Strauss (1987) and Strauss and Corbin (1990). However, in all cases, qualitative analysis is modelled by the following four phases: exploration of

discovering concepts; specify working out concepts; reduction of determining the core concept and the underlying relations; and integrate answering specific research questions by way of the elaborated theory (Wester, 1984).

4.3 Research process

The study has been conducted in the University of Giessen, Germany for achieving researcher's PhD but primary data has been collected in Bangladesh from various institutions and community leaders through key informant interview by using semi-structured interview schedule. It is already mentioned that organic farming has introduced in Bangladesh three decades ago, but progress is very little in true organic sense. On the other hand, the use of chemical fertilizers and poisonous pesticides are increasing day by day. What are the reasons? The intention of the researcher is to identify what are the problems to practice eco-friendly agriculture, why farmers are compelled to use so much chemicals, how it could be reduced, what will be the impact on food production as well on food security of reducing chemicals. The answers of those questions are explanatory in nature. In addition, very few respondents may answer elaborately. As eco-friendly farmers are motivated or guided by some government and non-government organizations, so, detail answers of those questions could be attained from the knowledgeable persons of the related fields. Due to exploratory nature of this research, qualitative research method has been selected and consequently, the key informants, the people who are mostly researchers in the respected field; at the same time, they contribute in policy making were interviewed.

4.3.1 The role of the researcher

To conduct qualitative study, a researcher must adopt the attitude of the research idea, develop the level of skill appropriate as a human instrument to collect and interpret data correctly; and prepare a research design (Lincoln and Guba, 1985). Strauss and Corbin (1990) termed the conditions as "theoretical sensitivity" of the researcher that could come from a number of sources; such as: personal experience, professional experiences, and professional literature. Basically, it refers to a personal quality of the researcher that refers to the capacity to understand, and capability to separate the pertinent from that which isn't (Strauss and Corbin, 1990).

As the instrument in a qualitative study, the researcher needs to handle the technical and interpersonal research issues. The technical issues involve the researcher's access and efficiency; the interpersonal issues involve ethical concerns and personal dilemmas (Marshall and Rossman, 1995). As a research student of organic farming area, the researcher had full access to the other researchers and the people who are working on this issue. They were also open minded to provide the information through their speech as well with, whatever documents and reports, they have available at their hand. Moreover, as a member of a farm family, the researcher has personal experience about traditional and conventional agriculture. So, considering all issues, it is believed that the researcher is able to handle the technical issues.

Establishing trust in qualitative research also involves exposing known biases and assumptions in the research process (Mason, 2002). The health and environmental impact; and farmers' burden of conventional agriculture has motivated the researcher to conduct the research on eco-friendly and organic agricultural issue. Bangladesh is an agricultural country where 80% of its people engaged with agriculture. We know that sustainable agriculture is necessary to attain the goal of sustainable development. The definition of sustainable agriculture lays great emphasis on maintaining an agriculture growth rate, which can meet the demand for food of all living things without exhausting the basic resources. Organic agriculture is one of the several approaches found to meet the objectives of sustainable agriculture (Narayan, 2005). Only farmers cannot implement organic farming. We have to work from all levels and all stakeholders should be conscious from all corners like, economic, social, political as well as personals. Therefore, the research on eco-friendly farming was started through engaging the important stakeholders with these assumptions and biases.

4.3.2 Data

Every qualitative research method uses one or more techniques for collecting data. These techniques range from interviews, observational techniques such as participant observation and fieldwork through recording. Written data sources include published and unpublished documents, reports, memos, letters, email messages, faxes, newspaper articles and so forth. We can also express the empirical sources as primary and secondary sources. Usually, primary sources are those which are unpublished, and the researcher has gathered from the people or organization directly. A secondary source refers to any books; articles etc. which have been previously published (Myers, 2009).

Family health international (2003) identified three most common qualitative methods which are: participant observation, in-depth interviews, and focus groups. Each method is particularly suited for obtaining a specific type of data. *Participant observation* is appropriate for collecting data on naturally occurring behaviours in their usual contexts. *In-depth interviews* are optimal for collecting data on individuals' personal histories, perspectives, and experiences, particularly when sensitive topics are being explored. The interview is the most used qualitative methods within the field (Mack, *et al*, 2005). The qualitative interview is unstructured in character. That's why the qualitative research is used in many disciplines (Ryan and Bernard, 2003). The qualitative data can be generated in three forms or methods. These are field notes, audio (and sometimes video) recordings, and transcripts (Mack, *et al.*, 2005).

4.3.3 Sampling key informants

Though possible, it is not necessary to collect data from everybody in a community/village in order to get valid findings. The objectives of any study and the characteristics of the study informants determine which and how many people to select (Mack, Woodson, Macqueen, Guest and Namey, 2005). There are three most

common sampling methods used in qualitative research: purposive sampling, quota sampling, and snowball sampling. In this study, samples have been selected through snowball sampling method that is also well-known as chain referral sampling, as at starting point of this research, it was very difficult to know about the key informants. In this method, participants provided information or recognised other probable participants, use their social networks to refer the researcher to other people who could potentially participate or contribute to the study. Snowball sampling is often used to find and recruit hidden samples, that is, groups not easily accessible to researchers through other sampling strategies (Mack, Woodson, Macqueen, Guest, and Namey, 2005). In this way, 22 key informants were interviewed using semi-structured interview schedule. Though sampling technique was followed, we were very much careful about their background, wideness of working area, experience and knowledge. Whenever information was found saturated, the researcher stopped. The whole sample selection method has been portrayed in Figure 5.1.

As everyone isn't a good key informant, so the researcher to be strategic in selecting them. "*Good key informants are people whom you can talk to you easily, who understand the information you need, and who are glad to give it to you or get it for you*" (Bernard, 2011). We had to select people who would either be affected by this research or have the power to make policy decisions, or, know a great deal about the issue (The Access Project, 1999). According to Marshal (1996); key informants are expert sources of information, who are personally skill, hold higher position within a society, able to provide more information and a deeper insight into what is going on around them. They are the "natural observers" and interested in the behaviour of those around them. They could observe the development of their society and make inferences. To select good informants, we have to think about the informant's role. The Politicians, officials, service providers, community leaders, business owners or cultural insiders could be the informants. Casley and Kumar (1988) recommend that 10-25 respondents should be include in a key informant study.

Before approaching a key informant, the researcher introduced himself, respective organization, and explained about the purpose of this research, the reason why the informant was selected as key informants, how much time will be needed to conduct the interview etc.

According to the research vision, data was collected on what standards our organic or eco-friendly farmers are following specially under the guidance of different government and non-government organizations. Informants were selected from those concern organizations. Though govt. is not directly supporting organic farming, but NGOs alone cannot play role in policy formulation. For any policy issue, govt. help is necessary. So, their view about organic and eco-friendly farming is very important. As the researcher was working in Proshika some years before, so it was started to talk with the director of organic agriculture programme. He told, "I am not expert. As director, I am new in this programme. But I will arrange an interview for you with B₁. He knows about this programme and he received several trainings from Japan and Europe". According to that, he was interviewed and the researcher received much

new information. Informant B₁ told, “B₂ is involved from the very beginning of this programme and he contributed so much with his principles in ecological agriculture. So, you may discuss with him”. We discussed and interviewed him and he told, “You will get more incredible information from B₃, as he is an organic researcher and up dated. His motivation and cost-return-benefit related information will be very much related with you. They arranged an interview over telephone for me and we went to him at the mentioned time. After interview, he told, “Now farmers are more conscious than us as they need to face high prices and unavailability of chemical inputs. You can go to our field and visit field situation. If your supervisor is interested to come to Bangladesh, you can welcome him to our different organic fields”. He said that their field at Madhupur (Tangail district) was visited and two community leaders (also contract farmers of Proshika) and one technical field worker were interviewed.

After interview, B₃ was asked, “Do you know any other organization that is following eco-friendly practices?” He told, “I know UBINIG is following, to some extent. I think they are very much traditional. I never talked or visited them, I just heard, you can visit”. After some days, the researcher went to their head office and discussed with Executive Director (informant B₃). From that, the researcher acquired much important information but failed to get answers of some scientific questions. Then she (B₃) suggested to discuss with informant B₄ (a plant breeder, researcher and consultant of UBINIG). After that, it was felt that information was saturated and no more interviews were necessary from UBING officials. They also invited to visit their Delduar field, how the farmers are practicing farming without chemicals. After 15 days; while visiting their field, it was found that the Nayakrishi farmers are so aware that they have organized chemical-free villages; they have community seed huts and compost pit in every house. Then, three leader farmers of them were interviewed.

The goal was to compare the local standards with international standard; therefore, the researcher’s idea was to know how vegetables are exporting. Which standard are they following? From where are the vegetables coming? According to that, we communicated with Hortex foundation who are engaged with export of horticultural crops specially vegetables. The high official from the foundation informed that they don’t export organic product. But they face some problems without following standard as our farmers are using so much fertilizer and pesticides and they don’t follow recommended dose. Therefore, many times, the foreigners refuse to import our crops. They told, “You can discuss with informant C₃ (BARI). We know that he is doing research on organic farming”. After 1 month, the researchers went to BARI (Pabna research station) and conducted the interview. While waiting for informant C₃, it was found that some farmers are waiting for some biological inputs (Bracon, Tycogramma). From their discussion against chemical use in agriculture, the researcher felt so curious that framers are now so conscious. Therefore, it was decided to interview their leader (informant F₆) and conducted the interview. After finishing, informant C₃ was interviewed.

That time, we came to know about 'Integrated Crop Management' (ICM) programme which is a relatively new eco-friendly practice. Therefore, the project director of ICM project was interviewed. He suggested, "IPM is ongoing and you may discuss with present director". But due to his shortage of time and according to his suggestion, informant C₅ was interviewed and he provided documents about IPM project.

From different sources including website, it was known about CDA, an NGO that is working at Northern region of Bangladesh; and Kazi & Kazi tea farm, a private farm in the same region, that export organic tea. Interviews were arranged with the both institutions. So, in July 2008, for a week, the researcher left for Dinajpur and visited CDA head office and Kazi farm and interviewed informant E₁ and C₆. At the same time, from attending different workshops and seminars at agricultural universities and research institutes, it was learnt that different branches of BARI are working on organic farming and biological pest management. As different types of researches are conducted from different branches, so, it was hard to understand, who can provide the maximum answer. Four persons were interviewed and selected C₁ and C₂ as key informants. Others were ignored due to information saturation. In the same way, Dhamrai dairy, an integrated commercial farm was discovered, which is doing research on effective micro organism and sell its' products in specialized shops naming as 'green product'. Similarly, informant C₆ was interviewed after his presentation on "possibility of organic farming in Bangladesh for export promotion" at Bangladesh Agricultural economists association at Bangladesh Agricultural Research Council, Farmgate, Dhaka.

Besides those persons and institutes, discussions were held with various GO and NGO offices who are practicing organic, some of them are working on indigenous knowledge, biodiversity etc. not specifically working on organic or eco friendly farming. Therefore, they were not included as informants.

In total, sixteen officials from government and different NGOs were employed as key informant for this research who has vast knowledge in their working field. The informants were sampled strategically in order to attain a highest degree of reflection.

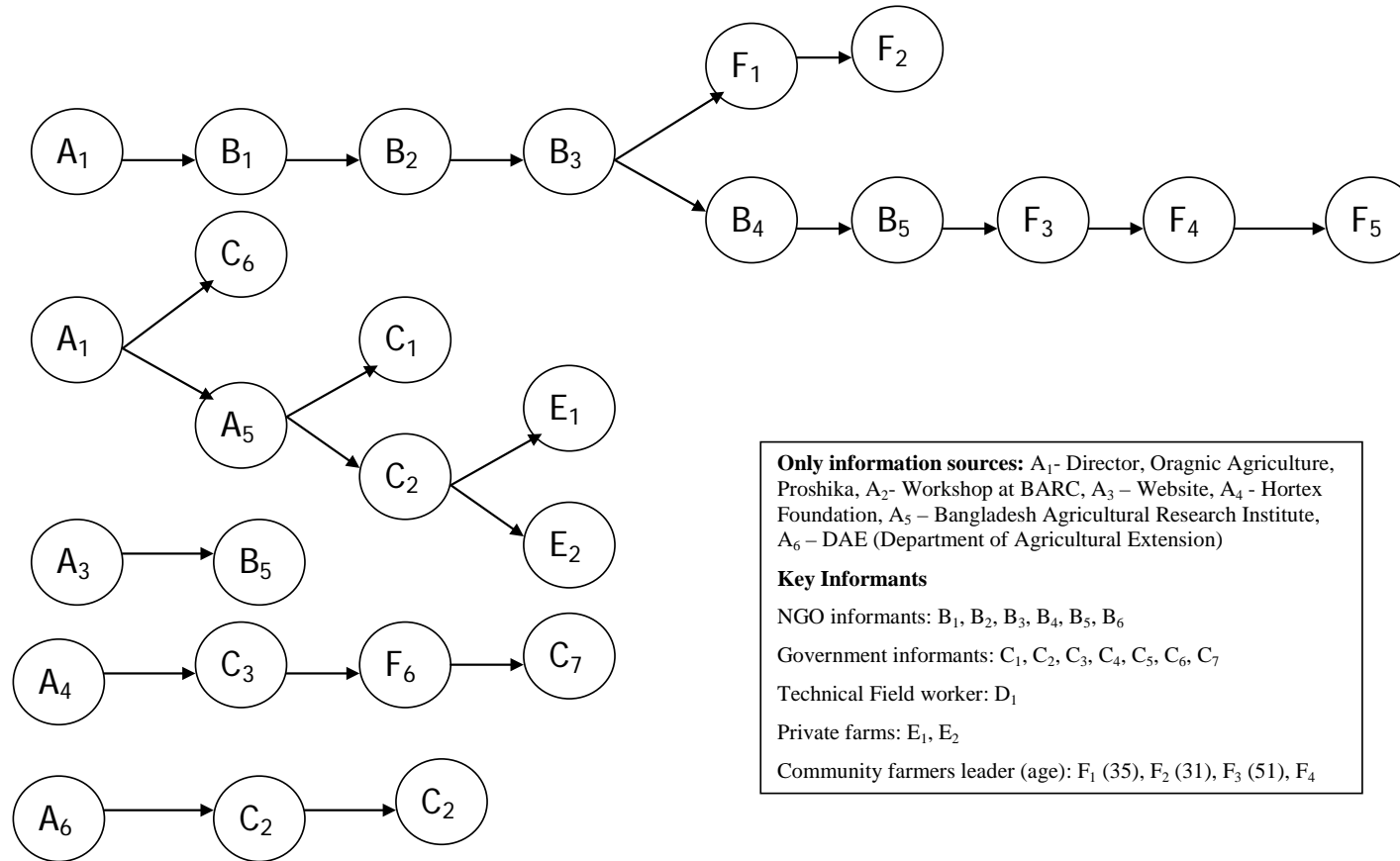


Figure 4.1 Snowball sampling of selection of key informants

In addition to their senior positions, the informants sometimes present their papers at different national and international seminars and they are able to contribute to formulate policy. Additionally, 6 community leaders who are practicing organic or eco-friendly farming were also recruited as 'key informants'. They were selected on the basis of information from GO and NGO officials. Most of the informants were interviewed in Dhaka (the capital city of Bangladesh), 2 of them in *Dinajpur* and *Panchagarh* (two North West districts), one in *Pabna* (a northern district) and community leaders were interviewed in their own places. Five community leaders live in *Tangail* district (*Delduar* and *Madhupur* sub districts) and one in *Pabna*. Besides Dhaka, all the sites were selected due to their richness in terms of eco-friendly practices. The information was collected from June to September, 2008.

4.3.4 Data sources and collection

For qualitative research, data can be collected from many alternative sources, such as: interviews, observations, historical documents, videos, drawings, dairies, newspapers, etc. The researcher can use one or several of these sources or in combination, depending upon the problem to be explored (Corbin and Strauss, 2008). But collecting and analysing data for qualitative research is more difficult than quantitative method. It usually involves fieldwork and the researcher needs to take into consideration the total context. The researcher is more responsive to the situation and must be able to adapt to the changing conditions. The methods by which the data were collected also contributed to the order and presentation of findings. At first, document data were collected and arranged, which included different reports of government and non-government organizations, published literatures from websites, books. Then, semi-structured key informant interviews were conducted with the purpose of enhancing or supplementing existing literatures; and in some cases, information were gathered through observation technique. However, the data were collected from three different sources – documents, interviews and observations.

4.3.4.1 Document data

At every research, researcher needs to read large number of previous literatures specially to know what kinds of works are available in his or her own field, where is the gap, to justify, why the research is going to be conducted and so on. Some studies rely only on documentary data. In case studies or grounded theory, documentary data may be collected in conjunction with interviews and observations (Denzin, 1989).

As one of the research objective is, to study the international classifications of organic and ecofriendly farming, therefore, different organic and eco-friendly standards have been studied and analysed from a vast number of literatures. The data for this objective were collected from books, journals and existing online literatures. To understand and compare local practices of organic farming, data were gathered from Proshika, UBINIG, CDA, DAE and other Governmental organizations the internet, libraries and strategy papers, project reports. Those data were acquired by different individuals at an earlier time point. Those materials were based around the

issue of sustainable agriculture, organic farming, Nayakrishi farming practices and the work of GOs. Large volume of document data has both positive and negative side. Due to the time limit, the researcher didn't have the time to look through all of the existing material. Therefore, it was not possible to present all of the relevant material within the thesis. On the other hand, there was no problem in finding enough valid material to write the paper.

4.3.4.2 Interview data

Interviews may be used as the main strategy for qualitative data collection, either as sole technique or in combination with others such as observation, document analysis (Bogdan and Biklen, 1982 in Hoepfl, 1997). For this study, key informants from different GO and NGO were interviewed. Marshall and Rossman (2006) have identified this as elite interviewing. "Elite persons are the influential, important, and the well-informed people in a community or organization and are selected for interviews due to their expertise in areas relevant to the research".

To attain information on views of key informants to organic farming and ecofriendly practices of farmers, it was decided to conduct interview with semi-structured open ended questionnaire. This is the most frequently used method in qualitative research and its' strong point is: in addition to covering relevant topics, they allow for the inclusion and follow-up of issues that arise during the interview, thereby allowing for the explanation of complex phenomena in detail and context (Mason, 1996). Lofland and Lofland (1984, in Hoepfl, 1997) stated that interview guide ensures good use of limited time; make interview more organized and help to remain interactions in track. Primarily, a draft interview guide was carefully developed which was pre-tested with 2 key informants. The basis for constructing semi-structured interview schedule was the production standards of international classification (mainly IFOAM production standards). After pre-testing, we reduced some questions; like how is the possibility of processing of organic products, how livestock is reared etc. - it seemed, those answers are not relevant to this research. Final interview guide was then prepared which contained 12 questions. Actually, the intension was to know the practices of existing ecofriendly farming, to identify the constraints and possibilities in Bangladesh and to find out the way of supporting farmers from the point of view of the informants' own perceptions, feelings, and beliefs.

One field assistant was helping to look for whether interviewees are answering in the right track or not, to control the recording etc. He was from agricultural background. Before selecting him, the research topic and idea had to discuss with the assistant elaborately. In total, five to six hour's discussion was held in several sittings.

Participants were formally interviewed in a single sitting that lasted between 45 minutes – 2.5 hours depending on the situation of the respective interview. Interviews were conducted in Bengali, the mother tongue of Bangladeshi, and tape-recorded with the prior consent of the participants. Some Field researchers rely most heavily on the use of written form of field notes, while some of them prefer tape recorder. For instance, Patton (1990) think, tape recorder is "obligatory", while Lincoln and Guba

(1985) suggest, “do not recommend recording except for unusual reasons, it may have the possibility of technical failure”. However, recordings have the advantage of capturing data more faithfully than swiftly written notes, which makes easier for the researcher to focus on the interview.

Before collecting data, each informant was told about the study purpose. Generally, interviews were conducted at their offices during the working period; in most cases, after the lunch break (usually in the morning, as the participants used to very busy). Two interviews were conducted at the residence of the participants. The number of key informants was determined based on information saturation. When the researcher felt that data is saturated, that is, same information is coming repeatedly, and then the interview was terminated. During these interviews, no interpreter was present.

For some questions, answers were brief and could be translated word by word, while for other questions the answers were so long that the translator had to keep brief notes and translate the main ideas and most important quotes of the farmer at the end of each answer.

The informants suggested the researcher to visit the areas where they have contact growers or where they are providing extension services – to watch the field situation and to talk with farmers. After going to field, discussions were held with influential farmers. Among them, one or two experienced influential eco-friendly farmers/community leaders were selected as key informant from each area. In total, 6 of them were considered as informants and some others were ignored due to information saturation. In case of farmers, the interviews were carried out followed by a visit to the farm, allowing for direct observation. The semi-structured interview schedule included motivation of farmers to switch to production without chemicals, farm size and what farmers are producing, how farmers are ploughing their land, how are they managing fertilization of land, disease and pest infestation, training and extension services provided by GO and NGOs, marketing of their products etc. In some areas, technical field workers (who are working in the respective organizations) were helping to know the contact farmers (Appendix 3).

Most of them were interviewed near to their farm or in their small farm house or under the shade of the trees. Interviews took place in a friendly atmosphere and all interviewees were communicative. At the time of community leaders' interview, NGO field workers, in some cases, extension workers were helping the interviewees to understand the questions, researcher's views, etc. They were also helping the researcher specially to know the study sites. Sometimes, problems were faced; for example, the interviewees often answered in a way that they believe –something that was hard to determine. Regarding this problem, Carlsson (2006) suggested that the best approach is simply to be aware of it.

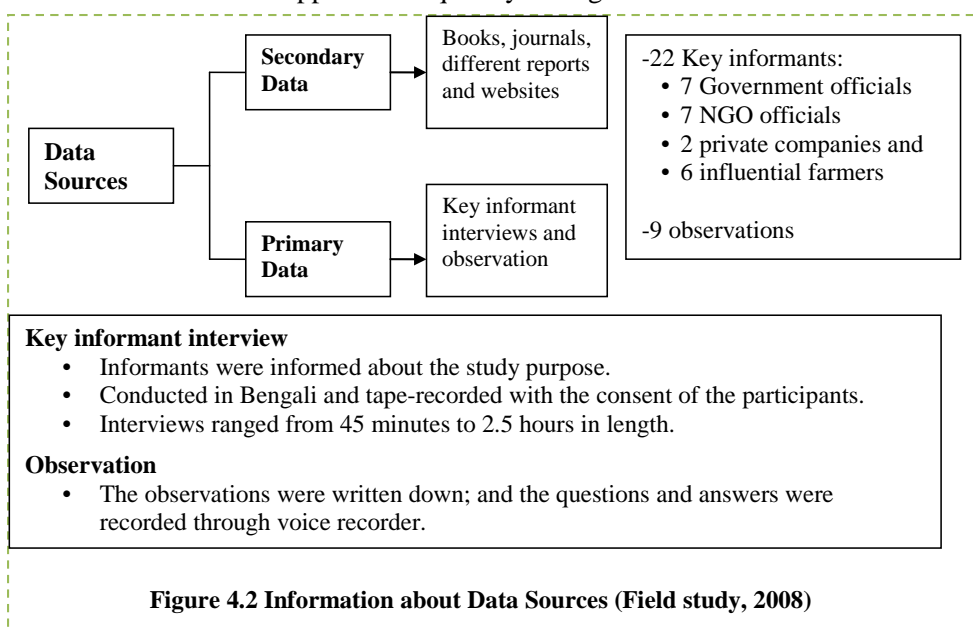
4.3.4.3 Observation data

It is a classic form of data collection in field research in the context of a natural scene. Observational data are used to describe how people behave and acts. As the researcher may enable to see things how events occur, therefore, the method provides

deeper knowledge and understanding (Patton, 1990). The researcher may interact or not with participants. Sometimes, the researcher may act as a full participant in the situation, with either a hidden or known identity.

While interviewing the key informants, some information were found suspected, and missing, for example, from where farmers are getting seed, how they use pesticides, fertilizers, etc, To get the missing and practical information, 9 observations were conducted. On the basis of information gathered while conducting interview, farmers and input sellers were visited at different places like, Narshinghdi, Mymensingh, Kishoregonj, Rangpur, Bogra, Jessore. Those districts were mentioned by key informants while giving example of different situations. Brief information regarding data sources has been provided in Figure 4.2.

While observing, in most cases, the researcher introduced, explained about the study and asked for permission. Few of them couldn't understand, what the necessity to write these issues is, but most of them were able to understand, however the researcher had minimal control over the persons and events of observation. Observations were written down and sometimes, the questions and answers were recorded through digital voice recorder. It was bit easy to collect data as all of the participants are doing research on eco-friendly issues. In most cases, several contacts were made with the participants before the actual data collection – that helped the researcher to establish rapport more quickly during data collection.



Participants were asked for permission to tape-record the interviews. Recorded interviews were fully transcribed and great care was taken that the anonymity of participants was completely protected (Kilian, *et al.*, 2003). Besides recording, it was

tried to write down everything like make a note of lectures in the classroom. But it was not possible to write hundred percent. But after conducting interview, in the same day, or after one day, field notes were studied and tried to fill up the gap. The inductive coding approach was utilized due to its methodology of deriving a theory from the data itself.

4.3.5 Data analysis

What is qualitative data analysis and how to do it? Bogdan and Biklen (1982) has defined as "working with data, organizing it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others". Qualitative researchers need to use 'inductive data analysis method', where the critical themes emerge out of the data (Patton, 1990).

According to Marshall and Rossman (2006) analytic procedures fall into seven phases: (a) Data organizing (b) Data immersion (c) Generating categories and themes, (d) Coding the data, (e) Offering interpretations through analytic memos, (f) Searching for alternative understandings, and (g) Writing the report or other format for presenting the study.

Zeller (1991) (cited Miles and Huberman, 1994; Nsanze, 2007); suggests that "*qualitative studies do not report 'data', they report 'scene'; that is, accounts of researchers' engagements overtime with informants in their surroundings*". Strauss and Corbin (1990) expressed two steps in QDA: identification of the themes or conceptual categories emerging from the raw data; sometimes referred as 'open coding'. The next one is: 'axial coding'. During this stage, the researcher is responsible to how the conceptual categories are linked and to build a conceptual model and finally, the researcher must translate the model into the story line. Seidel (1998) describes QDA as a process of noticing, collecting, and thinking about interesting things. The process is iterative and can be repeating in every cycle. For example, while thinking about one thing, researcher also starts noticing new things in the data. Then he again collect and thinks about new things. A considerable number of authors reported that they analysed qualitative data by "general inductive approach". Thomas (2003) has presented the inductive coding process. This has shown in Table 4.1. However, in all the analysis process, the researcher applies specific tools that help to document reflection processes, find answers to research questions, reformulate research questions, elaborate the analytic framework or produce overviews of data and at last to develop a new or improved theory (Peters and Wester, 2006).

The intention of this section is to explain how the collected data is relevant to the international classification, local practice and problems; and the data will reach from research question to conclusion point. In other words, how the data were recognized, read, sorted, strategically classified, and interpreted. The researcher used conceptual tools to manage and categorize the three data sources (documents, key informants interview, and direct observation) offered different complimentary evidences relative

to the two primary research questions: i) How the local eco-friendly practices are far from international organic standard? ii) What are the realities and constraints to implement eco-friendly farming? What points could work as opportunity to adopt organic farming in Bangladesh? Interpretation of the answers of the research questions requires systematic management of the potentially massive collection of retrievable data (Masson, 2002; Ritchie, Spencer, & O'Connor, 2003, Foster, 2006).

Table 4.1 Steps followed in inductive coding process of qualitative data

Step 1	Step 2	Step 3	Step 4	Step 5
Initial read the text data	Identify concepts from the text data	Label the concepts to create categories	Reduce overlap among the categories	Incorporate similar categories and create a model
Many pages text	Many segments of text	30-40 categories	15-20 categories	3-8 categories

Sources: Creswell (2002) cited in Thomas (2003)

Analysis took place simultaneously with data collection, and was used direct to the next interview. In this way, the previous interview and data provide guidelines to the next. Interviews were recorded through digital voice recorder and transcribed verbatim by researcher. Transcripts were then entered into MAXQDA10, a qualitative data management software programme. Data were analysed in the light of inductive approach where major themes are emerged from transcription through a rigorous and systematic reading and coding (Thomas, 2003; Elliott and Gillie, 1998). Therefore, the transcripts were read several times to identify themes and categories. Primarily, six interviews were selected on the basis of their wideness of information and subjected to sentence-wise identification of themes and sub-themes. Then a coding frame was developed considering research questions. If new codes appeared, the coding frame was changed and the transcripts were reread according to the new structure. Coded segments were summarized, and analyzed to develop categories, which were then conceptualised into broad. The process was done many times.

The result of the study has evolved directly from the key informant interviews. In some cases, quotations have been edited to improve readability, without changing the speaker's intent (Middleton *et al.*, 2005). The purpose of the study is to trace out the problems of eco-friendly farming in Bangladesh. The intention of the analysis is to look mainly the “problems” from key informants’ perspective. The underlying goal of this research is to find a way to implement eco-friendly or organic farming to bring sustainability in agriculture which will reduce farmers’ burden, keep the soil and environment in good health, protect the health of citizens and will care for biodiversity.

Data analysis started with levelling and coding. The data were labelled according to the identified themes of the research questions and organized according to conceptual categories. Cross-sectional coding of data with multiple types of categories occurred.

The categories generated to use cross-sectionally were done so for each research question. The cross-sectional coding was unique for all research questions.

From inductive analysis approach, a coding tree was created. Generating concepts or variables from theory or previous studies is also very useful for qualitative research, especially at the inception of data analysis (Berg, 2001). Therefore, at first, the collected data were categorized and key themes were developed under: motivation to organic farming, organic standard, input use status, different problems, food security, marketing, possibility of organic farming, policy recommendations, etc. Those sections once more categorized according to different standard, constraints, opportunities and recommendations (Figure 4.3).

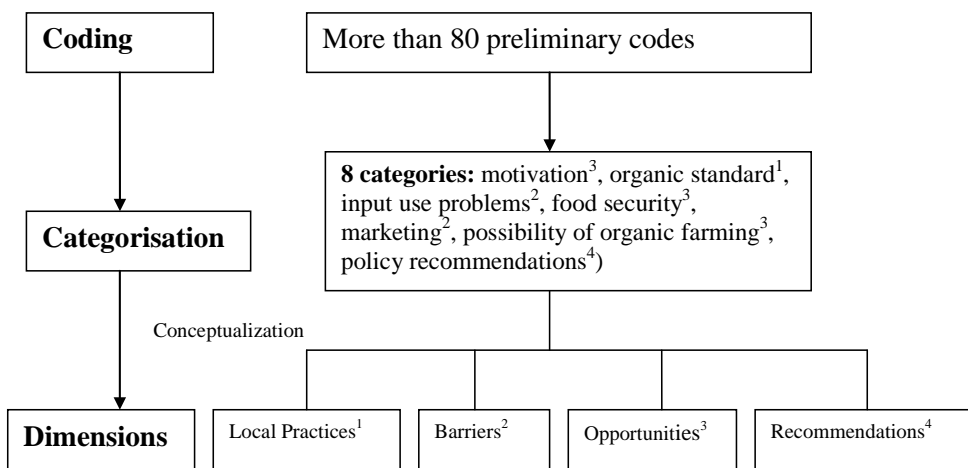


Figure 4.3 Steps of data analysis procedure (Thomas, 2003)

In addition, barriers to promote organic farming were roughly categorized as:

1. Govt policy
 - Grow more food
 - Policy of input subsidy
2. Input related problems
 - Seed
 - Fertilizer
 - Pesticide
3. Market related problems
 - Unavailability of products
 - Existence of middlemen
 - Lack of consumers' trust
4. Lack of awareness of different stakeholders (farmers, government officials, input dealers and sellers, consumers etc.)

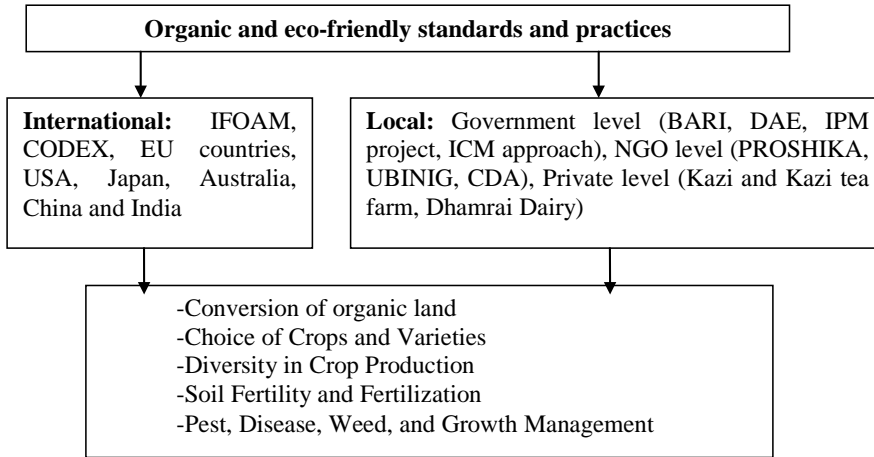


Figure 4.4 Categorization of data to compare organic and ecofriendly standards (Author’s analysis)

Ideally, multiple coders would have been employed to enhance reliability, but the researcher was the sole coder. Thus, there may have been some limits on reliability, but the collected documents and data appeared consistent. At the same time, the work is under discussion with some of the key informants; in this way, reliability was tried to maintain. Further, ordering the data by conceptual categories as well as by research questions ensured that the processed data would offer depth to the description of key informants on organic or eco friendly practices and, as well, would address the research questions thoroughly.

4.4 Conclusion

Credibility, transferability, dependability, and conformability are serious concerns of qualitative research. To combat these potential errors, multiple sources of data (triangulation), purposive and snowball sampling technique, prolonged engagement in the field, and wide description of data collection method have been used for this study. In the presentation of findings, these techniques were employed in order to describe the results. Cross-sectional coding and content analysis guided the identification of themes inherent to the three data sources. Those themes are going to lead the next chapter’s discussion regarding the standards, problems and opportunities of eco-friendly farming in Bangladesh.

CHAPTER 5 CLASSIFICATION OF ORGANIC AND ECO-FRIENDLY FARMING

Different countries as well as different places mention different types of production practices as organic farming. But all the standards are in the same opinion in terms of avoiding the use of hazardous chemicals. As a class of alternative agriculture, organic farming is a method that ‘provides sustained yields through the use of ecologically-sound management technologies’ (Altieri, 1987 in Jimenez, 2006). Roughly speaking, there are two different kinds of organic farms in the world: certified organic farms and non-certified organic farms. Several farms are following organic practices, but do not follow the details of any standards. The systems are often referred to as non-certified organic or eco-friendly or environment friendly farming. Like certified organic farms, inspection, certification and labelling are not subject matter of non-certified system (Willer and Yussefi, 2004). Stone (2006) has proposed a classification system in order to better understand the vast range of different types of organic agriculture (Diagram 5.1).

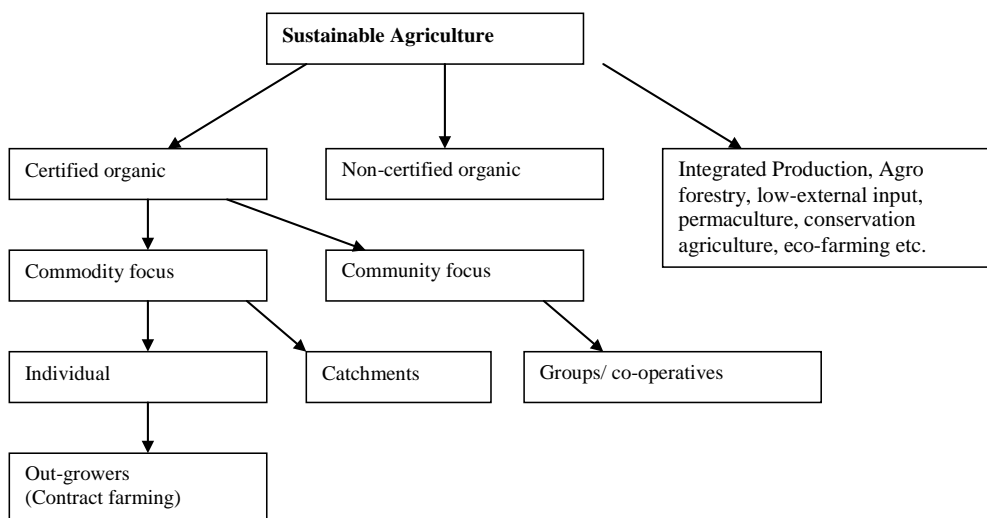
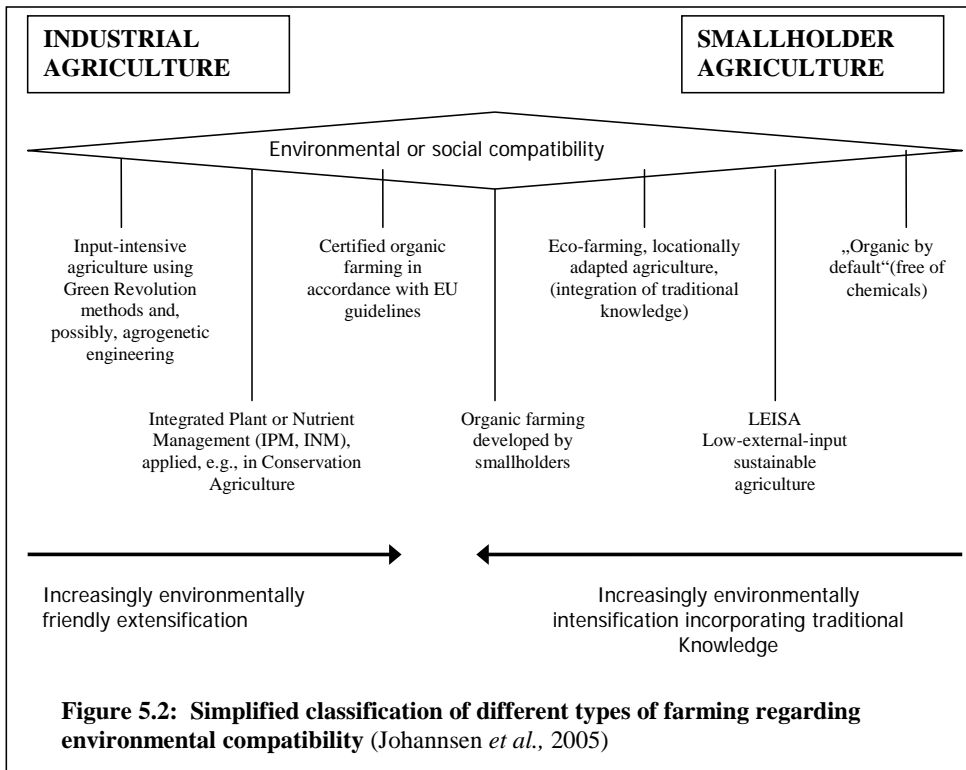


Figure 5.1: Classification of Organic Agriculture (Hauser, 2005, cited in Stone, 2006)

In addition to certified organic farming, there are numerous other concepts of agricultural production. They range from the intensive use of “modern” technologies such as genetic engineering to the various sustainable agriculture approaches (Johannsen *et al.*, 2005). In a simplified manner, the development of organic farming can be viewed from two sides: an increasingly lower use of chemical inputs in modern agriculture on the one hand and an integration of modern ecological insights into the traditional range of methods on the other, as illustrated in the following diagram (Diagram 5.2).



The input-intensive types of cultivation, the Green Revolution begun in the 1960s by the international agricultural research institutes, presented on the left side of the diagram. Here, the emphasis was given on introducing high-yielding varieties of cereal crops in the countries of the South, and the aim was to increase agricultural production. The various concepts of sustainable agriculture have emerged as a counter movement to the technologies of the Green Revolution; for example, Integrated Pest Management (IPM), Integrated Nutrient Management (INM), etc. Conservation agriculture is referred by the FAO as a method of incorporating an integrated management of soil, water and agricultural inputs. Its three most important principles are permanent soil cover, minimum interference with soil ecology and crop rotation. But usually, it involves increased herbicide input. So, a number of environmental advantages are offset by greater use of chemicals (Johansen, *et al.*, 2005).

Sustainable agriculture is a basic term that also encompasses organic farming. By this farming system, it is indicated that all approaches based on local resources, technology and traditional knowledge among farmers regarding local environmental factors with scientific insights. Organic farming is a kind of sustainable land use that completely avoids chemical fertiliser and pesticides and enhances the natural agro-ecological system (Samie *et al.*, 2010). Certified organic farming can be clearly distinguished from other sustainable types of farming through standard and quality

seals. However, it is a special type among all types of Organic Farming. “Low-external-input and-sustainable-agriculture” (LEISA) is another variation, though it does not entirely exclude the use of pesticides and synthetic fertiliser. It is intermittent between “only” sustainable and “still” organic. The term “organic by default” refers small-scale producers without access to modern farming input who are “organic” for lack of any alternative (Johansen, *et al.*, 2005).

Like ‘organic farming’ a number of concepts are discussed to refer eco-friendly farming such as ‘environment friendly farming’, ‘environmentally sustainable farming’, ‘integrated farming’ etc. “Eco -friendly farming is a farming of integration of biological, cultural and natural inputs including integrated disease and pest management practices. It not only advocates for stopping or restricting the use of chemical fertilisers, pesticides, weedicides and other chemicals but also it emphasises the need for farming which should create an ecological balance and a micro-environment suitable for health and growth of soil microflora, plants, animals, and finally the vast population which consume the farm produce” (Harendar Raj *et al.*, 1996). The important differences between organic and eco-friendly farming are mentioned in Table 5.1.

Table 5.1: Difference between organic and eco-friendly farming

Organic farming	Eco-friendly farming
The goals are to make harmony rather than conflict with natural systems and minimise the use of non-renewable energy, to achieve crop production with economically viable, socially just and environmentally concern.	The goals are to protect the environment with achieving profitability, optimal agricultural production and increasing productivity without posing any severe problem to our environment
Stringent standards exist for organic food production, handling and processing – make the farming system highly structured.	Strict standards do not exist.
Certified organic farms produce for premium price.	Eco-friendly farming produce with the spirit of human and environment concern
Organic farming is guided by some rules and regulation, food must be certified.	There are no specific rules and regulation, Eco-friendly food is not officially certified.
An organic farmer may use more resources including land than necessary and waste these.	Eco-friendly farmers cultivate less land and grow several crops intensively to conserve land resources.
Organic farms including food processing plants, are sometimes heavily dependent on non- renewable energy sources, even some certification does not cover issues such as fossil fuel – not always fulfil the sustainability issue;	Eco-friendly farmers and processors know that the continued use of non-renewable resources can't be used forever and thus pay attention to use less energy – the farming system is sustainable in many ways;
Organic farming policy doesn't require that farmers or processors attempt to conserve water resources;	Eco-friendly farming methods may include using reclaimed water for some crops, planting drought-tolerant crop species or using reduced-volume irrigation systems.
All organic farms are eco-friendly	All eco-friendly farms are not organic

Source: Own comparison

Bhat (1999) illustrated as: “The basic concept of environment friendly agriculture lies between modern chemical and mechanical inputs; in other words, it is the blending of both old and new methods and techniques of agriculture in order to complement the effects of each other for ensuring optimum agricultural productivity and environmental safety. It is mainly aimed to achieve optimum agricultural production without posing any severe problem to our environment”. According to Gerber and Hoffmann (1998), “The knowledge system supporting eco-friendly farming may include: 1) all the know-how and facilities necessary for production procedure, processing, marketing facilities and consuming products within the eco-friendly farming system; 2) the epistemology and the influence of the socio-cultural context, and 3) the institution supporting the promotion of these processes. There is much evidence from research, field trials and farm experience is that organic agricultural practices are generally more eco-friendly than conventional agriculture, particularly with regard to lower pesticide residues, a richer biodiversity and greater resilience to drought (OECD, 2003).

Crucefix (1998) illustrated that organic farmers could be classified based on motivation – the reasons that convince them to convert their land under organic management. Based on the objective, there could be two types of organic farmers: forced and motivated farmers. The main stimuli for developing organic agriculture have been identified as: economic necessity and/or unavailability of chemical inputs, environmental concerns, social concerns, personal philosophy and market demand.

Narayan (2005) mentioned about three different types of opinions about the relevance of organic farming in India: the first one simply treats it as craze; the second category consists with conscious farmers and scientists – who thought that organic farming is good for soil and health, but we should proceed carefully in consideration with the national needs that includes lower production during the initial period and the rising cost of labour. The third category advocates its adoption wholeheartedly. They think that tomorrow’s ecology is more important than today’s conventional farm benefits.

5.1 Similarities and dissimilarities among international standards

The IFOAM Norms and Codex Guidelines stand as the two international organic baseline standards and are already known to be quite similar in terms of production standards. The Codex Guideline includes little that could be considered certification requirements, whereas the IFOAM Norms include ‘Criteria for Certification’ (Schmid, 2002). It is noted that IFOAM standards are clearly written as ‘standards for standards’ whereas the Codex Guidelines are closer to a production standard and this should be taken into account when performing the comparison. Both however assume that more specific standards may be developed at the local level (ITF, 2004). Several countries are formulating or have adopted laws and regulations on organic production, processing and certification requirements to control the use of labels indicating organic origin (Vogl, *et al.*, 2005). The three regulations EU, NOP and JAS are the main organic markets that have influenced all others. As per Organic

Certification Directory, 2003 published by Grolink, there are 364 certification bodies across the world, but they are unevenly spread; 290 of them are located in European Union (106), USA, Japan, Canada & Brazil (Willer, 2008). An attempt has been made to compare some eminent international standards. IFOAM standards, CODEX, EU regulation, USDA, JAS and in some cases, Indian standards are discussed in this section on the basis of IFOAM basic production standards. The standards are described here:

5.1.1 Choice of crops and varieties

According to IFOAM organic rules, numerous crops and varieties should be produced in the farms to enhance the sustainability, self-dependency and biodiversity. Appropriate varieties and good qualities of seed or planting materials shall be used (IFOAM, 2008). EU regulation supports this principle as: flexibility could be provided regarding the application of production rules, to make it possible to adapt organic standards and requirements to local climatic or geographic conditions. Japanese standard specifically mentioned about the youngest available seedlings for vegetative reproductive plants (JAS, 2007). Additionally, it is mentioned in the CODEX that seed and reproductive materials should be collected from plants grown organically at least one generation or, in the case of perennial crops, two growing seasons (CODEX, 2010).

It could be said that all the standards have a common basic requirement for organic seeds and transplants. Where an operator can demonstrate to the officially recognized certification body that the above requirements are not available, seeds can be treated with the recommended materials. In those exceptional cases, the certification body shall set time limits. But in all cases, the uses of genetically engineered varieties are illegal. Japanese organic standard treat it as “non use of recombinant DNA technology”. Moreover, pollen and transgenic plants are not allowed in the Indian standard.

5.1.2 Length of conversion period

The word ‘Conversion’ is used in the EU while ‘Transition’ is used in the US. Conversion period allows the farm to establish its management system and builds soil fertility. According to IFOAM, conversion period should be adequate long to improve soil fertility extensively and to maintain ecological balance. Annual crop shall only be considered organic when a conversion period of at least 12 months passed prior to the start of the production. In the case of perennials, period of at least 18 months prior to harvest shall be necessary. In case of pastures, the conversion time period is at least 12-month (IFOAM, 2006d). In case of CODEX, conversion period is at least two years before sowing, and in the case of perennial crops other than grassland, at least three years before the first harvest of products. If the whole farm conversion is not possible at the same time, the holding must be split into organic and conventional units separately. Standard-setting organization could extend conversion period depending on past use of land, management capacity of the operator and

environmental factors. In accordance with US standard, a crop shall come from the land that has been free from prohibited materials for 36 months, no exception is mentioned. For verification, an initial inspection must be made before certification (Kuepper, 2007).

In case of EU, Japanese and Indian organic standard, the principles shall normally have been applied for at least 2 years before sowing of annual or biennial crops, or 3 years before harvesting of perennial crop. Exceptions are provided for, and in a number of member states generous exceptions are granted. Like US standard, in EU, initial assessment is mandatory before certification (IFOAM, 2005).

5.1.3 Diversity in crop production

In some standards, diversity in crop production or crop rotation is included in the soil fertility management; while in some other standards, it is considered as a separate section. IFOAM states that soil management is the foundation of organic production. Therefore, organic growing systems care for the soil and surrounding ecosystems and provide support for a diverse species that shall be ensured by minimum crop rotation and/or variety of plantings. Minimum standards for perennial crops shall be set the certifying body. EU regulation and Indian organic classification also follows the same rule (IFOAM, 2005a).

5.1.4 Soil fertility and fertilization

Among all production practices, soil fertility management differs noticeably from one standard to another. According to basic IFOAM standard, nutrient losses from the farm should be minimized. Nutrients should be used in such a way and at appropriate times and places to optimize their effect. Material of microbial, plant or animal origin shall form the basis of the fertility program (IFOAM, 2002). Limitations could be on the basis of location, timing, methods, treatments, or inputs applied. Mineral fertilizers shall only be used (if necessary for maintaining long-term fertility) together with other techniques such as organic matter additions, green manures, rotations and nitrogen fixation by plants. Mineral fertilizers (that are included in the positive list) shall be applied in the form in which they are naturally composed and extracted and shall not be rendered more soluble by chemical treatment. Chilean nitrate along with all synthetic nitrogenous fertilizers, are prohibited (IFOAM, 2005a).

With similar sense but expressing in a different way, CODEX standard states that, the fertility and biological activity of the soil should be maintained by cultivation of legumes, green manures, multiple rotation programme; incorporation in the soil of organic material, etc (EAP, 2008). By-products from livestock farming may be used, if the animals are raised in accordance with the guidelines. The recommended substances may be applied only to the extent that adequate nutrition of the crop or soil conditioning are not possible by the previous methods or, in case of manures, if not available from organic sources (CODEX, 2010). EU regulation also follows similar rules. Only the listed organic or mineral fertilizers may be used, if necessary (EU Regulation, 2007).

US standard mentions that organic growers can apply natural organic materials and crushed rock mineral to improve the soil. Some natural fertilizers originated from plant and animals are allowed when necessary. The different point from other standard is: farmer may use sodium nitrate sparingly. If the fertilizer label carries a logo indicating that it is listed by organic materials Review Institute (OMRI) or the Washington State Department of Agriculture (WSDA), farmer can reasonably be assured that the product is allowed for use. The standard also provides a list of prohibited fertilizers. But burning of crop residues is strictly prohibited (Kuepper, 2007).

According to Japanese organic standard, farmers may use natural substances or those derived from natural substances like, composts, fertilizers of animal and plant origins, fertilizers of mineral origin (source of P, K, Ca, Mg, s, Si), trace elements, soil conditioners of mineral origin (perlite, vermiculite etc.) wherever necessary (JAS, 2007).

National programme for organic production (NPOP), India is designed in the light of IFOAM standards. In addition, some points are mentioned as: over manuring should be avoided, manures containing human excreta should not be used. In case of deficiency, mineral fertilizers can be used as a supplementary source and should be applied in their natural composition. Minerals containing high concentrations of heavy metals should be avoided. Bio-fertilizers can be used safely under all ecosystems and in all the crops (NPOP, 2005; p: 28-30).

The US rule has a different approach than the EU, Japanese and IFOAM regulations. Principally in the US, natural is OK unless specifically prohibited, Synthetic is not OK unless positive listing. In case of Japan and the EU, all inputs need positive listing. Private certifiers may be more restrictive than required by law. The most significant difference is: in the US rule, for meeting up to 20% of the nitrogen requirements, Sodium nitrate is allowed. It is prohibited in IFOAM and EU rules (Rundgren, 2001).

Manure and compost

Composting is not required in IFOAM standard, but it is mentioned that private standards may have considerably stricter requirements of composting, its origin, quality and quantity (IFOAM, 2005a). EU has limitations on the origin of manure. Conventional manure may be used if it originates from 'extensive animal husbandry' and composted conventional manure may be used unless it comes from 'factory farming'. Japanese standard requires all manure must be composted (EU Regulation, 2007). The US Standard has requirements for composting of manure regardless of origin. The standard regulates how manure is used in organic production to prevent microbial contamination. If farmer uses manure during the growing season, it must be thoroughly composted using a high temperature process (131- 170⁰ F) for at least 3 days if he use it in static aerated piles; 15 days, for a frequently – turned window system. Application may not occur within 90 days of harvest for fruits and vegetables

whose edible portion does not touch the ground or receive ground splash. For those crops whose edible portion does contact the soil or soil particles, applications may not be made within 120 days of harvest. Worm-composted manure (vermicompost), dried manure, guano, manure tea and compost tea have the same restriction as uncomposted manure (Kuepper, 2007).

5.1.5 Pest, disease, weed and growth management

Organic farming systems apply biological and cultural ways to prevent undesirable losses from pests, diseases and weeds. According to IFOAM rule, these problems are managed by the knowledgeable application of one, or a combination of the measures: *“Choice of species and varieties that are well locally adapted to the environment, crop rotation programs, Physical or mechanical cultivation, protection of natural enemies, predators, creating ecological or environmental buffer zones, diversified ecosystems. Intercropping, thermal weeding, seed bed preparation, acceptable biodynamic preparations from stone meal, farmyard manure or plants/household manure, mulching and mowing, grazing of animals, mechanical controls such as traps, barriers, light and sound” (IFOAM, 2005a).*

In addition to IFOAM rules, CODEX states that pests should be avoided by good manufacturing practices. Recommended managements include physical barriers, ultra-sound, light and ultra violet light, traps, temperature control, controlled atmosphere and diatomaceous earth. Only recommended substances are allowed in severe cases. In cases of severe threat to the crop and where the above mentioned measures do not work, remedy may be referred. Codex has developed ‘maximum pesticide residue limits’ for food commodities in international trade. Maximum residual levels are proposed for each pesticide for individual food and feed items or particular groups of products (Flynn 2002; FAO and WHO 2006b).

According to EU regulation, parasites, diseases and weeds must be controlled through selection of appropriate varieties and species, adequate crop rotation program, mechanical means of cultivation, protection and encouragement of the natural enemies of parasites (e.g. mushrooms, nests, and dissemination of predators) and burning. Materials or substances included in the positive list of EEC Regulation 2092/91 may be used, if necessary (EU Regulation, 2007). The US organic standards states that organic growers must manage weeds, diseases and insect pests through prevention, cultural practices, and biological controls. Where these do not provide sufficient control, a limited number of pesticides may be used. There are several classes of allowed pesticides. These include bio-pesticides, botanical (plant based) materials, minerals (copper, sulphur, baking soda, diatomaceous earth), superior spray oils, hydrogen peroxide, and insecticidal soaps. The standard also listed prohibited pesticides (Kuepper, 2007).

5.1.6 Avoiding contamination

Organic product could be contaminated through hazards that include pesticide spray drift, engine fluid, and fertilizer runoff. IFOAM and private certifiers usually requires preventative measures such as buffer zones, planting of hedges etc. to avoid potential contamination in organic products (IFOAM, 2005a). According to US standard, farmer must prevent contamination of soils and crops. If neighbours use prohibited chemicals, organic farmer must need to establish a buffer zone. If farmer sprays conventional pesticides in his non-organic areas, he needs to use a separate sprayer to use for organic field and clearly label it for organic use only. If he uses any equipment for conventional production, he needs to be sure to clean it thoroughly before it is used on organic crops and soils. This is especially important with fertilizer spreading and seeding equipment. Farmer should not store organic produce where it might be contaminated by sprays, fumigants petroleum products, or any other prohibited substances (Kupper, 2007).

The EU has no regulations regarding contamination from the outside. The commission proposed to implement “zero tolerance” in the EU regulation. Heavy metals are regulated in a number of EU approved inputs (e.g. Cadmium in Phosphates). The US rule mentions products may not contain prohibited substances at levels greater than 5% of EPA tolerance. The rule requires defined boundaries and buffer zones’. Many private standards have restrictions re production site, e.g. not close to roads or other major contamination sources. Irrigation water is not regulated in EU and US regulations. GMO contamination is not clearly regulated in any of the systems (Rundgren, 2001). The main distinguished features of different international standards have been presented in Table 5.2.

CLASSIFICATION OF ORGANIC AND ECO-FRIENDLY FARMING

Table 5.2 Comparison and special features of different international standards of organic practices

	IFOAM	CODEX	EU	JAS	US	India
Conversion period (minimum)	12 month for annual and 18 month for perennials.	2 years and 3 years respectively.	Similar to CODEX	Similar to CODEX and EU.	3 years	Similar to CODEX, EU and JAS.
	Inspection during conversion period is a requirement in most cases.					
Selection of crops and varieties	Organic sources of seeds and transplants. Several crops and varieties should be produced.	Reproductive materials from plants grown organically at least one generation	If un-treated seeds are not available conventional treated seeds may be used.	The youngest available seedlings for vegetative reproductive plants	Use of conventional seeds is possible, if organic seed is not available.	Follow IFOAM rules.
	*Genetically engineered varieties are prohibited in all cases; crop rotation and diversification must be followed in all standards.					
Soil Fertility and Fertilization	General requirements: The soil fertility should be maintained by cultivation of legumes, green manures, multiple rotation programme; incorporation in the soil of organic material. In all standards, only the listed organic or mineral fertilizers may be used, if necessary.					
	Chilean nitrate along with all synthetic nitrogenous fertilizers are prohibited.	Similar to general requirements.	Similar to general requirements	Farmers may use natural substances or those derived from natural substances.	Farmers may use sodium nitrate. Burning of crop residues is prohibited.	IFOAM standards + avoid heavy metallated minerals, over manuring, human excreta.
Manure and compost	Composting not required.	Not mentioned.	Composted conventional manure may be used if it is not from 'factory farming'.	all manure must be composted	Composting of manure regardless of origin.	Not mentioned.
Pest, disease, growth, weed management	General requirements: Pests should be managed by physical and mechanical methods (IFOAM, 2005). Only respective recommended materials are allowed in severe cases. In addition, CODEX has developed 'maximum pesticide residue limits'. The US standard has listed prohibited pesticides.					
Avoiding contamination	preventative measures such as buffer zones, planting of hedges etc.	No such regulations.	"zero tolerance" to prohibited materials	No such regulations.	Organic farmer must need to establish a buffer zone. Tolerance is till 5% level.	No such regulations.
	GMO contamination is not clearly regulated in any of the systems					
Environmental aspects	Provision of improving landscape & biodiversity	No such regulations.	Environmental issue is mentioned	Buffer zone to waterways	Conservation of biodiversity is mentioned	Conservation of biodiversity is mentioned
Labelling and consumer recognition	Seal for products certified by an IFOAM Accredited certifier.	Private certification labels.	EU logo – only for EU products.	JAS marks are available for foreign production.	US Seal marks are available for foreign production.	Seal marks are available

Source: Own comparison.

5.2 Organic and eco-friendly practices in Bangladesh

The progress of organic agriculture in Bangladesh is very slow. Yet we have been able to convert only 1,162 ha of area so far, which is a mere 0.01 percent of the cultivated area (Paul and Henning, 2011). Though government policy is always to promote “grow more food”, several eco-friendly projects have been implemented through the Department of Agricultural Extension (DAE) with support from different aid agencies since 1980’s. But still there is no standard; inspection and certification system exists in the country. Organic growers, promoters and sellers are working scattered. Due to lack of standards, organic products cannot compete or enter into the world market and also failed to get confidence of internal consumers. However, in Bangladesh, eco-friendly agriculture is practiced from three different levels: NGO, private and government (Diagram 6.3). Regarding classification of farming in Bangladesh, informant D₁ mentioned,

“Three types of farming are practicing in Bangladesh: Traditional, conventional and eco-friendly /organic. In traditional farming, farmers didn’t use chemicals but there was no management. Farmers couldn’t give back organic matter to the soil due to lack of knowledge. They only used cow dung but not in a scientific way. Production was very less but population was also very less. So, farmers could not produce adequate amount of food compared to their necessity with some exception. In conventional farming, farmers use more and more agrochemicals which are already proved as unsustainable. But ecosystem and management are included in the organic or eco-friendly farming. In the air, 78% element is Nitrogen. So, Nitrogen is available everywhere. But farmers need to know how to fix it in the soil, how to add organic matter in the soil, how to produce compost scientifically. These were absent in traditional farming. Organic farming is not traditional –resource management and scientific technical knowledge have been added with traditional farming” (informant D₁: para.5, Appendix page 195).

Informant P₂ distinguished between ecological and organic farming as: “Organic agriculture works for the sustainability of soil. But ecological agriculture means the entire natural ecosystem. Farmers have to plant the trees which are suitable for the crops. If they plant different types of trees, different kinds of animals, birds, insects come – that develop a sound ecosystem” (para. 2). Informant P₃ defined why Proshika tell organic agriculture though the name of their programme is ‘ecological agriculture’. Organic farming is a familiar term to everybody and worldwide. “When ecological agriculture is said, people get confused; we become tired to explain it. We tell ‘organic’ with farmers but not with a researcher” (Informant P₃: para. 1, Appendix page 171)

“The concept of organic farming is critical in Bangladesh because when we raise the issue, the word ‘certification’ always comes to the next. Ecological farming varies place to place. Ecology includes surroundings, crops, animals, biosphere etc. Eco has very easy meaning. If I use less amount of fertilizer, less pesticide, compost -

these are eco-friendly farming – that means to help the ecology. If I don't use tree wood, I am helping the ecology, it is eco-friendly. So, eco farming differs from man to man. But, truly organic maintains strict rules and regulations” (Informant P₃: para. 3, Appendix page 172).

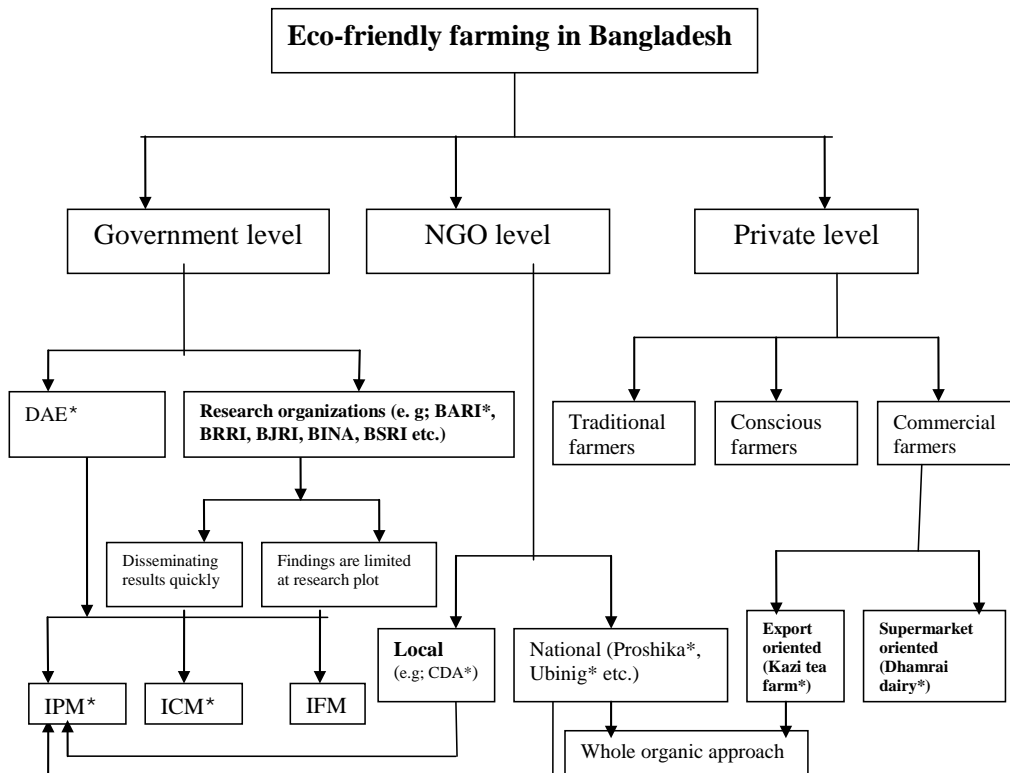


Figure 5.3: Organizational structure of eco-friendly farming in Bangladesh (Source: Own observation)
 * Institutions of the key informants

Ministry of agriculture is the main constituent for agriculture at government level. In Bangladesh, MOA develops agricultural policies, plans, regulations, acts, introduce new technologies, monitor allocation of agricultural inputs and relevant subsidies etc. to achieve sustainable agricultural development and food self sufficiency. In government organizations, employees perform their duties to implement government policy (MOA, 2006). Though policy is ‘to promote more food’, government has given emphasis on reducing indiscriminate chemical use. With this objective, DAE is providing training; research organizations are trying to introduce bio-pesticides, bio-fertilizers – on the whole, integrated crop management. Some of them are trying to implement ‘official organic certification’. NGOs are registered organizations established by persons who are not part of the government, though sometimes, funds are raised by the government. Generally, NGOs are non-profit organizations work towards improving the quality of life of disadvantaged people for poverty alleviation

and human resource development (Newaz, 2003). The Private Organizations are self-sustaining special interest groups, to whom primary goal is profit.

5.2.1 Practices followed in eco-friendly or organic farming in Bangladesh

5.2.1.1 PROSHIKA

PROSHIKA was started in 1975 with organizing some farmers association. Farmers were organized for the awareness regime, leadership development; and social, economic, political - overall development. In the beginning, farmers told that they were using more and more fertilizers day by day, insects' attacks and remained though insecticide was used, as a result production cost increased but amount of production decreased (PROSHIKA, 2005). *As agriculture is the main occupation of Bangladesh and income would be increased through agriculture, especially small and marginal farmers. With that strategy, the thinking was how fertilizer can be made with lowest cost. From that feeling, Proshika started to provide training farmers to producing compost. After some years, it was found that the weight of cow dung and compost is very high. To prepare it at home and bring to the field, which is very costly and labour intensive. Moreover, some farmers didn't have cow. Again if they had cow, they used those cow dung for cooking purpose as fuel. After a couple of years, Proshika realized that Bangladesh has opportunity to produce biomass for organic agriculture because of it's' rainfall pattern, humidity and temperature condition and the growth of trees are very rapid. Proshika decided to grow sesbania, kheshari etc. – leguminous and green manuring crops – those produce N₂ fertilizer and biomass (Informant P₁, para 3 & 4. Appendix page 162).*

From that time, farmers broadcast the leguminous seeds in the crop field before planting each crop to get supply of Nitrogen fertilizer. When leguminous plants grow, those are grinded in soil before flowering. Then nodules are produced through N₂ fixing. One statistics showed that in this way, it is possible to fix 35 kg Nitrogen and 1 metric ton biomass per hectare. Biomass is the feed for earthworm and after eating, it produces Phosphorus and Potassium through mineralization, as earthworm plough the soil from one side to another side – uplift the ground soil. This process creates all kinds of necessary trace elements + phosphorus+ potash and micro organisms create boron, Zink through ion exchange. So, in this way, a complete fertilizer dose is managed and the required fertilizer for soil is produced in the soil. Some farmers use pit compost, vermicompost etc. water hyacinth, weeds from vegetable gardens and kitchen wastes are used as compos materials (based on the information of informant P₁, para 5. Appendix page 163).

Informant P₃ pointed, *“We don't believe that the development of soil fertility could be possible by external input. If we don't disturb or destroy the soil fertility, we don't need to improve. We only need to maintain by crop rotation, intercropping, mulching etc. As we have already destroy the fertility by using huge amount of chemicals, therefore, we use compost, quick compost, green manuring. Basically, we work as*

soil quality may not deteriorate. If we practice organic for 5- 10 years, then we don't need to add organic matter even, organic fertilizer" (para 3. Appendix page 162).

Proshika emphasize on maintaining soil moisture for irrigation management. If soil is rich in organic matter and moisture is maintained properly, then farmers don't need irrigation. Therefore, Proshika principle is to practice mulching. *"As the soil quality is already deteriorated, so, we need irrigation. We encourage surface water or rain water rather than using ground water" (Informant P₃, para 3. Appendix page 172).*

For managing pest, Proshika's principle is: natural control. Proshika doesn't permit any chemical as pesticide. When farmers apply pesticide, pests die, at the same time predators like frog, spider, lady bird bittle – those eat harmful pests- also dies. Pest-predator ratio unbalanced. The life cycle of frog is 3 months. For maximum pest, it is 21 days. So the reproduction is more in pests than predator. As a result, the amounts of pests will more than predators due to application of pesticide. In case of natural control, predators rapidly eat pests. If farmers do not use pesticide, pest-predator ratio will be balanced. It is experimented that frogs eat 3 times more pests than their body weight (Informant P₁, para 7. Appendix page 163).

Informant P₁ mentioned that Rice Hispa (locally known as 'Pamri poka') eats only leaf and after eating, they leave before flowering. So, no food is needed for leaves. As a result, more flowers appear. So, this beetle doesn't affect production. Therefore, Proshika suggests the farmers not to use any pesticides against this insect. Sometimes Ministry of agriculture is spraying pesticides from aeroplane. For Stem Borer (local name Majra Poka), farmers spray liquid juice of Neem leaf (kept in a jar for 15 days). There is no cost to make it because almost all farmers have neem tree. If farmers dig branches of trees, then birds will come to eat the insects. Sometimes Light Trap is used. Fermented plant juice works very well in case of vegetables. For producing 1 litre of plant juice, Tk. (local currency of Bangladesh) 10 taka is needed. Due to practicing organic management, Proshika feels no problem about pests. *"We have also found that if we compare between: how much production we are getting after applying pesticide and how much we lose without applying pesticide, then, mostly, in the second case, farmers get more profit" (Informant P₁: para 10. Appendix page 164).*

Informant P₃ mentioned, *"If the soil health is good, plant health will be good and they will not be attacked by disease. When we use hybrid seed, we have to apply fertilizer. In our country, fertilizer means urea, which again means overusing or imbalance use of nitrogen which makes the plant 'fleshy' for which pest attacks. We need to know better in which situation the pest will not attack than how to control pest. I have practiced many times. For example, I planted Aus rice without using chemical fertilizer; I didn't face any pest attack in that plot. At the same time, in another field, I planted Boro rice with chemical fertilizer and pest attacked. So, if we produce food for insect and pest, they will come. We should know, what are their foods and not to produce those foods" (para. 4. Appendix page 164).*

Proshika feels that to protect local variety is very important for two reasons. One is local variety seeds play very important role for crop rotation and diversification. Another reason is variety is a genetic resource of a country. HYV seeds are also producing from this local variety. Therefore, Proshika suggest farmers have to produce seed on his own farm. The advantages are:

- 1) Farmers know the behaviour of this variety
- 2) Seeds are highly adaptable to the environment
- 3) Seed are not dependent on chemicals
- 4) Cost of seed is very less, so cost of production reduced
- 5) Farmer can use when he needs
- 6) It is the way to protect genetic resources

(Source: Murakami, 1992)

Proshika farmers divide their land for vegetables and field crops. Regarding cropping pattern, informant P₁ described that farmers produce 6 crops in vegetable land and 3 crops in the field. For field crops, a standard cropping pattern is:

1st year: Boro rice – Sesbania (green manure) – transplanted Aman – Potato.

2nd year: Maize – transplanted Aman – Grass pea (green manure) – Boro rice.

3rd year: Sesbania – transplanted Aman – Potato – Boro rice

(*para.10. Appendix page 164*).

The informant also mentioned that in coastal area, the Proshika contact farmers can produce three crops like ‘Wheat-Pulse-Aman’ or ‘Pulse-Aus-Aman’, whereas others cultivate only Boro rice. It was said that if pulses are cultivated in Barisal (one coastal district), no pulses and rice will be needed to import (*para. 10*). Bangladesh will be food surplus. Informant P₃ believes that cropping pattern varies according to ecology; for example, some patterns are better in high land, some in low land, special types for south Bengal, and so on. Cereal crop is our main crop. Some crops need dry weather, so, these crops should be produced in the dry season. The day length, weather etc. are very important for cropping pattern. In summer, day length is 14 hours and it is 10 hours in winter. So, summer crops will not be grown very well in winter and winter crop’s yield cannot be good at summer (*para. 12. Appendix page 165*).

From one observation, it was found that in 2007-2008, one farmer’s cropping pattern for his vegetables’ land was: “Early Cauliflower – Red amaranth - Cauliflower/ Cabbage – Broccoli/ Carrot – Spinach/ summer veg. - Bitter gourd – brinjal.” Banana was planted as boundary crop. Informant P₁ mentioned that these 6 crops could be possible only in organic method because chemicals are not applied and soil remains healthy. Instead of normal compost and green manure, quick compost is used. Fermented Plant juice is also used as fertilizer and pest management for brinjal, cabbage and cauliflower (*para. 10. Appendix page 164*).

Proshika has been providing extension services to the farmers since many years. Now about 11,000 farmers are working with Proshika. They stopped to use of chemical fertilizers and pesticides completely. About following standard and marketing system, informant P₃ stated:

“We think; our level is not lower than the international standard because we do not use any types of chemical. We maintain soil fertility with crop rotation and we do not use any chemicals. As we do not export, so standard is not followed properly. We have no problem to follow standards. But it is a long term process and it needs huge amount of money. The local and foreign scientists visited our farmers’ field; they have good idea about our rules. Proshika help farmers to sell their products. Three days in a week, our trucks go and brings products form the purchase centre and supply these to different mega shops. We have a list of contract growers. Those who are practicing our rules for 3-4 years, when we become satisfied, give them identity card and we certify them as our farmers. The central staffs visit the farmers every month. The numbers of our listed farmers are increasing day by day” (para 14 & 16. Appendix page 166).

5.2.1.2 UBINIG’s principles and Nayakrishi farmers’ practice

After severe flood in 1988, farmers of Tangail District started a new agricultural movement with the help of UBINIG. Through this agricultural practice, farmers do not depend on modern inputs, they use organic and bio-inputs for their cultivation (Mondal *et al.*, 2010). The farmers utilize their communal agricultural knowledge and get relevant support through training from UBINIG. UBINIG established an ‘organic farming training centre’ at the Pathrail village (Delduar) in Tangail district, and the training is mainly provided by UBINIG’s staff. UBINIG and Nayakrishi farmers are actively working to protect local and indigenous variety seeds. One of the ten principles of UBINIG is: ‘seeds and genetic resources are common property of the community and must be conserved at household and community level’. Ubinig feels that seed is the key input of agriculture that determines the requirements for other inputs such as pesticides, fertilizer and agricultural technology (UBINIG, 2001).

About protecting variety Informant U₂ mentioned, Nayakrishi farmers’ believe ‘Friend is old, toy is new’. Organic farmers especially women of the farm family serve as curator for maintaining genetic diversity, protection of indigenous and traditional variety seeds through participatory approach.

“We are farmers; we must conserve indigenous and local varieties to protect environment and ensure food security. Local varieties can cope with climatic changes and natural disasters. Farmers know the characteristics of the variety which they know from long time. If we use and plant hybrid seed and tell, we will not apply chemical fertilizer and pesticide – it is not possible. These seeds are born with fertilizer. When we plant seeds; we have to apply fertilizer, the plant will be healthier

with so many leaves and pests will attack and we have to apply chemical pesticide” (Informant F_{U2}, para. 15. Appendix page 203).

UBINIG believes that management of soil fertility cannot be considered as a single issue, it includes crop rotation, pest management, irrigation management and many other management issues. Their principle is: farming is not only rice and jute trees; Ducks, hens, cows, goats - birds and animals are also the part of farming. Because they supply organic matter and, poultry birds control insects through eating. Therefore, all Nayakrishi farmers raise cattle and poultry and use compost to maintain soil fertility. Every Nayakrishi farmer prepare a compost pit and mix cow dung, water hyacinth and household waste and put there. Crop rotation is also followed to maintain soil fertility. Farmers maintain three agricultural seasons: *Rabi* (winter), *kharif- 1* (summer) and *kharif – 2* (rain and autumn). The major winter crops are: pulses, oil seeds, potato, sweet potato, cereals, vegetables and spices. The main summer crops are Aus rice and jute and in rainy season, *Aman* rice (based on the speech of informant U₂, para. 4. Appendix page 178).

Cropping pattern helps to maintain soil fertility and pest management

In Tangail district, farmers sow mashkalai or kleshari (which are leguminous and also pulse crops), before one month of harvesting Aman. As kleshari is a legume, it fixes the nitrogen and adds organic matter to the soil. After that, according to rotation, they plant jute. The jute leaves are fallen into the field and rot, which produces biomass, organic matter and huge amount of fertilizer. Then farmer’s plant transplanted Aman. Rice belongs to *Graminie* family, their root is fibrous and jute is a tape rooted plant. So, trace elements of compost and fertilizer of rice go to the ground level through leaching. It is very important that jute gives back 80% to the soil what it takes in its’ lifetime. As a result, they get many benefits: soil fertility status is maintained and weed, disease and pests are also managed (Informant U₁, para 4. Appendix page 174).

Informant U₁ also described that if farmers follow continuous rice, more weeds grow in the field; monoculture hosts them all the time on the plot. Then these weeds become a permanent problem. Farmers’ found that the yield from Jute-*Aman* pattern is more than *Aus-Aman* pattern. Moreover, if farmers plant different crops, food habit of pests change, they feel discouraged and go away. If some pests attack on Nayakrishi farmers’ land, they remove mechanically. They don’t apply any organic or inorganic pesticide. Nayakrishi farmers not have problem with pest management (para 6, Appendix page 174).

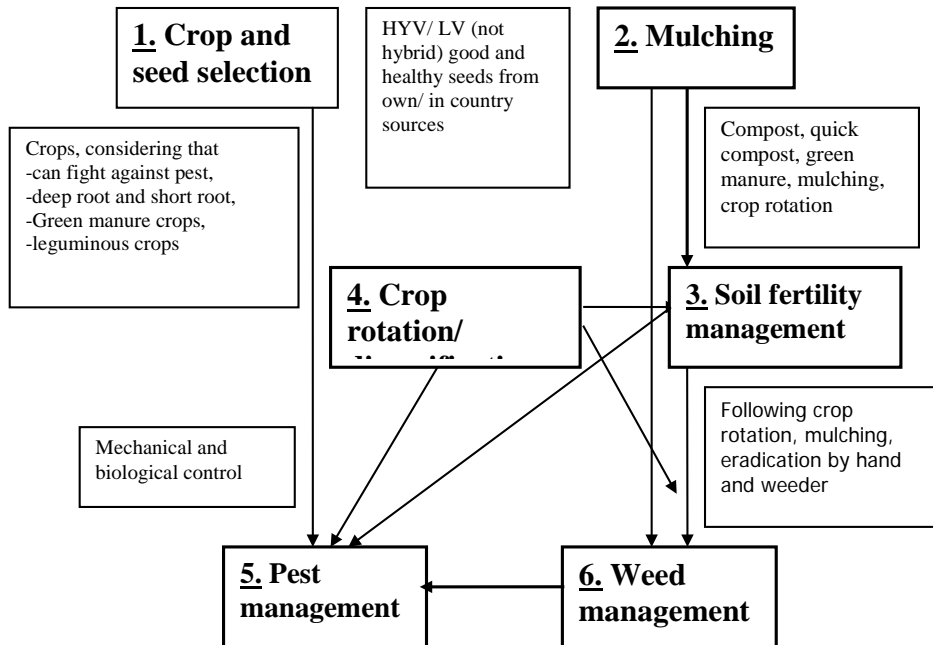


Figure 5.4: Main crop production practices of Proshika and UBINIG (Source: Own observation)

Regarding standard, informant U₂ informed, “Our goal is: to satisfy the local need and to offer food sovereignty to the farming community, we are trying to protect environment and ensure safe food, we didn’t reach to commercial stage. For getting certification, at first, we have to apply, and then the certification authority will come for inspection for three years. Till now, we don’t have surplus production. To export in different countries, we need to follow different standard. At first, we need bilateral agreement with foreign countries where we will export. At this moment, we feel, at least, we have to start with local certification process. But in 2003, FAO measured our 10 principles with the rules of organic farming”. At present, throughout Bangladesh a total of 65,000 rural households have now converted to practicing Nayakrishi (para 14. Appendix page 175).

5.2.1.3 Community Development Association

Community Development Association (CDA) mainly deals with sustainable land use and farm management for the marginal and landless farmers. CDA provides training on compost making (CDA, 2006). Informant C₁ pointed out that farmers select crops surface rooting crops and deep rooted seasonal crops, follow crop rotation, plant green manure crops, use compost, quick compost, cow dung, azolla, etc. for soil fertility management. Mechanical and biological techniques are used to remove pests from the crop field. Crops are smaller in size, but the quality is better than chemically

produced crops. The view of CDA and their farmers is: proper knowledge and resource management are very important for sustainable agriculture.

5.2.1.4 Kazi and Kazi tea farm, only certified organic farm in Bangladesh

The farm was started in 1986 in such unfertile and sandy land that tea board was suspecting whether it would be possible to produce tea here or not? At the very beginning, emphasis was given on soil development by relay cropping and covers cropping. Relay crops were mainly leguminous crops those were cultivated for Nitrogen fixation. Cover crops (i.e. *dhaincha*, pulses, and bean) were cultivated to maintain soil fertility. The soil was also covered by mulching materials besides growing cover crops. Good quality straw was used as fodder for cow and bad quality was used for mulching. Till then, the farm is practicing the same practices. The farm has dairy unit in each production area. Totally 1200 cows are reared to produce compost for organic tea farm. Herbal medicines, fresh water, organically grown and purchased foods are given to livestock to produce biogas and compost. As the farm has got certificate from SGS and USDA, form their compliance, compost house is must in organic farm (Informant K₁, para 2. Appendix page 180).

Three types of dangerous pests mainly attack tea garden like Caterpillar, red spider mites, *Helopeltis*. The farm uses three round of 1% Neem oil solution (100 litre of water with 1 liter of Neem oil). Ritha (soapnut, one fruit) helps to make the solution quickly. The solution is applied only to the attacked area. If infestation is severe, the area is red marked and the solution is applied for three times and, one round solution is applied for prevention in the near by area. Secondly, some medicinal trees, like *bashok*, *nishinda*, *neem*, *amloki*, *Raktochandon*, *bakful* etc. has been planted to create the environment as pests feel to discourage to attack. In the gardens, all shade trees are medicinal plants (10 raw tea plant and then 11th raw medicinal plants, basok for the protection of pest). Marigold was also found. These combined plantations maintain ecological balance, remove negative environment, which means tea plants find a good and ecological surroundings (Observation and described by informant K₁, para. 5. Appendix page 180).

“If we use chemical fertilizer, pest comes automatically. As we don’t use chemicals, our plants don’t grow so fast, may be therefore, we don’t face serious pests’ attack. Pests are parts of our biodiversity. Sometimes, pests come naturally and if ecology is maintained in the right way, it goes naturally away and don’t arrive at the injurious level” (Informant K₁, para 5. Appendix page 180).

On the basis of observation and description of informant K₁ (para 7), it was found that the farm practices mulching instead of irrigation. In the farm area, dew falls down whole of the year at night time. If mulching materials keep on in the field, the dew water conserved rather than evaporate. After cutting the weeds with scissor or any cutter, these are covered by mulching materials. Weeds are not eradicated from the root completely as there could be possibility of soil erosion and ecological imbalance. As the farm is situated in a drought area, so water management is a big

issue. Therefore, water is always reserved in water reservoir or in tank in every tea garden. There are also good drainage systems as tea plants cannot tolerate water. SGS and USDA – each authority is visited 2 times in a year to check their conditions and compliance. The farm produces organic tea mainly for export to Europe and USA.

5.2.1.5 Dhamrai Dairy, an integrated farm

Dhamrai dairy started its' activity from 1992 with the slogan of 'healthy food, not medicine'. The concept was: using inorganic agrochemicals cannot sustain for longer. The farm processes cow dung and by products from crop and livestock farming and make safe compost and these are applied to next crop e.g. to produce grass, fodder, maize, rice instead of using chemical fertilizer and pesticides. Sometimes vermi-compost is also used. As some conventional feeds for fodder and livestock are bought from inorganic sources, so the products cannot be said as organic. For producing compost, the farm applies effective micro-organism technology. Besides dairy, fish, rice, grass, different summer and winter vegetables are also produced from compost. In case of pest control, the farm follows mainly IPM method like mechanical control and sometimes Neem oil is also used (based on the information of informant D₁).

“We don't use antibiotic, agrochemicals, urea treated straw. Our ecosystem is until now so good that if we put bamboo stick or branches of trees, then birds and other predators come. These birds and predators eat the harmful insects. If we can create the environment, the pests and insects are controlled naturally. In near future, when we will collect all fodder from our farm, then we can think the farm is organic. Now we should give the first priority on: to provide healthy life for our next generation.”
(Informant D₁, para 1. Appendix page 195)

The informant mentioned that we must follow standard – either national or international. Before thinking of export, it is necessary to establish a strong local market where farmers can sell their product where there will be very less middleman. Priority should be given on: to provide healthy life for our next generation.

5.2.2 Initiatives from government level

Where NGOs and private farms are practicing entire organic or eco-friendly approach, govt. has given emphasis on pest management. Some researchers of different government research institute are trying to implement other production practices, for instance, BARI researchers. They are working separately from their own motivation. There are some researchers who are motivating the nearby farmers to adopt organic practices and farmers have also implemented. Being a national research organization, Bangladesh agriculture research institute (BARI) has initiated research and development activities since 2006 following the IFOAM rules (Nazim Uddin *et al.*, 2007).

Informant G₃ started to work on organic farming with his research work on 'best use of household waste and cow dung to produce rice through producing compost'. His

research result was, when compost is producing for about 3-4 weeks, and then it became very active and works very quickly. It is called 'active compost period'. In that case, no nitrogen fertilizer is necessary. Water content is the most important factor for compost making. After that, he is trying to spread the result among the farmers of different places, specially, nearby farmers in his working area. According to him,

“Compost is the main element of soil fertilization and crop rotation is the main magic of fertilization process. In some cases, bio fertilizers are applied. We are suggesting chemical fertilizers if necessary, not in excessive rate. But we are very much allergic about pesticide (para 11. Appendix page 187)”

Some projects are running under BARI in some areas of Bangladesh, where farmers are not using pesticide; rarely do they apply pesticides in case of brinjal, whereas conventional farmers apply pesticides 140-160 times in a production period. They are using sex pheromone to protect plants from pests for which they don't incur any cost. If farmers don't apply chemical pesticide, 70 sex pheromones are enough for 1 hectare of land. Some farmers use Tycograma in every 7 days as bio agent. Sometimes, mechanical method is used if pest infestation is less, and if pest attack is severe, they spray neem oil or mixer of (unprocessed) milk and water (10 litres of water + 10 gram of milk) (Informant G₃, para 10. Appendix page 187).

It was observed that BARI attached farmers mainly produce organic farming to eat fresh, chemical free products. They prepare bio or organic fertilizer by mixing poultry manure, household waste and water hyacinth; and cultivate numerous vegetables like, tomato, different leafy vegetables, spinach, cabbage, radish, ladies finger, egg plant etc. and follow crop rotation. Bitter gourd, bean etc. are produced as boundary crops; otherwise poultry birds destroy the vegetables. Community leader (F_{G1}) of Pabna BARI area reported,

“Last year, in one piece of my land, I produced onion in organic way. The yield was neither better nor worse, but profit was more. After that I planted jute and then broadcasted Aman. The yield of both jute and rice was vast more. I found onion – jute – Aman rice is very good cropping pattern. I also planted cauliflower with bio fertilizer. I have never seen such large size cauliflower. We already started to use organic fertilizer. Last year, I applied in half of my land. This year, I will cultivate my 100% land. I am thinking that I will not even go to the shop of chemical fertilizer. You know that our soil should content 5% organic matter, but it has less than 1%. If we continue this, do you think that we can survive? Organic fertilizer has the quality to provide all kinds of food to the soil. But for producing organic cultivation, we must raise cow. Otherwise, we cannot apply good quality compost” (para 4. Appendix page 203).

Farmers received organic knowledge from Bangladesh Agricultural Research Institute. A group named PCCS (producer-consumer's cooperative society) has been

formed. Farmers sell their products with fewer prices than the existing market price (but, more than farm gate price) to their consumers. The consumers provide the information, where farmers can get organic inputs and sometimes they also supply their cow dung, household and poultry wastes (Researcher's own observation, informants G₃ and F_{G1}).

Recently, BARI has joined one international program namely, ANSOFT-AFACI-BARI project where 11 developing countries are involved and the goal of the program is to promote informational exchange among ANSOFT member states as well as to develop working groups including researchers, international organizations and national authorities. Therefore, a network is needed to form to fulfill the desired goal, the endeavor. The network may contribute to scientific information and production improvement in organic agriculture and agribusiness activities. Therefore, BARI wish to spin an umbrella among the stakeholders, where researcher, planners, extension workers, donor, universities may work together with a unique approach (Nazim Uddin *et al.*, 2007).

IPM project

IPM activity was first started in 1981 with the introduction of the first phase of FAO's inter-country programme (ICP) on IPM in rice crop. This programme provided IPM training to build the training capacity of the Department of Agricultural Extension (DAE) and to introduce Farmer Field Schools (FFS) for training of farmers. By the end of 2001, a total of 1,137 persons from DAE and about 300 from different NGOs have been trained as IPM trainers (www.moa.gov.bd/advertisement/IPM.htm). Informant G₂ mentioned that now DAE execute the programme in Bangladesh through farmers' field school. The duration of IPM training is 14 weeks and 50 hours. Mainly two types of crops are selected for example and practical knowledge: rice and vegetables (cucurbits, cauliflower groups, bean type crops and brinjal).

“Totally, we teach them, how they can produce insecticide free crops and vegetables, but not fertilizer free, proper and balanced dose of fertilizer. We discuss about total crop management, e. g: fertilizer management, water management, pest management, disease management, weed management, because, pest management is not a single activity. In any case, if they need to apply, they must use by following 4Rs: RIGHT INSECTICIDE, RIGHT DOSE, RIGHT METHOD AND RIGHT TIME” (informant G₂, para 2. Appendix page 185).

IPM project of DAE works with three motives: lessen production cost, produce more and keep the environment safe. Govt is now trying to go far from applying more chemicals. To implement about this, informant G₂ stated,

“First year, we suggest them to organic in 50% land and inorganic in another 50% land. Here, organic means ‘pesticide free’. Soil fertility is managed by using organic fertilizer, leguminous crops, green manuring, crop rotation etc. Pest is managed by

biological and mechanical pest control that we teach them in IPM training. In the second year, we suggest them for 75% organic and 25% inorganic. In the third year, 100% organic” (Informant G₂, para 1. Appendix page 185).

Informant G₄ stated that before 40 years, govt. motivated farmers to apply pesticide and distributed it freely. The govt. employed extension workers went to farmers’ crop field and applied to the crop. However, govt. has come far away from that point that it started to use pesticide. Informant G₁ expressed that the Economic division of BRRI has found that IPM training has increased the farmers’ knowledge. Result also showed that farmers increased their productivity from 8-10% because of increased knowledge, better management, use of balanced fertilizer, good land preparation, good healthy seeds etc.

“Previously farmers thought that all insects are bad. Now they know that there are some beneficial insects which can eat the harmful insects. They have reduced the use of pesticides. They don’t apply pesticide just to see any pest at their land. At first, they think it is necessary to control the pests. They also try to use different methods of pest control. They know as well which variety is suitable for which season, how land could be well prepared, which fertilizer is for which use etc. (Informant G₁: para 10, Appendix page 164).

Informant G₂ described (para 5. Appendix page 185) that Bangladesh Agriculture Research Institute (BARI) & Department of Agriculture Extension (DAE) provided synthetic sex pheromones and beneficial insects to a number of farmers in some vegetable growing hubs and find out if these inputs could replace harmful pesticides to reduce damage to public health as well as harmful pests can be controlled by using sex pheromone traps.

“When farmers started to use sex pheromones and beneficial insects, the rate of damage diminished. We have to bear Tk 15,000 as cost for chemical pesticides only to produce bitter melon per hectare of land. Now, we need to spend only Tk 4,000 for the same size of land” (Stated by farmer during observation)

Informant G₂ pointed out that one fifth of the total output of aubergine in Bangladesh produced in Jessore. Over the last couple of years, they have been doing away with pesticide use and yet having far bigger harvest of brinjal with no pest attacks at all. Artificial secretion of sex pheromone in brinjal fields is the secret behind the magic.

The potentiality of bio pesticides has increased substantially in recent years, as extensive and systematic researches have enhanced their effectiveness. Recently scientists of Bangladesh Agricultural Research Institute (BARI) have developed bio-rational based IPM packages against several destructive insect pests of different vegetables crops. Some of the examples are: sanitation (weekly removal and destruction of pest-damaged shoots and fruits that harbor brinjal shoot and fruit borer (BSFB) larvae from the field), use of sex pheromone, artificial release of bio-control

agents, mechanical control, spraying of soap water, community based IPM approach etc. However, initiatives of different private companies on different bio-rational products development and marketing have been started from 2005 in collaboration with BARI. During that year, only around 140 hectare of vegetable lands was cultivated using pheromone and bio-control agent. However, the coverage of bio-pesticide increased several folds thereafter and during 2009-10, the coverage extended to more than 16,000 ha with a sale value of more than 20 million taka (increased 120 times within 5 years period). However, during the initial period, only pheromone had good demand among the farmers, because farmers convinced very quickly by its practical and visual actions (Based on the information of informant G₆; para 8. Appendix page 190).

Informant G₆ also described that some farmers of Bangladesh are cultivating organic products unknowingly; for example: indigenous & tribal people of Hill Area are producing vegetables organically from long ago due to their ignorance about chemical fertilizer, pesticides and herbicides. The farm families rear domestic animals and birds at their home. They make farm yard manure from animal's excreta from historical age.

In context of Bangladesh, along with the short term measure of pest management, the long-term goal of IPM is to achieve sustainability of agricultural production. But it is true that only 4 percent farmers of the country have received this training (MOA, 2012). Like the farmers of other Asian countries with similar IPM programmes, the IPM-trained Bangladeshi farmers were also able to reduce their pesticide use to the extent of 80 percent with an increased yield of about 10 percent (Informant G₆). However, to ensure a significant and positive impact of IPM at the national level, training needs to be arranged for a large number of farmers (MOA, 2002).

ICM approach

The current Integrated Crop Management (ICM) is much broader concept than the IPM. It deals with several major aspects of farming, including the importance of quality seeds, soil health, soil fertility management, integrated pest management and homestead vegetable production (informant G₁). About including good variety, the informant mentioned as:

“If we want to get good yield, we need good variety of seed, not only good or healthy seed or the seed which germination is 100%, from where we will get higher production. In our village culture, in case of marriage, people check the heredity. Why? Heredity means variety, good variety. . For example, in case of rice, BRRI-29 is a good variety; other varieties don't give good yield. If farmers use healthy seeds from any other less quality varieties, then it is not possible to get good yield. So, first component of ICM is good variety, good seed, good plant” (para 7. Appendix page 193).

Homestead vegetable gardening is another important point of ICM. If farmers produce vegetables throughout the year, then s/he can keep some vegetables with

family members and some can sell. So, farm family will get nutrition from his own source and can save some money and get extra income. The women in Bangladeshi villages are anaemic. If they go to doctors, then they suggest, taking iron tablets. But if we produce *Kalmi shak*, *Lal shak*, *banana*, *guava* etc, they can get iron all time. If farmer's plant *Kalmi shak* for one time, then it spread for whole the year and farmers can cut every 2 days for consuming (informant G₁, para 7. Appendix page 193).

5.3 Comparing the local and international standards

The comparison between the local and international standard is necessary to know that how the local practices are far from international standard. In this section, considerable international organic production standards have been measured. Table 6.1 shows the comparison among different standards in terms of production practices.

The main theme of Proshika is: Soil nutrients can be supplied from soil through proper management. If we do not destroy fertility by improper management, it doesn't need to apply from external sources. The only issue we have to add is management. Ubinig's theme is: seed is the main input of agriculture. Seed determines what other inputs are necessary for crop production. If farmers use local seeds and follow crop rotation, farmers will get sufficient production and soil fertility will be maintained. Chemical fertilizer and pesticide has a positive relation. If farmers apply fertilizer, pest will automatically attack. Proshika and its contract farmers were motivated to such farming due to their consciousness about soil quality degradation for the impact of green revolution and influence of Proshika. Nayakrishi farmers were motivated due to input shortage, increasing cost of farming, leaving farming occupation etc. reason - especially after natural disaster. However, Proshika and Nayakrishi farmers are now philosophically motivated. The private farmers are also motivated from their own philosophy as they are educated and now they turned to the market demand. Kazi farm is already certified from SGS and USDA. In case of Dhamrai dairy, some of the feed stuffs for livestock are not organic, supplied from market; therefore, it is not completely organic but as other inputs are collected from internal sources it can be treated as eco-friendly farm.

It has been found that Proshika, Nayakrishi, BARI farmers, Kazi and Kazi tea are practicing mulching, selection of appropriate species and varieties crop rotation with leguminous crops, mixed cropping, cover cropping, green manuring, composting, mechanical eradication of weeds, traps and barriers, protection of natural enemies of pests through provision of favourable habitat, such as hedges and nesting sites for pest control. Government has given emphasis on pest management and farmers who have extension contact with DAE; they are practicing IPM practices very well. DAE suggest farmers to apply chemicals followed by four conditions as last resort – right insecticide, right time, right doses and right method. Kazi and Kazi tea has established ecological buffer zones through the plantation of medicinal plants. Additionally, Dhamrai dairy is rearing poultry without any antibiotic.

Proshika and BARI farmers apply cowdung, vermi compost, quick compost, fragmented juice as organic fertilizer. *Sesbania*, household waste, trees leaf are used

as green fertilizers. Nayakrishi farmers also follow this. In addition, women of the households put all organic household and kitchen residuals in a pit to be rotted and cover it for making compost. CDA farmers use kitchen residuals, cowdung, and tree leaf. Cow dung from the organic dairy farm is used to produce compost in Kazi and Kazi tea farm. Other farmers don't follow strictly the fertilization policy. Proshika and BARI farmers are not considering the origin of manure but Nayakrishi farmers are composting manure in household which are also originated from organic sources. So, Proshika and BARI farmers can be compared with US standard and Nayakrishi farmers with EU and Japan. `Kazi and Kazi tea` and `Dhamrai Dairy` - are also using compost from their farm animals. The standards have been compared in Table 5.3.

Bangladesh agriculture is in vicious circle due to using chemicals. Govt. slogan is `produce more food` and subsidy and agricultural loan for providing HYV and chemical inputs. Farmers are poor and their knowledge is also very poor on organic farming. Media campaigns and untrained neighbours put pressure on organic farmers to use chemicals for high yields. Insufficiency of organic inputs is a main problem in Bangladesh for promoting organic farming. Organic concept is introduced by NGOs. At present, govt. also started to think about sustainability in agriculture. If we consider the local practices of selected Bangladeshi farmers, then Proshika gives emphasise on crop rotation and compost, UBINIG – on local variety seeds and govt. – on pest management. Nayakrishi farmers are very near to the standard of EU, USA and Japan. Kazi farm is already exporting 100% of their products in the USA and EU countries. Proshika and BARI farmers and Dhamrai dairy need to improve animal husbandry and fertilizer management to reach at international level. If we follow the adoption process (Rogers, 1983), Kazi tea farm and Nayakrishi farmers are in adoption stage. Proshika and BARI farmers and Dhamrai dairy farm are in trail stage. Farmer who has extension contact with govt. is in awareness stage.

CLASSIFICATION OF ORGANIC AND ECO-FRIENDLY FARMING

Table 5.3 Comparison of different local standards of organic practices

Categories	PROSHIKA	UBINIG	CDA	Kazi and Kazi tea	BARI
Organic products	Vegetable and cereals crops, aquaculture, apiculture.	Vegetable, fruits, oil crops, cereals.	Vegetable and cereal crops	Tea and medicinal plants	Vegetables
Conversion period	farmers converted their land into organic from 12 to 15 years		1	5	5-7 years
Seeds and planting materiales	Proshika members produce seeds	Farmers produce seeds and store in own house and community seed store	Farmers collect good quality fruit for seeds and dry.	Kazi and Kazi tea maintains good quality planting materials	BARI contact farmers are preserving good quality seed for each crops.
<i>Crop diversification</i>	All standards follow crop diversification				
Fertilizer management	Apply compost; follow crop rotation, green manuring, mulching.	Apply compost; follow crop rotation, green manuring, mulching.	Kitchen residuals, cow dung, tree leaf.	Cow dung from the organic dairy farm is used to produce compost	Apply cow dung, vermi compost, quick compost,
Manure	Don't consider origin of manure	Every household prepare compost from organic sources.	don't consider origin of manure	Compost from their farm animals.	don't consider origin of manure
Pest, disease, growth, weed management	Farmers select appropriate species and varieties, follow crop rotation, mechanical protection etc.	Farmers don't use any type of pesticide (organic or inorganic)	Mechanical control and use resistant varieties.	Kazi and Kazi tea has established ecological buffer zones with plantation of medicinal plants.	Farmers doesn't use pesticide
Avoiding contamination	Group members can only avoid contamination.	UBINIG farmers established eco-village	No rules	Only Kazi tea has established buffer zone.	No rules
<i>Soil and Water conservation</i>	Resources should be handled in a sustainable manner.	protect improper use and pollution of surface and ground water	No rules	Follow US standards	No rules
<i>Animal husbandry</i>	PROSHIKA, UBINIG, CDA, Kazi and Kazi tea and BARI farmers are following rules like IFOAM: sufficient free movement; sufficient fresh air and day light; protection against excessive sunlight, temperature, rain, wind; enough lying and resting area and access to fresh water and feed.				
<i>Labelling</i>	Proshika Logo	UBINIG logo	There is no logo	Kazi tea logo	No logo
<i>Environmental aspects</i>	Healthy soil and environment	Healthy food, healthy environment and happy life	Ecologically balanced environment.	Healthy life	Green food and healthy environment

Source: Author's own comparison

5.4 Conclusion

Bangladesh is exporting some agricultural crops but not as organic. For exporting as truly organic, certification is necessary. But certification requires bi-lateral or multilateral agreement between countries, time for inspection and money. On the other hand, we need to provide good quality chemical free foods to the consumers at local and national level - for which certification is not necessary. The exported agricultural products are also consumed by ethnic consumers, they don't require certified organic. But the products are accepted in the international market as harmful chemicals are not found.

It could be mentioned here that less than 5% farmers follow organic practices. There is also lack of conscious consumers for which organic farming is not locally recognized. So, we have to identify what are the problems in the way to get recognition. Both producers and consumers have to know how they will be benefited from organic farming. Producers benefit is to keep the fertile soil for future generally; and consumers' advantage is good health. To implement this, the problems and opportunities need to be analyzed. Government has also started some measures in favour of eco-friendly issues very slowly. Government has turned to integrated farm management from pest management views. But how much, it would be successful, that is another question. Without identifying problem, taking some initiative may likely cutting the tree from the root, but pouring water from the top. Therefore, the next section will be continued on problems and probabilities based on the field study results.

CHAPTER 6 BARRIERS AND OPPORTUNITIES IN THE WAY OF ORGANIC PRACTICE IN BANGLADESH

6.1 Introduction

Modern agriculture methods have brought spectacular increase in productivity –more cereals, more food products per person employed. Given access to sufficient inputs knowledge and skill, large amount of food can be produced. But most farmers in developing countries like Bangladesh are poor and marginalized from inputs and products markets. Thus an important question is: how farmers can produce more food with cheap, low-cost, locally available technologies and inputs; as well as they can do it with methods that do not add to existing environmental harm caused by agriculture. In contrast to modern system, organic agriculture represents a purposeful attempt to make the best use of local natural resources. The aim of organic agriculture is to create integrated, environmentally and economically feasible agriculture systems in which emphasis is given on utilizing locally available renewable resources (Scialabba and Hattam, 2002 in Jimenez, 2006). The use of external inputs is reduced as far as possible. Recently years have seen an impressive increase in adoption of organic cultivation in many developed agriculture. To implement the system of developing or under developed agriculture, the strength and weaknesses needs to be identified.

6.2 Barriers to promote organic farming

The main question of this chapter is: why farmers cannot promote organic farming in Bangladesh. What are the obstacles that farmers are facing? Though we have very little number of true organic farms, there are some non-certified organic or eco-friendly farms. The basic information has been collected from the key informants, who are trying to promote eco-friendly or organic practices. After analysing those information, the problems will be identified that will guide us to forward recommendations. However, the major barriers have been presented in Figure 6.1.

6.2.1 Barriers from policy level

Government think: organic farming has negative impact of on food security

Political decisions highly regulate the agricultural sector in Bangladesh. In 1965, the Government launched a 'Grow More Food' campaign, introduced HYV rice (i.e. IR5 & IR8) and provided fertilisers and low lift pump (LLP) at a highly subsidized rate with pesticide at free of cost to popularize these inputs among the farmers and meet the country's food shortage. Since 1980s, Bangladesh has received more than doubled the production of cereal grains, despite a continuous decline in arable land. Our policy level think that without this impressive growth in the production of cereals, poverty and food insecurity would have been much worse than it is today. The political government frequently declares 'we are now self-sufficient' or 'our food security has been achieved' and they make it a weapon to win the elections (Baten, 2010). According to Informant G₃, *"In policy level, importance is given on fulfil of stomach, not considering disease and health hazard. Nutrition and health*

development are not given importance for policy makers” (Informant G3, para 2. Appendix page 186).

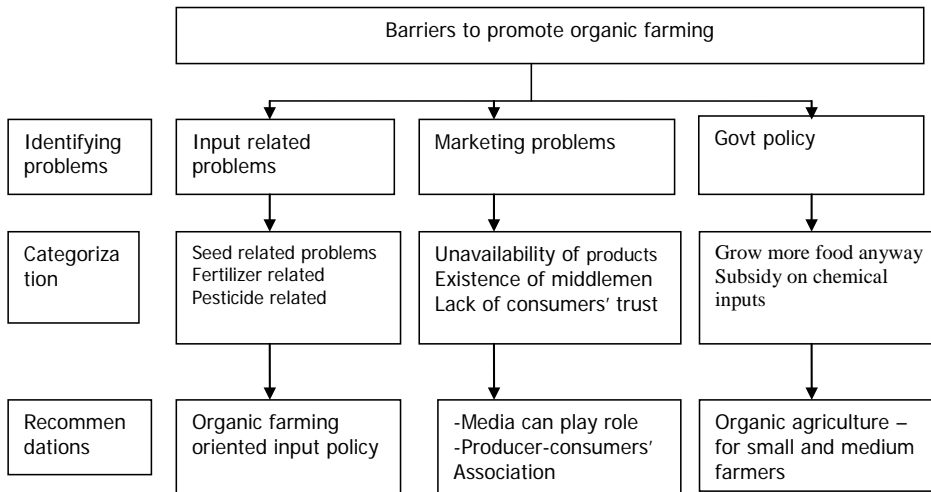


Figure 6.1 Major barriers of organic farming (Author’s perception)

It is claimed that, organic agriculture gives lower yields, and there isn’t enough organic fertilizer to boost yields substantially. In Bangladesh, by food security, govt. implies the availability of rice. Similarly, a farmer in Bangladesh feels secured about food if he has required rice in his house (UBINIG, 2011). The main purpose of Bangladesh agriculture is to provide food for her increasing population. Therefore, it is always advertised from the policy level ‘grow more food’. Informant G₃ opined as:

“We must produce adequate food. Otherwise, we have to import for which price will be more. Due to lack of purchasing power, there will be famine and many people will die due to lack of food. We have to use HYV and hybrid seed which means high input variety. We don’t have enough livestock to produce compost or organic inputs that we can convert our 10% of our land to organic. So, we need to use chemicals. If we practice organic, our production will be less. So, in Bangladesh, organic farming might be not possible in large scale.” (Informant G1, para 1. appendix page 182).

While Ministry of agriculture always try to implement grow more food by applying chemicals, some govt researchers’ view is different. Their view is: ‘provide food for all, not poison’. Informant G₃ mentioned:

“When we raise our voice about organic food, policy makers always say, this is a threat to our food autarky – which is not right. Our yield has decreased 40-50% for the dependency on chemical inputs. Govt. thinks, environmental workers are trying to create a famine and expressing different view than Ministry of agriculture– which is very harmful for the country.” (Informant G3, para 7. appendix page 187).

Eighty percent arable land of the country is now offered for cultivation of rice. But still Bangladesh needs to import rice. This is because the high yield claim is turning into high input requirements and trade off with other food crops.

Allocation of budget to subsidy on chemical inputs

Even though agriculture sector receives a substantial priority in the budget, most of the resources are allocated to short term measures such as subsidy in fertilizer and irrigation. For instance, in the financial year 2009-10, 7.9% of annual budget was allocated to agriculture. Only 2% of agro-budget was allocated for agricultural research. Unfortunately, no long term strategy had been proposed to conserve or effective use agriculture biodiversity, or judicious use of local high yielding variety for improving food production. Moreover, in 2010, government announced an increased allocation of subsidy in non-urea fertilizer to 55% than previously proposed 15%. However, the subsidy mainly targets fertilizer, irrigation and other mechanized agriculture inputs rather promoting biodiversity based ecological agriculture (Baten, 2010).

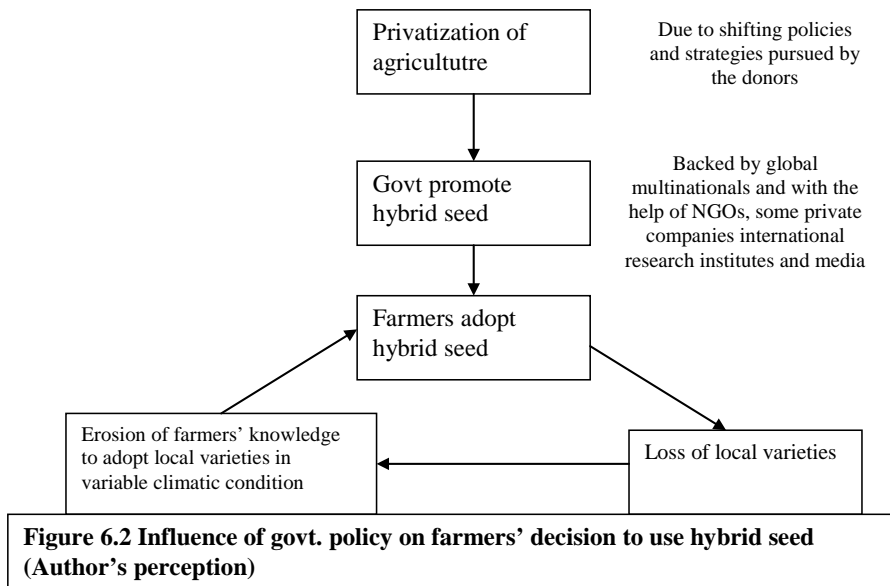
6.2.2 Input related problems

Is promotion of hybrid seed a problem for Bangladesh agriculture?

Farmers of Bangladesh mainly use three types of seeds: imported hybrid, high yielding variety (HYV, local and imported) and indigenous local varieties. The local varieties, farmers can produce without using chemicals by following crop rotation and maintaining proper management. Farmers can conserve the seeds for the next season. As farmers own the seed, they can produce how many crops as they want. But, there is problem with imported HYV and cross breeds that adaptability power is very less. In Bangladesh, hybrid seeds are imported from the countries where the weather is not similar as Bangladesh. So, it is very difficult to adapt in local environment. HYV seeds are produced in laboratory and cross breeds are in commercial farms. Both of them are produced in artificial environment with using high chemical inputs. Their characters change due to applying high dose of chemicals and become highly dependent on hybrid seed package which include chemical fertilizers, pesticides and irrigation water. As a result, organic/ bio fertilizer doesn't work at the time of production (Informants U₁ and P₂). Now the question arises, why the farmers don't use local variety, and why again and again, they are being compelled to go for cultivation dependent on fertilizer-pesticide-irrigation? The answer could be the govt policy to promote hybrid seed backed by multinational companies with the help of some NGOs and international research institutions.

“Once there was a time, govt. officers used to come to farmers and told them to go to the market in the evening to take tea. At night, the male members of our village used to come back with some hybrid seed, fertilizers and pesticides. They distributed us free of cost,” community leader F_{G3} expressed (Informant F_{G3}, para 4, Appendix page 201).

Due to adoption of trade liberalization policies by the government, Bangladesh was imposed to allow World Trade Organization (WTO), International Monetary Fund (IMF) including many multinational corporations to come forward to control the agriculture sector of the country. UBINIG feels that government is patronizing HYV and hybrid seed and taking the opportunity in the name of natural disasters and to feed the nation. The focus of government has been shifted from ensuring more agricultural yield to ‘commercialisation’ of hybrid seed. At the same time, hybrid seed companies are getting power to dictate the Ministry of Agriculture. The extreme commercialisation of hybrid seed could be detrimental to food security, both at the household as well as national level (UBINIG, 2008 and informant U₂).



“Seed is the key of agriculture. That key should be to our own hand. As hybrid varieties do not produce seed, so farmers cannot save hybrid seed for the next season. Every time, farmers have to buy. Farmers normally get very limited time for planting seed. There are many examples that farmers waste their valuable time for buying seed. Sometimes dealers make artificial crisis for getting higher price. In this way, the legal right of farmers over seed, which they practiced from long time, now handed over to the companies; hence, the producer (farmer) has become consumer of some transnational companies. In this way, the Bangladeshi farmers are experiencing tremendous seed crisis” (Informant U₁: para 16. Appendix page 176).

Hardly there is any research on the local varieties and practices to address local variety seeds in variable climatic situations. From synthesizing farmers’ view, it was found that ‘due to excessive dependency on hybrid, farmers’ knowledge on local varieties has been seriously eroded. This tendency will make farmers more vulnerable

to meet climate change challenge. Management of hybrid seed is so ‘complex’ that if mishandled it could lead to total crop failure’.

Govt policy and imbalanced fertilizer use

Fertilizer becomes a very sensitive and political issue in Bangladesh agriculture. Sometimes, the ruling political party loose popularity, if it failed to meet the demand of fertilizer timely. From the green revolution period, govt promoted fertilizers and now farmers have adopted in a way that they think, ‘We are farmers and fertilizer is our life. Which party can ensure us to make fertilizers available in the market, we will cast vote in favour of that and help them to come to the power’. Therefore, ministry of agriculture tirelessly work to meet the demand of fertilizer. But it is not possible to get supply of all kinds of fertilizers.

We know that there are 46 micro and macro nutrients. Farmers of Bangladesh are familiar with mainly three fertilizers, urea, triple super phosphate and muriate of potash. Farmers try to use these three but their use depends on the price and the availability of fertilizers in the market. As the price of Nitrogen fertilizer is lower than other fertilizers and availability is also more, therefore mostly they use urea, not balanced fertilizer. Due to excessive and unbalanced use of fertilizers, soil becomes unfertile. As a result, production decreases; and next year, farmers apply more fertilizers. One statistics show that fertilizer consumption has increase from 313 thousand tones in 1970-75 to 3,223 thousand tones in 2000-04 (Shah, *et al.*, 2008).

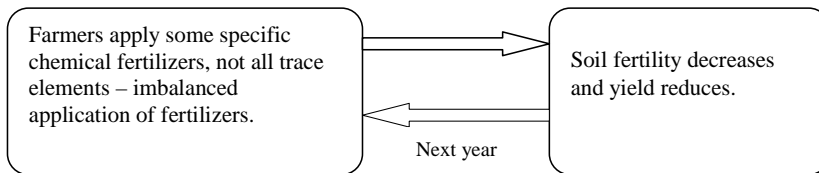


Figure 6.3 Vicious circle of imbalanced fertilizer application and decrease in production
(Author’s perception based on literatures and answers of key informants)

Though government of Bangladesh is aware about to avoid or reduce the amount of fertilizer, to feed the huge population, government has to take policy to produce more food to meet immediate demand by using more fertilizers. The government’s remark is:

“We have to produce large amount food to keep pace with population growth. To do this, we need to use more inputs. If we use conventional seeds and don’t apply fertilizers, we will loss huge amount of crops. There will be famine and many people may die due to lack of food” (Informant G₁, para 9, Appendix page 184).

There are many constraints to the use of organic fertilizers at farm level. The major problems could be identified as: use of biomass, crop residues, animal dung, etc. as fuel or fodder; unavailability of green manuring seeds due to mono cropping; the tendency of sharecroppers to maximize their yield; Lack of farmers’ know how on

soil organic matter management; lack of proper extension service; necessity of more labour and hard work to produce organic fertilizer etc.

Pesticide – The most dangerous chemical in Bangladesh agriculture

Farmers of Bangladesh started to use pesticide in 1957 with 3 tons of imported pesticides. Before the introduction of HYV rice, applications of pesticide were very limited. With the higher yield potential of HYV rice, farmers who applied fertilizers to increase production, felt compelled to protect from severe outbreaks of pests with dangerous pesticides. Until 1976, the government promoted the use of pesticides by supplying it free of cost to farmers (100% subsidy). Extension workers went to farmers' crop field and applied to the crop. The subsidy was reduced to 50% in 1976. The pesticides business was moved to the private sector which leads to a decline in consumption level in 1979 and subsidy was completely withdrawn. The use of pesticides again increased in 1987 and until now, it holds the trend. Insecticide was commonly used for pest control, which accounted for approximately 90% of total consumed pesticide (UNESCAP, 2002). Bangladesh crop protection association alleged that 15,376 metric ton pesticides had been sold in Bangladesh in 2001 whereas it was 37,712 metric ton in 2007 – amount of pesticide use increased 145.26% within seven years. Now question arises, what are the reasons that farmers are using chemical pesticides?

Why farmers use chemical pesticides?

i) Relationship of hybrid seed-fertilizer-pesticide

There is a positive relationship between chemical fertilizer and pest infestation. When fertilizer is applied, crop plants grow so fast that pests come to eat the small and soft leaves. So, as much as farmers apply fertilizer, as many as pests will come (Informants U1 and F_{P2}). The organic theme is: if the soil health is good, plant health will be good and they will not be attacked by disease. Informant G₅ opined as:

“Due to lack of proper management, soil is becoming degraded. Degraded soil is unhealthy soil. Unhealthy soil grows unhealthy plants that are easily attracted by pest (insect & diseases). Then farmers use chemical pesticides to kill the pests which are poisonous and harmful for all living beings. There is no consideration of the root causes of pest attack and consequently, pest problems are getting worse” (Informant G₅, para 10. Appendix page 191).

ii) Sales promotion of dealers and companies, lack of facility at DAE and illiteracy of farmers

During the era of green revolution, govt. motivated farmers to apply pesticide. Now farmers are so habituated that they cannot think crop production without using pesticide. *“When chemicals came into our agriculture, that time, people didn't want to accept, even these inputs were free. After that, farmers started to use, now to come back, farmers need to adjust slowly. But people are changing their belief” (Informant F_{P2}, para 4. Appendix page 198).*

Informant G₂ mentioned that many pesticide companies have been established last two decades. They try to advertise their product and in most cases, farmers become bias. DAE is motivating farmers in different ways not to use chemical pesticides. But farmers don't want to accept. Companies have dealers in every village. They are going to farmers' door to door influencing every farmer. Informant G₃ expressed his view as, *"When the pesticide dealers or sellers sell the pesticides, they suggest farmers to hang the container in the middle of the field as after watching the container may be the neighbour farmer will think that 'my neighbour has applied pesticide, If I don't apply, my crops will be infested from pests'. This process is just to motivate others to use pesticides. Sometimes, dealers are so active that they are going to crop field with bottles of pesticide and tell the farmers that you don't need to pay money or you can pay later for this pesticide. But we don't have enough strength"* (G₃, para 11, Appendix page 175). There are 12,500 sub assistant agricultural officers working under the department of agricultural extension to advice farmers that are very few compared to 11.8 million farm family. Each of them needs to visit everyday at least 40 farmers, which is very difficult (Informant G₃).

Informant F_{P2} said, *"I have never seen any govt official, or supervisor. Govt always say, we have less manpower, but those who are govt. field workers, they never come to us. But company people are going everywhere to sell their chemical products; and some NGO workers come forward to stop the use of chemicals. Sometimes, local agriculture office suggested to use low amount of fertilizer but to avoid pesticide"* (Informant F_{P2}, para 9, Appendix page 199).

Most of our farmers are not well educated. When farmers notice about pests and diseases or any kind of problem in their field, they always interested to go to dealers rather than come to formal extension workers. Dealers take the opportunity and they recommend and sell those pesticides which are available to them (Informant G₄: para 7, Appendix page 183).

Observation 1: An intelligent farmer Mostafa (38) from Narshingdi district: He planted Boro rice and flowering was happened in right time. On 10th April, 2008, he was doing intercultural operation in his field. Different coloured polythene and plastic bottle were hanging over the branches and sticks. Mostafa said that these were the empty packets and bottles of pesticides which he applied in field. It was asked to him that whether any insect or pest attacked his rice. He answered, "No, but any time insects and diseases can attack. So, these are preparations in advance".

Observation 2: Farmer Abdus Satter (33 years old) was going to his home from the market. He was bearing two bags in his two hands. There was urea fertilizer in one bag and soybean oil, salt, potato, onion and one packet of pesticide in another bag. He expressed, "I planted Boro rice two months before, but Stem borer attacked my rice field. I will mix the fertilizer and pesticide together. Then I will apply to rice field. When it was asked, "do you know how dangerous is to bring pesticide with food items?" Abdus Satter replied, "We are watching and doing this from our birth". In fact, he was bearing 'siren 20 EC' which is applicable to control Cut Worm of potato and jute, not at all for rice stem borer. Abdus Satter is illiterate. He said, "If we need medicine (pesticide), we come to Matin (salesman). We take medicine according to his advice. Matin is a great entomologist as well as pathologist for us". While interviewing Matin (42), it was found that the representative of company told him to sell this medicine. Matin is engaged in his business since last 17 years and his educational qualification is class V. He has no training on pesticide but has licence from department of Agriculture.

A survey was conducted by CARE about testing of farmer's knowledge about rice insect pests. The results indicate that very few farmers could identify major pests; they were not able to differentiate between rice pests and predators. Previously farmers felt that all insects were bad for crop and therefore insecticides should be applied in order to ensure healthy crop (UNESCAP, 2002). IRRI research found that since last 40 years, 85% of pesticides in Bangladesh was used unnecessarily. Farmers felt that may be pests will attack and they used pesticides (based on the information of informant P₃, para 4. Appendix page 172).

iii) Lack of organic pesticide

According to informant G₄, farmers spray the crops with harmful chemicals as they cannot get organic pesticides and the components of biological pest control. It was found that farmers in some areas of Jessore district were producing vegetables at lesser costs while protecting the environment. It could be noted that Jessore is an intensive vegetable growing area and one fifth of the total amount of aubergine in Bangladesh is produced in Jessore. The frequency of spraying insecticides in brinjal was 84 times in 1994, at least twice in a week. But in 2001 and 2004, the frequency increased to 140 and 160 times respectively, they had to spray at least once everyday. It means the pests were becoming drug-resistant, but the scene was started to change in 2008. They stopped to use pesticide. The informant also mentioned that the Magic Traps are popular among farmers of Bangladesh but ironically the supply is so little that farmers face problems for controlling pests in a natural, environment-friendly, safe and secured way to enhance crop production (G₄, para 2, Appendix page 179). Informant G₄ stated that there is also huge demand for bio pesticide like bracon, tycograma for vegetables but the government has not yet approved to bulk import and mass use of pheromones (Informant G₄, para 5. Appendix page 189).

iv) Rules of buying and selling pesticides

The present continuing rules '*The Pesticide Rules- 1985*' and getting licence of dealers is one of the main reasons of uncontrolled buying and selling of pesticide. According to that regulation, any adult person aged from 18 to 55 can get licence with only Tk. 75 of retailer and Tk. 300 for wholesaler. Neither educational qualification nor training on pesticide use is precondition for retailer or wholesaler. Any illiterate person can get the licence. On the other hand, any buyer can buy any amount of pesticide – which is very dangerous (Informant G₄, para 7. Appendix page 182).

It could be therefore said that not only lack of farmers' knowledge, but also unconsciousness, commercial mentality and lack of knowledge of pesticide wholesalers and retailers are responsible for this increasing pesticide use.

6.2.3 Problems of marketing of organic products

Marketing of agricultural commodities is a crucial in Bangladesh. In case of eco-friendly or organic product marketing, the problems can be analysed under three

different circumstances, like, consumers' awareness, lack of consumers trust on organic products and irregular availability of products in the market.

Informant P₂ mentioned, *“Though farmers produce organically, but our consumers always look for good looking, glossy and big products. Organic products are not always good looking. If we bring these to Dhaka city, we cannot sell without consumers' awareness. If consumers are not aware, we cannot expand the market. Consumers don't know, what is organic and those who know, they don't believe the products as organic, since these are not looking very fresh than chemical used products. Even some people are studying on organic farming, they don't want to buy organic products; they don't think about its future impact on their child. We have to develop consumer's awareness. Consumers should know the harmful effect of chemicals. The issues should be broadcasted from media”* (Informant P₂, para 17. Appendix page 172).

Society for Sociological Research (*Forsa*) conducted a survey in 1997 on 1000 Germans for their view of organic products. It was found that the lack of trust of organic products and the lack of availability - were two of the main reasons why consumers do not buy more organic food. The trade sector saw that lack of a common seal is the main limiting factor for the further development of organic market. Such a seal was launched in January 1999 and appeared on the market in January 2000 (Haccius and Lünzer, 2000). Beharrell and MacFie (1991) mentioned that consumers generally link quality of organic products with its appearance, but Lin et. al. (1986 cite in Bonti Samuel and Yiridoe, 2006) found that organic consumers consider 'appearance' as less important factor with a high preference for chemical-free products. In general, taste of the product, freshness and shelf life are other characteristics that shoppers consider in their purchase decisions.

Another informant P₃ found, lack of proper marketing is a major problem. Regarding this issue, he pointed out, *“Contract farmers can produce huge amount, but we don't have marketing facility. There are 0.5 million families in Dhaka who would like to buy chemical free product. But we don't have the capacity to reach them. In my family, I started to buy chemical free vegetables. But these are not available daily in the market. When I buy vegetables produced with chemicals, my family members don't eat these. In this way, they stopped to eat vegetables. Instead, they are eating red meat (beef) or fish where the traders use formalin. But chemically produced vegetables are better than formalin mixed fish. So, we are in dangerous situation due to lack of proper marketing system”* (Informant P₃, para 8. Appendix page 182).

Informant G₃ told about another issue like: *“Previously, there were some organic super markets. But they failed due to lack of trust. People didn't believe that those were safe food. So, firstly we have to create consumers for our products. If consumers can trust, the rich and educated people will buy with 2/ 3 times higher price”* (Informant G₃, para 14. Appendix page 196).

There are some mega shops in the big cities that are helping farmers to sell their products by chain marketing systems. They have a different shelf for organic

products sealed “produced by XX”. But when, production is more, they cannot buy the whole amount and there are some eco-friendly areas where wholesalers never go to buy the products. In that case, to create demand from local consumers is necessary.

6.3 Possibility and opportunities of organic farming in Bangladesh

Organic agriculture is not only a philosophy but also a means of achieving sustainability in agriculture that addresses economic, social and environmental issue. By adopting organic, one could potential to get rid of toxic chemical pesticides and synthetic fertilizers, which over time can save from the adverse effect soil health (Crucefix, 1998). Crucefix, 1998 also classified the benefits of organic agriculture in terms of agriculture, environment, social, economic and institutional issues. Some of these benefits are presented in Table 6.1. Actually, in this section, the possibilities and opportunities of organic farming in context of Bangladesh will be discussed:

Table 6.1 Probable benefits of organic agriculture

Parameter	Potential benefits
Agriculture	Long term soil fertility, high food quality, reduced pest/disease, self-reliant and stable production, Increased diversity
Environment	Reduced pollution, dependence on non-renewable resources, soil erosion, wildlife protection, resilient agro-ecosystem, compatibility of production with environment
Social conditions	Improved health, better education, stronger community, reduced rural migration, gender equality, increased employment, good quality work
Economic	Strengthen and self-reliant local economy, increase income security, reduced cash investment, minimise risk
Institutional	Social cohesion, stability, democratic organizations, enhanced capability

Source: Crucefix (1998, p.3)

6.3.1 Organic farming and food security

World Food Summit (1996 in Scialabba, 2007) defined as: “*Food security prevails when all people, all the time, have physical and economic access to sufficient safe and nutritious food to lead for an active and healthy lifestyle.* To be food secured means: the amount and quality of food available globally, nationally and locally, access to food for people at all time, and prepared the food safely. The extent to which organic farming can contribute to food security is still being debated in the literature. Central to this debate are the issues of yield and productivity. The impact

of organic farming could be judged from the productivity of the previous agricultural system on the same land. It was found that organic farming have the biggest potential to increase yields in marginal lands or lands under traditional agriculture (IFAD 2003, 2005b). According to Woodward (1996), conversion to organic farming may affect total food production for short run in developing countries and can disturb food security, but in the long run, farmers will attain sufficiency. Madeley (2002 cited in Jimenez, 2006) illustrated that organic farming has the ability to empower women which has further beneficial impacts on food and nutrition security.

To answer the question '*Can organic farming feed the world?* Woodward (1996) replied as: "the answer depends on the definition of 'feed'. Whether feed means a diet which is diverse, fresh, low in saturated fat and cholesterol, high in vegetables, pulses, fruits and grain products, or a diet that is rich in proteins, convenient to a developed world lifestyle and high in short term pleasure?" quoting from Dennis T Avery "*Organic farming cannot feed the world, but I do not believe the world can pay for such kind of "resource-costly" agriculture much longer*". Yussefi and Willer (2003) and Sarker and Itohara (2008) have argued organic agriculture is not just a solution for developed countries, but can also be beneficial for the countries of the south, where it can contribute to purposeful and sustainable socio-economic and ecological development.

In the similar way, if it is asked 'do we only look for the amount of the food, when we think about the food security, or we will look also for food quality?' If we consider food quality, then organic agriculture is the best practice. There are some chemicals that are so dangerous that residual effect could be active for 1000 years; for example, 'heptachlor' which is used for producing sugarcane. So, for this kind of residual effect, many generations will be destroyed. So, if we want to save people from danger, we need to provide them safe food. Food for human being should be healthy and poison free (informant K₁: *para 8, appendix page 190*). Informant P₃ expressed: "*It is better not to produce food with chemicals which is harmful for body and health*" (*para 2, Appendix page 172*).

A nation is considered food secure based on four dimensions that includes food availability, food access, food stability and food utilization. A household is assumed as food secured when it can produce or able to buy adequate food to meet all of its members' nutrition needs (Scialabba, 2007). Informant P₁ expressed his view as: "*It is not sure that if a country produces enough food, all people will get sufficient food. If we think about the condition of India, we see that they are in food surplus nationally. But about half of the nation takes below 2000 kcal food, but, food is not secured in all farm or family level. So, national food security doesn't mean family level food security but the opposite is true*" (*Informant P3, para 2. Appendix page 171*).

According to informant P₃, "*If I produce 100 tons of rice, it doesn't mean that 100 families will achieve food sufficiency. If they don't produce, they will not get and, may be, they will die due to lack of purchasing power. So, it is an issue of*

distribution. Our govt, overall the govt of the third world countries are producing food without thinking the holistic approach. Their idea is, if food is produced in one country, all people of that country will get food – which is not right” (Informant P3, para 2. Appendix page 171).

Proshika contract farmers (Key informants) feel that they don't need to use a large area of land; instead they can use a small area of land to cultivate diversified crops round the year. It is possible to maximize cropping intensity is with the available land space of the farmers, investment would be less and they could gain more economic benefit within their local environment. Barua (1999a) found that organic farmers can produce several varieties of crops in different seasons of Bangladesh. These diverse varieties could eventually enrich the soil fertility as well as the nutritional requirements of the rural people. Moreover, the farmers don't need to spend their time, money and energy for chemical fertilizers and pesticides (Barua, 1999b). Supporting these views, informant P₁ mentioned,

“Due to the fact of following crop rotation and proper farm management, farmers and the whole nation can achieve food security. In Bangladesh, 70% of farmers hold 1-2 bigha of land. If farmer grow Aus– Aman – Lentil in his one bigha of land, then he will get 30 maund paddy and 4 maund lentil. After processing 1 maund paddy, farmers get 27 kilo rice. If 5 members exist in a family and needs 2 kg rice per day, they need 18 maunds of rice and 2 maunds of Lentil. After consumption, farmer can sell some rice and lentil. From 2 rice crops, farmers will get straw that he can use to feed 1 cow and 25 hens. In this way, farmers could receive 4 liters of milk from cow, egg and meat from those chickens. Almost all farmers have 3- 5 decimal homestead land, if he invests taka 2000 in the homestead land, he can manage the whole year vegetables. So, if farmers get 3 field crops, homestead vegetables for the whole year, milk from one cow, eggs and meat from 25 poultry birds, then they are food secured – this is the way to food security. We can say that organic agriculture is a way to food security for very small and marginal farmers” (Informant P₁, para 2. Appendix page 171). The concept has been presented in Figure 6.4.

Not only the producers, but the poor consumers can also achieve food security. If farmers don't use chemicals, their costs of production will decrease. They can sell their products at lower prices and consumers also would pay lower price. Informant P₁ noticed that, *“With practicing organic management, I think it is possible to keep the price of rice within Tk. 20 whereas consumers are now paying Tk 40-50. In organic way, we harvest boro rice by spending Tk. 250 per maund. On the other hand, farmers who used chemical fertilizers needed Tk. 430. So he should sell tk. 700, but if I sell with tk. 500 then profit remain Tk. 100. We get 27 kg of rice from 1 mound of paddy. So if the price of rice is Tk. 500, what price stands for per kg of rice? It is below Tk. 20. The people can buy rice in low price and farmers also get profit by Tk. 100. In this way, we will get more crops with lower cost. The conventional farmers cannot do this due to rise in price of chemical fertilizer and pesticides” (Informant P₁, para 11. Appendix page 165).*

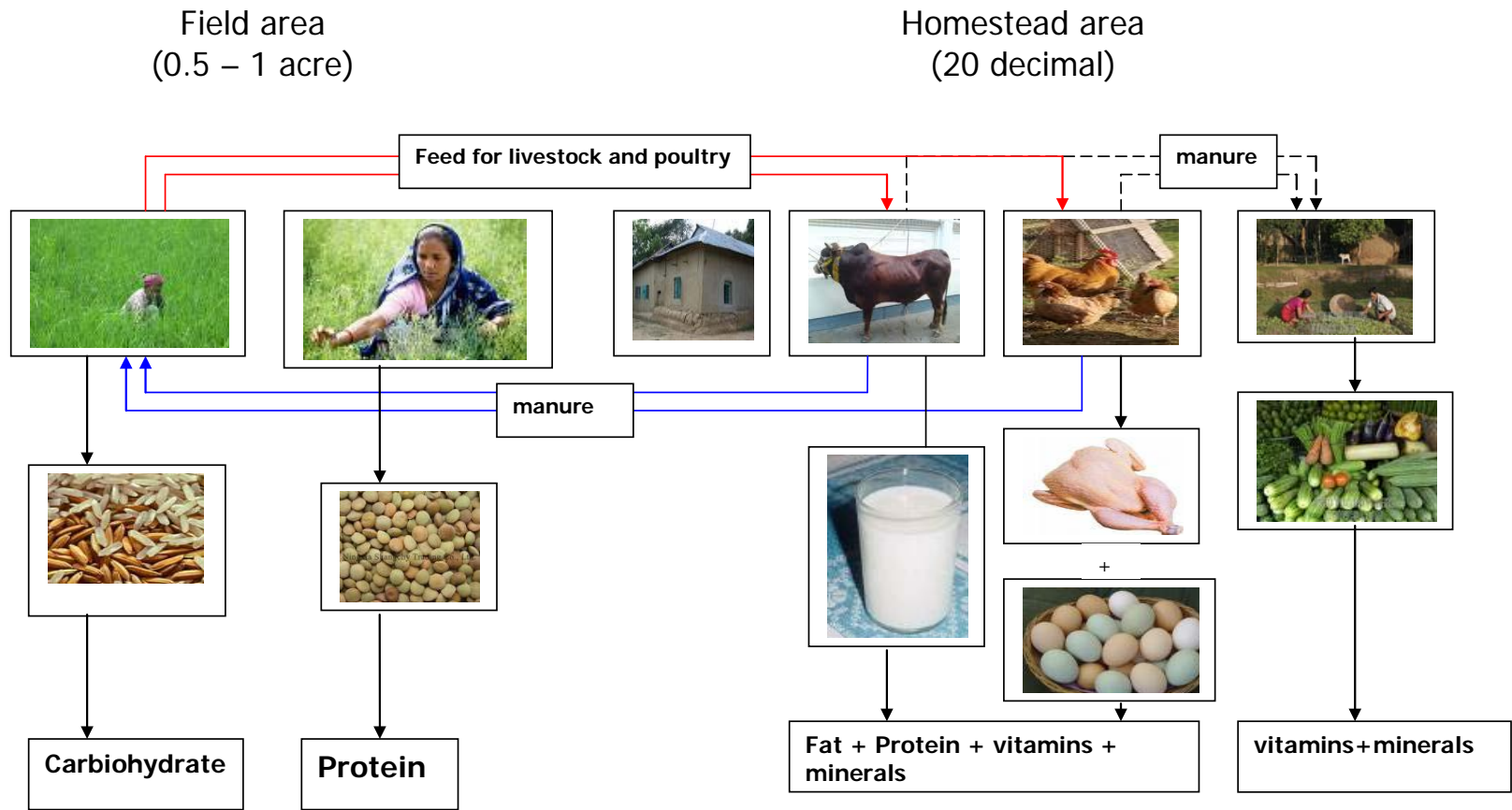


Figure 6.4: A way to food security through organic farming (Farm family will get all necessary items whole of the year) (Author's analysis based on the information of informants)

Informant P₃ stated as: *“Due to monocropping, our rice production has increased, but has food basket increased? We have lost pulses, oil seeds, and spices. We are producing Boro rice with artificial water in the winter or dry season. Water will come in the rainy season, but we cannot produce pulses, spices, oilseeds in that season. So, we may produce rice and jute in that season. Informant P₃ also stated as: “This monoculture calculation is not right, because it is leading to stop from production of other cereal crops, fish, livestock, poultry birds and many uncultivated sources of food” (Informant P₃, para 3, Appendix page 172).*

Informant U₁ also revealed that *there are 200,000 Nayakrishi families in Bangladesh. They don't have food shortage, they have food sovereignty. They are not very rich but don't feel food insecurity. They are self sufficient. Small farmers, who have 2/ 3 bighas of land, are interested to work in this way. Though Nayakrishi farmers would not go to be rich, but there is no example that they become landless. They are self contained by virtue of their engagement in the productivity (Informant U₁, para 10, Appendix page 175). Food sovereignty means that “all people have the right to get safe, nutritious and culturally appropriate food and food-producing resources and the ability to sustain themselves in the societies” (Windfuhr and Jonsén, 2004).*

6.3.2 Cost-return- profit-benefit-yield issues

Organic farming has been proved as environmentally sustainable, but can it also be economically sustainable? Many studies around the world have shown that organic farming can be a financially viable alternative to conventional farming practices. In developed countries, price premiums for organic produce also make a major contribution to the financial viability of organic farming systems, For instance, Nieberg and Offermann (2003) found that in several EU countries, organic farms enjoy more profit than conventional farms because of the high premium prices. But what about developing or least developed countries like Bangladesh, where subsidy is distributed to conventional agriculture. The results are presented here which have been found from key informant interviews and to some extent, from observation. Informant P₁ pointed out:

“In 1991, we calculated the costs and returns for producing Aman rice. We needed tk. 103 to produce 1 mound of rice whereas Tk. 250 was needed, who used chemical fertilizer and pesticides. The price of rice was Tk. 330. As a result our profit was about Tk. 200 and conventional farmers receive profit just tk.100. So, cost of production of organic growers was less and they got more (double) profit. The yield was 70 maund/ acre for organic and 55-60 maund with using chemicals. Moreover, their food was not free from poison; it was harmful for health, land and environment” (Informant P₁, para 9, Appendix page 164).

The informant also mentioned that, *“the price of oil and the price of chemical fertilizer are positively related as biofuel is needed for producing fertilizers. As price of fuel is rising, so, price of fertilizer is also rising. GoB import Urea with Tk. 50 per kg. Farmers are paying only Tk. 12. Government is giving subsidy for the rest. GoB is also paying high subsidy for irrigation. But if we follow Aus – Aman – Lentil; this*

cropping pattern, less irrigation will be needed. Our farmers have to come far away from international fertilizer and oil market” (Informant P1, para 12. Appendix page 165). His views are also supported by Pimentel (2005a in Setboonsarng, 2006), who found that in the US, organic farming approach for maize and beans not only use an average of 30% less bio fuel, but the soil conserve more water and biological resources, induce less erosion, maintain better quality than conventional farming does.

Table 6.2: An example of two brothers (one of them is practicing Nayakrishi)

Nayakrishi farmer	Topics	Conventional farmer
I want to keep my land for future generation	Future perspective	There is no future in farming.
The health of my family members will be better as most of the foods we are producing without chemicals	Motivation	I have to do hard work, always engage with farming and fertilizer and pesticides are available
Rice, jute, pulses, different leguminous crops and vegetables	Produced crops	rice, wheat – cereal crops
I am getting profit than before, from investing Tk 100, I receive 150.	Return	I get marginal profit, if I invest Tk 100, I get Tk 103
I sell my products all the year round.	Selling products	In a year, I can sell crop 2/ 3 times
I use seed from my reserve, prepare compost and other fertilizers, very rarely I need to think for pesticide	Dependency on purchased inputs	I have to buy seed with high price, and all the year I need to buy fertilizers and pesticides
As I keep many seeds, after flood or storm, I plant the seeds those are suitable for the season. Within some weeks, I start to get return	After natural disaster	If my crops wash away after flood, I become very much worried about seed, where I will get money to buy seeds. Sometimes, I have to go for loan and the again to buy fertilizer.
My view is: if we apply chemicals, more pest will attack	Crop failure due to pest	I always apply pesticide to be safe from pest attack
Women are the owner of seed and they always help to prepare compost. Women feel empowered due to working	Women involvement	I think, in case of organic farming, women are burdened with more work.

Source: Observation (2008) during field study. The example has been found at Tangail district

Due to lower costs of production, lower price could be possible to fix. As a result, consumers are allowed to pay lower price. Informant F_{U2} told,

“We are destroying our own health by spending our own money on chemicals. Why do we cultivate our land with chemical fertilizer and pesticide? May be we will get 70 maund after using chemicals, but without chemicals, we will get 10 maund less. The price of that 10 maund will go for chemicals”. Farmers need to calculate the profitability. For example, the yield of conventional farmers is 50/60 maunds and

their cost stands is equivalent to the price of 45/50 maunds of rice. On the other hand, we are producing local variety without using chemicals where the yield is 45/50 maund per acre and cost of production is equivalent to 10/15 maunds of rice price. Which one is beneficial? – we have to calculate” (para 4. Appendix page 202).

“Five years ago, I could not feed even one meal a day to my children. My husband used to cultivate high yielding varieties of paddy, but he had to discontinue because it was too costly to produce and it was difficult to survive. In the past, we also used chemical fertilizers and pesticides for the production of the paddy but we could not afford it because of the high price of fertilizers. If one uses chemical fertilizers and pesticides for agriculture, he would have to distribute this every 16 days. In such a situation, one would only be occupied with the purchase and distribution of fertilizers and pesticides. If this continued his life would be ruined” (Quoted in Barua, 1999a, p.85).

Many people felt that ‘Organic agriculture is for luxurious people. But Proshika feels that it is making a joke by violating nature. Organic farmers enjoy, “Low cost – high productivity – safe and sound environment – socially and economically sound farming – farmers’ freedom – happy and healthy life” (Informant P₁).

6.3.3 Crop diversification in Bangladesh

In 1915, the Agricultural Research Institute in Dhaka estimated that there were about 15,000 varieties of rice in Bangladesh. Whereas there are as many as 62 varieties of local boro rice available with the farmers. Only a few HYV of rice along with the few hybrid varieties are presently cultivated (UBINIG, 2011). Moreover, this area is also enriched with leguminous pulses (3,463 plants genetic resources of local origin from 8 species have been identified). Besides, this region is home to more than 80 fruit species with high number of PGR. In case of vegetables, 39 species (11 species of tubers, 8 of leaves, and 20 of fruits) with more than 10,000 PGR again bear testimony to this region’s species richness (Banglapedia, 2004).

6.3.4 Role of research organizations

BARI, BRRI, and BARC – all the govt. scientific organizations are now conscious. The scientists of BARI, BRRI are very interested in eco-farming. They are trying to learn the technology from NGOs and would like to work together. They try to practice integrated crop management (ICM), compost making. Now they realize that because of using chemicals, the ecological sustainability is under threat. It is a very good sign. They are also worried about the quality or safety of the product. Their realization is: “*we are at crossroad to review whether the current use of agro chemicals is appropriate” (Informant G₃: para 8, Page 191).*

Now a day, Govt started to suggest environment friendly farming or GAP for all farmers in which farmers must reduce the use of pesticide. Four of the informants (P₁, P₂, U₂ and K₁) said, ‘now govt suggests farmers to produce bio fertilizer which we are practicing since 10 years. They try to learn from us: how much yield we are getting from using compost, how others are getting from using chemicals, what happened without chemicals, how much profit or loss we receive after using chemicals. Govt. is very much cordial to introduce IPM and ICM to reduce

indiscriminate use of chemicals. In addition to pest management, ICM include selection of good variety, healthy seeds, good soil health, good land preparation and homestead vegetable gardening. Recently, Govt. has introduced bio pesticides through some projects (Informants P₁, P₂, U₂ and K₁).

6.3.5 Increasing price of chemical fertilizer

Recently, due to rising fuel price, govt. has increased the prices of fertilizer and pesticides which is a good opportunity for the extension of organic farming for eco-friendly workers. Now, many conventional farmers are trying to learn from technical workers of Proshika and leader farmers, how they can adopt the technology. They are looking for alternative technology and want to learn the organic technology of Proshika.

In addition to the above mentioned points, it could be stated that Bangladesh still has a large rural and disadvantageous population practicing traditional farming due to the lack of input access and technical know how. Majority of them have been producing crops simply by using unbalanced chemical fertilizer with little bit organic manure with unknown scale. There is potential to increase productivity of these traditional cultivation systems by adopting organic farming. Informant D₁ asserted, *“In terms of using agro-chemicals, the position of Bangladesh is better than many other countries those are using more dangerous chemicals. Our farmers have accepted only three fertilizers and some pesticides. We are organic by default and advantage is, we don't need to do very hard work to go to organic. Whatever, some of our farmers are doing in terms of eco-friendly farming; this is one step of organic farming”* (para 3, Page 186). Setboonsarng (2006) also found that many of the poor farmers in remote areas enjoy comparative advantage over farmers of intensive areas because their existing practices are largely organic by default. Even in Europe, organic agriculture is more likely to be found in disadvantaged or adverse areas to conventional agriculture production (Häring, *et al.*, 2004).

6.4 Analytical suggestions to implement organic/ eco-friendly farming

The government needs to review the present agricultural policies based on the research findings in favour of organic agriculture. In contrast to modern system, organic agriculture is a system that ensures the best use of local natural resources (Scialabba and Hattam, 2002). Most farmers in developing countries like Bangladesh are poor and marginalized from inputs and products markets. Therefore, the uses of external inputs, whether inorganic or organic, need to be reduced as much as possible.

6.4.1 Promotion of local varieties

Bangladesh has enough of its own high yielding varieties of crops, which need to be protected and promoted (Kelly, 2008). For example, there are as many as 62 varieties of local boro rice available with the farmers. These varieties can be grown without any chemical fertilizer and pesticide. It was also observed that the HYV varieties developed by the BRRI including BR-28, BR-29 can be grown without fertilizer and

pesticide. The yield of these varieties can be increased with appropriate management as practiced by the farmers. The Nayakrishi Farmers got good yield of 4.3 metric tonnes per hectare for BR-28 and 4.5 metric tonnes per hectare from BR-29 (UBINIG, 2007). For conserving biodiversity, to preserve varieties in seed banks is not enough. The maintenance of one variety in different places could generate new varieties through which more diversity could be created (FAO, 2003b). The only effective means to overcome 'corporate and scientific nature' is horizontal resistance that is to make plant breeding as communal and widespread as possible (Robinson, 1997). Robinson (1997), further states that "*Breeding Crops Reduce Pesticide Dependency*". A good example "Network of biodynamic seed production and plant breeding, Germany" could be followed how farmers can participate in seed production and plant breeding.

Local knowledge should be patronized and more research and development should be done on it. Seed is a genetic resource of a country. Farmers should produce seed on own farm. Community seed store can be established by community farmers. The community farmers keep seed in this house and store here. If farmers need seed, they can collect from community seed store and after harvesting, they need to give back two times more to store again. The community seed store "Seed Hut" plays very important role to preserve the seed locally (Informant F_{U1}). Nayakrishi farmers' "seed hut" is a wonderful concept to minimise the problem of crisis of good seed especially after natural disaster. This model could be followed to whole over the country.

6.4.2 Use of less chemical pesticides

Regarding pesticide use, both producers and consumers need to be conscious. Informant F_{U3} strongly said, "*Womens' maternal health was better before using chemicals in agriculture. Previously we took medicine from medicinal plant. Now we always go to doctor to take chemical medicine*" (para 6. Page 201). Her speech is also supported by Aubert and Leclerc (2003, cited in Jimenez, 2006), who found that organic farming helps to reduce maternal mortality through consumption of better quality (foods with higher vitamins and minerals) and more diversified food. Children have access to more diversified diets that provide them all nutrients and oligo-elements necessary for their growth. Surveys conducted by IFAD (2005b, 2003) show that health problems due to pesticide exposure is one of the main reasons why conventional farmers are shifting to organic farming. Farmers of Karnataka, India reported that many health problems disappeared after they shifted from conventional farming to organic farming (IFAD, 2005b).

The proposed activities of different actors could be presented graphically as shown in the Diagram 6.5. Farmers may use pesticides as the last option to control pest following 4R. All stakeholders regarding pesticide using and selling e.g; farmers, pesticide dealers, sellers and employees must be educated and trained. As pesticide is very harmful for health and environment, therefore, instructions must be labeled in Bengali language.

Informant G₄ expressed,

“Pesticide dealers and sellers must need to have educational qualification of minimum 10 class and they must be trained. Alternatively, pesticides must be bought and sold according to the recommendation from the specialists. It should be banned to buy and sell pesticides without prescription” (Para 7. Page189).

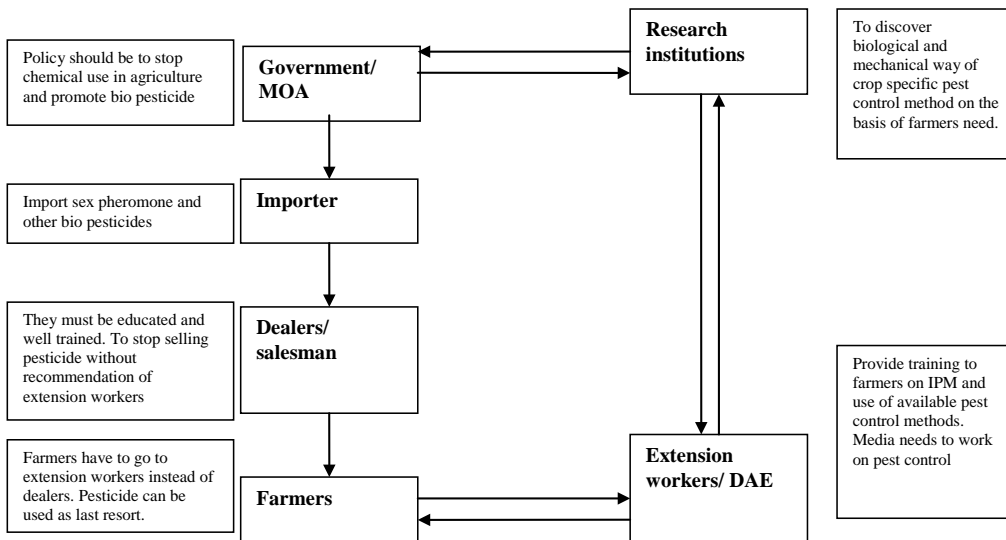


Figure 6.5 Proposed activities of different actors of pesticides (to stop chemicals) (Author's analysis)

6.4.3 Increase soil fertility

Bangladeshi farmers are highly dependent on urea fertilizer that is degrading the soil as well, farmers' costs of production is increasing. To get rid of these problems, efforts need to be made at national level on organic matter recycling, crop rotation, mixed cropping, green manuring, for instance, to promote the use of *Sesbania* or black gram as a green manure, use of compost, bio-fertiliser etc. Most technologies are developed in research stations. Many of these are not compatible with farmers' practice. Therefore, farmers are not interested to adopt that technology. If farmers are considered as a part of the participatory approach, they will adopt the technology (Hossain, 2001). To improve the soil fertility, large-scale extension programmes and farmers' training and demonstration should be provided on different green manure crops, compost making etc. Green manure seeds (*Dhaincha*, cowpea and sun hemp) must be adequate available throughout the country (Informant F_{p1}). A more diversified cropping pattern, which includes oil seeds, pulses or vegetables in rotation with rice, will benefit the soil.

6.4.4 Develop proper marketing system

Farmers could be encouraged to produce all rice, fruit, and vegetable, fish and livestock products in compliance with GAP (Good Agricultural Practices). Informant G₃ said, “*At this moment, we don’t need accreditation from outside. We have to start with local certification process. If we could build up 10 millions of consumers, then we need to work for 10 years. Our motive should be: save our population, save our consumer. If we want to go to trade level, it will hamper our objectives. We will say our product as safe food, not organic. Otherwise, it will make conflict with IFOAM, EU etc. Before thinking of export, we need to establish a strong local market. We should give the first priority on: to provide healthy life for our next generation*” (para 15, appendix page 187).

Traceability system of selected farm products also needs to be promoted. To solve the marketing problems, firstly, it is necessary to develop consumers’ trust. Informant G₃ said, “*If we avoid the use of chemicals; we can call it eco food or safe food. Safe food must be nutritious and will not be health hazardous for today or tomorrow. To develop trust, we need to organize centrally. First of all, we have to develop consumers for our products. The important thing is: our earlier consumer must need to be well educated. Our main purpose to develop trust which is a continuous transparent system as consumers can believe that nothing is wrong here and there is no leakage in this system*” (para 4. Appendix page 187). He also added that trust can be established with the help of widely accepted, trusted and respected persons in the society such as teachers, doctors, GOB researchers, and extension workers from reputed NGOs, consumers’ association, media persons, etc. Scientists from different sector, toxicologists will facilitate them. Policy issues, certification body, media campaign will work at national level (Figure: 6.6). If consumers trust, rich and educated people will buy with 2/ 3 times higher price.

At local level, producer-consumers’ cooperative society (PCCS) could be established. Producers will go to that market with their product and consumers will come to buy. Farmers sell at Tk. 2 which is selling in normal market at Tk. 3. Both producers and consumers will be benefited as no middleman exists there (Figure 6.7). This can be a model (informant G₃). Informant F_{G1} who is already engaged with this kind of marketing said, “*We have a group named PCCS. We sell products to our familiar consumers with lesser price than the existing market price. The consumers provide us information on the availability of organic inputs and sometimes they supply us their cow dung, household and poultry wastes*” (Informant F_{G1}, para 11, Page 204).

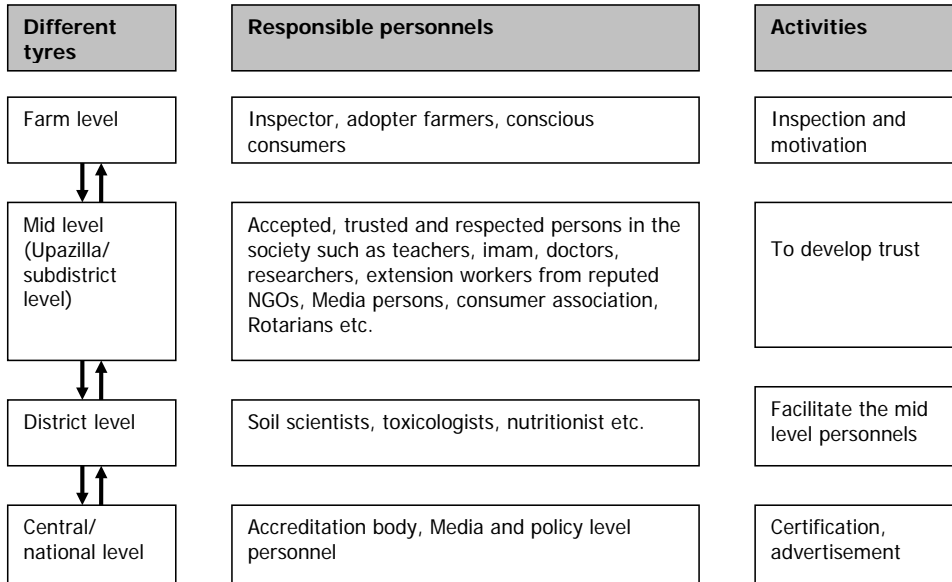


Figure 6.6 Quality control systems to develop consumer trust on organic/ eco food (Author's analysis based on the information of key informant G₃)

farmers could involve in organic farming that do not use any chemical ingredients. There should be grading and necessary processing facility; and at least, a minimum standard or certification system. We have the potentiality to export in Japan and in Europe (Informant P₂: para 20, Appendix page 170).

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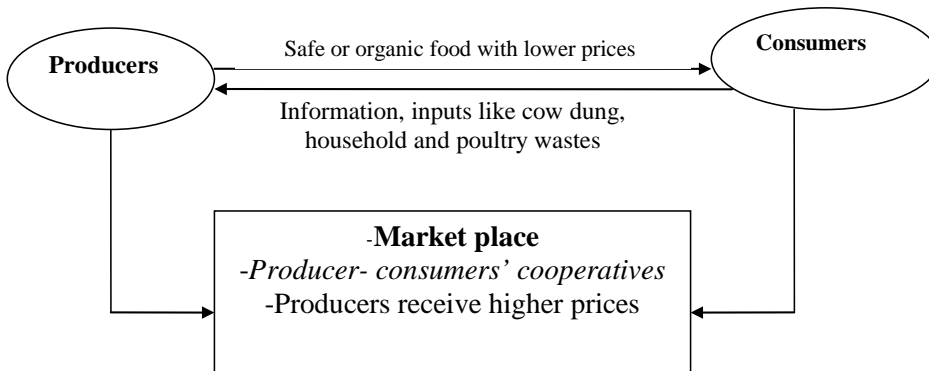


Figure 6.7 Example of local organic product marketing system (Author's analysis based on the information of key informant F_{G1} and G₃)

6.4.5 Consumers' awareness

Most of the studies conducted on why consumers purchase organic foods found due to being conscious that such products are safer, healthier, and more environmental friendly than chemically produced alternatives (Bonti-Ankomah and Yiridoe, 2006). Wang *et al.* (1997 cited in Bonti-Ankomah and Yiridoe, 2006) reported that 76% of survey respondents from China believed that organic food is safer than conventional alternatives, and actually preferred organic to conventional food. In Costa Rica, consumers of organic food reported health concerns as the number one reason for purchasing organic, followed by environmental concerns (Aguirre, 2001). (Bonti-Ankomah and Yiridoe, (2006) expressed that lack of consumers' knowledge and awareness was considered the foremost reason why consumers are not willing to buy organic food in the US organic food market. So, it could be said that, to be motivated to buy organic food or products, consumers should be conscious.

In every food, there is possibility to have residual amount of pesticide. But the level should be at minimal level. If it is more in any crop, it affects health. Consumers should know maximum residual limit (MRL). The electronic and print media can play important role to do this. Govt. of Bangladesh is working on residual effect through Hortex Foundation to capture the export market of vegetables. The importers provided a list of MRL for some vegetables. It is necessary to test maximum residue limit before marketing of agricultural product. Informant G₂ mentioned, "*In Bangladesh, BARI and Bangladesh Atomic Energy Commission have their capability to do this*" (Informant G₂, para 6. page 186).

6.4.6 Proposed adoption process for organic farming

Adoption is not an easy process; farmers need to learn the technology, credit and many other related issues. For farmers' adoption of organic farming, Proshika's method could be followed. In that process, theatre and video documentation is played to disseminate the farming technology

Proshika has video documents on organic technologies. In case of theatre, 1 to 2 thousand farmers gather in a field in sub district level (upazilla) level. The local farmers play role as actor. After theatre, the documentation is repeated, and again, farmers are invited in their field for watching the technique. In farmers' field, the technical worker or experienced farmer express how they are working? For example, one farmer tells how he prepared compost, what is the process, when he used it, how many times, what was the ratio etc. Theses are the processes of socialization. The informant said, "*We arrange it for two times, at growth stage and at harvesting stage*". Informant P₂ said, "*Why are we following socialization process? Once, farmers didn't want to adopt chemical agriculture; we are the people, who influence them to adopt. We bring them in front of media. Now, it is our responsibility to save them from chemicals. Mentally, they were adapted with one system, now they need to adapt with another system*" (para 4, Appendix page 167)

After documentation, Proshika form farmers' group. Informant P₂ said, "*We don't want to impose our solution towards them. We want to hear how they treat their*

problems and what can we do on the basis of those problems. (Para 2. Page 162) Since last couple of years, Kazi tea farm has also started to form groups for surroundings farmers as they can learn organic practices. Already, those farmers are practicing on 50 acres of land on cooperative basis (Informant K₁).

In the next stage, training is arranged for farmers' learning about making of compost, fermented plant juice, seed bed preparation, pit differences, decomposition and fermentation procedure – the entire technical issues. To follow the training, there are two kinds of monitoring. Process monitoring follows that training is going on in the right way or not, and whether farmers could learn it properly, that is impact monitoring. Technological gap is minimised by farmers training.

For adoption of any technology, farmers need financial help. Therefore, credit is provided based on their need for the listed farmers. It is a process to recognize organic farmers. According to Informant P₂, *“we have to take responsibility and need to give continuous support for organic farmers at least for three years. In each ADC (area development center), Proshika has technical worker. They have depth on organic agricultural knowledge” (Informant P₂, Para 4. Page 168).*

In the last stage, Proshika recognize the organic farmers. The informant (P₂) said, *“There is a transition period. Some farmers become organic very quickly, and some of them try to follow but mix little amount of fertilizer. We list the groups and the farmers. We observe and monitor them for three/ four years. When the technical workers recognize them as organic farmer, they list them. May be from all farmers, 20% convert their land to organic” (Informant P₂, para 4. Appendix page 167).*

6.4.7 Policy option regarding agricultural extension

The efficiency of agricultural extension services needs to be improved through human resource management (HRM), training, skill development, institutional strengthening and logistic support. The extension agencies in three sectors (government, non-government organization and private) can continue to work on organic farming within their own organizational structures and procedures, but effective coordination should be established and department of agricultural extension can monitor it.

The extension workers are the linkage between the farmers and DAE. These people are poorly paid and overburdened with workload. Besides, their training facility is not adequate. Side by side, the extension workers of the NGOs and private companies have better incentives. So the incentive structure of the DAE extension workers should be reorganized in order to reduce disparity. As the responsibility of the agriculture services mostly goes to the extension workers, they should be provided proper training as well as better incentive. For successful extension, the linkages and networks with research, farmers, and extension providers (public and private) must be enhanced. Research needs to be conducted both on research stations and on-farm with farmers.

As the NGOs and private sectors have different target groups in different regions, there should be a guideline of for the extension services of the NGOs and private

companies in order to protect the marginal farmers who constitute the major portion of the farming population in Bangladesh.

Organic farming can be practiced or implemented from two different levels: homestead and field crop. The small and marginal farmers can start it with practicing at homestead level. Before starting the use of chemicals in Bangladesh, different vegetables were grown in most of the homestead areas under multiple cropping systems. Women were playing the dominant role in that system. They used to grow vegetables of local varieties by using indigenous technologies mostly for family consumption and surplus to sale. Since twenty to thirty years, homestead production has decreased. The scenery is: at one stage, they started to use fertilizers; the production was increasing for two to three years. After that soil fertility started to decline, pests appeared and production started to decrease. They felt discourage and left homestead vegetable gardening. Now the women can start again and come forward for organic cultivation. On the other hand, farmers could be recommended to start to practice organic way in their one portion of land. Govt. can work for few eco villages. Vegetables having high market potentiality can be grown on commercial scale in the field to meet the demand of domestic and export market.

6.5 Conclusion

Obviously, to produce food for 160 million people of Bangladesh is a big challenge. But, so-called modern agriculture system that pays no attention to biodiversity is not a solution. Standing in front of such reality, government should rethink about sustainable agriculture. We have resources, techniques, and good examples, but need integration and patronisation of good practices otherwise achieving self-sufficiency in food production will remain a dream. Bangladesh has lost about 1 million ha of arable land from 1983 to 1996. Population growth poses another great threat to crop productivity. Besides, crop agriculture in Bangladesh has become regularly vulnerable to the hazards of climate change – flood, drought, salinity in particular. Additionally, poor management practices, especially of pests and diseases, fertilizer, water and irrigation have largely contributed to significant decline in crop productivity. Small and marginal farmers that constitute majority of farm population are constrained by poor financial resources and cannot, therefore, afford high management costs of high input technology.

From the discussion and consideration of other social factors, it could be recommended that small households rather than rich and big farms initiate organic rice farming like China. Due to use of huge amount of chemical pesticide, total biodiversity is under threat but the harmful pests are growing resistance. At the same time, the increasing of cost of agriculture put pressure on farmer as well as the economy of the country. Promotion from the pesticide companies, dealers and salesmen, lack of manpower in DAE, lack of farmers' knowledge, use of hybrid seed and excessive use of nitrogen fertilizer – are identifies as the major causes of overusing of pesticides by farmers.

While non govt sectors are following the eco friendly methods, govt. is giving emphasis on reducing the use of chemicals. At present, BARI, DAE, BADC – govt organizations are giving emphasis on integrated pest management. Though BARI and DAE provided Sex Pheromone and some bio pesticide as an experiment to introduce but these became very popular. But the scarcity of bio pesticide again compelled farmers to use chemical pesticides. Mono-cropping practice is also responsible for severe pest attacks. So, crop rotation is very important. As IPM training has increased the farmers' knowledge, therefore, training is very important for farmers.

It seems that govt. and non govt. organizations are in same direction about using chemical pesticides in Bangladesh agriculture. But the invisible hand of multinational companies and dealers, who are supplying chemicals – creating hindrance for them. Therefore, govt needs to reformulate their policy towards agricultural inputs.

CHAPTER 7 CONCLUSION OF THE STUDY AND POLICY RELEVANCE

7.1 Background and problem statement

Though agriculture plays a crucial role in overall economic development of Bangladesh, but the existing practices of modern agriculture has created a large negative impact on farmers and the environment. The significant problems are topsoil depletion and degradation, contamination of groundwater because of agricultural poisons, ignoring the living and working conditions for farmers, increased costs of production, the decline of family farms, health hazards due to degradation in food quality, etc. The use of chemicals as well as external inputs is increasing every year in Bangladesh as farmers do not get expected amount of production due to losing soil's own fertility. At the same time, the price of agricultural inputs is also increasing. Consequently, farmers are getting looser day by day. Question rise, how long the process of exploit land and other natural resources - could be continued. We already have spoiled these resources to a great extent. We must choose the environment friendly way that can meet the present need and also conserve the resources for future use. We must find the alternate means before going the situation at an uncontrolled level.

The study is an attempt to protect natural agricultural resource bases from further degradation in Bangladesh and to ensure long term sustainability in agricultural system. Literature says that the concept of 'organic agriculture' would be very much helpful to overcome the situation. To be a farm truly organic, certification is required that involve huge cost which is rarely affordable for Bangladeshi farmers. The other issue is: govt. policy is to achieve food self sufficiency. Government think that organic practices in agriculture could lead less production and could be a threat to food security.

While the developed countries maintain internationally recognised standard of organic farming, no such standard is available in Bangladesh. Therefore, the understanding of organic movement in Bangladesh from the part of international classification is necessary to promote any systematic development. Based on the overall situation, the objectives of the study are to assess the standards of organic farming in international perspective and the practices of eco-friendly farming in Bangladesh and to look for the constraints and possibilities of eco-friendly way of farming in Bangladesh.

7.2 Research design

As organic or eco-friendly movement is guided by some nongovernmental organizations, so this study would like to explore what standards they are suggesting farmers and what are the problems faced by different actors in relation to eco-friendly practices, such as researchers, influential farmers, community leaders etc. At the same time, the researcher has tried to analyse government's view. The study has been

conducted on the basis of the information of the 22 key informants. Due to the nature of ‘multiple realities’ of this research, qualitative research method seemed more appropriate that helped to emerge new findings. Data have been collected from three different sources – documents, interviews and observations; and key informants have been selected by following purposive and snowball sampling technique.

Interviews were recorded through digital voice recorder and transcribed verbatim by researcher. Transcripts were then entered into MAXQDA10, a qualitative data management software programme. A coding frame was developed considering research questions. Data were analysed in the light of inductive approach.

Key themes were developed under: motivation to organic farming, organic standard, input use status, different problems, food security, marketing, possibility of organic farming, policy recommendations, etc. Those sections once more categorized according to different standard, constraints, opportunities and recommendations. Standards were recategorized by following IFOAM basic standards of crop production. Those are choice of crops and varieties; length of conversion period; diversity in crop production; soil fertility and fertilization; and pest, disease, weed, and growth management.

7.3 Results and findings

7.3.1 Classification arrangement of organic and eco-friendly farming

Sustainable agriculture is a basic term that includes organic farming. This farming system indicates that all approaches are based on local resources, technology and traditional knowledge among farmers on local environmental factors with scientific insights. This practice works entirely without synthetic fertiliser and chemical pesticides and enhances the agro-ecological system. Organic agriculture is different from other types of sustainable agriculture due to its standard, certification and quality seals. However, there are two different kinds of organic farms in the world: certified and non-certified. Many of the non-certified farms are following organic practices, but do not always fulfill the particulars written in the standards. Those are termed as eco-friendly farming.

The IFOAM Norms and Codex Guidelines stand are the two international organic baseline standards. The Codex Guidelines is designed mainly to meet the trade requirements, whereas the IFOAM Norms include ‘Criteria for Certification’ and ‘standards for standards’. Both however, assume that more specific standards may be developed at the local level. The three regulations EU, USDA NOP and JAS are the main organic markets in the world that dominate all other standards and influence the ‘organic product’ growing countries. However, all the standards have a basic requirement for organic seeds and planting materials, that is, these resources should be originated from organic sources. However, if organic seeds are not available in sufficient quality or quantities, a number of changes could be made for short period. But genetically engineered varieties are strictly prohibited.

In case of conversion to organic land, the period is minimum 12 months, according to IFOAM rules, while in case of CODEX, EU, Japanese and Indian organic standard, the period is at least two years. In US standard, a crop shall come from the land that has been free from prohibited materials for 36 months.

Among all production practices, soil fertility management differs noticeably from one standard to another. However, in all practices, the soil fertility should be maintained by cultivation of green manures, legumes, suitable crop rotation, crop diversification; absorption in the soil of organic material etc. But there are many differences in terms of organic fertilizer use.

The principles to control parasites, diseases and weeds are relatively similar in all regulations. The common measures are selection of appropriate varieties and species, adequate crop rotation, mechanical and biological means of cultivation, protection and encouragement of the natural enemies of parasites etc. Substances, only mentioned in the positive list of respective regulation may be used. The IFOAM and USDA regulations strictly indicate to maintain ecological buffer zones.

7.3.2 Practices followed in eco-friendly or organic farming in Bangladesh

Eco-friendly agriculture is practiced from three different levels in Bangladesh: NGO, private and government level. Among all NGOs, the study chose Proshika, Ubinig and Community Development Association (CDA). Two private organizations (Dhamrai dairy and Kazi and Kazi tea farm) have also been selected. Besides, few organic researchers and extension workers from different govt. research institutions have been chosen as the key informants of this study.

The main idea of Proshika is: soil nutrients can be supplied from soil through proper management. If we do not destroy fertility by improper management, it doesn't need to supply nutrients from external sources. The only thing is: we need management to maintain soil fertility by crop rotation, intercropping, mulching etc. Farmers follow green manuring and use different types of compost for adding nutrients and organic matter. Proshika feels that if we follow natural process in agriculture, we can solve all problems.

UBINIG's belief is: seed is the main input of agriculture. Seed determines the requirements for other inputs such as pesticides, fertilizer and agricultural technology. If we use hybrid seed, we have to apply fertilizer. When fertilizer is applied, pest automatically attacks. If farmers use local variety seeds and follow crop rotation, they will get sufficient production, and at the same time, soil fertility will be maintained. UBINIG and Nayakrishi farmers are actively working to protect local variety seeds. They believe: 'variety is a genetic resource of a country. If the soil health is good, plant health will be good and they will not be attacked by disease'.

Community Development Association (CDA) provides training on compost making and farmers use biological method for pest control. The perception of Dhamrai Dairy is: using inorganic agrochemicals cannot sustain for longer. We should give the first priority on: to provide healthy life for our next generation.

Where NGOs are working on total organic management, Government has given emphasis on pest management. For instance, under IPM project, farmers are provided training on pest management. Recently government has also realized that pest management is not a single activity, it includes many other management activities. With this view, ICM project has been introduced.

The production practices of Proshika and Ubinig are in line with the practices of IFOAM and other basic standards. Therefore, their practices could be considered as organic. 'Kazi tea farm' is already certified from SGS and USDA. In case of Dhamrai dairy, some of the feed stuffs for livestock are not organic, supplied from market; therefore, it is not completely organic but as other inputs are collected from internal sources it can be treated as eco-friendly (nearly organic) farm. The Proshika and its contract farmers were motivated due to their consciousness about soil quality degradation for the impact of green revolution and influenced by Proshika. Nayakrishi farmers were motivated due to input shortage especially after natural disaster. However, Proshika and Nayakrishi farmers are now philosophically motivated. The private farm owners are motivated from their own thinking as they are educated and now they turned to the market demand.

7.3.3 Barriers to promote organic practice in Bangladesh

The major barriers that have been found from this study could be classified as: government policy to achieve food self sufficiency, allocation of budget to subsidy on chemical inputs, regulation of pesticide marketing, problems of organic product marketing etc. Govt thinks "Organic farming has negative impact of on food security. We have to produce adequate amount of food by using hybrid seed or high yield variety. As we don't have enough livestock to produce compost or organic fertilizer, we have to use chemicals. If we practice organic, our production will be less. In that sense, organic farming might be a threat to food autarky."

Most of the resources of agricultural budget are allocated to short term measures such as subsidy in fertilizer and irrigation rather than different long term production factors. Therefore, farmers feel encourage to apply more fertilizers that leads them to apply pesticides.

Due to seed policy and in the name of 'availability of good quality seeds', farmers of Bangladesh are becoming dependent on imported hybrid and high yielding variety seeds, for which high chemical inputs need to be used. Both of them are produced in artificial environment with using chemicals. As a result, organic/ bio fertilizer doesn't work at the time of production.

Major constraints to organic fertilizer use in Bangladesh have been identified as: inadequate supply of biomass, green manuring crop seeds, crop residues, animal dung; lack of proper extension services, farmers' knowledge on organic soil management etc. Farmers of Bangladesh are using chemical pesticides at an increasing rate due to lack of organic pesticide, increase in the area under HYV, sales promotion by pesticide dealers and companies.

Lack of marketing facility is a very crucial problem of Bangladesh agriculture. This problem can be classified as: lack of consumers' awareness, lack of consumers trust and irregular availability of organic products in the market.

Though so many barriers exist, still organic researchers are not hopeless even in the overpopulated and developing countries like Bangladesh. Some of the positive points have been found in this study. These are mentioned below:

7.3.4 Possibilities of organic farming

Organic agriculture could be a way to food security for small and marginal farmers. Researchers have proved that if farmers follow crop rotation and diversification, soil fertility is maintained and production would not be less than the conventional practices. As a result, farmers will produce more varieties of food crops and overall production will not decrease. If farmers don't use chemicals, their costs of production will be less. Therefore, they can sell the product at lower prices and consumers would pay lower price. In this way, food security could be achieved from both producer and consumer's level.

It is proved from this research that organic agriculture do not provide lower yield or less profit as compared to conventional agriculture, rather chemical agriculture is harmful for health, land and environment. Bangladesh is endowed with many varieties of rice, pulses, fruits and vegetables and all local varieties don't provide lower yield. Therefore, good or high yielding varieties could be identified from local and indigenous varieties. Now the scientists are doing research on ecological farming, trying to learn the eco-friendly technologies and would like to work with the NGOs. Now they realize that we have increased the use of chemicals that destroyed the soil, quality of food is unsafe, costs of production have increased and ecological sustainability is under threat. Their realization is: we are at crossroads to review whether the current use of agro chemicals is appropriate.

7.4 Policy implications

Organic agriculture could be one of the best options for sustainable agriculture in Bangladesh as low external input technology is required. NGOs and farmers are gradually adopting organic farming techniques as a method of improving productivity and food security. However, to promote organic farming, the following recommendations could be specially mentioned:

Agriculture policy and institutional support: The relatively high successes of organic farming in many countries are due to: consumers' awareness on health problems caused by the consumption of contaminated food and farmers' attention to environmental degradation. So, the media need to expand their effort to broadcast the harmful effects of conventional agriculture. This issue could be included in the school, college and University level curriculum. Farmers' training and participatory research is needed to improve the soil fertility, quality seed production etc.

Government should introduce organic friendly agriculture policy. Efforts on chemical fertilizer should be reduced. The government could closely collaborate with NGOs

that are willing to work on organic farming and sustainable agriculture. The contribution of organic agriculture to employment creation and household food accessibility – may make a good focus to integrate it in agricultural development plans.

National agricultural budget should allocate resources for organic farming development, like agro-ecological research and training programmes, knowledge networks etc. that cover all aspects of the organic food system, production, processing, local certification and marketing. An independent organic farming research institute could be established that will coordinate among all researchers. Eco-village could be established as pilot project for export.

Quality seed production: As seed is the key input of agriculture and it determines the requirement of other input. Therefore, seed policy is very important for our agriculture. Policy should be to produce seed locally. To meet the demand for seed, BADC's current seed production programme needs to be strengthened. Besides, government should support (e. g; providing credit on easy terms, training) farmers, private sectors and NGOs for the production of quality seeds. BADC can work to establish 'community seed store' at upazilla level.

Pest management: To get rid of from pesticide, farmers should use balanced or less fertilizers. Training should be provided to farmers to have sound knowledge on insect/ beneficial pests, their natural control process and influence on the yield, 4Rs (right pesticide, right method, right dose and right time) of applying pesticides, Economic Threshold Level (ETL) etc. Pesticide dealers and market related people must be educated. The instructions, contents, formulation, proposed use, recommended dose, formulation and expiry date must be labelled in native language. Employers are required to provide necessary training and equipment to employees to handle pesticides.

Fertilizer management: Farmers' belief or attitude towards chemical fertilizers use needs to be changed through training, broadcast from media etc. Alternative sources of fuel need to be developed instead of cow dung, household waste, crop residue etc. Appropriate crop rotation and diversification needs to be followed. To encourage the use of balanced fertilizers, government should continue subsidy on non-urea fertilizers. Farmers should gradually reduce their dependence on the use of chemical fertilizers.

Role of extension: Necessary steps could be taken in small-scale trial to expand organic farming. Field level government officers should be active and go to the field. On-farm trials, field days, and farmers' participatory research and extensions could play a vital role to enhance a build-up in farmers' capacities. To increase manpower in DAE is a crucial demand now. If it is not possible, private extension services could be encouraged where several farmers can collectively hire a state recognized advisor.

Marketing of ecological products: Govt. needs to intervene or facilitate the organic product marketing. To solve the marketing problems, consumers' trust needs to be established. At local level, producer- consumers' cooperative society (PCCS) could

be established. Eco-village could be established with targeting export. An independent national certifying institute could be established to certify local eco-friendly farmers.

Generally speaking, government and non-government organizations should concentrate their highest efforts in identifying the key problems. Short, medium and long term goals and standards for organic agriculture should be established to achieve sustainable food security. However, at this moment we have to trade off among sufficient food production to keep pace with population growth, alleviating hunger and poverty, increase the intensity of agricultural production and maintaining favourable ecological conditions for sustainable agriculture.

CHAPTER 8 SUMMARY (ENGLISH AND GERMAN)

8.1 Summary (English)

Agriculture plays a crucial role in overall economic development of agro –based developing countries like Bangladesh. In those countries, green revolution emerged in 1960s with the slogan of ‘produce more food’. Within a couple of years, farmers received ‘package technologies’ of HYV seed-fertilizer-irrigation. With the adoption of these technologies, farmers started to use chemicals and they were getting more production for a decade. Most of the newly developed inputs and technologies were subsidised, even free that time. After some years, farmers as well as policy makers get warning of yield reduction and large negative impact on human and the environment like degradation in soil quality, contamination of groundwater, increased costs of production, health hazards, etc. The uses of chemicals as well as prices are still increasing every year in Bangladesh. Question rise, how long the process of exploiting land and other natural resources - could be continued. We must find the alternate ways before going the situation at an uncontrolled level.

The study is an attempt to protect natural agricultural resource bases from further degradation in Bangladesh and to ensure long term sustainability in agricultural system. With the concept of sustainability of agriculture, developed countries are practicing ‘organic farming’, where they strictly maintain standards and regulations. The developing countries are practicing organic for export and in many places, for local consumption, the farmers are trying to reduce the overall use or indiscriminate use of chemicals in agriculture – that is very often termed as ‘eco-friendly’. Based on the overall situation, the objectives of the study are to compare Bangladeshi standards with international rules and to look for the constraints and possibilities of eco-friendly way of farming in Bangladesh.

Qualitative research method has been followed to conduct the study. Data have been collected from three different sources – documents, interviews and observations. A total of 22 key informants have been selected by following purposive and snowball sampling technique. Interviews were recorded through digital voice recorder and transcribed verbatim by researcher. Transcripts were then entered into MAXQDA10, a qualitative data management software programme. A coding frame was developed considering research questions. Data were analysed in the light of inductive approach.

For comparison purpose, a couple of important international standards have been chosen like, IFOAM basic standards, CODEX Alimentarius guidelines, EU regulations, USDA, Japanese agricultural standards (JAS), NAASA and Indian Organic Standards. The IFOAM Norms and Codex Guidelines stand are the two international organic baseline standards. The three standards EU, USDA and JAS are the main regulations that dominate all other standards and influence the ‘organic product’ growing countries. The comparisons have been made based on the ‘IFOAM Basic Production Standards’ such as land conversion to organic, Selection of crops and varieties, Soil fertility and fertilization, pest, diseases, weeds and growth management, avoiding contamination etc.

Eco-friendly agriculture is practiced from three different levels in Bangladesh: NGO, private and government level. Among all NGOs, the study chose Proshika, Ubinig and Community Development Association. Two private organizations (Dhamrai dairy and Kazi and Kazi tea farm) have also been selected. Besides, few organic researchers and extension workers from different govt. institutions have been chosen as the key informants of this study.

Organic concept in Bangladesh is introduced and carried out by NGOs. At present, govt. also started to think about sustainability in agriculture. In terms of production practices, Proshika gives emphasise on crop rotation and compost, UBINIG – on local variety seeds and govt. – on pest management. Nayakrishi farmers are very near to the standard of EU, USA and Japan. Kazi farm is already exporting 100% of their products in the USA and EU countries. Proshika and BARI farmers and Dhamrai dairy need to improve animal husbandry and fertilizer management to reach at international level.

Bangladesh agriculture is in vicious circle due to using chemicals. The major barriers that have been found in this study could be classified as: government thinking of ‘organic farming has negative impact of on food security’, excessive promotion of hybrid seed in the name of ‘availability of good quality seeds’, allocation of budget to subsidy on chemical inputs, insufficiency of organic inputs, farmers poor knowledge, increase in the area under HYV, sales promotion by pesticide dealers and companies, regulation of pesticide marketing, lack of consumers awareness, lack of media campaign, problems of organic product marketing etc.

Still there are positive points that make us hopeful that ‘organic way of farming’ is possible in Bangladesh. Researchers have pointed that organic agriculture could be a way to food security for small and marginal farmers as well as consumers. Now, it is also realized at policy level that ‘we are at crossroads to review whether the current use of agro chemicals is appropriate’.

To reduce the use of chemicals in Bangladesh agriculture, the research has forwarded some important recommendations, like, quality seed production at domestic level, introducing organic friendly agriculture policy, broadcasting in media on ‘the harmful effects of conventional agriculture’, farmers’ training and participatory research, establish an independent organic farming research institute, eco-village, increase the manpower at DAE, organic farming in education curriculum, development of marketing system, etc. Generally speaking, government and non-government organizations should concentrate their highest efforts in identifying the key problems. Short, medium and long term goals and standards should be established to achieve sustainable food security. However, at this moment we have to trade off among sufficient food production to keep pace with population growth, alleviating poverty, increase the intensity of agricultural production and maintaining favourable ecological conditions for sustainable agriculture.

8.2 Zusammenfassung (German Summary)

Thema: Umweltfreundliche Landwirtschaft und ökologischer Landbau in Bangladesch – Internationale Klassifizierung und örtliche Vorgehensweisen

Hintergrund und Problemerkfassung

Obwohl die Landwirtschaft eine entscheidende Rolle bei der gesamtwirtschaftlichen Entwicklung des Landes Bangladesch spielt, haben die Vorgehensweisen in der modernen Landwirtschaft negative Auswirkungen für die Bauern und die Umwelt. Es gibt erhebliche Probleme hinsichtlich Erosion und Verarmung der Böden und der Verschmutzung des Grundwassers mit Pestiziden. Die Produktionskosten steigen, die Betriebe der Bauernfamilien verarmen und die Qualität der Lebensmittel nimmt immer weiter ab und stellt eine Bedrohung für die Gesundheit der Bevölkerung dar. Die Anwendung von Chemikalien und Düngemitteln nimmt in Bangladesch jedes Jahr weiter zu, weil die Bauern aufgrund der abnehmenden Bodenfruchtbarkeit nicht die erwarteten Produktionsmengen erzielen. Gleichzeitig steigen die Aufwendungen für die landwirtschaftlichen Produktionsfaktoren. Infolgedessen werden die Bauern Tag für Tag ärmer. Es ist fraglich, wie lange dieser Prozess der Ausbeutung der Böden und anderer Umweltressourcen noch weiter gehen kann. Die natürlichen Ressourcen sind schon in großem Ausmaß zerstört. Ein Ausweg besteht darin, sich für umweltfreundliche Maßnahmen zu entscheiden, die sowohl dem augenblicklichen Bedarf decken als auch die zukünftige Nutzung sicherstellen. Dies ist notwendig, bevor die Situation außer Kontrolle gerät.

Die vorliegende Studie ist ein Versuch, die natürlichen landwirtschaftlichen Ressourcen Bangladeschs vor weiterem Raubbau zu schützen und eine nachhaltige Produktion sicherzustellen. Die Literatur zum „organischen Landbau“ hat wirkungsvolle Ansätze um in dieser Situation nachhaltige Verbesserungen zu erreichen. Um ökologische Produkte zu verkaufen, ist eine Zertifizierung erforderlich, die mit hohen Kosten verbunden ist, was für bengalische Bauern kaum zu verwirklichen ist. Außerdem ist es das erklärte Ziel der Regierung in der Lebensmittelversorgung autark zu werden. Es gibt Befürchtungen von dieser Seite, dass ökologische Praktiken zu verminderter Produktion und noch größerer Abhängigkeit führen könnten.

Während es in den westlichen Ländern international anerkannte Standards zur ökologischen Landwirtschaft gibt, bestehen in Bangladesch keine vergleichbaren Regelungen. Daher ist es notwendig, dass die internationalen Anforderungen der ökologischen Bewegung in Bangladesch verstanden werden um eine systematische Entwicklung zu ermöglichen. Es ist das Ziel dieser Studie, unter den aktuellen Gegebenheiten nach Möglichkeiten zu suchen, um international anerkannte Standards zum ökologischen Landbau in Bangladesch anzuwenden und nachhaltige Anbausysteme zu entwickeln.

Untersuchungsmethoden

Da der organische Landbau und die Ökologiebewegung auf der Agenda von Nicht-Regierungsorganisationen stehen, möchte diese Studie erforschen, welche

Maßnahmen den Bauern zu empfehlen sind und an welchen Stellen die verschiedenen Beteiligten (Wissenschaftler, einflussreiche Bauern, Verwaltungsangestellte, usw.) Probleme bei der Umsetzung des ökologischen Landbaus bekommen könnten. Gleichzeitig wurde versucht, die Sichtweise der Regierung zu analysieren. Aufgrund der Natur der vielfältigen Realitäten dieser Untersuchung, schienen qualitative Forschungsmethoden geeigneter um zu neuen Erkenntnissen zu gelangen. Die Daten wurden aus drei verschiedenen Quellen gesammelt: Unterlagen, Interviews und eigene Beobachtungen. Die Schlüsselinformanten wurden ausgesucht nach dem Stichproben- und dem Schneeball- Auswahlverfahren. Insgesamt wurde 22 Schlüsselpersonen interviewt.

Die Interviews wurden digital aufgezeichnet und wörtlich transkribiert. Die Transkripte wurden dann in MAXQDA10, einem Software Programm zum qualitativen Datenmanagement eingegeben. Der Rahmen in Bezug auf die Erhebungsfragen wurde entwickelt. Die Daten wurden mit einer induktiven Herangehensweise analysiert.

Als Schlüsselthemen wurden herausgearbeitet: Motivation zum organischen Landbau, Regeln zum organischen Landbau, aktuell erforderliche Produktionsmittel im Landbau, Sicherheit der Lebensmittel, Vermarktung, Möglichkeiten des ökologischen Landbaus, politische Empfehlungen. Diese Themen wurden eingeteilt nach unterschiedlichen Standards, einschränkenden Zwängen, Möglichkeiten und Empfehlungen und in Relation gesetzt zu den IFOAM Grundnormen, insbesondere der Wahl der Gattung der Feldfrüchte und der Länge der Umstellungsperiode, der Bodenfruchtbarkeit und Düngung, dem Insektenbefall von Krankheiten, Unkräutern und dem Wachstumsmanagement.

Ergebnisse

Klassifizierung von umweltfreundlicher Landwirtschaft und ökologischem Landbau

Nachhaltige Landwirtschaft ist ein Grundbegriff der den organischen Landbau beinhaltet. Nachhaltigkeit geht davon aus, dass alle Unternehmungen auf lokale Ressourcen, Technologien und traditionelles Wissen der Bauern zurückgreifen, und sowohl lokale Umweltfaktoren als auch wissenschaftliche Erkenntnisse berücksichtigen. Der ökologische Landbau arbeitet ohne Kunstdünger und Pflanzenschutzmittel und fördert ein ökologisches landwirtschaftliches System. Der ökologische Landbau unterscheidet sich von anderen Formen der nachhaltigen Landwirtschaft durch die Anforderungen, die Zertifizierung und das Prüfsiegel. Andererseits gibt es überall auf der Welt zwei Arten organisch arbeitender landwirtschaftlicher Betriebe, zertifizierte und nicht zertifizierte. Viele der nicht zertifizierten Betriebe folgen den organischen Grundsätzen, aber sie erfüllen die Standards nicht in allen Punkten. Diese Betriebe werden als umweltfreundliche Betriebe bezeichnet.

Die IFOAM Normen und Codex Richtlinien sind die beiden Grundlagen des internationalen Grundsatzprogramms zum organischen Landbau. Die Codex Richtlinien wurden hauptsächlich entwickelt um den Anforderungen des Handels gerecht zu werden, während die IFOAM Normen die Kriterien zur Zertifizierung und

die Regeln für alle Anforderungen enthalten. Beide basieren jedoch auf der Annahme, dass genauere Regelungen auf lokaler Ebene festzulegen sind. Die drei internationalen Normen EU, USDA NOP sowie die JAS gelten für die Weltmärkte, dominieren alle anderen Regelwerke und nehmen Einfluss auf den organischen Anbau in den Ländern. Alle diese Normen fordern übereinstimmend als Grundvoraussetzung, dass Samen und Pflanzmaterial aus organischem Anbau zu stammen hat. Für den Fall, jedoch, dass organisches Saatgut nicht in ausreichender Menge oder Qualität erhältlich ist, kann es für einen kurzen Zeitraum eine Reihe von Ausnahmen geben. Dabei ist genetisch verändertes Saatgut strengstens verboten.

Die Umstellungsphase der Böden auf organische Landwirtschaft dauert laut IFOAM Norm mindestens zwölf Monate, während CODEX; die europäischen, japanische und indische Regelungen einen Zeitraum von mindestens zwei Jahren fordern. Laut amerikanischer Normen muss die Ernte von einem Acker kommen, auf dem 36 Monate lang keine verbotenen Materialien verwendet wurden.

Die Anbaumethoden zur Erhaltung der Bodenfruchtbarkeit weichen in den verschiedenen Normen erheblich voneinander ab. Grundsätzliche Übereinstimmung gibt es jedoch in den Gedanken, dass die Bodenfruchtbarkeit durch den Anbau von Gründüngung und Leguminosen erhalten werden soll ebenso wie durch Fruchtwechsel, ein breites Spektrum angebaute Pflanzen und durch die Anreicherung der Böden mit organischem Material. Hinsichtlich der Anwendung von organischem Dünger gibt es große Unterschiede.

Die Vorschriften zur Bekämpfung von Pflanzenkrankheiten, von tierischen Schädlingen und von Unkräutern sind in den verschiedenen Vorschriften relativ ähnlich. Als allgemeine Maßnahmen genannt werden die Auswahl geeigneter Anbaupflanzen und geeigneter Sorten, ausreichender Fruchtwechsel, mechanische und biologische Maßnahmen während des Anbaus sowie der Schutz und die Förderung der natürlichen Feinde der Parasiten. Es dürfen nur Substanzen verwendet werden, die in der Positivliste der entsprechenden Regularien aufgeführt werden. Die IFOAM und die USDA Normen schreiben zusätzlich die strenge Einhaltung von ökologischen Pufferzonen vor.

Umweltfreundliche Landwirtschaft und ökologischer Landbau in Bangladesch

Die Steuerung und Unterstützung von nachhaltiger Landwirtschaft in Bangladesch erfolgt in drei Bereichen: durch Nicht-Regierungs-Organisationen, durch Privatpersonen und durch Regierungsorganisationen. Untersucht wurden in dieser Studie Betriebe der Proshika, Ubinig und der Community Development Association (NGOs). Weiterhin wurden zwei Privatbetriebe ausgewählt: die Dhamrai Molkerei und die Kazi Teeplantage. Außerdem wurden einige Schlüsselinformanten ausgesucht unter Wissenschaftlern für Bodenbiologie und Mitarbeitern aus verschiedenen Forschungseinrichtungen der Regierung.

Die Grundidee von Proshika ist: Pflanzennährstoffe stehen im Boden von selbst zur Verfügung, wenn er sorgfältig behandelt wird. Wenn die Fruchtbarkeit nicht durch falsche Maßnahmen beeinträchtigt wird, brauchen keine zusätzlichen Nährstoffe aus

anderen Quellen zugeführt werden. Es ist nur darauf zu achten, dass die Bodenfruchtbarkeit durch ausreichenden Fruchtwechsel, Mischkultur, mulchen usw. erhalten wird. Die Bauern halten sich an Gründüngung und stellen verschiedene Arten von Kompost her, um dem Boden Nährstoffe und organisches Material zuzuführen. Nach Meinung der Proshika sind alle Probleme lösbar, wenn in der Landwirtschaft die natürlichen Umsetzungsprozesse nachgebildet werden.

Ubings Lehrmeinung ist, dass das Saatgut den entscheidenden Faktor für den Erfolg der Landwirtschaft bildet. Das Saatgut bestimmt den Einsatz anderer Maßnahmen wie Pestizide, Dünger und Agrartechnologie. Wenn Hybrid-Saatgut benutzt wird, muss auch gedüngt werden. Erfolgt eine Düngung, so haben die Landwirte automatisch mit Schädlingen zu kämpfen. Wenn die Bauern auf lokal erprobte Sorten zurückgreifen und den Fruchtwechsel einhalten, werden sie genug ernten und zusätzlich die Bodenfruchtbarkeit erhalten. Die Bauern der UBINIG und Nayakrishi –Organisation setzen sich aktiv für den Erhalt traditioneller lokaler Sorten ein. Sie glauben daran, dass die genetische Vielfalt eine Ressource des Landes darstellt. Wenn der Boden gesund ist, wird auch die Pflanze gesund wachsen und nicht von Krankheiten befallen werden.

Die Community Development Association (CDA) empfehlen die Anlage von Komposten und die Bauern nutzen pflanzliche Mittel zur Schädlingsbekämpfung. Die Dhamrai Molkerei vertritt die Sichtweise, dass Kunstdünger schädlich ist und dass es erste Priorität sein sollte, eine gesunde Lebensweise für die nachfolgende Generation zu sichern.

Während die NGOs alle Aspekte der organischen Landwirtschaft verwirklichen möchten, beschränkt sich der Hauptaugenmerk der Regierung auf die Schädlingsbekämpfung. So werden z.B. im Rahmen des IPM Projektes Bauern über Schädlingsbekämpfung belehrt. Erst seit kürzerer Zeit nimmt auch die Regierung wahr, dass Schädlingsbekämpfung nicht isoliert betrachtet werden kann, sondern im Zusammenhang mit vielfältigen anderen Kulturmaßnahmen steht. Aus diesen Erkenntnissen heraus wurde das ICM Projekt gegründet.

Die Anbauweisen von Proshika and Ubinig entsprechen den Forderungen der der IFOAM und anderen Grundsatznormen. Demnach können diese Betriebe als organisch wirtschaftend betrachtet werden. Die Kazi Teeplantage wurde bereits durch die SGS und die USDA anerkannt. Was die Dhamrai Molkerei betrifft, so werden die Tiere zum Teil mit Futtermitteln vom Markt versorgt, die nicht organisch angebaut wurden. Daher arbeitet der Betrieb nicht völlig organisch, aber nach Angaben interner Quellen kann die Arbeitsweise doch als ökologisch bezeichnet werden. Die Proshika und deren Vertragsbauern waren durch die abnehmende Bodenfruchtbarkeit und den Einfluss der grünen Revolution sehr motiviert und wurden durch Proshika geschult. Die Nayakrishi Bauern wurden motiviert durch Mangel auf Seiten der Produktionsfaktoren, vor allem nach Naturkatastrophen. Mittlerweile sind die Proshika und Nayakrishi Bauern grundsätzlich überzeugt von ihrer Arbeitsweise. Private Bauern wurden aufgrund von Informationen und aus eigener Anschauung heraus überzeugt und decken nun den Bedarf des Marktes.

Hindernisse auf dem Weg der Verbreitung der organischen Landwirtschaft

Die großen Hindernisse werden aufgrund der Erkenntnisse dieser Studie wie folgt eingeschätzt: Ziel der Regierungspolitik ist die Selbstversorgung mit Lebensmitteln. Die öffentlichen Gelder werden verwendet zur Subventionierung chemischer Produktionsmittel. Die Gesetzgebung zur Vermarktung von Pestiziden ist problematisch. Die Vermarktung organischer Produkte ist schwierig. Die Regierung vertritt die Auffassung, dass organische Landwirtschaft einen negativen Einfluss auf die Versorgungssicherheit hat und dass Hybridsaatgut und gentechnisch veränderte Sorten höhere Ernten bringen werden. Aufgrund unzureichender Tierhaltung sei die ausreichende Herstellung von Kompost oder organischer Düngemittel nicht möglich, weshalb chemische Dünger notwendig seien. Durch die organische Landwirtschaft werde die Gesamtproduktion von Nahrungsmitteln vermindert. Daher könne die organische Landwirtschaft eine Bedrohung für die Unabhängigkeit des Landes von Nahrungsmittelimporten darstellen.

Das meiste Geld des Landwirtschaftsbudgets wird eher für kurzzeitige Maßnahmen wie die Subventionen für Dünger oder Bewässerungsmaßnahmen verwendet. Langfristiges nachhaltiges Denken zur Verbesserung der Produktionsfaktoren steht dem gegenüber zurück. Daher fühlen die Bauern sich ermutigt, Düngemittel anzuwenden was wieder den Einsatz von Pestiziden erfordert.

Aufgrund der Saatgutpolitik und unter dem Namen von „Verfügbarkeit von hochwertigem Saatgut“ werden die Bauern in Abhängigkeit von Hybrid-Saatgut und hochgezüchtetem Saatgut gedrängt, das einen hohen Einsatz von Chemie zum Anbau benötigen. Dieses Saatgut wird unter Laborbedingungen hergestellt und organischer oder Naturdünger reichen hier zum Anbau nicht aus.

Als größte Hindernisse bei der Verwendung von organischem Dünger in Bangladesch wurden die folgenden Gegebenheiten festgestellt: unzureichende Verfügbarkeit von Biomasse, zu wenig Saatgut für Gründünger, Mangel an Ernteresten und tierischem Mist, mangelnde Beratungsdienste, fehlendes Wissen der Bauern über organischen Anbau. Die Bauern in Bangladesch benutzen vor allem deshalb in zunehmendem Maß chemische Insektizide, weil organische Mittel nicht erhältlich sind.

Absatzschwierigkeiten sind ein gravierendes Problem in der bengalischen Landwirtschaft. Die Schwierigkeiten setzen sich zusammen aus mangelndem Konsumentenbewusstsein, mangelndem Vertrauen der Konsumenten und unregelmäßiger Verfügbarkeit organischer Produkte am Markt.

Obwohl es so viele Schwierigkeiten gibt, ist die landwirtschaftliche Forschung nicht hoffnungslos, auch in so überbevölkerten Entwicklungsländern wie Bangladesch. Einige positive Aspekte wurden in dieser Studie aufgezeigt wie im Folgenden noch einmal aufgeführt wird:

Die Chancen der Organischen Landwirtschaft

Organische Landwirtschaft kann die Ernährung von Klein- und Kleinstbauern sicherstellen. Die Forschung hat gezeigt, dass die Bodenfruchtbarkeit erhalten bleibt, wenn die Bauern Mischkultur und Fruchtwechsel einhalten. Die Ernte ist nicht geringer als bei konventionellem Anbau. Im Ergebnis werden die Bauern vielfältigere Erntegüter produzieren und die landwirtschaftliche Gesamtproduktion wird nicht sinken. Wenn die Bauern keine chemischen Produkte einsetzen, sinken ihre Produktionskosten. Sie können ihre Ware daher zu einem günstigeren Preis verkaufen und die Konsumenten brauchen weniger zu zahlen. So kann die Ernährung sowohl auf der Produzentenseite als auch auf der Konsumentenseite gesichert werden.

Es wurde in dieser Untersuchung dargestellt, dass organische Landwirtschaft nicht geringere Erträge oder weniger Gewinn erzielt als die konventionelle Landwirtschaft, wo hingegen Dünger und Pestizide schädlich sind für menschliche Gesundheit, Böden und Umwelt. In Bangladesch gibt es viele Sorten von Reis, Hülsenfrüchten, Obst und Gemüse und lokale Sorten erzielen keine geringeren Erträge. Daher sollten Hybridsorten und HochleistungsSaatgut zurücktreten zugunsten von ausgewählten lokalen Sorten und heimischem Saatgut. Wissenschaftler forschen über ökologischen Landbau und versuchen mehr zu erfahren über umweltfreundliche Technologien und möchten mit den Nicht-Regierungsorganisationen zusammenarbeiten.

Auswirkungen auf die Politik

Organische Landwirtschaft könnte eine der besten Möglichkeiten auf dem Weg zu einer nachhaltigen Landwirtschaft in Bangladesch sein, da hierzu nur wenig Produktionsmittel importiert werden müssen. Um die organische Landwirtschaft weiter zu fördern werden die folgenden Maßnahmen empfohlen:

Agrarpolitik und institutionelle Unterstützung: Die vergleichsweise großen Erfolge organischer Landwirtschaft in vielen Ländern beruhen vor allem auf: hoher Sensibilisierung der Verbraucher gegenüber Gesundheitsproblemen, die durch den Konsum minderwertiger Lebensmittel verursacht werden und der Aufmerksamkeit der Bauern gegenüber Umweltbelastungen. Daher sollten die Medien das Thema der schädlichen Auswirkungen chemischer Landwirtschaft aufgreifen. Das Thema könnte in den Lehrplan der Schulen mit aufgenommen werden. Die Ausbildung der Bauern und deren Teilnahme an der Forschung sind erforderlich um Bodenfruchtbarkeit, Saatgutqualität u. a. zu verbessern.

Die Regierung sollte die organische Landwirtschaft politisch unterstützen. Die Werbung für chemische Dünger sollte eingestellt werden. Die Regierung könnte eng mit den NGOs zusammenarbeiten die sich für nachhaltige organische Landwirtschaft einsetzen. Es könnte ein guter Ansatz sein, die organische Landwirtschaft in landwirtschaftliche Entwicklungsprogramme aufzunehmen und deren Beitrag der bei der Schaffung von Arbeitsstellen und der Sicherung der Ernährung zu betonen.

Die Haushaltsgelder für Agrarwirtschaft sollten Mittel für die Entwicklung der organischen Landwirtschaft bereitstellen, z. B. zur landwirtschaftlich-ökologischen

Forschung und entsprechenden Trainingsmaßnahmen, für Bildungsnetzwerke, in denen alle Aspekte der organischen Lebensmittelwirtschaft einschließlich Produktion, Verarbeitung, lokaler Zertifizierung und Vermarktung aufzugreifen sind. Ein unabhängiges Forschungsinstitut für organische Landwirtschaft könnte eingerichtet werden, das alle Bemühungen koordiniert. Es könnten Ökodörfer gegründet werden als Pilotprojekte für den Export.

Bildung, Forschung und Weiterbildung: Organische Landwirtschaft und die bewusste Wahrnehmung der Konsumenten (schädliche Auswirkungen der Chemikalien auf die Gesundheit der Bevölkerung) könnten als Thema auf den Lehrplan der High School, der Colleges und Universitäten gesetzt werden. Es wäre nützlich, die Bauern über organische Kreisläufe weiterzubilden. Die Unterstützung der Bauern mit Forschungsprojekten ist notwendig, um die Bodenfruchtbarkeit und die Saatgutqualität zu verbessern.

Herstellung von hochwertigem Saatgut: Das Saatgut ist der Schlüsselfaktor in der Landwirtschaft und bestimmt die Notwendigkeit weiterer Inputs. Daher ist die Politik zum Saatgut sehr wichtig. Das Saatgut sollte lokal produziert werden. Um den Bedarf zu decken, sollten die aktuellen Saatgutprogramme der BADC intensiviert werden. Außerdem sollte die Regierung den privaten Sektor, Bauern und NGOs bei der Produktion von Qualitätssaatgut unterstützen, z.B. durch Kredite zu günstigen Konditionen und durch Fortbildungen. Das BADC könnte die Aufgabe übernehmen, einen lokalen Saatguthandel auf Kreisebene einzurichten.

Schädlingsbekämpfung: Um Schädlinge zurückzudrängen, sollten die Bauern auf eine ausgewogene und mäßige Düngung achten. Die Bauern sollten unterrichtet werden, damit sie ein profundes Wissen über Schädlinge und Nützlinge im Einsatz als Gegenspieler haben und deren Einfluss auf den Ertrag kennen (4Rs: richtige Pestizide, richtige Methode, richtige Dosierung und richtiger Zeitpunkt). Händler für Pestizide und in die Vermarktung involvierte Personen müssen Fortbildungen erhalten. Die Gebrauchsanweisungen, Inhaltsstoffe, Anwendungsmengen und Anwendungsgebiete, sowie die Ablaufdaten müssen in lokaler Sprache auf den Etiketten der Produkte stehen. Arbeitgeber sollen verpflichtet werden, ihren Angestellten die notwendige Ausbildung und die Ausrüstung zur Verfügung zu stellen, wenn sie mit Pestiziden umgehen.

Umgang mit Dünger: Die Einstellung der Bauern zu chemischen Düngern muss durch Fortbildungen, Medienkampagnen etc. geändert werden. Es sind alternative Dünger zu Kuhdung, Haushaltsabfällen, Ernteresten u. ä. zu entwickeln. Mischkultur und angemessener Fruchtwechsel sind einzuhalten. Um eine ausgewogene Düngung zu unterstützen, sollte die Regierung die Verwendung von nicht-harnstoffhaltigen Düngern subventionieren. Die Bauern sollten ihre Abhängigkeit von chemischen Düngern schrittweise reduzieren.

Die Aufgabe der Ausweitung: Es könnten die notwendigen Schritte zur Ausweitung der organischen Landwirtschaft zunächst in kleinen Versuchsreihen unternommen werden. Regierungsbeamte auf Feldebene sollten die Initiative

ergreifen und Besichtigungen vor Ort vornehmen. Versuchsfelder, Feldtage und die Einbindung der Bauern in wissenschaftliche Untersuchungen könnten eine entscheidende Rolle spielen um den Aufbau von Kapazitäten bei den Bauern zu fördern. Es ist jetzt von entscheidender Wichtigkeit, die DAE personell zu verstärken. Falls das nicht möglich sein sollte, können private Beratungsdienste gefördert werden, damit mehrere Bauern gemeinschaftlich staatlich zertifizierte Berater beauftragen können

Vermarktung ökologischer Produkte: Die Regierung muss in die Vermarktung von organischen Produkten eingreifen und sie vereinfachen. Um Probleme hierbei zu lösen, ist es notwendig, das Vertrauen der Verbraucher aufzubauen. Auf lokaler Ebene könnten Produzenten-Konsumenten-Kooperative (producer-consumers' cooperative society (PCCS)) eingeführt werden. Es könnte ein Ökodorf errichtet werden um Exportmöglichkeiten zu erschließen. Es könnte ein unabhängiges nationales Zertifizierungsinstitut gegründet werden, um die lokalen ökologisch produzierenden Bauern zu zertifizieren.

Insgesamt sollten Regierung und NGOs alle Kräfte konzentrieren um die Schlüsselprobleme zu identifizieren. Es sollten kurz-, mittel- und langfristige Ziele und Richtlinien für die organische Landwirtschaft eingeführt werden, um die Versorgung der Bevölkerung mit Nahrungsmitteln nachhaltig zu sichern. Zum augenblicklichen Zeitpunkt jedoch gilt es eine ausreichende Lebensmittelproduktion zu sichern, um mit dem Bevölkerungswachstum Schritt halten zu können und Hunger und Armut zu lindern. Hierzu ist es erforderlich die landwirtschaftliche Produktion zu steigern ist aber auch gute Umweltbedingungen zu schaffen für eine nachhaltige Landwirtschaft.

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Appendix

Appendix 1: Key Informant Interview Guide for GO/ NGO Officials

Name of the key informant _____ Designation _____

Address _____

Date of Contact _____ Date of interview _____

Thank you to allow me to meet with you. Also, I would like to thank you for your kind participation in this interview. Though, I already informed my purpose to meet with you over phone, I am telling again. I am PhD student of University of Giessen, Germany and conducting a research on “Eco-friendly and Organic farming in Bangladesh - International classification and local practice”. To carry on this research, I have to conduct key informant interview. As you, along with your organization are devoted on the eco-friendly agriculture (organic farming), therefore, I have selected you as a key informant. When I publish the results, if you like, I can send you the final report of the research. During this interview, I will take a few notes, but because it is hard to write down everything that is being said I would also like to record this interview. I have some questions that I have organized in semi-structured way.

1. With which motive eco-friendly farming/ ecological farming programme was started in your organization? How this programme is related with farmers?

As I already mentioned about my research topic, I have to know from you about the standards or practices, you are following or you are suggesting farmers. As you know, to be a farm or a product organic, there are some issues about standard and certification. In that aspect, I would like to ask you,

2. Do you follow any international standard? (If no,) why are you not following standards? Do you think that standard and regulations should be introduced?

3. What are the crops your contact farmers are growing in eco-friendly practices?

4. Which types of varieties you/ your contact farmers are growing/ you are suggesting in eco-friendly practices? Do you think that hybrid seed is an obstacle for practicing eco friendly farming? (If yes) How?

5. As we know that there are some restrictions on chemical fertilizers in case of organic as well as in eco-friendly farming. Therefore, farmers may face problem. So, what types of practices and inputs you are suggesting farmers to follow for soil fertility management instead of synthetic fertilizers?

6. Like chemical fertilizer, restriction is also applicable against chemical pesticides. So, how they cope with this? What inputs/ methods are used by farmers to alternate chemical pesticides?

7. In any case, if farmers need to apply pesticide, in that situation, what will be your recommendation?

8. Do you think that crop rotation is important? Yes () No ()

(If yes) What types of cropping patterns are followed by farmers, or you suggest for farmers?

9. There is a saying that organic practice is not possible without rearing livestock as compost is the main element of organic fertilizer and cow dung s its main component? Do you think that raising livestock is important for eco-friendly farming? (If yes) how livestock help?

10. Do you think that production is less in organic way of cultivation? (Yes/ no) Sometimes, our policy makers say, ecofriendly agriculture has negative impact on food security. What is your opinion?

11. Do you have any written documents that farmers can follow as standard? If yes, what are the standards? (Could you please give me a copy of your document?)

12. We know that your organization is doing research or following eco-friendly farming. But are you working for extension of eco-friendly farming? If no, do you have any plan? If yes, what kinds of problems do you face in extension?

13. We know proper agricultural marketing system is a common problem of farmers of our country? How your product or the products of the contact farmers are marketed? Do you think farmers need better system? How could it be possible?

14. Do you have you any plan in future to convert your farmers' eco-friendly farming land to organic land? (Yes/ No) If yes, how it would be possible?

15. How is your opinion about the possibility of organic/ ecofriendly farming at large scale? What could be the point for the policy makers to help in this issue?

16. Could you please provide me some suggestion that could be useful for government policy makers to work for eco friendly farming? Please answer from your experience.

THANK YOU for taking the time to participate in this interview. I believe, your views will be very much helpful to conduct my research. At the same time, the environment as well as farmers will be benefited from our discussion.

Appendix 2: Interview Guide for Community Leader/Influential Farmers:**A. DEMOGRAPHIC INFORMATION:**

1. How old are you?
2. For how long have you been working on this farm? _____
3. How many people work on the farm? _____

B. DESCRIPTION OF FARM:

1. What is the area of your farm?
Eco-friendly cultivated _____
In conversion _____
Conventional _____
2. What are the main products?
3. Are you a member of any farmers association?
No _
Yes _ what are the benefits for you?
4. Where do you search for information on farming practices and ways to improve your farm?
5. Do you visit and exchange information with other farmers? Yes _ No _
6. What are your reasons to convert/ not convert to organic farming?
Financial reasons _
Fitted with previous farm management _
Wish to contribute to environmental conservation _
Encouraged by officials _
Encouraged by other farmers _
Other _ What? _____
7. Why do you feel that we need to be conscious about environmental issue in agriculture?
8. Where did you get information first to be conscious about environment friendly farming?
9. Did the shift to organic farming change your priorities for your farm? If yes, how?
10. Have there been changes in the productivity of your farm since the conversion?
Yes _ What? No _
11. What are the crops you are growing as eco-friendly way?
12. From where do you buy seeds?
13. What are the methods and what types of inputs you are using for land fertilization?
14. What are the methods and what types of inputs you are using for pest management?
15. Do you follow crop rotation? Please mention the cropping pattern of your eco-friendly cultivated land for last two years?
16. Do you know about organic farming?
17. Do you know that to be a farm organic, standard and regulations should be followed?

18. In your sense, what are the advantages of standard and regulations?
19. Are you interested to form farmers' association for movement of organic farming?
20. What are the obstacles you facing for eco-friendly farming?

C. MARKETING

1. How do you sell your produce? Why?
2. What are the advantages and disadvantages of marketing your produce in this way?
3. Do you process products on farm?

No _ Why?

Yes _ What?

D. IMPACT ON FARM:

1. What are the major challenges for your farm?
2. How do you think the agricultural policy impacts on your farm?
3. Would you like to add any other information?

THANK YOU for taking the time to participate in this interview. I believe, your views will be very much helpful to conduct my research. At the same time, the environment as well as farmers will be benefited from our discussion.

Appendix 3: Name, description and coding of key informants

Serial	Code	Name	Designation
1.	P ₁	Dr. Kazi Faruk Ahmed	Former president, Proshika, pioneer of ecological agriculture programme in Bangladesh.
2.	P ₂	Dipak kumar Ghosh	Principal Programme coordinator, Proshika & ex-director, organic agriculture, Proshika
3.	P ₃	Kazi Khaze Alam	Director, natural resource management programme, Proshika & former director of ecological agriculture programme
4.	U ₁	Dr. Abdus Sobhan	Consultant, UBINIG & ex-Chief Scientific Officer, Bangladesh Jute Research Institute
5.	U ₂	Farida Akhter	Founder and executive director, UBINIG & famous environmental worker and renowned writer
6.	C ₁	Abu Kamal	Programme coordinator, community development association
7.	K ₁	Md. Sajjad Hossain	Manager, Kazi and Kazi tea estate limited
8.	G ₁	Dr. Mohammed Shamsul Alam	Project Director, Integrated Crop management, & Assistant Senior Advisor, Agricultural Extension Component
9.	G ₂	Md. Monirul Islam	Agricultural Extension Officer, Department of Agricultural Extension, Khamarbari, Dhaka, Bangladesh
10.	G ₃	Dr. M. A Momin	Ex Principal Scientific Officer, On-Farm Research Division, Bangladesh Agricultural Research Institute, Pabna
11.	G ₄	Dr. Syed Nurul Alam	Chief Scientific Officer & Head, Entomology Division, Bangladesh Agricultural Research Institute
12.	G ₅	A H M Monirul Haque Naqvi	deputy director (export) of BADC, Project Director of Integrated Quality Horticulture Development Project
13.	G ₆	Dr. M. Nazim Uddin	Scientific Officer, Olericulture Division, Horticultural Research Centre, Bangladesh Agricultural Research Institute
14.	G ₇	Dr. Shafiqul Islam	Principal Scientific Officer, Bangladesh Rice Research Institute (BIRRI)
15.	D ₁	Md. Hasibur Rahman	Managing director of Dhamrai Dairy Limited
16.	P ₄	Abdul Malek Worker (28)	Technical worker, Proshika
17.	F _{P1}	Nurul Islam, farmer (35)	Community leader, Kuragacha, Madhupur (PROSHIKA contract grower)
18.	F _{P2}	Abu Bakar Siddique (31)	Contract farmer of Proshika and trainer of other farmers
19.	F _{U1}	Abdul Awal (51)	Nayakrishi community leader
20.	F _{U2}	Md. Moinuddin (48)	Farmers' leader
21.	F _{U3}	Rekha Akter (50)	Nayakrishi farmers' leader
22.	F _{G1}	Abdur Rahman (55)	Contract farmers' leader of BARI, Pabna

BARI - Bangladesh Agricultural Research Institute, BIRRI - Bangladesh Rice Research Institute, BADC - - Bangladesh Agricultural Development Corporation, ICM – Integrated Crop Management, IPM – Integrated Pest Management

Appendix 4: TRANSCRIPTION OF RAW DATA

P₁

Length of interview: 1 hour and 50 minutes

Paragraph 1: Ques: with which motive, did you start ecological agriculture programme in Proshika? (He checked the questionnaire, I would like to ask him this question and try to get this answer, but he described from himself 1 hour and 20 minutes)

Ans: There was a famine held in Bangladesh in 1974. I went to Roumary, a place of north Bengal for relief work in that time of famine. I saw that many people were died due to lack of food. There was a large market (hat) where I was staying and rice, pulses, salt, egg, etc- all food items were available in the shop but 10-12 people were died under a big tree in front of this market with starvation. At that time, I thought “this famine has not happened due to unavailability of food because foods are available in the market; it is created due to lack of purchasing power of poor people. Secondly, those people died without any protest, they could plunder food from the market. They died silently without any complaint. From this, I think they have not only low purchasing power but also no protesting power. Then it was clear to me that famine does not occur from the unavailability of food, it is created for the lack of purchasing and protesting power. Then I decided to organize an association that increase purchasing and protesting power of the poor. With that aim, PROSHIKA was started in 1976. Though it was started in 1976 but we informally started in 1975. We got registration in 1976. We bought 70 acres of land in Manikganj with 1 lakh taka.

Paragraph 2: At first, we started to provide training to farmers on making compost in 1975. Agriculture is the main occupation of our country’s people and income would be increased through agriculture, especially small and marginal farmers who had 1 or 1.5 bighas of land. If we want to increase their income, it must be based on agriculture because, they will not get better income as an agriculture labor. Isn’t it? For that our strategy was to increase farmers’ income especially small and marginal farmers. With that strategy, we think how fertilizer can be made with lowest cost. Then we provide training to make compost. In the same time, we formulated poor and landless farmers organization and from the beginning. We discussed, how they treat their problems, what are the problems they face. We did not want to impose our solution towards them. We wanted to hear how they treat their problems and what can we do on the basis of those problems. About 30 groups were formed in that time in five places of Bangladesh namely Saturia from Manikjonj, Dhamrai, Mehendigonj from Barisal, Bhairov from Kishorejonj and Comilla sadar. I wanted to know from them how they treat their problems. In the beginning they did not want to tell anything. They used to tell “You know better, we are illiterate, what we can say?” In the beginning I asked them to call me as “vai” (Brother), not “sir” to make easy. Secondly, we decided not to sit in the chair. If there was arrangement that every one could sit in the chair and have enough chairs, then we sat. If they arrange only two chairs for us and others sat in the floor then we used to sit on the floor. In this way, we built good relationships among us and they started to talk freely. At first, they didn’t discuss about the problem of agriculture, it was agricultural loan. They expressed, “we do not get loan easily. We can loan from village “Mahajon” at rate of monthly 20%. In this way, we have to pay interest above tk. 200 in a year. So, please help us – how we can get loan easily? In this ground, we started to give loan in 1976 without any collateral, which is called micro-credit now-a-days. Grameen bank did not establish that time. BRAC was established but they didn’t have credit program. We gave loan for goat raring, loan to return back of their cultivated land which were rented, loan for cow raring, loan for duck-chicken raring, etc.

Paragraph 3: We formed two types of organization, male and female. Other NGOs worked with more female organization. Our thinking was, as the male members were directly engaged with farming, so they realize farming problems more than female. In fact, we had more male organization than female. They said, “Please observed that we are using more and more fertilizers day by day, insect’s attacks and remain though insecticide is used, as a result production cost is increasing but amount of production is decreasing”. Chemical fertilizer and pesticides was first use in 1965-66 in Bangladesh. At first different companies give these free but it was highly expensive and deteriorating yield over time. We thought “how we can provide fertilizers with less cost”. Then we started to provide training on making compost. But we observed a problem;” the weight of cow dung and compost is very high. If we make it at home and bring it to the field, it becomes costly because it needs more labor”. By this time, we discussed with farmers how compost could be made in their land with low cost. Besides that, some farmers had no cow. Again if they had cow, they used those small amount of cow dung for cooking purpose as fuel.

Then tea was ordered.

Paragraph 4: In 1978, a meeting of IFOAM was held in Montreal of Canada. Most probably the head office of this was in France. I went to Montreal for attending in this meeting. In this meeting, organic leaders discussed about many aspects. One aspect was biodynamic agriculture. It was discussed by somebody from Germany, I came to know the name of Rudolf-Steiner and I became familiar with many issues. From there, it seemed to me that, temperature, rainfall, season etc of European countries were different from our country. We have more opportunity to produce biomass for organic agriculture than European countries because in those countries, only one crop is produced in a year, but in our

country we could produce three crops because of favorable rainfall, humidity and temperature condition and in our country the growth of trees are very rapid. Everything in our country grows very rapidly. For that reason, we can produce huge biomass. So it seemed to me that organic agriculture could be done in lower cost than European countries and we have to do it because of overpopulation. After coming back in Bangladesh, I started searching, how fertilizer can be produced in the land at low cost. I know about sesbania (*dhaincha*), that is from leguminous family and have the capacity to fix Nitrogen in soil. Our farmers produce sesbania, kheshari but do not bulldoze with soil. Sesbania is used as fuel. Farmers don't know that it fix Nitrogen similar to Kheshari.

Paragraph 5: Then we decided to grow sesbania, kheshari etc. So these leguminous crops are grounded with soil before flowering to produce organic matter and this organic matter enhance the activities of earth warm and micro-organism. From this concept, Sesbania or kheshari seed were broadcasted in the crop field in November before 15 days of harvesting Aman. After 15/ 20 days of aman harvesting, when leguminous plants were big in size, those plants were smashed in soil before flowering. Then modules were produced through N₂ fixing. At the same time, biomass also produced those would be used as food for earthworm and other micro organisms. These micro-organisms bring trace elements (P; B, Zn) from soil & increase yield per unit of land. Detrimental pests and insect are controlled by frog, lizard, spider, earthworm etc. Soil is a valuable resource. The 5-7 inches of upper portion of soil supply nutrient element to the plants. More than 40 million micro organisms live in one spoon of soil. Due to apply of chemical fertilizers, the MOs die, soil becomes acidic as well as unfertile, and plants cannot take nutrient from the soil. Then crop production hampered. We have to produce food but not disturbing the environment. We know that earthworm and micro-organisms increased soil fertility and produced food for plants. If farmers follow the cropping system like: 15 days before of cultivating one crop, farmers need to plant leguminous crops for 15 days and the small plants should be grinded with soil. The biomass will be produced which will be food for earthworm and micro organism. One statistics showed that in this way, it is possible to fix 35 kg. Nitrogen per hectare. If we plant Boro rice, then in the middle of May, Sesbania could be cultivated and grinded in June. It produces 29 kg of N₂ and 1 metric ton biomass. If those 1 ton biomass smash in soil then how much organic matter would produce. Then farmers can plant Aman, when sesbania is again in the field. For this Aman, Compost is not even necessary. The required fertilizer for soil was produced in the soil.

Paragraph 6: However, N₂ is already fixed in soil. How the other fertilizers will be managed? What earthworms do? Soil is the food for earthworm. We feed the earthworm biomass and after eating it produces Phosphorus and Potassium through mineralization, as earthworm plough the soil from one side to another side – uplift the ground soil. This process creates all kinds of necessary trace elements + phosphorus+ potash and micro organisms crate boron, Zink through ion exchange. So, in this way, a complete fertilizer dose is managed. So, the cropping pattern is: Leguminous crop – Aman – Leguminous crop (Sesbania) – Boro – Lentil. In this way, we got the solution. It is possible to get 70 maund/ acre from Aman rice and 80 maund/ acre from Boro which is not possible with using chemical fertilizers. In the boundary of rice field, 'German grass' can be planted as fodder. So, Proshika feels that if we follow natural process in agriculture, we will get the solution. On the other hand chemical fertilizers make the soil acidic and this acidity destroy bacterial growth that means growth of earthworm in the environment. Soil acidity becomes zero and neutral in organic production as a result ion exchange becomes correct.

Dipok, one of our colleague, learned a technology from Japan namely, Fermented plant juice. Fermentation is created through keeping small pieces of banana tree with sweet (gur) in a jar for 7 days. After 7 days it creates juice and we use it in the vegetables. We got tremendous result from it as a plant growth regulator. 4/5 spoon juice can be mixed with one liter. It showed good result in cabbage and eggplant. I also act as pest control.

Paragraph 7: But what is natural process of pest control?

Ans: Proshika principle is: natural control. When farmers apply pesticide, frog, spider, lady bird bittle – these types of predators – who are eating harmful pests- reduced. So, pest resistance grows if pesticides are used. When pesticide is applied, pest dies, at the same time predator also dies, Pest-predator ratio unbalanced. The life cycle of frog is 3 months. For maximum pest, it is 21 days. So the reproduction is more in pests than predator. As a result, the amounts of pests will more than predators due to application of pesticide. In case of naturally control, predators rapidly eat pests. As a result our first decision was we did not use pesticide. Then our pest-predator ratio will balance. It is experimented that frogs eat 3 times more pests than their body weight.

Another findings of research is: Rice Hispa (locally known as Pamri Poka), is not harmful for rice. It attacks on rice leaf but leave before flowering. The adult beetle feeds on the green portion of the leaf. So, no food is needed for leaves. So, this beetle doesn't affect production rather than production increased. We came to know that nothing should be used, if pamri pests attack. So we become save from the pamri without any pesticides. But to get rid from this beetle, sometimes GoB is spraying pesticides with using Helicopter. For Stem Borer (local name Majra Poka), if farmers' spray mixture of Neem leaf and Urine of cow (kept in a jar for 15 days and spray this mixture) – it works very well. If farmers put (dig) branches of trees, then birds will come to eat the insects – these are the organic pest managements. Sometimes 'Trap of Light' and 'Fermented plant juice' work very well. For producing 1 litre of plant juice, Tk. 10 is needed. Proshika doesn't permit any chemical as pesticide. We give those advices to the farmers since many years. Now about 11,000 farmers' are working with Proshika. We teach them about those matters. One thing is do not use pesticide, results less

pests attack because if predators are alive then all pests are eaten by those predators. For example, a frog eats three times more pest of its body weight. So if frog is in the field, what is your tension? So don't use pesticide, follow previous instruction to control pamri and majra pests. Those are our organic pest management. So we have no problem about pests. We were able to do this. What happened for that? The use of chemical fertilizers stops completely. As a result, the cost of chemical fertilizers and pesticides were saved. On the other hand, to make organic fertilizer, only sesbania seed required, no transport cost. Only 1/2 labor is required for grind it to the soil.

Paragraph 8: Ques: What are the crop varieties and what kind of seeds, your contact farmers are growing in eco-friendly practices?

Ans: There are many examples that farmers buy low quality seed. For example same farmers buy cabbage seed but after germination, it was recognized as mustard seed which are the causes of that farmers are suffering from the problem of seed those, are characterized by (low quality, less germination rate, less yielding, old, disease infected). Due to this reason, farmers fail to produce crop in time. Again, there is problem with HYV and cross bred. Adaptability power is very less. HYV seed are produced in laboratory and cross breeds are in commercial farmers. Both of them are produced in artificial environment and with using high chemical inputs.

Their characters change due to applying high dose of chemical fertilizer in a way that organic/bio fertilizer doesn't work at the time of production. Before releasing HYV seed, it passes some artificial generation. So, it is very difficult to adopt in local environment. In Bangladesh, hybrid seeds are imported from the countries that the weather is not like Bangladesh. At the same time all kinds of seeds are expensive. Farmers cannot collect seed for the next time production. Every time, farmers have to buy. Seed dealers and suppliers motive is also to make farmers dependent on hybrid seed. Farmers normally get very limited time for planting seed. There are many examples that farmers waste their valuable time for buying seed. Sometime dealers make artificial crisis for getting higher price of seed. It is not sure that farmers will get seed at the time of sowing. Proshika feels that to protect local variety is very important for two reasons. One is, local variety seeds play very important role for crop rotation and diversification. Another reason is this variety is a genetic resource of a country. HYV seeds are also producing from this local variety. Without this local variety, it is not possible to invent HYV and hybrid seeds. The developing countries are already conscious about protecting local variety. After considering above mentioned problems Proshika's principle is: farmers have to produce seed on his own farm. The advantages are:

- 7) Farmers knows the behaviour of this variety
- 8) Seeds are highly adaptable to the environment
- 9) Seed are not dependent on chemicals
- 10) Cost of seed is very less, so cost of production reduced
- 11) Farmer can use when he needs
- 12) It is the way to protect genetic resources

Paragraph 9: It was about in 1991, when we started documentation. , we calculated the costs and returns. That time, we needed tk.103 for producing 1 mound of aman paddy where as tk. 250 were needed, who used chemical fertilizer and pesticides. At that time the price of rice was tk. 330. As a result our profit was about tk. 200 and conventional farmers receive profit just tk.100. Moreover, their food was not free from poison; it was harmful for health, harmful for land, harmful for environment and aquatic life of water hampered because of chemical fertilizer and pesticides. We observed that there is no fish in the beels (big pond). That means they got benefit by destroying everything. But out cost is less and profit is more. For example we got 70 mound rice, they got 5-10 mound more than us by using chemical fertilizer and pesticides. So we are producing by following this system.

Paragraph 10: Ques: What types of cropping patterns are followed by your controlled farmers?

Ans: we produce 6 crops in vegetable land and 3 crops in the field. These 6 crops could be possible in only organic method because if we use chemical then soil burned and they can not produce 4 times, where we produced 6 times. We produced early cauliflower. This cauliflower harvest in the mid October. Then produced red amaranth that needed one month. Then cultivated late cauliflower and/or cabbage. This late cauliflower is harvested in January-February. After that broccoli is cultivate here. Carrot was cultivated in some lands instead of cabbage and then we cultivate spinach. In summer, we cultivate either bitter gourd or eggplant, then pointed gourd. We cultivate banana and country bean as boundary crops. That means we harvested 7 crops from one land. We can not use green manure here, we use quick compost. Quick compost can be made within 15 days. In case of normal compost takes 3 months. To summarise, for field crops, a standard cropping pattern is:

1st year: Boro rice –Sesbania (green manure)– transplanted Aman – Potato.

2nd year: Maize – transplanted Aman – Grass pea (green manure) – Boro rice.

3rd year: Sesbania – transplanted Aman – Potato – Boro rice.

On the other hand, in vegetable land, we produce 6 organic vegetables following like:

Early Cauliflower – Red amaranth - Cauliflower/Cabbage – Broccoli/ Carrot – Spinach/ summer veg.
(Aug- Oct) (Oct - Nov.) (Nov. – Jan.) (2 months) (Bitter gourd, brinjal)

In vegetable plots, it is better to plant banana as boundary crop. Here quick compost is used instead of green manure. Fermented Plant juice is also used as fertilizer and pest management for brinjal, cabbage and cauliflower. We try to cultivate three crops in south Bengal where they cultivate one. Wheat-Pulse-Aman, Pulse-Aus-Aman. If pulses are cultivated in Barisal properly, there is no need to import pulses, no need to import rice. BD will be food surplus but not like India. They do not think food security in family level but we think in family level.

Paragraph 11: Ques: Do you think that organic/ ecofriendly agriculture has negative impact on food security?

We got 6 or 7 crops but what is its implication? 70% farmers of our country who have 1-2 bigha land, how they can achieve food security. They are in food deficit, isn't it? If we saw the food security status of India, we see that they are in food surplus nationally, isn't it? But about half of the people take below 2000 cal food, but, food is not secured in farm or family level. So, national food security doesn't mean family level food security but the opposite is true. Our 70% of farmers are poor; they have 1-2 bigha land. So if food will secure for that people then whole nation will be food secured. Suppose one farmer has 1 bigha land. If farmer grow Aus– Aman – Lentil in his one bigha of land, then he will get 30 maund rice and 4 maund lentil. From 1 maund paddy, farmer will get 27 kilo rice after processing. If his family member is 5, then he needs 2 kg. rice per day. So, he needs 18 maund of rice. At the same time, he also needs 2 maunds of Lentil. After consumption, farmer can sell some rice and lentil. From 2 rice crops, farmer will get straw. With this straw, 1 cow and 25 hens can be feeded. If he rare a cow and used straw as its feed and produce 4 liter of milk per day. If he rare 20-25 chicken, he will get egg and meat. Farmers also have 3- 5 decimal homestead land – from which he can grow vegetables for the whole year. If he invests taka 2000 in the homestead land, he can manage the whole year vegetables. By following this organic system he produced 3 crops in the field and 6 vegetables in homestead area, one cow, 25 chicken that ensure completely food security and food surplus. We try to rapid spread of this information in the whole country. And if this can be done then I think it is possible to keep the price of rice within tk.20. The conventional farmers can not do this. The reason for rise in price of rice and other things is to use chemical fertilizer and pesticides.

Paragraph 12: There is a relation between the price of oil with the chemical fertilizer and pesticides. Bio fuel is needed for producing chemical fertilizer. The price of oil is 130 dollar/ barrel and it is rising. So, Bangladesh must be alarmed just now. Finance minister announced that the price of urea is tk.10 and it will increase. The import price of urea is taka 50 and that means subsidy amount is taka 40/ kg. So, price must be increased through subsidy is given. As a result, the price of rice will not decrease though production is more. But as in organic method, no chemical fertilizer and pesticides is used. So, the aus, aman and pulses can be produced in the lowest costs. We have statistics that got of Bangladesh is paying taka 30,000 core for importing chemical fertilizer and pesticides. If we don't import those items, huge currency of the nation will be saved as well as farmers production will increase. Two students of the Agricultural University asked me “you say that rice can be produced by tk.20/ kg, how is it possible? Do you have any magic?” I told “I do not have any magic. Nature has magic. Magic from almighty and we follow it. How nature fertile the soil? If we feed earth worm and micro organism, they will feed us. We smash sesbania or leguminous crops in soil then earthworm and micro organisms eat it and fertile the soil in natural process and N₂ flows in the air. Natural air contains 73% of N₂ in the air and leguminous crops can take N₂ from air and give back to the soil. Result shows that it works as a fertilizer. So, why do we need chemical fertilizers as every thing is in the nature? Suppose now, we harvest boro rice for which we spend, tk. 250 per mound including all costs. We have to spend more, as we did not work directly in the field. But farmers have family labors, so their cost will be less. On the other hand, farmers who used chemical fertilizers needed tk. 430. So he should sell tk. 700, but if I sell with tk. 500 then profit remain tk. 100. We get 27 kg of rice from 1 mound of paddy. So if the price of rice is tk. 500, then what price stands for per kg of rice? It is below tk.20. So what does it mean? The people can buy rice in low price and farmers also get profit by tk.100. So, our farmers have to come far away from international fertilizer and oil market. Then, we will get more crops, cost will be lower, our land will save, our water will save and save thousands of taka, those we spent for fertilizer and import. But govt. does not want this; World Bank and many other representatives of those companies do not want it. The World Bank, our advisors, Ministry of Agriculture – they are their representatives. They are making business with our poor farmers and making money. They treat this organic system as conspiracy because we want to stop their gigantic business. We are fighting in this way.

Interviewee: I told many things, you check that have anything remains.

Interviewer: Thank you for giving valuable information. We have some more questions but maximum answer we get from the discussion. What methods are followed for maintain soil fertility besides quick compost?

Ans: One is vermin compost, another is green manure. Quick compost, vermi compost and fermented plant juice are used for vegetables. We have some books and documents for quick compost. You can take those, which will be useful for you.

Paragraph 13: Ques: We know that there are some organic standard such as IFOAM, CODEX, EU, USDA, JAS, USDA, JAS. Proshika is the pioneer of organic farming in Bangladesh but do you not follow any standard?

Ans: We think we are above the international standard because we do not use any types of chemical. There is provision to use some recognized chemical in international standard but we do not use. So, our standard is higher than international standard. According to some international standard, farmers can use calcium, phosphate and some organic chemical pesticides. We also use pesticide, that is bio or organic pesticide. For example, pesticide is made from neem leaf and cow urine. Pamri poka is not harmful for rice. We should not do anything for that. We undertake a research with IIRRI where we observed that they eat only leaf and after eating leaf they leave before flowering. As a result, more flowers appear which leads more production. Last year, our agricultural minister Motia Chowdhury came here. That time, pesticides were applying from plane to kill "pamri" in Barisal. Then I told her, Motia apa, it is wrong. Actually pamri is not harmful rather it is useful; we found it from a research. Next year you may set a signboard in Barisal as "Pamri poka asen vai, apnader sagoto ganai" (come on stem borer, we welcome) ha ha ha.....

Minister said, "What are you saying, if I follow, my minister ship will be cancelled out. All the local MPs pressure me-why insecticides are not spraying? Why we do not take any action? Brother, next time the responsibility will go to you". So it is the strategy from international companies. In this year mazra insect slightly attacked in aus rice. We use the mixture of neem leaf and cow urine and we teach the farmers. There is no cost to make it because farmers have neem tree. FPZ is needed for vegetables. Only tk. 3-4 is required for making it and 1 liter can be sprayed in 1 bigha of land. Last year we used it for bottle gourd (chalkumra). Production was excellent. It is pesticide as well as hormone.

Paragraph 14: Ques: Do you have any written rules and regulation for Proshika?

Ans: We have many training manual where describes how farmers work, how to make green manure, how to make FPZ, how to make compost, how to prepare organic pesticides? We made video documentary for that. We define every process clearly through these video and every process is based on research. We have document in the main research centre where it described the cost and production of green manure. So what practices are followed in organic agriculture, it is described in manual. But we did not use any chemical because our country is suitable for biomass production. It is enough that is the growth of sesbania and khesary in one and half months and make fertilizer accordingly. I got two green manures in a year, what is the necessity to use chemical? No fertilizer is needed for me. So there is no matter of chemical use from my side.

Paragraph 15: Ques: Have any plan to follow international standard in future?

Ans: We send one of our colleagues to learn about EU and IFOAM standard. We will make plan after his coming back. As we do not export, so standard is not followed properly. But we have no problem to follow those standards. Again standard is a long term process and it needs huge amount of money.

Story: In 1984, there was a bilateral agreement that Bangladesh Agriculture ministry will monitor the activities of Proshika. Agriculture ministry gave this duty to BARC to monitor us. There was a gentle man namely, Mr. Rahim (Scientific Officer, BARC). He came here to visit organic farm and after visiting, he become angry and said what are you doing? You are national enemy? I reply, why? The food production will be decreased in Bangladesh by following your method. I told "no, production will not decrease, cost will decrease and we already prove it".

"What do you say? As a scientist, we know, without fertilizer there will be no production. I give you a report and follow it". "As a chemistry student, I know, what is chemical. I know the bad effect of chemical. All of the pesticide company was arms factory in the time of 2nd world war. They killed us in one approach previously and now they started to kill in this method. You tell me national enemy or anything, doesn't matter, but we must leave in these chemicals". He becomes very angry. It was in 1977. Another topic that is that fertilizer is not available in the market even huge subsidy is given. Two days before, I had a meeting with near by farmers. They said they have no problem with input price. Proshika farmers tell 'fouzday krishi' to chemical agriculture and 'Peace agriculture to organic agriculture.

Paragraph 16: Ques: Where can we get the organic farming report?

Ans: You can get it from Dipok. We are trying to spread this technology effectively through farmer's field school, Peoples Theater, etc.

Paragraph 17: Ques: Do you know any other organizations that work about organic farming?

Ans: Ubinig. I heard they work with bio-diversity. We do not support hybrid but we are not against local HYV because we should increase our production and HYV can produce with organic. We want to address the problem of productivity. Production increases but cost decreases in our technology. Organic agriculture is a way of food security for very small and marginal farmers. The reasons I told previously, food security. Food security is the biggest achievement in Bangladesh for Ecological agriculture. Such as, soil, water but special benefit is small and marginal farmer's organic agriculture and include them into food secured position through crop intensification which is very difficult by conventional method.

P₂:

Time: 1.20 hour

Paragraph 1: Q: when did you start eco-friendly farming? What was the motive?

Ans: The people of Bangladesh were first familiarized with organic farming in 1976. Not only Proshika, but also some foreign experts were also involved with it. Especially we must mention Jenny Lacker, a French eco-farming expert ----- introduced its procedure in Bangladesh agriculture. Our motive was to utilize traditional knowledge base, where govt. was busy to adopt green revolution, but gradually Proshika (an NGO) brought improved technology on its application. At the same time, we also worked for extension to spread the knowledge. So, Proshika works with two motives: technological improvement and extension. The distinction between eco-farming and organic farming is that organic farming deals with the spirit of organic relationship with organic nature (organic nature includes soil health, agricultural eco-system). Organic agriculture works for the development and sustainability of soil. But in ecological or natural agriculture, not only soil, we have to develop the entire natural ecosystem. And eco-farming deals with different species of plants.

Paragraph 2: We have to plant the trees which is suitable for the crops. If we plant different types of trees, then different kinds of animals, birds, insects will come – that will develop a sound ecosystem, which will work as a basis for the development of ecological farm. So, basic difference is like this, but difference is not too much. In case of organic farming, we have to work for a sustainable system. We need to grow leguminous crops. A sustainable boundary plantation is followed with fast growing plants and high aeration character and the plant is pruned from 2-3 times in a year. The pruning materials could be used as manure in the field because it rotten quickly and we can also use it as mulch material. The branches and trashes are used as fuel wood. Sometimes the boundary crops acts as blockade against inclemency's and bird can sit on it to swallow/consume pests and insects and finally make the ecosystem balance.

Paragraph 3: What we are doing for technology socialization is: people theatre plays a massive role to disseminate this farming technology to the farmers. So, we use it as a big media and another is ICT materials. We have video documents on: What kind of technology is used in farmer's field, which is performing how etc. The performers display various activities before the farmer at every evening from village to village, thus the potential farmers clarify their ideas and queries about efficient farming methods. It is a process of socialization. In case of people's theatre, 1 to 2 thousand Farmers gather in a field. We have people's theatre group in Upazilla level. The local farmers play role. We repeat the documentation in theatre, at village in the evening and again, we invite the farmers in farmers' field. In farmers' field, they express how they are working? For example, one farmer tells how he prepared plant growth regulator, what is the process, when and where he used it, how many time, what was the ratio etc. we arrange it for two times, at growth stage and at harvesting stage. Then we arrange five days training for farmers' better performance and direct practice about making of compost, fermented plant juice, seed bed, pit differences, decomposition and fermentation procedure – the total technical issues. After preparing quick compost (when they mix oilcake,), farmers sometimes tell they are facing problem of bad smell. The surrounding people are complaining about it. That means, they are not mixing it properly. They follow anaerobic decomposition process, mix huge amount of water, as a result, a bacteria is formed which produces enormous sulphur and mythen gas. But when optimum moisture condition followed, then aerobic decomposition will be started and the bacteria will not release sulphur and ammonia. These kinds of technological difference is minimised by farmers training. If we only tell them, they will not learn. When they will do it by themselves, then they can follow it correctly. After formal training, we provide them technical support. In each ADC (area development center), we have technical worker. They have depth organic agricultural knowledge. Here we also provide credit without collateral which is called "plus plus credit plus". Plus plus means we organize farmers, form farmers association or group, they become conscious about their demands and rights, they receive need based credit and start to save with repayment and, then they engage with organic agriculture project. When the project starts, they get technical assistance. And to follow the whole process, then get help from media like people's theatre, ICT materials, farmers' field etc. and then formal training. To follow the training, we have two kinds of monitoring. Process monitoring follows that training is going on in the right way or not, and whether farmers could learn it properly, that is impact monitoring.

Paragraph 4: Why are we doing socialization process? Once, farmers didn't want to adopt chemical agriculture; we are the people, who told the farmers that *bokar foshol pokay khai, ek bosta shar shomandosh bosta dhan etc.* We bring them in front of media. Now, it is our responsibility to save them from chemicals. Mentally, they were adapted with one system, now they need to adapt with another system. That's why, we are now engage with socialization process through Proshika. But we have to provide them the compatible technology.

Now question rise, what kinds of obstacles we face? There is a transition period. Some farmers become organic very quickly, and some of them try to follow but mix little amount of fertilizer. The last year impact monitoring data tells that now we have 11000 contact farmers. About 80% farmers are involve with organic farming and 20% of them are in transition i. e., practices both organic and inorganic farming. Last year, we formed 4800 groups. Each group is formed with 10 members. We list only the groups, not the farmers. We will observe and monitor them for three/ four years.

When the technical workers recognize them as organic farmer, they will list from them. May be from 40000 farmers, 20% will be converted as organic farmer.

There is difference between our organic farming and organic project. Organic project is open for the listed farmers. It could be finished within one year. It is a process to recognize organic farmers. But we have to take responsibility and need to give continuous support for organic farmers at least for three years.

Paragraph 5: Ques: which crops are selected for organic practices?

Ans: Actually, we started with indigenous varieties. Then we realised that we need to use local HYVs, but we are against of hybrid. For rice and wheat, we have selected HYVs. In case of summer vegetables, we use local varieties. Our farmers are producing seed. In case of winter vegetables, cauliflower, cabbage and broccoli are not local varieties. We use Indian seeds for these crops. We discourage hybrid varieties. Our experiment tells that these varieties could not be produced without using chemicals.

Paragraph 6: Ques: what practices do you follow for soil fertility management?

Ans: How to start it? Ok, we use green manure, quick compost, cowdung, normal compost, farm yard manure. Recently, we have started to work on natural plant growth regulator. We are practicing mulching. This year, we have planned to check the performance of IMO (indigenous micro organism). Because, recently, government has started to import EM (effective microorganism). When we started chemical agriculture, our thinking was which fertilizer we should apply for which crops, what is the dose, how the price of fertilizer etc is. We don't calculate the total impact. We always bound our calculation among N-P-K – three elements. But trees or plants need 46 elements. We are not applying all. We know, Bangladeshi soil should contain 5% organic matter but we have only less than 1%. What does it mean? It means some soil contain less zinc, some are deficit in boron and so on. It not only reduces our production, it has also severe harmful health impact. Before some days, I was reading a report from a scientific journal. There is an incident that happens in Turkey. A doctor found that some mothers are married from long time. They could not conceive or facing early abortion. The doctor is working on what is the reason behind this. He was practicing on their food habit and food items. Finally, he found the wheat (from which their bread is made from) is has zinc deficiency. Then he gave one dose of medicine with zinc. So, do we look for the total impact? We never think like this. We have recommended dose for the crops. Farmers follow this. If we apply three fertilizer in the first year, the in the second or third year, do we need to apply the same dose? We have found from our field trial that we don't need the same dose. We have found that without chemicals, sometimes production reduces by 2%, but profit is more. Now question is: do we only look for the amount of the food, when we think about the food security, or we will look also for food quality? If we consider food quality, then organic agriculture is the best practice.

Paragraph 7: Our soil contains less than 1% organic matter today. What does it mean? Where are we living? Where is our future going? What will happen if we don't conserve the organic matter? What are we doing in the name of using chemicals? We are handing over our farmers hard earning money to the foreigners as nearly 80% of our chemicals, we need to import from outside. Most of these are imported from China. But now we can see some hope. I feel very proud that when I see that BARI, BRRI researchers are now trying to follow our practices. Since last couple of years, I have attended in some seminars. Previously, they were treating us as mad. They asked us: how do you tell about organic farming? Do you have any research base? They were angry with us. The big scientists want to learn from us- how do you do this one, which practice etc. They try to practice integrated crop management (ICM). Now they realize, "we have increased the use of chemicals. Therefore, soil has been destroyed, costs of production have increased and ecological sustainability is under threat". It is a very good sign. They look for us to get appointment with us.

Paragraph 8: Ques: what is the basic difference between IMO and EMO?

Ans: EMO is a bacterium which is produced in Japan. We are worried about that if this bacteria is pollinated with our local bacteria, it may produce a dangerous bacteria. This may not only be harmful for our environment, but also for soil. EMO is costly also. If we produce it locally, then cost could be reduced. For example, we can produce 10 cc of plant growth regulator with taka 2. But to buy the imported one, farmers need to pay taka 45 – 75. So, if we can produce IMO locally, then it will not be crossed, it will not be dangerous and it will serve the same purpose with very less cost.

Paragraph 9: Ques: what practices do you suggest for pest management according to proshika's principle?

Ans: we have research result in this issue. We have complete research document. Proshika, BRRI, IRRI, Natural resource institute (Greenwich University, UK.) and Commonwealth Agriculture Bureau International (UK) jointly conducted a research on 'presence of pesticide on rice'. They found that:

- 1) There are 346 beneficial insect and 266 harmful insects. So, it is true that no. of beneficial insects are larger than no. of harmful insects.
- 2) In organically managed rice field, predator and harmful pests are equal. But in chemical used field, no. of pests are near to double than predators.
- 3) Chemical used field contain 38% more pest than organically managed field.

- 4) 30% more useful insects have been present in organic field.

Paragraph 10: We have also found that if we compare between: how much production we are getting after applying pesticide and how much we lose without applying pesticide, then, mostly, in the second case, farmers get more profit. Of course, we have to follow crop rotation and crop diversity. The more we practice crop diversity, the less will be the pest infestation. Another issue is: though sometimes, scientists, extension workers are not conscious, the farmers are conscious. If you get time, you can visit informally our field. In the last boro season, no organic farmers needed to apply chemical pesticide.

Paragraph 11: Once, I had to work at one organic farm in Japan for three months for practical learning. The farm owner was the father of Shimpei Murakami (who works at Proshika for long time). He is the author of our book "Nature". His father is a famous organic farmer in Japan. He had also organic poultry farm. When the farmers buy day old chick, all farmers keep them at temperature controlled room as the chicks never affected by cold. But Murakami's father did: He climbed little bit in the mountain and kept them in a net and fed these two times in a day. He found that 50 chickens died among the 200. After one month he went to higher altitude of that mountain with the chickens. He fed them again like previous and find again, 10 of these died. After one month, he again climbed to higher altitude and fed these chickens, 10% of them again died. Then he brings the rest of the chicken to his farm. I found, those chickens were never affected from any disease in their lives, which means, those were resistant to disease.

Paragraph 12: Ques: what types of cropping pattern do you follow or suggest following?

Ans: There is variation in following cropping pattern according to ecology; for example, one type of cropping pattern is followed in high land, another type in low land, special type for south Bengal, another type in the middle of the country and so on. Cereal crop is our main crop. Before and after cereals, we produce, short duration other crops, in many cases, leguminous. We are now thinking to produce vegetables to increase the intensity. Since long time, the cropping pattern of Barisal was Aus- Aman- fallow. But now we are thinking to change and to produce Mug Dal (leguminous crop). Now, the pattern will be Aman- Dal- Aus/ Boro. Normally, boro was not producing in the Southern part. Since, last year, it started. So, from this dal production, he is getting more production and return and on the other hand, he is getting soil fertility by fixing nitrogen.

Paragraph 13: Ques: Is Proshika having any written document about their standard?

Probe: how they are practicing about crop or variety selection, soil fertility management, pest management etc.

Ans: We have some publications. Also, to implement every project, there is specific policy which is determined from upper level. Once we had SGS certification about good agricultural practice. But they didn't provide that, it is totally organic. But we need to certify for export and rules are different for different standard. For example, EU has some rules, which are different from USDA and Japan. This is a big complex issue. Another important issue is, those who are working for certification, I don't know why they ask for so much money. SGS asked for taka 4 lacs every year. IFOAM required taka 62 lacs. Can you imagine it? The poor people will give 62 lacs taka. If we could maintain only one standard from IFOAM, then we could go for this process. Therefore, for saving the cost, we don't forward for it. We have sent one worker to receive training on organic certification.

Paragraph 14: The main thing is: all local and foreign scientists, who visited our farmers' field, they have good idea about our rules. But for local marketing, we have contract growers, we certify them our farmers. What we have done recently for trust building of consumers is: they can go to our field, they can discuss with farmers. There is one example: our honey has certified by BSTI as organic and we exported it to Japan. But the Japanese didn't accept it. Then their agricultural ministry checked it with a higher level team and they found, it is truly organic. Our future plan is if we can do bilateral agreement for export, then we will maintain their process. Otherwise, if all the concerned international organization can make an alliance under IFOAM and form a unique certification body, then we will think. Proshika is practicing ecological agriculture, but we are telling organic agriculture because, it is an easy and familiar term to everybody and worldwide. But when we tell ecological agriculture, people get confused; we become tired to explain it.

Paragraph 15: Ques: Is Proshika having any brochure, leaflet etc. about their standard?

Ans: We have 4 publications as books and many leaflets. One is for homestead vegetable gardening, one is for field crops, one manual is only for farmers as they can understand, one is for general people "nature".

Paragraph 16: Ques: Do Proshika have any future plan for better marketing?

Ans: We help our farmer for selling their products. In Tangail (Madhupur), Narshingdi (Belabo) and kishoregonj (Hosepur and Pakundia), three days in a week, our tracks go and bring products from the purchase center and supply these to different mega shops. They have a different shelf for organic products sealed "produced by Proshika". From whom, we will buy product, we have a list. Those who are practicing our rules, when we become satisfied and give them a identity card. We don't buy from new or any conventional farmers. The central staffs visit the farmers every

month. The numbers of our listed farmers are increasing day by day. Now consumers can understand the products which are produced by using chemicals, spoil very quickly, especially leafy vegetables. But our product lasts long time. The life cycle of organic tree is also longer. *Chichinga* is produced two and half months, if we use chemicals, but, organic farmers can get the production for three and half months. That means, life span as well as fruiting time increases.

Paragraph 17: Another issue of marketing is: we have to develop consumer's awareness. Though farmers produce organically, but our consumers always look for good looking, glossy and big products. Organic products are not good looking. If we don't aware consumers, we cannot expand the market. We have so many farmers; they are producing so much vegetable. If we bring these to Dhaka city, we cannot sell without consumers' awareness. For building consumers awareness, we have different activities including video documentation. Though some people are studying on organic farming, even they don't want to buy organic products. He doesn't think what will be the impact in future for his child. In Bangladesh, marketing system of agricultural products is complex and arranged in a way that farmers are always looser. For example, when I go for visit the farmers Madhupur, I see, in a farm or market place, the *faria* buys some products with very low price. Just after some minutes, in the same place, he sells it with better price, or he stores the products in his godown (store house). Then, one *bepary* transport these products to Dhaka or Chittagong or other big cities and sell to the wholesaler. After that, the retailers buy from the wholesaler and sell to the consumers. In this way, whereas farmers receive taka 5 for each kilogram, consumers pay taka 20. Therefore, we have to break the system.

Paragraph 18: Recently, govt. has increased the prices of fertilizer and pesticides which are very good sign for Proshika. It is a good opportunity for the extension of organic farming. Now, many farmers look for our technical workers and leader farmers, how they can adopt the technology. They are looking for alternative technology and want to learn the organic technology of Proshika. So, we have two important things: compatible organic agricultural technology and we use the tools (from formal training to field technical assistance for technology) which are helpful for socialization process. Another thing is: the price of production inputs has greatly increased, near to double. Therefore, we are getting tremendous response from farmers.

Paragraph 19: Then Mr. Dipok was discussing his views as (may be for summarising):

A monitoring unit constantly inspire the whole processes from plantation to selling out the output. Agricultural inputs like seed (both lv and HYV), cow dung, compost, green manure, IMO are commonly used for production purpose. In the soil of Bangladesh contains only less than 1% organic matter to its requirements about 5%. But due to application of organic manure profitability increased, food quality improved and cropping pattern changed from double cropping to multiple cropping. Now the scientists of BARI, BRRI are very interested in eco-farming than organic farming. In Bangladesh Proshika maintains farming standard, marketing system and certification mark. The products of eco-farming are sold as organic farm product (due to world wide familiarity) in different places of Bangladesh like Madhupur, Tangail, Dhaka etc under close supervision. The products of organic farming are also higher durable and nutritious than inorganic farming due to application of chemical fertilizer. In broad sense eco-friendly farming consist of ecological agriculture and organic farming where no chemical substances are utilized. The government should take the liabilities to ensure food security through strengthening the activities BARI, BRRI, BARD and enhance awareness about the importance of eco-friendly farming.

Paragraph 20: Organic farming is undertaken in homestead area or around the homestead area for commercially production of fisheries, livestock, vegetable etc. Here compost, quick compost. Crop rotation, intercropping, mulching, green manuring surface water are applied as an alternative against chemical fertilizer to improve the soil quality soil fertility soil productivity and to maintain soil moisture. To control weed, pests, and insect intensive organic measure is used. Cropping pattern like rice-pulse- other crop, rice – wheat- pulse, production of leafy vegetables, bean, oil seed, mustard, linseed, sunflower etc. maintain a fresh and convenient ecological balance. The production of crop through the maintenance of crop condition and seasonal condition is called ecological farming. In an ecological village, about 400-500 farmers involved in organic farming who do not use any chemical ingredients. This is, why these products are export potential in Japan, Europe etc. Here Proshika can increase crop production and awareness among consumers but they have no capacity to export it. Farmers grow Grass pea (*Lathyrus sativus*) at maturity of Aman rice as a relay crop. Grass pea is incorporated into the soil as green manure by ploughing after harvesting of Aman rice. Boro rice is then planted. Azolla is grown in the rice field and mixed with soil at the late vegetative stage of Boro rice and Dhaincha is grown before harvesting the Boro rice. The land is then prepared for the next crop by mixing Dhaincha with the soil.

Paragraph 21: To increase the soil organic matter, farmers use quick compost, which is the mixture of oil cake, rice bran and chicken or duck manure/cow dung in the ratio of 1:2:4 as a basal and top dressing. This contains 2.56% N, 0.98% P and 0.75% K and is a very cost effective and quick acting compost. Some farmers use liquid fertiliser (alternative to urea) or pit compost, heap compost, vermin compost. Weeds from vegetable gardens are used as composting materials. Some farmers harvest pulses by uprooting and use them as manures, which can add additional nitrogen to the soil. In Bangladesh, a number of Non Government Organizations (NGOs) and Government Organization (GO) have been working to introduce organic matter as a source of nutrient for crop production in their respective projects with active involvement of the target people. Different organizations have used different terms such as

ecological agriculture, regenerative agriculture, organic agriculture, etc. Proshika is promoting the application of organic matter through an ecological agriculture programme by its group members (land-less and marginal farmers). A study shows that the trained group members use more organic fertiliser than non-trained non-Proshika group members. On farm trials, field days, farmers' participatory research and extension play a vital role in developing the farmers' knowledge of soil organic matter management.

Paragraph 22: In 1997, Proshika conducted a study in thirteen areas. Cow dung and poultry manure are a common source of manure. Farmers also use water hyacinth after composting where it is available. Farmers wanted to use oil cakes as organic manure, but cost and irregular availability prevent application. A green house study was conducted at BRRI to evaluate the effectiveness of various organic materials relative to chemical fertilisers for wetland rice. Among the organic materials tested, cowpea was superior with respect to mineral composition followed by Dhaincha and Azolla. Addition of compost failed to increase grain yield. It was estimated that the application of cowpea and Dhaincha shoot at the rate of 0.17% (3.4 t/ha) and 0.36% (7.2 t/ha) on dry matter basis would be enough to produce a rice yield comparable to that obtained with the application of recommended dose of chemical fertilisers (80-25-35 kg/ha N-P-K). Such large amounts of Cowpea and Dhaincha can be grown as a green manuring crop. BARC co-ordinated an 'Integrated Plant Nutrition System (IPNS) project'. The basic concept of IPNS is to use all possible organic sources available in the farm to supply plant nutrients and thereby to reduce the dependence on chemical fertilisers for sustainable and environmentally sound agriculture. The elements of IPNS are chemical fertilisers, animal manures, FYM, compost, crop residues, green manure, azolla, Rhizobium, etc. Recent studies showed that the combined use of mineral fertilisers and organic manures increased the yield of potato, mustard and wheat by 18–36% over mineral fertiliser alone. Under this project, green manure and FYM are promoted in the farmers' field. Results from previous data showed that the yield increases due to balanced fertilisation over farmers' practice were 20–67% in lentil, mustard, wheat, potato, cowpea, groundnut and HYV Boro rice grown in different parts of the country.

Paragraph 23: What are the major constraints to organic farming in Bangladesh?

There are many resource constraints at farm level: Inadequate supply of biomass, crop residues, animal dung, etc.; crop residues and cow dung used as fuel or fodder, shortage of green manuring crops seed (Dhaincha, Grass pea, Sun hemp, Cow pea, Black gram, etc.), sharecroppers will hardly invest in the future of land over which they have no control, lack of alternative fuel in rural areas such as natural gas and timber from agro forestry, farmers' lacking knowhow on soil organic matter management, lack of proper extension services. Continuous addition of biomass is needed to build up organic resources in the soil, which is difficult to maintain as it degrades very rapidly due to the high temperature, rainfall of tropical humid climate and also due to intensive cropping in Bangladesh.

P₃:

Time: 46 minutes

Paragraph 1: Question: what is the basic difference between organic and ecofriendly farming? With which motive did you join to the ecological farming programme of Proshika?

Ans: Difference between organic and eco-friendly: I came from a rural family. The goal of Proshika was to prepare an alternative social system. Therefore, I joined to this organization. After that, my thinking was: to develop alternative agricultural system. Now what farmers are practicing are not farmers oriented. So, alternate could be eco-friendly. Eco-friendly agriculture must be organic, environmentally sound, and chemical free. Eco-friendly is a broad term. So, we named it as ecological agriculture. I don't think these two terminologies are so much different in terms of practice. Organic is an easy term for all including farmers. We work not only with farmers, but also with nation and want to relate global. At first, we organized farmers for the awareness regime, leadership development, and development of social, economic, political and overall development. But we had limitation in terms of efficiency. Therefore, at first, we started for farmers' homestead gardening. Though we thought, we could not work about the whole national agricultural system. Also, it was not so clear that what will be our output, how should we proceed. Then, the thinking was broad and spreaded; we started to work with cropland, farm level. Now we are practicing organic for fisheries and livestock – that means all the branches of agriculture. Now Proshika is more effective. We tell organic with farmers but not with a researcher.

Paragraph 2: We have to face problem. How?

Agriculture department is the largest department in our country. They can work from ministry level to grass root level. They always try to implement grow more food, green revolution etc., they have to maintain good relationship with international community, multinational companies, donor agencies, World bank, ADB, IMF. Our thinking is opposite. Govt. says to provide food for all people. Since thirty years, we say that provide food for all people, not poison. What is happening now in Bangladesh is wrong concept. The definition of food is: which is good for health. If we take poisonous food, then it will be harmful for health. Secondly, it is not sure that if we produce enough food, it doesn't mean that all people will get sufficient food. If I produce 100 tons of rice, it doesn't mean that 100 families will achieve food sufficiency. If they don't produce, they will not get and, may be, they will die. So, it is a matter of planning of distribution. Our gov't, overall the gov't of the third world countries are producing food under the direction of developed

countries, without thinking the holistic approach. Their idea is, if food is produced in one country, all people of that country will get food – which is not right. In the same way, they don't think about the quality of food. Our idea is, it is better not to produce food with chemicals which is harmful for body and health. As we are working in opposite direction, so, our achievement is very less. But we have long term achievement. In 1981, the secretary of ministry of agriculture sent a letter to Proshika- addressing that Proshika is trying to create a famine and expressing different opinion than MOA, and practicing alternative agriculture – which is very harmful for the country. Since, last couple of years, they are telling about organic, compost making. They are now worried about soil fertility and the quality or safety of the product. BARI, BRRI, BARC – all the govt. scientific organizations are addressing and recognizing the issues. It is our success. When govt will work and we could help them with our experience – then success will come. But we cannot take the responsibility of the whole nation. We tried to develop technology and farmers will adopt. We will show the result to govt, national and international organizations. We all will try to implement. Then, everything will be solved.

Paragraph 3: Ques: what practices do you follow for soil fertility management?

Ans: we don't believe that the development of soil fertility could be possible by external input. We will not disturb soil fertility. If we don't destroy the fertility, we don't need to improve. We only need to maintain. So, our question is how to maintain it? As farmers have already destroy the fertility by using huge amount of chemicals, therefore, we use compost, quick compost, crop rotation, intercropping, green manuring, mulching etc. Basically, we work as soil quality may not deteriorate. If we practice organic for 5- 10 years, then we don't need to add organic mater even, organic fertilizer. This crop needs dry weather. So, when weather is dry, then we need to produce it. We produce IRRI rice in all the season with using ground water. Our rice production has increased, but is food basket increased? We have lost pulses, oil seeds, and spices. We are producing rice with artificial water. Water will come in the rainy season, but we cannot produce pulses, spices, oilseeds in that season. So, we will produce only rice and jute in that season. The day length, weather etc. are very important for cropping pattern. In summer, day length is 14 hours and it is 10 hours in winter. So, summer crops will not be grown very well in winter and winter crop's yield cannot be good at summer. **About irrigation**, we don't encourage ground water. We are more interested to use surface water, rain water. We emphasize on how to maintain soil moisture. For this, we practice mulching, if soil is rich in organic matter, then moisture can be maintained. In that case, we don't need irrigation. As the quality is already deteriorated, so, we need to use surface water irrigation. In any case, if it is necessary to use ground water, we have to use shallow tube well.

Weed control: if needed, manually.

Paragraph 4: What inputs or methods are used by farmers to alternate chemical pesticides?

We need to know better in which situation the pest will not attack than how to control pest. The organic theme is: if the soil health is good, plant health will be good and they will not be attacked by disease. When we use hybrid seed, we have to apply fertilizer, in our country, fertilizer means urea, which again means overusing or imbalance use of nitrogen which makes the plant artificially healthy and fleshy for which pest attacks. If we practice in organic way, plants get more micro and macro nutrient in balanced way, the result becomes opposite. I have practiced many times. For example, I planted aus rice without using chemical fertilizer; I didn't face any pest attack in that plot. At the same time, in another field, I planted Boro with chemical fertilizer and pest attacked. Because, when I applied fertilizer, the rice plant grown and pests came to eat the small and soft leaves. So, if we produce food for insect and pest, they will come. We should know, what are their foods and not to produce those foods. Secondly, IRRI research found that since last 40 years, 85% of pesticides in Bangladesh was used unnecessarily. Farmers felt that may be pests will attack and they used pesticides. The motive was to run the business of multinational companies, not agricultural development.

Paragraph 5: Ques: What types of cropping patterns are followed by your controlled farmers?

Ans: we ensure green manuring in cropping pattern. (then, some answers were repeating)

Paragraph 6: Ques: Do you have any written documents that farmers can follow as standard? If yes, what are the standards? Why are you not following international standards of organic farming? If no, do you think that standard and regulations should be introduced?

Ans: we don't believe that ecological farming can be controlled by any rules or regulations. Rules are: sun rises, sun sets, sometime sun shines for 14 hours in a day, sometimes, 10 hours, sometimes wind blows from northeast, sometimes from southwest, sometimes season is cold, again hot summer etc. Rules are not manmade; all the rules are made from nature. As crops have life, so it is also directed by nature. Those are the scientists in the world, who can follow the nature's rules and regulations. Future plan about maintaining standard: When I walk in the Dhaka city, I have to follow the rules of Dhaka city. When we want to export our product, we need to follow their standard. If we maintain the rules of nature, then European, Japanese etc. rules is not a matter. If we don't use chemicals, everybody will accept our product as organic. Therefore, the only thing is not to destroy the nature.

Paragraph 7: If we follow ecological standard, the standard of whole world will cover. But if we follow organic, it may not be possible to cover all standards. Again, different organizations and countries have different standards. If we follow ecological practice, the whole Japan, EU, America will cover. If we want to export at this moment in Europe, then we have to follow their standard. Some chemicals enter to our soil through leaching and wind. According to EU regulation, we can export. Because, the level of chemicals is less than what EU limits. But Japan will not accept. They don't accept any level of chemical. In that case, we need to prepare eco-village. If all farmers in one village produce organic product, then they (Japan, America) will accept. If we want to compete in global market, then we need to develop eco zone. Also, we should have packaging, processing, storing, marketing, LC, transportation facility. Proshika can produce huge amount, but we don't have marketing facility. We are not skilled in marketing.

Paragraph 8: Consumer's awareness is not a major problem. For example, there are 0.5 million families in Dhaka who would like to buy chemical free product. But we don't have the capacity to reach them. In my family, I started to buy chemical free vegetables. But everyday, these are not available in the market. When I buy vegetables produced with chemicals, my family members don't eat them. In this way, they stopped to eat vegetables. Instead, they are eating red meat (beef) or fish where the sellers use formalin. But chemically produced vegetables are better than formalin mixed fish. So, we are in dangerous situation due to lack of proper marketing.

U₁:

Length of interview: 1 hour 27 minutes

Paragraph 1: He looked over the questionnaire and started to answer as: UBINIG has been working in Tangail since 1984 among the weavers. After the flood of 1988, UBINIG involved with these farmers for disaster relief and support to farmers in the form of seed and credits. During this period, they became acutely aware of the crisis for seed and it was a general crisis in agriculture. To get a more comprehensive understanding of how farmers perceive chemical agriculture, UBINIG undertook a study and a wealth of information was collected. Following particularly terrible floods in 1988, some farmers, together with UBINIG (Policy Research for Development Alternatives), a non-governmental organization, gathered together to seek an alternative - not just an alternative method of farming, but community-based work, which is organic in nature. They named it Nayakrishi Andolon. It is a practical response of farmers against the destruction of environment and the consequent loss of their means of livelihood. The movement is against privatization of natural resources and the consequent erosion of common property rights and, loss of seeds and genetic resources in Bangladesh. There are seed huts. Nearby farmers keep seed in this house and store here. If farmers don't have seed to produce something, they can borrow from here. If anybody takes, he or she is obliged to return here 2 kg of seeds after the season. Of course, it is farmers own resource but to conserve the resource, we follow this procedure. Before any crop season, all farmers sit in a meeting and discuss and share their joy and sorrow, agriculture related problems etc. For example, last year, it was flooding. But now, this time, Tangail farmers are transplanting Aman after making their land wet through deep tube well irrigation. Though, we are not in favour of DTW, but, there is no way without irrigation like "necessity knows no law". In seed hut, one side is seed and another side is sitting place. Male and female - both types of farmers sit together to discuss about contemporary issues and problems. There are Nayakrishi Committees at village level. Due to the existence of this committee, they have unity and fellow feelings for each other. Their feeling is: 10 heads can think well than 1 head. It is like medical board. When Doctor find one serious patient as complex case, they sit together to discuss about that patient.

Paragraph 2: During the year 2007, there were two consecutive floods affecting 46 districts in the north and middle zones and a cyclone SIDR affecting 13 districts in the south western coastal areas. The farmers incurred heavy losses due to the loss of Aman rice crop. The seedbed and the just transplanted Aman rice crops were washed away during the flood in July and August and the cyclone SIDR blew when the Aman rice was about to be harvested. In totality, it is indicative of a serious crisis. Ministry of Agriculture was planning for bringing more land under Boro cultivation or encourage planting hybrid seedlings for better yield! It was further learnt that the Department of Agriculture Extension (DAE), Bangladesh Agriculture Development Corporation (BADC) and Bangladesh Rice Research Institute (BRR) have taken especial efforts for extension of boro rice. Hybrid rice like Jagoron, Hira, Sonarbangla, Aftab LP 50, ACI-1, ACI-2, Aloran (BRAC) and Surma-4 (Syngenta) will be grown. In the mean time advertisements in the television on these hybrid seeds have been broadcast with attractive songs and dances indicating their bumper harvest. This claim of yield of hybrid rice is baseless. The farmers were cheated previously regarding the yield of hybrid rice. Concerns were expressed against the same type of deception of the farmers involving hybrid rice cultivation. At the same time, UBINIG also helped farmers through getting fund from 'Christian Aid'. At first we asked to farmers, "what is your requirement?" They answered, "we need the seed for winter crops (Mug, Okra, Bitter gourd, cucurbits, etc)." Then we gave them 8 types seeds. Among them the yield of Sweet gourd was very good but Sesame was completely lost due to storm (Nargis) in last April. Some farmers also could not harvest sweet potato. As they produced 8 crops, they lost one or two crops, but they could harvest other due to crop diversification. Those who cultivate hybrid rice, they lost absolutely. So, our farmers produced 8 crops, may be they lost 4 crops and survived with 4 crops, but modern farmers who used hybrid rice seed; they tried to produce only rice but failed to harvest.

Paragraph 3: Ques: which crops and varieties do farmers produce to practice Nayakrishi?

Ans: Rice is our main crop. Farmers cultivate local variety of rice – that is local for any specific region. If we tell about Tangail, the local varieties are ridha, chamara, bawaylla, etc. for other crops; farmers as well as we prefer indigenous and local varieties. About protecting variety, their belief is: “Friend is old, toy is new”. The variety which we know from long time may provide lower yield, but we will not be looser. We know all the characteristics of this crop. On the other hand, may be, we would like to get higher yield from high yielding variety, but we don’t know the requirements of that crop, that means, we don’t have proper technological know how. Farmers are very smart, may be, our technical term they don’t know very well, but they cultivate crops according to their ‘jo’ (field condition)-, that variety which they are growing heriditically – consistent with nature. *Jo* – a local term which is the meaning of many things together like as, day length, temperature, relative humidity – all natural issues. Our goal is: to protect indigenous variety, to protect environment and to ensure food security.

Paragraph 4: Ques: what kinds of practices do you suggest or farmers follow for soil fertility management?

Ans: Management of soil fertility cannot be considered as a single issue, it includes crop rotation, pest management, irrigation management and so on. As UBINIG is the advisor of farmers for soil fertility management, we suggest compost. Farmers prepare a compost pit and mix cow dung, water hyacinth and household waste and put there. Every Nayakrishi farmer has a compost pit. Otherwise, crop rotation is also followed to maintain soil fertility. I can give you an example about one pattern: in Tangail district, farmers sow four crops together in *Baishakh*: Sesame (Til), Kown, Aus rice and Aman rice. At first, they harvest Kown (cereal crop), then sesame, then Aus rice and at last, they harvest Aman rice. Before one month of harvesting Aman, they sow mashkalai or kleshari (which are leguminous and also pulse crops). After that, they cut Aman in agrahayan and kleshari is still in the field. After harvesting kleshari, they plant jute. As kleshari is a legume, it fixes the nitrogen and organic matter to the soil. According to rotation, they produce jute. The jute leaves are fallen into the field and rot, which produces biomass, organic matter and huge amount of fertilizer. After that farmers produce transplanted Ropa Aman, not Bona Aman. As a result, we get two benefits: soil fertility status is maintained and weed is also managed. If we follow continuous rice in cropping pattern, more weeds grown in the field. Then these weeds become a permanent problem for farmers.

Paragraph 5: At the time of producing Aus rice, there are some weeds (specially, *Cyprus iria*), these became fertilizer by rotting. Rice belongs to Graminie family, their root is fibrous and jute is a tape rooted plant. So, trace elements of compost and fertilizer go to the ground level through leaching. After rice, if farmers produce jute, then the tape root bring those leached elements. It is very important that what jute takes in its’ lifetime, 60% gives back to the soil. Farmers’ found that if they follow Jute-Aman pattern, it gives better than Aus- Aman pattern. As Nayakrishi farmers don’t apply chemicals in their field, so, Algae, earth worm, other beneficial insects are also found in their lands which make the soil fertile. It is a biological system which is food for the soil. As a result, they don’t need to apply food from outside for the soil. Farmers can understand from their experience what element is shortage in their soil according to the nature of the present crop. Sometimes, but rarely, farmers need to use fertilizer. But they are very wise. As they practice agriculture intensively, they can understand more than researcher. In this way, every Nayakrishi farmer is also a researcher. What Nayakrishi farmers are practicing from 20 years, now government is suggesting.

Paragraph 6: Ques: How Nayakrishi farmers manage the pest?

Ans: I think you must know that there is a positive relationship between chemical fertilizer and pest infestation. So, if farmers’ don’t apply fertilizer, then pest attack will be decreased. Moreover, [crop rotations](#) help to control weeds, disease and pests. If farmers produce continuous rice, they (monoculture) host them all the time on the plot. Rice and wheat are two types of crops. One is monocot and another is dicot. There is no similarity. As a result, food habit of pests change, they feel discouraged and go away. Automatically, the system doesn’t favour pests. If some pests attack on Nayakrishi farmers’ land, they remove mechanically. They don’t apply any organic or inorganic pesticide. Nayakrishi farmers not have problem with pest management. What they are practicing since long time, govt is trying to bring it as technology. Since some years, it was told as IPM, now they have termed it as ICM. Due to using [chemical pesticides](#), many species of fish have already been lost. All indigenous species of fish lay egg from May to August. At that time, Aman, late Boro rice stands in most of the wetland area and farmers use as much as chemical pesticides and it obstruct fish reproduction. We can consume many weeds as vegetables. But if pesticide is applied then it will not be edible.

Paragraph 7: Mr. Abdus Sobhan said, “I was a plant breeder at Bangladesh Jute Research Institute. The scientists of BJRI made a schedule of fertilizer dose. There was a schedule that farmers should apply fertilizer at the time of land preparation before sowing. I had feeling against fertilizer and Pesticide. I had argument on that point, why should I apply fertilizer before sowing. I will sow the seed, then it will grow and after one month, the plants need to take food. Why I need to apply fertilizer before one month. For this, some fertilizer will be washed and leached, some will evaporate and some will be useful for growing weed. These weeds will take food from that fertilizer. So, it will increase cost of weed control. I had argument on that point. But they are agronomist. They were doing according to their discipline and still they are following this practice. They think they are always right”

Paragraph 8: Ques: Do you suggest farmers to raise livestock or poultry? Why?

Ans: UBINIG suggest farmers to raise cattle and poultry. Because farming is not only the combination of some rice and jute tree. Ducks, hens, cows, goats – all birds and animals are also the part of farming. They help farmers. They supply organic matter and poultry also eat insects. We encourage poultry and livestock rearing.

Paragraph 9: Question: As Nayakrishi farmers avoid chemical, has it any impact on Production?

Ans: There is one real example of two brothers. One practices modern agriculture with chemical inputs. He produces rice, jute, wheat. If we calculate his benefit cost, he is facing loss. He just lies in break even point. Sometimes he gets some marginal profit. If he spend Tk. 100, sometimes he get return Tk.103 but without including family labour. If he calculates the wage for himself, cost for his own land etc. and total costs of production, he is in completely loss situation. Always he is worried to manage money to buy fertilizers and pesticide. Another brother, he practices Nayakrishi. He is producing rice, jute, pulses, different leguminous crops and vegetables. He is selling his products all the year round. He has income flow all the year round. He doesn't need to buy fertilizers and pesticides. At present, half of our population are landless and poor. In 1966, Ford and Rockefeller foundation heled us to make us poor (beger). In 1972, food production was 9 million tons but now it is 27 million tons – just 3 times. But where are our Kaon, China, Mustard etc. minor crops? You know, the protein content is 12, whereas, it is 8 in rice.

Paragraph 10: Rice is producing in 80% of our total cultivable land and in 75% of that total land, HYV and hybrid rice is produced. The area for hybrid rice is increasing everyday. Still Bangladesh needs to import rice. We have to wait, when India will send rice. But Nayakrishi has 200,000 families. They don't have food deficit, they have food sovereignty. They are not very rich but don't feel foods insecurity. They are self contained. Small farmers, who have 2/3 bighas of land, are interested to work with Nayakrishi. Rich farmers don't have close relationship with Nayakrishi. If farmers want to follow the rules of Nayakrishi, he and his family members need to work hard. Rich farmers would like to transplant Aman rice in his 10 bighas of land with some hired labour. Then he will sometime hire labour for weeding, applying fertilizer and at last for harvesting. He is not interested to produce jute or khesari. After harvesting transplanted Aman, he will produce wheat and then again rice in the same way. Though Nayakrishi farmers would not go to be rich, but there is no example that they become landless. They are self contained by virtue of their engagement in the productivity.

Paragraph 11: Ques: Does UBINIG play any role for the marketing of Nayakrishi products?

Ans: Each Nayakrishi area, there is a shop of farmers where they sit and sell their products. It is called 'Shaisho Shundar'. For example, in an area, we have 50 farmers. They bring their crop to that shop and conscious farmers come to buy. Price is same like conventional product. But Nayakrishi framers get more profit than conventional farmers because their cost of production is less as they are not using chemicals as inputs. Sometimes, UBINIG buy their crops and bring to Shaisho Prabartana (sales centre of UBINIG). We don't have own land. Then they get more prices.

Paragraph 12: Ques: Do you have any written documents about what Nayakrishi farmers are practicing?

Ans: There are some books. But the important thing is: we have some verbal literature. We have to interact with farmers in focus group discussion. We follow two ways to reach the message and technology to farmers. These are the two training systems: general learning session (GLS) and advanced learning session (ALS). Every farmer who wants to join in Nayakrishi group, they come to GLS and those who are progressive and have sharp knowledge, educated, they are selected for ALS to conduct some research in local area. Ten rules are our guiding principles.

Paragraph 13: Ques: Do Nayakrishi farmers follow any international standard?

Ans: In 2003, FAO asked what standard, Nayakrishi farmers follow. We gave them our 10 principles and standard. They published it. We don't follow IFOAM or any other international standard. For organic production, cost is more. So, we have to get better price for those products. For getting better price, we need to develop consumers' trust. When consumers will trust? - If we have certification. We produce some products, which are very rare, like, binni rice, kataribhog rice. If we could follow standard, we could export. The farmers of Dinajpur can produce that rice in organic way. If they could export, they could get more prices.

Paragraph 14: Ques: why are you not following standard?

Ans: Due to lack of communication, we are not able to follow standard. To export in different countries, we need to follow different standard. At first, we need bilateral agreement with foreign countries where we will export. Then, we have to follow standard according to their regulation. Till now, we don't have any agreement. But we don't have surplus production. For getting certification, at first, we have to apply, and then the certification authority will come for inspection for three years. Our goal is: to satisfy the local need and to offer food sovereignty to the farming community, we are trying to protect environment and ensure safe food, we didn't reach to commercial stage. But at this moment, we feel, at least, we have to start with local certification process. The English name of our programme is 'new agricultural movement'. In one word, it is called 'biodiversity based ecological agriculture'. We are practicing organic but due to lack of standard, we cannot tell it as organic.

Paragraph 15: Ques: In which motive did you start movement?

Ans: As the name of our organization is, Policy Research for Development Alternatives; so when government and formal sector is in one way, we are in the alternate and opposite way. We can understand that Ford and Rockefeller's foundation had a long term plan to capture the seed market of developing countries. In 1961, UPOV was established by the International Convention for the Protection of New Varieties of Plants and arranged convention in Paris. In 1962, East Pakistan Agricultural Development Corporation was developed. Crop Seed Ordinance was established in 1974. IRRI rice has introduced in 1966, but within 1976, yield had been reduced. We didn't establish those organizations, all these incidences were happening continuously to establish plain play ground for those who will control the market. National seed ordinance has been revised again in 1997 and in 2005. In the revision of 1997, it was said that rice, jute, wheat, potato and sugarcane – seeds of these 5 crops should be certified. Now in the revision of 2005, seeds of all crops in the market should be certified and these will be available in laminated packets. So, if you are a good seed producer, you cannot go to market to sell your seed. You can use it but cannot go to the market without certificate. But certifying authorities are east west, Mc Donald, Syngenta – those who are maintaining the interest of international companies. In last winter, farmers produced BORO in 4.4 million hectares of land. Of these, 1.2 million hectares was under hybrid. This is a foreign variety, we have to import it, we cannot produce it. It is a plan of business in future to control our agriculture. These are long term plan and some countries are helping for that like, Canada, USA, Sweden and Netherlands. Their God fathers or companies of those countries are entering to the market and will come with seed business within few years.

Paragraph 16: I would give you a bad example as: seed is the key of agriculture. That key should be to our own hand. But key is already handed over to international companies. For example, we need 4,000 metric ton jute seeds. BADC can meet 2% of the demand. In case of jute, if we cannot import seed from India, then we need to stop jute cultivation. Is it expected for a country like Bangladesh? We were the highest producer. Jute is originated from Bangladesh. We were the highest exporter. We made tremendous change in jute production. In 1966, our farmers produced 80% indigenous variety and 20% Tosha. But now farmers produce only 10% indigenous and the rest 90% Tosha. But our soil is suitable for indigenous variety or local scientists should develop variety. Now we plant those seeds, which India can give supply – those are not suitable for our soil. At present, our farmers need 1,200,000 tonnes of rice seeds – the whole is coming from China. Last year, I went to Pirojpur where the farmers were affected by SIDR cyclone, farmers received hybrid rice seeds and some chemical fertilizers from Government without any cost. But rice fields were affected by Bacterial Leaf Blight and they could not produce rice. When cyclone affected, they lost everything. After that, they will survive with their producing crops but when the crops (hybrid rice) affected, they become helpless.

Paragraph 17: It was further learned that the government will provide essential inputs like fertilizer, pesticide, seeds and irrigation facilities to the farmers. UBINIG observed that the farmers could not cultivate Aman rice properly for shortage of fertilizer. Now the question arises, why the farmers are again being compelled to go for cultivation dependent on fertilizer-pesticide-irrigation? The fact is that the government is going to offer subsidy on fertilizer, pesticide, electricity and pump machine, etc. to introduce hybrid seeds in the interest of the company. It is known to every one that the farmers will not be able to save and use hybrid seeds for next year. They will be again bound to buy seeds from the market with higher price. This is creating golden opportunity to the companies for earning profits instead of strengthening agriculture and the agricultural system. Bangladeshi farmers have enough of their own high yielding varieties of Aman and Boro rice, which needs to be protected and promoted.

Paragraph 18: It was noted that a group of seed dealers and micro-credit based NGOs are active for introduction of hybrid seeds taking the advantage of the natural calamities and disadvantaged condition of the farmers. These activities are totally unethical. If the hybrid seeds were really good, the companies would have not to wait for such vulnerable situation. They claimed 20-25 percent higher yield. But they were silent about the high cost of production. Moreover they concealed the fact that the farmers can not save hybrid seeds for next season sowing. The price of hybrid rice Alok seed was 200 to 225 taka/kg whereas the price of the seeds of local varieties of rice was 12 to 15 taka/kg that time. BRAC compelled the farmers to take these seeds along with fertilizer and pesticide tied with its program for micro-credit. Most of the farmers observed unfilled grain (*Chita*) in this hybrid rice. Alok 6201 seed could not be sold in the market without the help of the micro-credit. According to BRAC's own research, hybrid rice Alok-6201 could be sold only 23% through dealers and 64% through micro-credit programme. The government did not take any action against the fraudulent act of the seed companies and the NGOs those who cheated the farmers and damaged the agricultural base of the country.

Paragraph 19: UBINIG research shows in dry season, boro rice is cultivated through irrigation by deep tube well. Due to introduction of boro rice cultivation, the acreage and production of pulses, oil seeds, potato and other crops have been reduced. Recent statistics shows that the area under boro rice has increased 46% from 1991-92 to 2002-2003. On the contrary area under pulses and oil seeds has reduced 25% and 11% respectively for increasing boro rice cultivation. It has also been observed that the so-called high yielding varieties are not at all high yielding. They are gradually becoming high-input varieties. This is a threat to the total food system and a policy against the food sovereignty. This monoculture calculation is wrong, because it is leading to less production of other essential food including other cereal crops, fish, livestock, poultry birds and other uncultivated sources of food. The total agricultural system is now under threat.

Paragraph 20: Due to irrigation for boro rice cultivation through extraction of under ground water, the water table has gone down. There are arsenic problems in drinking water. Desertification in the northern region of the country has been intensified. Arsenic has entered in the food chain. That means this system has not only destroyed our food sector but also has exposed us to take poisons like arsenic with food. The civil society must stand against this policy. There was a report of new problem of Chita (unfilled grain) in hybrid boro seed in the newspapers in the beginning of 2007. It is worth mentioning that in this regard the local varieties of boro rice are adapted to the changing environment. The seeds from the companies must not be used without proper examination of their performance. UBINIG collected information on local varieties of boro rice in Mymensingh, Sylhet and Comilla and found that the local varieties of boro rice including Bansful, Lahya and Rata were free from Chita during the same period. The concerned experts of agriculture department mentioned Chita was due to cold injury. It is astonishing to see that efforts are there for extension of the same hybrids again in this year for production.

Paragraph 21: The Seed Companies through the Seed Certification Agency have registered a total of 44 hybrid rice for release. Out of these only one hybrid, BRRI-1 belongs to Bangladesh, one (Loknath) imported from India and the rest are imported from China. Whereas there are as many as 62 varieties of local boro rice available with the farmers. These varieties can be grown without any chemical fertilizer and pesticide. It was also observed from UBINIG research that the HYV varieties developed by the BRRI including BR-28, BR-29 can be grown without fertilizer and pesticide. The yield of these varieties can be increased with appropriate management as practiced by the farmers. The Nayakrishi Farmers got good yield of 5.3 metric tonnes per hectare for BR-28 and 5.5 metric tonnes per hectare from BR-29. Since monopoly seed business can not be established with the local varieties of rice, so the efforts are there to destroy the local seed system in order to create market for seed from the companies. The government has planned to increase production of Hybrid boro rice in the non-conventional areas. UBINIG feels strongly that boro rice cultivation should be continued only in the conventional areas with the locally developed varieties and the HYVs must be developed by local scientists in collaboration with farmers. The farmers should be provided with all sorts of cooperation for augmenting production.

Paragraph 22: There were three agricultural periods in Bangladesh. These are rabi (winter), kharif- 1 (summer) and kharif - 2 (rain and autumn). The major crops of rabi include: pulses, oil seeds, potato, sweet potato, cereals, vegetables and spices. The rabi period include the Bangla month of Agrahayon-Chaitra. The kharif - 1 period covers Baishakh - Sraban. The main crop of this period is aus rice/jute. The kharif -2 period covers Sraban - Agrahayon. The main crop of this period is aman rice. Now a day the crops are not grown as per the conventional periods. Unduly the cultivation of high yielding varieties and hybrids of boro rice have been extended to non-conventional area at the cost of pulse, oil seeds, vegetables and other crops. Boro rice is cultivated with irrigation from underground water. These lands remain fallow for about 2-3 month after harvest of boro rice and before transplanting aman rice. There is a need for increasing rain fed aus rice and reducing boro rice area. The genetic base of rice has been narrowed down by HYVs and hybrids. Rice is now vulnerable to pest epidemics.

Paragraph 23: Now farmers feel that for the first two years, the chemical fertilizer increased their production, then, it stabilized and now started to fall. Yet, peasants are applying more and more fertilizers in the hope of rising production." the intensive use of fertilizers did not substantially raise their rice production but rather, made their soil hard and less capable to hold water. So what they did in their locality was to use manure along with chemical fertilizers. They tried to mix cow dung and rotten hyacinths which, based on their own observations, improved the quality of their soil. the use of HYV's have made them victims of a vicious cycle of fertilizers because in order to maintain production level, they applied more fertilizers which made their plants greener and softer, and thereby prone to attract more insects than the non- chemical fertilizers. Hence, he concluded that, the farmers became more and more dependent on using different types of fertilizers to combat harmful insects. Consequently, these farmers' experiences have taught two important things, to wit: (1) the use of chemical fertilizer is not sustainable because it has negative effects on the people and environment; and (2) the traditional indigenous knowledge of the farmers enable them to adopt alternative ways of agricultural farming to solve their problems encountered in using chemical fertilizers. And in the process, they have slowly learned to combine modern technology and their traditional knowledge to make their land productive. Thus,

these farmers' experiences became the basis for the birth of the new concept of agricultural development called Sustainable Agriculture.

U₂:

Time: 45 minutes

She mentioned, as an ED, I will try only to focus my view followed by your questions from my practical experience. You may record, if you like.

Paragraph 1: The farmers, weavers, fishers, cultural activists and others in a joint statement declared that we will preserve biodiversity, and we will resist against any attempt to destroy biodiversity. They have expressed their clear position against the use of pesticides, hybrid seeds, deep tube-wells, commercial shrimp cultivation and destruction of mangrove forest, destruction of indigenous knowledge and skills, destruction of local industries and community skills such as handloom, pottery, blacksmith, bamboo works etc. They have said NO to World Trade Organization and a resounding NO to the exploitative practices of transnational corporations and the corporate "globalization". The pledge was to resist any form of exploitative and colonizing relation imposed in the name of "free trade" or any alien production system that destroys local livelihood and the possibility of a true global order of unity, equality and diversity. It was declared that the patenting or any form of intellectual property will not be acceptable to the people and Bangladesh with the people in the South Asia region will resist such attempt by all means.

Paragraph 2: All the occupational groups present in the festival found a common link among themselves. Their existence and livelihood are threatened by the so-called 'development' interventions which in essence mean destruction of local knowledge, local skills and disintegration of rural life. The free trade and commercialization reinforced the economic and political power of urban elites and created a new consuming class of foreign products and foreign technologies making majority more and poorer. The pauperizing impact of structural adjustment programme has already created a absurd reality that is socially unstable and politically violent. The WTO Agreements, particularly the TRIPS and the Agreement on Agriculture will be devastating to already precarious situation of the people at the grass roots, specially the farming communities and the rural life.

Paragraph 3: In 1998, the Bangladesh National Seed Board broke long-standing policy and announced that private companies could import 2,200 metric tonnes of seed for cultivation in the coming *boro* (dry) season. Bangladesh was hit by a prolonged flood from July to September that year, and the imported seeds were part of the government's post-flood rehabilitation program. Farida Akter mentioned it as "*the forced flood of hybrid rice in Bangladesh*". Immediately following the Seed Board's decision, Advanced Chemical Industries, Ltd (ACI) of Bangladesh announced plans to import hybrid rice from India. The variety it imported was Aalok 6201 from Hybrid Rice International, a subsidiary of Proagro, which is owned by Aventis, the world's largest agrochemical company. ACI was not acting alone. IRRI supported the introduction of hybrid seed through training workshops, and private companies and seeds were sold by ACI and a large micro-credit agency in the area, the Bangladesh Rural Advancement Committee (BRAC). If you remember, we may recall, *immediately after the flood, BRAC aggressively promoted Aalok 6201, farmers had to accept credit and pay very high interest, but at the same time they had to accept the proprietary technology of ACI*. In fact, most farmers were not even told that they would be unable to save seed from the hybrids in the following year. They were only informed after the harvest by a threatening advertisement in one of the daily papers warning them not to save seed.

Paragraph 4: The introduction of hybrid seed in Bangladesh is intimately connected to micro-credit and "*Micro-credit is the only way that hybrid seed can be sold in countries like Bangladesh*." About half of Bangladesh's 120 million people are bound by some form of micro-credit financing, and big agencies like BRAC are the engines for a cash economy in the countryside. Consequently, the seed industry has formed a direct alliance with BRAC to coerce farmers into planting hybrid seed. For instance, when Gulab Jan, a resident of Delduar, approached BRAC for a 3,000 taka (USD 60) loan to repair her leaky house, she was given 2,700 taka in cash and the rest in hybrid seeds. She expressed to while my visit to Delduar, "*When I protested that I had no land to cultivate it on, they asked me to find someone who has – but nobody wants hybrid seeds around me*."

Paragraph 5: Farmers in Bangladesh, already suffering from the flood, were used as test cases for hybrid rice production. The results are not impressive: Aalok 6201, despite its high cost and chemical input requirements, was struck by blast infection and gave little to no yield advantage over the popular inbred varieties BR 28 and BR 29. UBINIG has investigated every success story reported in the papers and found each of them to be untrue. Farmers have reacted with anger to the forced introduction of hybrid rice. They have held demonstrations and rallies throughout the country and one farmer is even taking BRAC to court over the agency's promotion of hybrid rice. Even Bangladesh's rice scientists are resisting the incursions of hybrid rice. As you know, eighty percent of land of the country is now offered for cultivation of rice. But still we are running short of food grains. This is because the high yield claim is

turning into high input requirements and trade off with other food crops. The farmers have been allured for chemical agriculture for higher yield of crops. The partners of development including the World Bank compel the government to go for high input based modern agriculture. The entry of hybrid rice was initiated in 1995. The introduction of hybrid rice was allowed without any trial. The supply of hybrid rice is mainly dependent on import. Most of the hybrid rice seeds are imported from China and India and sold at 10 times higher price than the local seed. The promoters of Hybrid seeds take advantage of the natural disasters to impose on the farmers. After the flood and cyclone SIDR fifteen companies, including ACI, Syngenta were actively engaged in promoting hybrid rice seeds. Critical debates are going on hybrid and GMO across the globe. These technologies are company owned, import dependent and not at all sustainable. The World Bank has been pushing those technologies into Bangladesh which failed in other countries.

So many answers were repeated. Therefore, these are not translated into English.

C₁:

Time: 45 minutes

Paragraph 1: CDA was started in 1986. The major programmatic activities during the more recent years have been the Environmental Sustainable Land Use Management Programme, Village and Farm Forestry Program (VFFP) and Integrated Rural Development Program (IRDP). Under the programme of land management, mainly farmers do – organic farming and waste management practices. Contract farmers are using compost and household wastes and bio pesticides but all of these are not so strict where organic inputs are not available. But farmers are trying and CDA is also trying to support on the basis of its strength and capacity. As it is a local NGO, so at this moment, they are not thinking about international standard. The main goal of this programme is to enhance food security, food safety as well as eradicate environmental degradation. CDA has very few micro credit programs. Up to at present, CDA could not provide help for marketing of the farmers' product. For farmers, CDA is only providing advisory services. CDA does not follow any international standard on organic farming because of communication problem.

Paragraph 2: More than 60% of farmers in Dinajpur Sadar in Dinajpur district feel that they had to apply more chemical fertilizer than the Bangladesh Agricultural Research Council (BARC) recommended rates to maintain yields. Farmers found that the soils are going to be harder and more compact, losing water-holding capacity because of extreme use of chemical fertilizer. Farmers thought that organic matter increases yield, reduces the production cost, improves crop growth and their economy, increases water-holding capacity and improves soil structure. They identified that a soil with a higher organic matter content is dark brown to black colour. Farmers realised that they can increase the organic matter content of the soils by adding cow dung and other organic manure or by leaving crop residues in the field. Another thing is: cow dung and crop residues are largely used as fuel. Before the introduction of HYV, when farmers cultivated local rice varieties, they could get more straw. More stubble was left in the field to decompose. Land preparation is now mechanised and since fodder is limited, so farmers keep less or no cattle at all; thus less cow dung is produced. Sometimes, rice straw and 'Water Hyacinth (*Eichhornia crassipes*)' is used as mulch in crops and vegetable field. In fields that are continuously flooded are gaining siltation and alluvium every year and these lands become fertile. In these fields, less synthetic fertiliser is applied compared to fields.

K₁:

Date: 29-07-2008, Time: 58 minutes

The key informant checked the semi-structured interview schedule. Then he told, let me tell from myself, and then, if anything left, you can ask me questions.

Paragraph 1: The farming was first started in the fallow and barren land with limited area of Rawshonpur in August, 2000. The land was full with sand, not only sandy, so unfertile that it was not cultivable for farmers. The local people called this kind of land "Danga". Danga is that kind of land that people cannot cultivate anything. Only some weeds could be grown, like Shon, Ulu, kash etc., not all kinds of weeds also. We first select Rawshonpur which is now our centre valley. Kazi and Kazi tea farm bought 620 acres of land. Out of total 620 acres, now tea was grown on 300 acres of area and 50-55 acres was used for paddy, wheat, maize, pulse, and all types of vegetable production on the basis of season and crop rotation. Now Kazi tea is producing tea on 1000 acres of land and 600 acres used for livestock, agricultural crop production, medicinal plants, Laboratory. Besides this, we have an ISD campus which is called 'Institute for Sustainable Development'. Ten acres of land is used for ISD campus. We have an university 'ULAB'. As the practical ground of ULAB students, we bring them to learn practical organic farming under the supervision of this institute's research laboratory. We have also a research centre which is in the name of Masanubo Fukuoka – pioneer of organic farming. We call it MFC (Masanubo Fukuoka Center). We have processing plant in Rawshonpur unit.

Paragraph 2: When we started to work in Rawshonpur, tea board was suspecting whether we can produce tea here or not? Firstly, we can produce tea in this drought and sandy area? Secondly, how is it possible to produce organic tea? Someone may produce in 1/2 acre. But, it is a big area (thousand acres). At first, we took it as challenge. As the land was very sandy, so, at the very beginning, emphasis was given on **soil development** by relay cropping, leguminous crops and cover cropping. Relay crops were mainly leguminous crops those were cultivated for Nitrogen fixation. Cover crops (i.e. dhaincha, pulses, bean) were cultivated to maintain soil fertility. Though the plan was tea production, but at first, farming was started with some agricultural crops like potato, wheat. Because tea is a long term enterprise, it takes long term investment costs and the cost is also very high. So, potato, wheat – these were produced for experiment that this land is suitable for organic farming or not. If land is not prepared for organic tea farming, then the company may face huge loss. At that time, the soil was also covered by mulching materials besides growing cover crops. Good quality straw was used as fodder for cow and bad quality was used for mulching. We have dairy unit in each production area. We are also rearing 1200 no. of livestock to produce compost for organic tea farm. Herbal medicines, fresh water, organically grown and purchased foods are given to **livestock**. There is sufficient space for animals to stand, lie down and turn around easily. Rice was produced in 200 acres of land in 2008 to feed farm workers and farm domestic animals.

Paragraph 3: What is the benefit to rare livestock? Some cow dung is used for biogas production. From this, slurry is coming out as by product. Again this slurry is applied over mulching in liquid form. It helps to decompose. And the rest of the cow dung is sent to compost house. From SGS and USDA compliance, compost house is must in organic farm. Therefore, in every house, there are big compost houses.

Paragraph 4: For producing compost, at first 9 inches of cow dung is put, then 3 feet green material over cow dung and then slurry is put on the upper portion. In compost making instrument, there are four chambers. Mixed cow dung, green material and slurry is put into 1st chamber for 15 days, then the next 15 days into the 2nd chamber, 30 days in the 3rd chamber and at last, 30 days in the 4th chamber. In this way, it needs 90 days to produce compost. This compost is then applied according to 250gm/tea plant. In case of big plant, up to 1 kilogram of compost is applied.

Paragraph 5: We have to face many delegations especially foreign delegations. They want to learn, what practices we are following for pest management. Before some days, there was a delegation team came from tea research institute. They were very much worried for pest control specially to save from Caterpillar. Three types of dangerous pests mainly attack tea garden like Caterpillar, red spider mites, Helopeltis. I heard from tea research scientists, last year; they faced 40% crop loss in Sylhet due to attack of red spider mite, where weather is very much favourable for tea. They didn't believe that, there is no red spider mite in our garden. They found Caterpillar in our garden and became worried. Naturally, they suggested us chemical pesticide. I said, we are not afraid about this and we will not use any chemical against this. We will only use three round of 1% Neem oil solution. Ritha (soapnut, one fruit) helps to make the solution quickly. That means, we make a solution by 100 litre of water with 1 litre of Neem oil. The solution is applied only to attacked area. If infestation of pest is severe, then it is red marked and the solution is applied for three times and in near by area, one round solution is applied for prevention. When they came for next visit, they were astonished, how is it possible, how it happened. Secondly, we plant some trees, those who control the pests naturally like bashok, nishinda, neem, amlaki, Raktochandon, bakful etc. These are called medicinal plants. In our gardens, all shade trees are medicinal plants (10 raw tea plant and then 11th raw medicinal plants, basok for the protection of pest). We have also planted Marigold. These combined plantations also maintain ecological balance, remove negative environment, which means tea plants find a good and ecological surroundings. If ecology is balanced, then, if some insects appear, they will leave automatically. You know, if we use chemical fertilizer and pesticide, then pest comes automatically. As we don't use chemicals, our plants don't grow so fast, may be therefore, we don't face attack of so many pests. Sometimes, pests come naturally and it goes naturally. It doesn't reach to the harmful level. It is part of biodiversity. If our ecology is balanced and environment is controlled in the right way, then these don't arrive at the injurious level.

Paragraph 6: As we already passed 8/9 years, at this moment, we are confident enough that we don't need any chemicals against pesticide. Now, we have 1000 acres of tea garden and 600 acres of medicinal plants. Now we have made an enough ground for peoples learning. We have also invited international specialists. Before, 6 months, a Japanese team came. From two months, two students came from USA, there prepare compost by themselves and do all kinds of works. After 4 months, a tem will come from Middle East. In this way, we are trying to spread what we are practicing. This is the only Bangladeshi organic tea which is sold in the world famous departmental stores in high prices "Kazi and kazi tea".

Paragraph 7: There are two certification agencies who are working for organic certification. Those are SGS and USDA. When we are able to get certification from SGS, finally it goes to the USDA. It is good news for us that this year USDA provided us the certificate. SGS provided it in 2006. They have widespread compliance issues, e. g; compost, organic management policy, worker's awareness, livestock rearing in organic way, no medicine or herbal medicine for livestock etc. In this farm, why we are producing rice. Because, if we produce rice, then our livestock will

get organic fodder. We produce rice, wheat, maize for getting organic fodder. If we don't produce, we will not get it. That's why, in the rest of the land, we produce agricultural field crops. It is must for every field. We all workers and family members also eat the organic food that we produce.

Paragraph 8: At first, question arises, why we are producing organic food and tea. The **vision** of Kazi & Kazi farm is to ensure chemical free food for the avoidance of fatal diseases of the human being. In this farm, everything is planned by Dr. Kabir. His view is: every human being should do something good, to do something for welfare. Now, in the world, most dangerous problem is to get food for man. Why? Farmers are producing GM food for which farmers need to use dangerous chemicals in the form of fertilizer, pesticides, herbicides etc. and our whole nation is consuming these poisons. Some of them are so dangerous that sometimes residual effect could be active for 1000 years. For example, heptachlore which is used in producing sugarcane. So, for this kind of residual effect, many generations will be destroyed. So, if we want to save people from danger, we need to provide them safe food. Food for human being should be healthy and poison free. To do this, the only way is to produce organic food by ourselves. We should not depend on others. What will happen if we do by ourselves? If we do, then, others will try to follow and learn. At this moment, what we are doing is we are practicing and since last two years, we have started to form groups for surroundings farmers as they can learn what we are doing. Already, those farmers are practicing on 50 acres of land on cooperative basis. We have another welfare organization named Kazi Shahed Foundation. This foundation is providing cow without any collateral and interest for the poor farmers after forming farmers group. The farmers will repay the loan from cow dung that they are getting from that cow and when the cow start milching, then they will give us half of their milk as long as the loan is not repaid. Nobody take any account for cow dung, but we take. Because, it is the most important thing for us for farming. Farmers get taka 0.60 for each kilogram of cow dung. From 4 litres of milk, they give us 2 litres and keep 2 litre for their family consumption. In this way, they repay the price of the cow. After the repayment of equal amount of money, the cow is belonged to the farmer. We disbursed taka 2.5 crore (Tk. 25 million) in this way at the surrounding village. We do this from our social responsibility. There is one condition from SGS to take social responsibility. What are we doing for society's welfare?

Paragraph 9: Question: What measures do you take for irrigation and weed control?

Ans: We don't irrigate directly. What we do is mulching. We don't dig or expose the soil to control weed. We cut the weed from upper portion of the soil and mulch it. We do it mechanically by hand or local knife or scissor. We don't disturb the soil and ecology. For this, water management is a big issue. You know, this is a drought area. Drainage is must in tea garden as tea plant cannot bear the standing water. So, we have made very large water reservoir in every garden which is very costly. We conserve water to face the drought season. We know nature is the whole process; it is not a single issue. When, there is water body, then the air of that area contains moisture. Kazi farm practices mulching instead of irrigation. In that area, dew falls down whole of the year at night time. If mulching materials keep on in the field, then they conserve the dew water rather than evaporate. After cutting the **weeds** with scissor or any cutter, these are covered by mulching materials. But weeds are not eradicated from the root completely as there could be possibility of soil erosion and ecological imbalance. As Kazi farm is situated in a draft area, so water management is a big issue. For this, water is always reserved in water reservoir or in tank in every tea garden. There are also good drainage systems as tea plants cannot tolerate water.

Paragraph 10: Ques: Please tell me about how and which standard is maintained?

Ans: We have written documents for each and every work. We maintain proper register and day to day transparent record keeping system that are very important in this type of farming. Record is kept for every agricultural crop from land preparation to Harvesting – for each and every work. How many people are working in which process? For tea, record of regular works such as plucking, temperature measurement, hygiene control, compost making and applying etc. are strictly maintained. Regular supervision and monitoring is done over the employee. The farm export neem tea, tulsi tea, bashok tea as herbal drinks besides normal tea to Europe and America. The import authority regularly checks our storage system. Storage is done according to international standard. How the products are stored, is there any risk or dangerous factor related to hygiene or information gap – these are also handled very carefully. They also check our workers are trained or not. We always provide updated knowledge to farm workers by Regular training. In case of hygiene control, the workers need to wear mask, gloves, apron etc. at the time of working, and after working time, they must wear these out. They must be careful as they are not carrying the germ. Each training program has manual. We need to provide the trainers. We need to maintain proper exhibition of mapping. How much land is distributed for tea production, how much is for agro, how much is for livestock etc. They always visit these things whether we are in proper level. We must have organic management policy as declaration from top management level. They also check whether we have proper arrangement of fire control. As surrounding farmers are not practicing organic farming, so, we maintain buffer zone. Kazi farm has constructed wide drain to isolate from conventional production. Some medicinal plants have been planted as hedge or shade trees like Shinduri, Nishinda, bashok etc. by the side of the drain as they can work as natural wall. Normally, SGS initiate the main process. When, everything is okay from SGS, then USDA visits.

Now Kazi tea farm is inviting international certifying authorities. SGS authority and Japan already visited the farm. We achieved SGS certificate from 2006. SGS and USDA – each of them visit 2 times in a year to check their conditions and compliance. If we fail to maintain, they will stop our certification. Recently, American consumers ordered for different herbal tea, like, neem tea, tulshi tea, bashok tea etc.

Ques: Do you have any written documents/ booklet, leaflet etc.?

Ans: Written documents, you may get in Dhaka office. You can discuss with Shafiq bhai (Dhaka).

You have provided me very rich information which will be very much helpful for my research work. If you like, after publishing the work, I will send you. Thank you very much.

G₁:

Time: 70 minutes.

Paragraph 1: Ques: do you think that organic farming is possible in Bangladesh? What kinds of eco-friendly farming are available in Bangladesh?

Ans: Those who have enough land but population is very less; they can practice true organic farming. But in Bangladesh, 1000 population is living in per square km. and we need more food production. We have to grow more food for this hungry population. For getting higher production, we have to use high yielding variety, for which, high input is necessary. What are the high inputs? Chemical fertilizer, pesticides, etc. without these things, you cannot get enough food. We don't have enough organic input. So, we need to use chemicals. If we practice organic way, then our production will be less. Another issue of organic is: **variety** has to develop that are pest resistant. In that way, fewer pests will attack and less pesticide will be applied. If we use cow dung to produce compost, that should be come from organically reared livestock. The fodder for that cow should be organic. We need to check that fodder was really organic. We must produce adequate food. Otherwise, we have to import for which price will be more. Due to lack of purchasing power, there will be famine and many people will die due to lack of food. We have to use HYV and hybrid seed which means high input variety. We don't have enough livestock to produce compost or organic inputs that we can convert our 10% of our land to organic. So, we need to use chemicals. If we practice organic, our production will be less. So, in Bangladesh, organic farming might be not possible in large scale.

Paragraph 2: If a farmer wants to **start** organic farming in true sense, then he or she needs 5/ 6 years. Farmer needs to take out the residual effects of chemical fertilizer. Farmer can start his effort with using compost. But we don't have enough livestock to use for compost. So, organic farming is not possible in true sense. It is possible only for some commercial farmers those want to export for getting higher price. In developed countries, you will find the price difference is so high between normal and organic products. Those who can afford, they only buy. We don't think that we can avoid insecticide or pesticide in large scale farming. It is not feasible for us.

Paragraph 3: If we want to reduce the use of pesticide, we need to reduce the indiscriminate use of pesticide. We need to explain to farmers that which pesticides and insecticides are more poisonous and which are less, e.g. this pesticide is the right one, this is less poisonous, don't use this pesticide etc. there are many categories of pesticides. There are some pesticides that if farmers apply today in their land, it is possible to detect after 40 years from that land. Some of these, if we apply today, tomorrow, there is no residual effect. Most of our farmers are illiterate in developed countries, farmers are educated. They are also able to update their knowledge from internet. Our farmers are using pesticides according to the recommendation of dealers. Sometimes they recommend those pesticides which are highly toxic and available to him. Then farmers buy it and apply to salad crops (cucumber or tomato) or brinjal. We eat Salad crops without cooking. So, we consume pesticide while eating those vegetables. In case of brinjal, farmers use high volume of pesticide. Farmers apply pesticide at morning and they harvest in the afternoon sell it in the evening and buyer cook and consume it in the night. In these ways, we are taking directly pesticide.

Paragraph 4: GAP: Good agricultural practice is different in different countries. BRAC is following EURO-GAP.

Paragraph 5: Government doesn't discourage organic farming rather than welcome it. Govt. is highly encouraging organic practices for export. But govt always suggest environment friendly farming for all farmers. We need inputs like fertilizer, pesticides etc. Now govt is suggesting GAP in which farmers must reduce the use of pesticide. In our sense, eco-friendly is the method that is friendly and not harmful for environment. We don't have any **standard or regulation**. In every food, there is possibility to have residual amount of pesticide. But the level should be minimum. According to organic regulation of different country or organization, they have different levels of limitation. We must follow IPM, to maintain GAP. Organic means without use of any chemical fertilizers and pesticides. Organic food has advantages. It is chemical free, so, it might not affect your health. It is good for health and environment. Because poisonous chemicals are not applying there. When farmers spray pesticide then pesticide spread at least 4 places: in the tree which is target, some in the air, some is consumed by breath that is spraying, some is going to the water and it has very harmful effect on aquatic plants and animals. In this way, pesticide is polluting environment. But in Bangladesh, **organic farming** might be not possible in large scale. So, we practice eco-friendly, that means reduce the use of

pesticide. In case of fertilizer, all the applied fertilizer is not used efficiently. Some vapour to the air. If we use 'guti (like small ball) urea' at the bottom of the plant, it reaches to the plant efficiently. If we broadcast urea, then 60% goes to the air.

Paragraph 6: Ques: what are projects running in govt. level?

Ans: IPM is an environment friendly, ICM is environment friendly. IPM is integrated pest management. When farmers produce one crop, there are many components or factors. ICM considers the whole issue. ICM is improved thinking on IPM. It is a holistic approach of crop production. My opinion is: IPM is apart of ICM. We follow IPM fully in ICM. But it is a part, not whole thing, seed should come, soil fertility should come,... IPM is judicial use of pesticide. The main objective of ICM is to produce more food without causing any severe environment problem. You ask me use pesticide but try to use as lees as possible. If bio pesticide (Neembicide, tobacco) or mechanical control works, then don't go for chemicals. In our village, so many weeds are grown, like, Neem, nishinda, bishkatali etc. – those are very good for biological pest control. Our mothers and wives use neem leaf in their seed store or rice stock. Because, it work's for pest management.

Paragraph 7: Components of ICM:

There are many factors that influencing crop production. The first one is:

- 1) Good variety: If we want to get good yield, we need good variety of seed, not only good or healthy seed or the seed which germination is 100%. If the seed has no potentiality, from where we will get higher production. In our village culture, in case of marriage, people check the heredity. Why? What is heredity? It means variety, good variety. . For example, in case of rice, BRRI-29 is a good variety; other varieties don't give good yield. If farmers use healthy seeds from any other less quality varieties, then it is not possible to get good yield. So, first component of ICM is good variety, good seed, good plant.

(I can show you a banner, you see, there are some components of ICM, the first component is seed management, at the left corner from the upper level, High yielding variety.)

- 2) Healthy seeds: Here emphasis is given on how farmers will test that the quality of seed is good. In most cases, farmers can check it by sound of teeth. Moisture content should also be maintained by farmers. ([need to search characteristics of good quality seed](#))
- 3) Good soil health: Farmers should know about balanced use of fertilizer and how to increase organic matter to the soil. There are 17/18 necessary nutrients that are needed for the soil. But the balance of N-P-K is the minimum and essential. Nitrogen keeps the tree green and makes the plants healthy. Phosphorus and potassium is responsible for flowering and fruit bears. If farmers see, the plants are yellowish and s/he apply only Nitrogen, then plants become healthy and farmer thinks that these plants are green and very nice. When there is no flowering and fruit due to lack of phosphorus and potassium then farmers think that my plants have been spoiled due to fertilizer. Bit it is not known to him that he didn't maintain balance.
- 4) Good land preparation: Land should be prepared according the crops necessity. Some crops don't need tillage, some need very little tillage. Farmers need to sow the plants in row. Irrigation, weeding etc. needs to be done in appropriate time. If there is any pest infestation, it should be tackled by predators, which are gifts from God. They live in nature. If farmers use pesticide without any consideration, then predators will also be died and pests will increase. If we use less pesticides, then predators (friend insect) will increase, and pests will decrease. When we see that predators are not able to control, then we will try eco friendly methods. There are also some other pest control methods without using chemical pesticides like mechanical control, use of bio-organism like herbal plants (i.e nishinda, biskathali, tobacco), sex pheromones etc. When all the practices fail to control the weeds, then farmers can use insecticides as the last resort. Four conditions or, four R's will be applied there: right insecticide, right dose, right time and right method. For example, BRRI recommended 10/ 15 pesticides and their right doses for rice stem borers. Farmers should apply right dose of one of those insecticides. In Bangladesh, there are more than 250 registered insecticides and pesticides. Sometimes, it happens that any one of those pesticides that farmers need for rice stem borer is not available to dealers and farmers also have very little knowledge about the right pesticide. BRRI fixed the doses of pesticides as doctors prescribe patients how much medicine anyone should take, for which disease, in which age, etc. if farmers apply pesticide without following their dose, it will not work. Brown stem borers suck plant juices from the bottom of rice plant. When sucking is finished, the stem borer leave and plant becomes started to be yellow. If farmers apply pesticide, when the plant is yellow, then pesticide doesn't work. If pest attacks in the bottom level, we should not apply pesticide from the upper level. Therefore, 4Rs are very important. Dealers take the opportunity and sell to farmers which one is available to him. When farmers apply, that pesticide doesn't work for his crop.
- 5) Homestead vegetable gardening is another importance of ICM. If farmers produce vegetables throughout the year, then some s/he can consume with family members and some can sell. So, farm family will get nutrition from his own source and can save some money and get extra income. The women in Bangladeshi villages are enemic. If they go to doctors, then they suggest, taking iron tablets. But if we produce Kalmi shak, Lal shak, banana, guava etc, they can get iron all time. If farmer's plant Kalmi shak for one time, then it spread for whole the year and farmers can cut every 2 days for consuming.

Paragraph 8: Ques: do you have any written document on ICM?

Ans: Till now, we could not develop. There is only one leaflet, which I prepared: on only my ideas. This is the first time approach. DANIDA funded two projects: IPM and IPNS – that were implemented by DAE. Then DANIDA said, when you produce crops, you have to follow many practices. The same staffs are going to a group to tell about pest management, another day he is going to another person to discuss about soil fertility management. DANIDA also fund another project on seed which is implemented by agriculture ministry. The ministry staffs are going to groups of farmers to tell about seed. Then, DANIDA said, accumulate all ideas and try to provide knowledge together on all these issues. Accumulate knowledge will work better than partial knowledge. In this ground, ICM project started.

Paragraph 9: Organic farming is not possible at this moment in large scale. We have to produce more food to keep pace with population growth rate to feed the large no. of population. Otherwise, many people will die due to lack of food. We have to use HYV seed. HYV means high input variety also. Our cultivable land is decreasing day by day because of constructing houses and roads for increasing population. We need Tk. 70 to buy 1 kg. of rice from outside the country. If there is lack of domestic production then consumers have to buy that rice with at least tk. 70. So, due to lack of purchasing power, there will be famine. Govt. cannot provide subsidy for large no. of people for long time. So, we need to produce more food and for this we need to use more inputs. It is not possible to eradicate insects from Bangladesh. If we don't want to use pesticides, then we have to use insect resistant varieties where pest and disease infestation will not happen – that means we need to develop GM variety. But the environmentalists raise their voice against GM varieties. So, organic farming is possible for develop countries those who have vast area and small no. of populations. In our country, we do not have one inches of free land. If we use conventional seeds and we don't apply pesticides, then some farmers will loss large amount of crops and costs of production will be high. But who will pay the farmers the high prices for that product. If they don't get high price, then farmers will not produce.

Paragraph 10: The impact assessed by Economic division of BARI and BRRI has found that IPM training has increased the farmers' knowledge. Farmers thought that all insects are bad. Now they know that there are some beneficial insects which can eat the harmful insects. They have reduced the use of pesticides. They don't apply pesticide just to see any pest at their land. At first, they think it is necessary to control the pests. They also try to use different methods of pest control. They know as well which variety is suitable for which season, how land could be well prepared, which fertilizer is for which use etc. Result also showed that farmers increased their productivity from 8-10% because of increased knowledge, better management, use of balanced fertilizer, good land preparation, good healthy seeds etc. But sufficient no. of farmers didn't get the opportunity to attend in IPM training. Only 0.5 millions farmers have been trained out of 11.8 millions through IPM project in Bangladesh. Now govt. of Bangladesh has formulated IPM policy and is implementing this programme through own finance.

Paragraph 11: You will see in the farmers field one thing: When the pesticide dealers or sellers sell the pesticides, then they suggest farmers to hang the plastic container in the middle of the field. With this approach, they try to advertise on their product as after watching the container may be the neighbour farmer will think that " my neighbour has applied pesticide, If I don't apply, my crops will be infested from pests." This process is just to motivate neighbour farmers to use pesticides.

Paragraph 12: Pesticide use and IPM policy: IPM was partially implemented. **Different policies in BD, 1999, NAP, NAEP etc.**

Paragraph 13: Ques: What is future plan of Govt.?

Ans. Govt has formulated national IPM policy. But unfortunately, the policy is not yet implemented. National agricultural policy was approved in 1999. The 7th policy of NAP says, IPM will be the main policy for controlling pest and diseases. The policy also addressed what to do to implement this. In this ground, when govt. again emphasized on pest control, then again national integrated policy was formulated. But govt. is very much cordial to introduce IPM and ICM to each and every farmer to reduce indiscriminate use of pesticide. IPM was very little implemented. If we can implement ICM properly, that would be a great success for Bangladesh.

Paragraph 14: According to IPM policy highly toxic pesticide can not be used in Bangladesh. According to World Health Organization (WHO), there are two types of pesticides: class Ia and class Ib. The use of Ia categorized pesticide has banned in Bangladesh e. g. DDT, BHC, heptachlore etc. These are not available now. If we apply DDT here, if we collect soil samples after 40 years, we will be able to find the residual effect. Unfortunately, DDT is used to preserve dried fish which is severely harmful. Though govt. has banned it, sometimes it is smuggled from neighbouring country India. The pesticides which are obsolete in India, they sell to Bangladesh and our farmers buy these unknowingly for cheaper price.

Paragraph 15: We should know maximum residual limit (MRL). If it more in any crop, it will affect you. Govt. is working on that because we export vegetables through Hortex Foundation. The importers test it. They provided a list of MRL for some vegetables. Now BARI has established one laboratory. They can recognize MRL of any crop. Last year, an workshop was held at BARC on how to increase our vegetable export. Lastly, we need to think, what could be realistic in context of Bangladesh.

You can discuss with Mr. Belayet Hossain (PD of IPM project) and Dr. Abdul Momin (BARI, Pabna research station).

G₂:

Time: 58 minutes

He checked the questionnaire. He told, "as DAE is mainly working with IPM project which is considered as eco-friendly measure, so, I think if I express my experience, it would be helpful for you."

Paragraph 1: We work with three **motives**: lessen production cost, produce more and keep the environment safe. Govt is now trying to go far from applying more chemicals. We are now worried about environment, soil fertility, at first, we fixed our farmers and their land. First year, we suggest them to organic in 50% land and inorganic in another 50% land. Here, organic means to use organic fertilizer, leguminous crops, green manuring, crop rotation etc. Pest is managed by biological and mechanical pest control that we teach them in IPM training. In the second year, we suggest them for 75% organic and 25% inorganic. In the third year, 100% organic; we have "nirdeshika" on that. We need more food production but we also have to save our environment.

Paragraph 2: Farmers' field school is very important for training. The duration of IPM training is 14 weeks and 50 hours. Mainly two types of crops are selected for example and practical knowledge: rice and vegetables. Vegetables are four types: cucurbits, cauliflower groups, bean crops and brinjal. Totally, we teach them, how they can produce insecticide free crops and vegetables, but not fertilizer free, proper and balanced dose of fertilizer. We discuss about total crop management, e. g; fertilizer management, water management, pest management, disease management, weed management. Because, pest management is not a single activity, it needs to learn the whole approach. In any case, if they need to apply, they must use right pesticide, right dose, right method and right time. The most dangerous subject is farmers are applying so much poisonous chemical pesticides. Normally, vegetable is more affected by pests than other crops. This technology will be sustainable because, after this training,

Paragraph 3: There are some examples that farmers applied **pesticide 140 times** before harvesting brinjal, even sometimes, they spray after harvesting. In Jessore district, the problem is severe. Now, it is proved to them that if they use sex pheromone method then they don't need to apply chemical pesticide. There is a **huge demand** for sex-pheromone, bracon, trycograma for vegetables but the government has no policy to initiate to make these insecticide and pesticide available to the farmer. Pests and insects attack more in vegetables. However, govt. has come far away from that point that it started to use pesticide. Before **40 years, govt. motivated** farmers to apply pesticide. Govt. distributed free pesticides and govt. extension workers went to farmers' crop field and applied to the crop. According to specialists, every pesticide is poison. So, we need to apply as less as possible and farmers should know right insecticide, right method, time and dose to apply pesticide. There was a survey at 2008 at 7 districts in Bangladesh. It was found from the survey that 95% farmers don't know which pesticide is suitable for which pests and diseases, how to apply and how much they should apply.

Paragraph 4: I think the country should adopt the "totally integrated pest management system" as the insecticide-based management system has failed to control many pests. "The pests are becoming resistant to almost all chemical pesticides as the frequency of spraying is gradually increasing while their efficacy is gradually decreasing. In rice field, on an average, 20% insects are harmful and 80% are beneficial and in case of vegetables, 30% destructive insects are surrounded by 70% helpful insects. Farmers spray 90% pesticides from the above level. When chemical pesticide is applied, then beneficial insects are being killed at first as they live normally at the upper level. Harmful insects live at the lower level to be safe from beneficial insects and they move to the boundary or neighbours land through crawling at the time of applying pesticide. After killing of useful insects, harmful insects destruct the crops more and more. Then pest control becomes very difficult with chemical pesticide. But **biological control** involves use of a specially chosen organism to control a specific pest. This chosen organism might be a predator or a parasitic which attacks harmful insects. Field demonstration results prove that the use of biological agents has no adverse effect on human health and the cost effectiveness of bio-control measures is very attractive, safe & sustainable.

Paragraph 5: In Bangladesh 79% imported pesticides are **used for rice**, 10% for vegetables and 11% for others (like cotton, sugarcane, tea etc.) Farmers use six times more pesticide in rice than vegetables. Brinjal stands top all cereals and vegetables in terms of per unit pesticide use in Bangladesh. Farmers apply only 0.2 litre pesticide per hectare in rice fields, 1.12 litres in vegetable (other than brinjal) fields but 1.41 litres in brinjal fields. We are motivating farmers in different ways not to use chemical pesticides. But farmers don't want to accept our advice. There are 12,500 sub assistant agricultural officers to advice farmers. Each of them needs to go to 200 farmers, which is near to impossible. So, we need to increase our manpower. When farmers notice about pests and diseases or any kind of problem in their field, they always interested to go to dealers rather than come to us. Not only lack of farmers knowledge, but also unconsciousness, commercial mentality and lack of knowledge of pesticide wholesalers and retailers are responsible for this increasing pesticide use "Over the last two years, many brinjal growers in Jessore, which produces one fifth of the total output of aubergine in Bangladesh, have been doing away with pesticide use and yet having far bigger harvest of brinjal with no pest attacks whatsoever. Artificial secretion of sex pheromone in brinjal fields is the secret behind the magic. What the scientists and researchers have done in the case of brinjal is that they have artificially produced female

BSFB **pheromone** and put a certain dose of it in the middle of an eggplant field inside low-cost traps to lure the male BSFB for mating. In the process, the tiny pests got eliminated with farmers requiring no use of pesticide. Pheromone is a chemical compound, produced and secreted by an insect or animal, that attracts opposite sex of the same species for mating. It has been calculated that earlier, farmers had to **spend** Tk 56,354 a hectare on pesticides for cultivating brinjal in a season but now they will need only Tk 15,000 for pheromones.

Paragraph 6: We need to test **maximum residue limit** before marketing of agricultural product. We don't have yet such kind of regulation. Our farmers are bringing the vegetables to market the next day of applying pesticide. But they should wait at least 13 days after spraying pesticides. In Bangladesh, BARI and Bangladesh Atomic Energy Commission have their capability to do this. Considering the widespread illiteracy of our farmers, it should be made mandatory for pesticide producers and sellers to print pictures on pesticide containers showing how to use and dispose of them properly after use."

Paragraph 7: Sex Pheromone is a small chemical capsule in a plastic bottle half-filled with soapy water. The farmers bait traps with capsule of 3 mg synthetic sex pheromones and water-filled polyethylene dispenser is kept inside, which secrete an aroma that is similar to the natural smell of the female sex pheromones. This works when the male pest is attracted with the sex pheromone thinking it as female pest. When the male pest enters the box it is trapped by the soapy water and the female pest cannot mate with the male pest and thus reproduction will fail. Such a trap catches up to 20 male moths of BSFB a night. One Pheromone Lure attracts male shoot and fruit borers for two months. When the artificial pheromone secretion loses effectiveness, farmers need to replace it with a new one. Cue lure has been found to be highly effective in controlling pests in fields where brinjal, bean, cabbage, cauliflower, pumpkin, cucumber and gourds are being grown. For producing brinjal in one hectare, farmers need to spend Tk. 50 to 65 thousand and it is possible to get 50% healthy brinjal. But if farmers use sex pheromone method, then pest and disease control cost stands for maximum Tk. 12 thousand and they are getting 90% disease free brinjal. A separate sex pheromone is used for each vegetable as different pests prey on different vegetables, Dr. Alam said. When there are sucking pests we can use mashed neem seeds and spray it and the result will be go because all the pests would be killed.

BARI is working with us. Dr. Nurul Alam (head of entomology division), works with biological agents. You can get vast knowledge from him.

G₃:

Time: 1hour 15 minutes

Paragraph 1: I started to work on organic farming with my PhD research work. The thinking was how to manage resources and organic household waste for crop production. Then leaf drop and animal wastes were also added in the thinking.

Paragraph 2: In our culture, importance is given on fulfil of stomach, not considering disease and health hazard. Nutrition and health development are not given importance for policy makers. I did my research on best use of household waste and cowdung to produce rice through producing compost. Our literature and soil scientists' saying is, it is not possible to produce crops by using only compost. But my research finding was, when compost is producing for about 3-4 weeks, then it became very active and works very quickly. In that case, no nitrogen fertilizer is necessary. Water content is most important factor for compost making. According to organic rules, organic farming is also eco-friendly farming. Organic allows some organic fertilizers and pesticides. But there is no residual effect at the time of harvest due to pre harvest interval. BRAC has achieved EUREP-GAP with the help of ATDP. This is less eco-friendly than ecological farming. If we help the ecology, for example, we reduce the use of fertilizer and use compost, then it is eco farming. We call it safe agriculture- safe food.

Paragraph 3: So, what are you practicing, organic or eco friendly?

According to organic rules, organic farming is also ecofriendly farming. What I understand, organic do allows some organic fertilizers and pesticides. But there is no residual effect at the time of harvest due to pre harvest interval (PHI). BRAC has achieved EUREP-GAP with the help of ATDP since 2004, which is now called global GAP. They only require, what we are producing, it should not be a cause of health hazard. This is less eco-friendly than other ecological farming. What is the meaning of ecology: my surroundings, my crops, my animals, my biosphere etc. Eco has very easy meaning: if I use less amount of fertilizer, less pesticide, using compost- these are eco farming – that means, to help the ecology. If I don't use tree wood, I am helping the ecology, it is eco farming. So, eco farming differs from man to man. But, truly organic maintains some rules and regulations. If we help the ecology, for example, we reduce the use of fertilizer and use compost, then it is eco farming. We call it safe agriculture- safe food. We don't want to tell organic as it always recalls us about accreditation. International accreditation is the common term for organic farming. But it is a great business. BRAC has achieved EUREP-GAP with the help of ATDP. This is less eco-friendly than ecological farming. It is for trade. BRAC is giving Tk. 1 million every year for holding EUREP-GAP certification which is a very big amount for organization. So, we think, it is a trade to organic or natural farming. We don't have much resource that we can convert our 10% of our land to organic.

Paragraph 4: Safe food is much acceptable than eco food. Safe food means which foods help to build up and growth of body and supply power or ability to work. That will not be health hazardous for today or tomorrow. It credits all the qualities of food.

Paragraph 5: I have different opinion in the case that we call eco farming but not eco food. But in case of organic, it is called organic, natural or safe food. We are trying to save or balance ecology in eco farming but food is not attention for eco farming; it is not considered what contains that food.

Paragraph 6: I started my research on organic farming from 2000. From that time, I had been sitting with the farmers those who were interested and wanted to give time.

Paragraph 7: The main constraint is, when we raise our voice about organic food, then policy makers always say, this is a threat to our food autarky – which is not right. Our yield has decreased 40-50% for the dependency on chemical inputs. One real example is: where IR8 was cultivated, in 80 decade, the yield was 40 mounds, but now yield is 20-25 mounds. In case of BRRI-29, yield has reduced by 50%, but potentiality of IR-8 is more than BRRI-29.

Paragraph 8: Soil microbial activity is hampered due to the dependency on chemical fertilizer. For this reason, organic refreshment is not happened. Micro organism has been destroyed due to increasing use of fertilizer. Production has increased because total cultivated area has increased, irrigation increased. We are cultivating in previous fallow land. Yield from specific land or net income from certain land decreased drastically. Production has increased only in flooded alluvial soil.

Paragraph 9: What kinds of crops are you suggesting farmers to cultivate without chemicals? Targets crops in this farming are mainly Salad crops, fruits and others crops that can be eaten without cooking. But we are also giving importance on brinjal and 17 cucurbit group vegetables.

Paragraph 10: What kinds of pest management practices do you suggest? Pest Management Practices: We are very allergic about chemical pesticide. Farmers are using Sex pheromone to protect plants from pests for which they don't need any cost. The happiest thing is: if farmers don't apply chemical pesticide, then 70 sex pheromone is more than enough for 1 hectare of land. If we use Tycograma in every 7 days as bio agent, it works very well. It is put in crop land making shapes like chocolates. Tycograma is a good tool for our research. If we treat the seed with Tycograma, then it works for the growth of creeping plants.

Paragraph 11: How soil fertility could be maintained? Soil fertility management: Compost is the main element of fertilization and crop rotation is the main magic of fertilization process. In some cases, bio fertilizer is applied. In some cases, bio fertilizers are applied. We are suggesting chemical fertilizers if necessary, not in excessive rate. But we are very much allergic about pesticide.

Paragraph 12: How framers are responding? Practically, this is a new era. Farmers are using chemicals for 40-50 years; they also used free of cost many years. Now, in our country, so many Pesticide Company and dealers have started business and they are so active that sometime they are going to crop field with bottles of pesticide and tell the farmers that you don't need to money or you can pay later for this pesticide. Then farmers become bias. Who will go to tackle this situation? Now farmers are so habituated that they cannot think crop production without using pesticide. They have dealer in every village. But we don't have any worker in one Thana. We don't have enough strength. We had some projects in some areas and farmers are also influenced in those areas. We didn't see that farmers are using pesticide in cucurbits but sometimes they apply pesticides in case of brinjal. But those products have been sold with pesticide used products. Our conventional farmers apply pesticides at morning and they bring products to market at evening but consumers are eating without washing.

Paragraph 13: Organic or safe food producers are producing in organic way. But what is the price of that food. We established a market named PCCS (Producer- Consumers Cooperative Society). Producers will go to that market with their product and consumers will come to buy. Farmers will sell in Tk. 2 which is selling in normal market at Tk. 3. They can sell because there is no middleman. Both producers and consumers will be benefited. This can be a model.

Paragraph 14: Recently we had a meeting with different types of business and social persons. The objective was to be organized centrally. We will give free service from the sense of social responsibility. Our opinion is: in every market, there can be a different stall for safe food products. Previously, there were some organic super markets like Proshika, Meena Bazar. But they failed due to lack of trust. People didn't believe that those were safe food. So, firstly we have to develop consumers for our products. If consumers can trust then rich and educated people will buy with 2/ 3 times higher price. So, our main purpose to develop trust which is a continuous transparent system as consumers can believe that nothing is wrong here and there is no leakage in this system. Quality control system is needed to establish in total tyre. We think that trust can be established with the help widely accepted trusted and respected persons in the society such as teachers, imam, doctors, GoB researchers, extension workers from reputed NGOs, consumer association, Media persons, rotarians etc. Scientists from different sector, toxicologists will facilitate them. Policy issues, certification body, media campaign will work at national level. But the main important thing is: our earlier consumer must need to be well educated.

Paragraph 15: Up to now, Bangladesh doesn't follow any standard. At this moment, we don't need accreditation from outside. If we could develop 10 millions of consumers, then we need to work for 10 years. For accreditation, we need to develop traceability system that means a clear picture of a product reaching to the consumers from producers e.g. which source and variety of seed has been used for this product, in which area –it has been produced, etc. Recently, EU and commerce ministry – together gave a recommendation for

Paragraph 16: Some of the Bangladeshi farmers are practicing organic farming under the supervision of different NGOs. It is very costly to get international standard. But why should we spend too much money for getting certification? At first, we have to develop our consumers. We need to work to save the health of our nation. Our motive is: safe our population, safe our consumer. If we want to go to trade level, it will hamper our objectives. We would like

to reach at a certain level that anybody can say that our system is better than certified system. We will not say that our product is organic food. We will say safe food. Otherwise, it will make conflict with IFOAM, EU etc. When we can develop this concept at our national level, Then we can follow international standard and export our food items.

Paragraph 17: The main **constraint** is, when we raise our voice about organic food, **policy makers** always say, this is a threat to our food autarky – which is not right. Our yield has decreased 40-50% for the dependency on chemical inputs. One real example is: where IR8 was cultivated, in 80 decade, the yield was 40 mounds, but now yield is 20-25 mounds. In case of BRRI-29, yield has reduced by 50%, but potentiality of IR-8 is more than BRRI-29.

(Repeated answers are not included here. The important exceptional discussions are translated)

G₄:

Time: 1 hour

Paragraph 1: Among the various constraints for low production of crops, severe infestations of insect pests and diseases are considered as the most important ones. Farmers of our country are mostly depending on the toxic chemical pesticides to combat with those pests attack. Due to indiscriminate application of pesticides, its consumption increased several folds in the last decade. During 1997-2008, pesticide consumption increased 329% and per ha pesticide use increased 600%. Bangladesh entered into era of synthetic chemical pesticide with the importation of 3 mt of chemical pesticides, which increased to the volume of 48,690 mt in 2008. Total estimated ex-depot sales value during 2008 was around Tk. 12 hundred cores. Although 80% of the insecticides are being applied in rice, but the frequency and amount of insecticide applications per unit area is highest in vegetables, especially in the high valued crops. Among various vegetable crops, high valued crops like brinjal, country bean, cabbage, cauliflower, cucurbits, tomatoes receive excessive amounts of pesticides as they sometimes suffer serious pest damage. On brinjal alone, commercial producers apply insecticides to produce marketable fruits at a cost of more than Tk. 40,000/00 per ha (35% of total production costs).

Paragraph 2: By using huge doses of pesticides we have destroyed our biodiversity. We have destroyed our friendly insects. We are also making our lives more risky as those harmful pesticides are entering our bodies through the food chain. Mindless spraying of chemical pesticides has a huge adverse residual affect on human health, nature and biodiversity. People are becoming physically handicapped or mentally retarded due to the chemical pesticides. This also causes strong headache, vomiting and physical weaknesses. **Overuse of chemical pesticide** is not only increasing the risk of human health, but also soil is losing its fertility, many species of fish, beneficial insects and birds that are useful for agriculture have already been lost - the whole environment is under risk for using chemical fertilizer and pesticide. **The surface water bodies and underground water reserves are being polluted.**

Paragraph 3: But there is hope. We can provide some good examples also. Farmers in Sikandarpur village in Jessore are earning more money by producing vegetables at lesser costs while protecting the environment also. They use Pheromone Trap; a simple device to kill insects instead of applying harmful chemical insecticides. He supervised the great efforts of the farmers. According to FAO, Jessore was one of the three regions in Bangladesh where pesticides were used excessively. The frequency of spraying insecticides in brinjal was 84 times in 1994, at least twice in a week. But in 2001 and 2004 **the frequency increased to 140 and 160 times respectively**, they had to spray at least once everyday. It means the pests were becoming drug-resistant, but the scene is different now. They **do not use pesticide. It is a revolution.** The trap is made with a plastic pot and '**Sex-Pheromone**' is kept inside it. BARI distributed one thousand Pheromone Traps this year among brinjal cultivators free of cost to popularise the unique method and the method is being used on all vegetable fields at Sikandarpur village. The pheromone technology promised to eliminate use of pesticides in brinjal cultivation, saving about one third of the farmers' total expenditure. Ninety percent of suicides in the villages of Bangladesh are happening for the easy availability of pesticide. Suicides are happening very often in Jhenidah district. According to district civil surgeon, 783 people committed suicide from 2003 to 2007 and 96% (751) of them committed through drinking **pesticides**.

Paragraph 3: Though farmers are always advised to stop applying pesticides in brinjal fields at least 7 to 15 days prior to harvesting, they do it even on the day of harvesting to save the vegetable from pest attacks. As a result, the **residual effect** of pesticides in brinjal poses serious health hazards and a risk of losing export market too.

Paragraph 4: Bangladesh crop protection association alleged that **15,376 metric ton pesticides had been sold in Bangladesh in 2001** whereas it was 37,712 metric ton in 2007 – amount of pesticide use increased 145.26% within seven years. But, in this statistics, the amount that was imported of outside the association was not included. The country imports pesticides worth 24000 crore taka every year – a huge business.

Paragraph 5: BARI and DAE provided synthetic sex pheromones and beneficial insects to a number of farmers in some vegetable growing hubs and find out whether these inputs could replace harmful pesticides to reduce damage to public health. **The government** has not yet approved to bulk import and mass use of sex pheromones. Production of beneficial pests, on the other hand, is very limited. It is still at the laboratory level. Only BARI and Safe Agro-Biotech Ltd, a private research and business center – produce some beneficial pests in their emerging laboratories. SABL got

special permission to import several sex pheromones item from ppw of DAE, MOA, GOB for the first time in the country. Another scientist pointed out that the multinationals which produce chemical pesticides are **politically** very powerful. So the **government** will have to be firm in dealing with the machinations of the multinationals.

Paragraph 6: About **the scarcity** of sex pheromones and beneficial insects, Dr **Alam** said, farmers spray the crops with harmful chemicals as they cannot get organic pesticides in time. **The Magic Traps** are popular among farmers here in Jessore elsewhere in Bangladesh that demand for those have increased very quickly. But ironically the supply is so little that farmers face problems in expanding this new found device for controlling pests in a natural, environment-friendly, safe and secured way to boost crop production. Some farmers were sharing their long battle against harmful pest attacks in the locality, how scarcity of safe and low-cost pest management inputs still compelling farmers to spray harmful and costly pesticides, hampering what many a farmers billing as a success story of the continuous efforts of a number of scientists to control pests in a natural and organic manner. Farmer said, "Scientists trained us to apply pheromone traps and beneficial insects on our crops to control pests. But these inputs are not available either in the market or in their (scientists) stock. Once the farmers got pheromone traps and beneficial insects free of cost, but now they are anxious to buy them to protect their crops, ". "We simply want adequate supply of those inputs."

Paragraph 7: Along with according to Dr. Alam, the **present continuing rules of selling pesticide** and getting licence of pesticide dealers is the main reason of uncontrolled buying and selling. 'The Pesticide Rules- 1985' was enacted 25 years ago. According to that regulation, any adult person aged from 18 to 55 can get licence with only Tk. 75 of retailer and Tk. 300 for wholesaler. Neither educational qualification nor training about pesticide use is precondition for retailer or wholesaler. Any illiterate person can get the licence. Government Agricultural extension officers' opinion is: pesticide dealers and sellers must need to have educational qualification of minimum 10 class and they must be trained. According to the '85 rule, any buyer can buy any amount of pesticide – which is very dangerous. Pesticides must be bought and sold according to the recommendation or prescription. It should be banned to buy and sell pesticides without prescription. If necessary, farmers can spray a selective pesticide after consulting with the local extension staff. Govt needs to amend '85 ordinance and to introduce bio pesticide.

Paragraph 8: Worldwide there is a downward trend of the use of chemical synthetic pesticide, but in Bangladesh the opposite scenario, aggression of toxic chemical pesticides prevails. The overall pest management situation of our country is not in a good shape. It has been reported that 98% of the vegetable growers feel sickness and 3% of them hospitalized due to the deleterious effects of pesticides. It has also been reported that about Tk. 7000 million is spent on health protection every year due to the adverse effects of pesticides and other pollutants in Bangladesh, as a result of their widespread use most of people are taking pesticides in their diets everyday. So, appropriate measures should be taken to develop and use of eco-friendly, sustainable, socio-economic pest management packages, which not only boost up the production of vegetables in Bangladesh but also ensure the quality of those crops.

G₅:

Length of Interview: 2 hours 10 minutes

He checked the questionnaire, I would like to ask him this question and try to get this answer, but he described from himself)

Paragraph 1: A project was started namely 'Integrated Quality Horticulture development Project' includes BARI, DAE, BADC etc. The main objective of this project was to develop the quality of horticulture product and export of 30,000 metric ton vegetable from Bangladesh every year. The aim was to export insecticide free vegetable and to capture foreign market from 1984. For this, 400 hectares of land was cultivated including 4600 farmers for producing organic product in Kaligonj upazila under Gazipur district. Training was mainly provided in case of post harvest handling activities. Exporters setup backward linkage with these farmers and providing 30% premium.

Paragraph 2: The major problem is that if soil texture lost, then at least 2 years should follow this land but our farmers are marginal, so it is not possible to them, so Government convince these farmers. A study showed that, 25-30% waste as a post harvesting handling and losses 400-500 core taka each year. Study also has shown that trader's loss more and producer's losses less. In the developed countries, the farmers who without organise from convention they get 25% from EU and 25% from government as a production cost i.e. 50% of production costs. But in Bangladesh government does not give anything. Main problem is people do not trust it is a organic product, as a result producer do not get higher price. If we use organic then the micro organism in the soil increase, as a result , production also increase and we keep our environment nice for the next generation. The greatest challenge of Bangladesh had to face after independence was the supply food for its millions. The green revolution technology starting from mid 60s (The than East Pakistan) was reprehensible for bridging the food demand supply gap and heralded a new era of self reliance in food production. It was highly gratifying that Bangladesh had achieved self-reliance in cereal crop production in the all shortest span of time. However, our traditional agro-systems suffered a great setback due to the indiscriminate use of chemical inputs, hybrid seeds and over exploitation of natural resources.

Organic Agriculture Concepts

Paragraph 3: Organic Agriculture has alternative term in use from same dimension as Ecological Agriculture, Biological Agriculture, Alternative Agriculture, and Natural Agriculture as known. Actually Organic is used in English speaking world, while biological is more often used in Latin language. In northern Europe, Ecological is commonly used. Other terms of Organic also used as Green Agriculture, Nature Friendly Agriculture. On the other hand Organic farming is a system of farming practices which is different from conventional farming that is heavily dependent on the use of chemical fertilizers and pesticides. Organic farming also named as ecological farming based solely on organic inputs. Ecological or organic farming systems have the potentials to reduce some of the negative impacts of conventional agriculture on the environment. Organic materials improve the physical, chemical and biological properties of soil in contrast of chemical fertilizers. So, the use of organic materials is, therefore, necessary to sustain the productivity of soil as well as soil health. The most common organic materials which are currently used through out the world are- bio fertilizer, humate fertilizers, manure spreaders, crop residues, green manure, bone meals, compost, farmyard manure, fish meal, fish wastes, liquid manure, sewage sludge etc.

Paragraph 4: Continuous application of chemical fertilizer and other chemical has already created adverse effects on soil properties and as a consequence yield stagnation or even yield decline has resulted. To restore natural productivity of the soil, use of organic materials is a must. The concept of organic farming also covers economic and social aspects of agriculture production. There are other but not organic approaches which represent alternative to high-external –input production systems and which are more environmentally friendly but not organic. An example is low-external-input sustainable agriculture (LEISA), which is based on the increased use of local resources. A key factors distinguishing LEISA from organic farming is the use of chemical inputs, which is reduced but not eliminated. Integrated farming systems combine the use of chemical and biological controls. Among the techniques utilize are Integrated Pest Management (IPM), Integrated Nutrient Management (INM) and Integrated Weed Management (IWM). Thus, integrated farming systems are seen by some as a compromise between organic farming and intensive conventional agriculture.

Paragraph 5: Sustainable agriculture depends on many factors although soil is the most important media responsible for sustainable agriculture, when the organic matter from plants and animal is mixed with the power of rocks (mineral), biological (micro-organism) activities and chemical action are started in the mixed matter (minerals, organic matter, water, air) and humus is formed through the activity of micro-organisms, in this regards, good soil divided into three areas; physical, chemical and biological areas. Whether or not soil is well structured depends on the allocation of three components (solids, water and air). If there is too much solid, the soil becomes hard. The soil should be enough.

Paragraph 6: Soft for plant roots to be able to penetrate. Too much in water in soil reduce the percentage of air and results in oxygen deficiency for plants roots. Too much air in soil causes drought. Thus the allocation of well structured soil is usually 45% solid (out of this, Humus 5%), 25% water and 25% air. Though we can determine that if the above component of the soil with desired percentage as good soil but we have to consider that the nutrient cycle that humus is made from organic matter by micro organism in the decomposition process and disappears in mineralization. Humus does not stay for ever in the soil. Thus if the supply of organic matter is stopped, the structured of the soil degrades. Chemical fertilizer never develops the structure of the soil. Rather, it destroys it by killing micro-organisms. The main reason for soil structure Degradation in Bangladesh is over dependency on chemical fertilizer and lack of organic matter supplied to the soil.

Paragraph 7: On the other hand organic farming is a system of farming practices which is different from conventional farming that is heavily dependent on the use of chemical fertilizers and pesticides. Organic farming also named as ecological farming based solely on organic inputs. Ecological or Organic farming systems have the potentials to reduce some of negative impacts of conventional agriculture on the environment. Organic materials improve the physical, chemical and biological properties of soil in contrast of chemical fertilizers. So, the use of organic materials is, therefore, necessary to sustain the productivity of soil as well as soil health. The most common organic materials which are currently used through out the world are – bio fertilizer, humate fertilizers, manure spreaders, crop residues, green manure, bone meals, compost, farmyard manure, fish meal, fish wastes, liquid manure, sewage sludge etc. Continuous application of chemical fertilizer and other chemical has already created adverse effects on soil properties and as a consequence yield stagnation or even yield decline has resulted. To restore natural productivity of the soil, use of organic materials is a must.

Potentiality of OF:

Paragraph 8: The intensive use of agro-chemical damaged our eco-systems and the delicate balance between its components. Reducing organic carbon status on one hand and treating the soil as metre physical medium ignored the biological basis of soil fertility. Similarly, the pest control by pesticides alone is skin to chemical invasion an eco-system. Use of fertilizer and pesticides and their designated aims of increased productivity and reduced damage due to pests respectively. But, the productivity of many crops has not shown proportionate improvement in the last 10-15 years despite the increased use of chemical inputs. Similarly, extensive use of pesticides has not reduced the losses due to pests. With these two facts in the background, **we are at crossroads to review whether the current use of agro chemicals is appropriate.** A conventional farming system has proved to be a curse to ecological balance, human health and global warming, the most pressing threat to life on earth. Agriculture play a major contributor to climate change, clearing forests for field, burning crop residues, submerging land in rice paddies, raising large herds of cattle and other ruminants and fertilizing with nitrogen, all release greenhouse gases to the atmosphere. The main gases

emitted are carbon dioxide (CO₂), Methane (CH₄) and Nitrous oxides (N₂O). On the other hand, agriculture is responsible for about 30 percent of human related emissions and 70 percent of nitrous oxide emissions. Agriculture ranks third after energy generation and chlorofluorocarbon production, contributing to greenhouse effect, the cause of climate change. The intensive use of agro-chemicals has resulted in unsustainable production systems. It is widely believed that organic agriculture is the answer to the present day agricultural problems on account of its agronomic, biological and mechanical methods in place of synthetic methods. Agro-ecological and organic farming system can be promoting opportunity in both industrialized and developing countries to reduce GHG emissions. The allocation of carbon credits for converting to ecological or organic production systems may also enhance the financial viability of this option for a large number of farmers.

Paragraph 9: Organic agriculture is **not only a philosophy but it's also a means of achieving sustainability in agriculture**. Sustainability would not only address economic issue but will also provide equal importance to social and environmental concerns. By adopting organic, one could potential get rid of toxic chemicals pesticides and synthetic fertilizers, which over time have proved to adversely effect soil health. Organic agriculture is based on use of organic materials and inputs. It is therefore being suggested that organic agriculture can provide solution to overcome damage to environment, climate changes, loss of resilience in eco-system and poor soil health. A system and process-oriented approach is followed in organic agriculture and it is not only based on minimizing the use of external inputs and avoiding the use of synthetic inputs. Before details on organic agriculture, it is what that organic agriculture can contribute significantly to reduce GHG's and sequester carbon in soils and biomass. Secondly, there is sufficient evidence that organic agriculture is superior to mainstream agriculture. This is even more important as the capacity of organic agriculture to contribute to the mitigation of climate change can be considered as an ancillary benefit to its primary goal of sustainable land use.

Paragraph 10: Ecological aspect:

- a) **Degradation of soil:** Soil structure is broken down, so the soil becomes hard, the water holding capacity is decreases, the nutrient-holding capacity also decreases. There is micro nutrient deficiency, micro organisms decrease in number and become inactive PH imbalance where in the soil become acidic, accelerated elimination of humus and death of some micro-organisms causing an imbalance
- b) **Increasing Pest Problem:** Degraded soil is unhealthy soil. Unhealthy soil grows unhealthy plants that are easily attracted by pest (Insect & Diseases). Then farmer use chemical pesticides to kill the pests which are poisonous and harmful for all living beings. There is no consideration of the root causes of pest attack in this consequently pest problems are not solved and get worse.
- c) **Degradation of food quality:** The products grown with chemical fertilizer are low in food quality, tasteless and also they cannot be preserved for a long time as they rot sooner. Not only have that but also in the nutrient contented of the products. Recently from the studies (Japan) that chemically grown products has less nutrient content (protein, vitamins, minerals) and higher water content compared with organically grown products. That means, the higher water content may be the main reasons for lack of taste and low shelf life of chemically grown products.
- d) **Polluting soil, water, air & products:** Use of chemical pesticides results in pollution of the environment as they are chemical poisons. They are very effective in killing living thing and have very long time residual effect. The poison pollutes the products first and the soil, water and water consequently.
- e) **Health hazards:** Health hazards may cause with two ways. One is that people eat the poisoned agricultural products and other contaminated food (meat, milk fish etc) from chemical agricultural production. The poison accumulates in the living body and through the food chain; the poison is condensed and become a health hazard. The other hazard is that the chemical fertilizer directly affects the farmers who use it (spray). In Bangladesh, most farmers handle pesticides without protection for their bodies even sometimes without upper cloth/s and they become usually serious victims. A cow and goat which has feed on crop residues sprayed with chemical, sometimes causes death.

Paragraph 11: Agriculture changes climate-how? Agriculture is a major contributor to emission of methane (CH₄), Nitrous Oxide (N₂O) and Carbon dioxide (CO₂). On a global scale, agriculture land use in 1990s has been responsible for approx. 15% of all green house gas (CH₄) emissions. One third of all Carbon dioxide emissions come from change in land use (forest cleaning, shifting cultivation and intensification of agriculture). Approx. two thirds of methane and most of nitrous oxide emissions originate from agriculture. At the same time, agriculture offers option to reduce GHG significantly. One is to reduce emissions and thereby, to the production of atmospheric CO₂, CH₄ and N₂O. Agriculture shares the avoidance emission reduction strategy potential with industry and other sectors. The second sector obtain consist in systematically sequestering of carbon dioxide in soils and in plant biomass. It is unique for all types of land use. To evidence emission reduction potential, Organic Agriculture can play **significant role in reducing carbon dioxide emissions**. This is because in these types of practices, it uses significantly less fossil fuel in comparison to conventional/chemical agriculture and this is mainly result of 1) Soil fertility is mainly maintained through farm internal inputs, i.e. Farm yard manure, legume production, wide crop rotation etc. and; 2) Energy damaging synthetic fertilizer and plant protection agents are off also.

Paragraph 12: Certification of organic product: Certification is a procedure for verifying that a product conforms to certain standards. In the case of organic product, certification is primarily an acknowledgement that these products have been produced according to organic production standards. These standards may be the standards of private associations or companies, or of certification bodies or of the state.

Paragraph 13: Degree of standard-an example: Say tomato has a certain price in the market place. A tomato claimed to be produced in accordance with organic farming principles, i.e. an organic tomato, often has a higher price in the same market place. A common way of informing consumers that certain products are produced according to organic production principles, thereby justifying a price premium, is the indication on product labels that the product are organic. During the last two decades there has been an extraordinary growth in the use of labels referring to the organic origin of products, as well as labels suggesting organic production methods using terms like 'green' and 'eco-friendly'. Until regulations on the labelling of organic products were implemented, it was difficult for consumers to know what was meant by the various terms and which production methods actually been used. Similarly, producers were in for unfair competition in the sense that products which were organic only to a certain degree could be claimed to be organic or environment friendly in various ways and therefore entitled to a price premium.

Paragraph 14: Certification Agencies Internationally: The International Federation of Organic Agriculture Movements (IFOAM), Codex Alimentarius Commission, Demeter International i.e., World Trade Organization (WTO), International Organization for Standardization (ISO)

Paragraph 15: Possibility of Effective Micro organisms (EM) Technology: Crop yield has been improved with chemical agriculture, which are employing agricultural chemical such as artificial fertilizers and pesticides. Artificial fertilizers have been applied in to the field. The soil has been destroyed year by year because farmers have been instructed not to return crop residue to the field for disease control and the organic matter has decreased. The balance of micro organisms in the soil also has been destroyed. Excessive fertilizers have polluted surface and ground water. Artificial pesticides released farmers from laborious labour. However, the pesticides have impacted negatively to environment and human health. Methyl bromide, soil antiseptic, is one of the causes in ozone layer depression. Another problem has appeared. Pest insects have gotten resistance to the pesticides although new one is developed. Maintaining high yield, farmers use strong dosage or new pesticides. The pesticides pollute soil and water. The pesticides have affected not only environment but also human health. Farmers are exposed when applying pesticides and consumers eat crops with pesticides residue. For example, Chlor-nitro-phen (CNP), herbicide for paddy field, is though to cause Gall bladder cancer, high mortality also. So the chemical agriculture is threatening environment and human health now. Concerning environment and human health, some farmers have employed organic farming. However, the yield might be reduced 10% to 50% compared with the chemical agriculture even though some studies have shown that organic farming increased yield. For maintaining the same level of yield between chemical agriculture and organic farming, it would be necessary to reclaim land widely when the organic farming is employed. The reclamation gives negative impact to environment such as tropical forest decreases. To maintain productivity, compost is supplied to the field. Unskilled farmers might supply immature compost to their field and crop might be more contaminated by coliform bacillus from manure than chemical agriculture produce. Moreover, making compost and weed control involves much labour in the organic farming. For extending organic farming to care about environment and human health, it is essential to get high productivity and to save labour for making compost and controlling weed.

Paragraph 15: Organic farming using EM had the yield as 7 times much as conventional organic farming and as 1.8 times much as chemical agriculture in peanuts. Organic farming using EM also gave the yield as 2.8 times much as conventional organic and as 1.1 times much as chemical agriculture in carrots. EM technology can also increase the productivity of organic system. Much labour is necessary for making compost and weed control in the conventional organic farming. Conventional compost depends on micro organism, which are including beneficial and harmful. To control harmful micro organism, which can cause a wide array of destructive diseases, it is essential to increase the compost temperature more than 60 C, turn over the compost heap several times, and keep the heap more than three months for getting matured compost. EM technology can reduce the labour for making compost. To increase beneficial micro organisms, which can integrate the soil-plant microbiological equilibrium include lactic acid bacteria, photosynthetic bacteria, actinomycetes and mycorrhizal fungi, EM technology uses organic matter to make EM compost, which is fermented organic fertilizer used with EM. For making EM compost, it is necessary to control the compost less than 40 C and keep away from air as much as possible. EM compost does not need turn over while the conventional compost needs. Its takes 3-14 days for fermentation, while conventional compost need three months at last. However, fresh plant residue must be provided into field directly for the activity of beneficial micro organism when the soil becomes Zymogenic-synthetic type. Then making compost will be unnecessary. Weed is controlled with EM technology. EM stimulates plant growth. Weed is also plant so EM encourages the weed growth. When EM makes weed to germinate at one time, it is the time to cultivate for control. Another method is that the surface is covered with vinyl sheet for fermenting weed after EM compost is scattered on. EM stimulates weed seed germination and growth in the first season. However, weed population declined progressively in the second and third seasons, mainly from the earlier EM enhanced reduction in the soil weed seed bank.

Paragraph 16: Chemical agriculture was important role for yield improving. However, those chemicals have caused some issues of environment and human health. Caring about environment and human health, it is necessary to shift from chemical agriculture to another agricultural technology that keeps same level of yield and labour at least. EM technology should be one of the agricultural technologies to solve the obstacle of extension in organic farming.

Paragraph 17: Organic agriculture for food security: Modern agriculture methods have brought spectacular increase in productivity –more cereals, more food products per person employed. Given access to sufficient inputs knowledge and skill, large amount of food can be produced. But most farmers in developing countries like Bangladesh are poor and marginalized from inputs and products markets. Thus an important question to which farmers can improve domestic food production with cheap, low-cost, locally available technologies and inputs. A supplementary issue related to the extent to which they can do it with methods that do not add to existing environmental harm caused by agriculture. In contrast to modern system, organic agriculture represents a deliberate attempt to make the best use of local natural resources. The aim of Organic agriculture also known as ecological or biological agriculture, is to create integrated, human, environmentally and economically viable agriculture systems in which maximum reliance is placed on locally or farm-derived renewable resources and the management of ecological and biological process. The use of external inputs, whether inorganic or organic, is reduced as far as possible. Recent years have seen a dramatic increase in adoption of organic agriculture in many developed countries. The important thing for most organic farmers is that it represents a system of agriculture rather than simply a set of technologies. The primary aim is to find ways to grow food in harmony with nature. The term organic is best through of as referring not to the type of inputs, used but to the concept of the farm as an organisms, in which the component parts- the soil minerals, organic matter, micro-organism, insect, plants, animal & humus-interact to create a coherent and stable whole.

Paragraph 18: Scope for Organic Agriculture in Bangladesh: Bangladesh has a large rural population still practicing traditional farming due to the lack of access to facilities and knows how. Farmers have been producing food crops simply by using unbalanced chemical fertilizer with little bit organic manure with unknown scale. There is potential to increase productivity of these traditional cultivation systems by adopting organic farming which include development of farming systems suitable to the local soil and agro-climate conditions, crop rotation and intercropping, efficient production of vermi compost and Farm yard manure from farm wastes and plant materials, pest management with improved farming systems and the use of botanical and other formulations. Such practices could change farming from subsistence to sustainable, providing safe & quality nutrition and ensure food security.

Paragraph 19: Recommendations: What needs to be done? The strategic plan sets out steps to help overcome the current challenges to introducing organic farming in the conventional food and agricultural sector. The recommendation in this plan are designed to lead to realization of the long-term vision that organic Agriculture will significantly replace the conventional food and agriculture sector depending on the success of the introductory phases of the organic programme. The strategic plan will be utilized and development with production – Access- Market (DAM) basis. Production- Access- Market, the triple gem should be used as a guide to deliver services development technologies to the wider public who have interest in organic Agriculture. Production in all potential areas will be supported provided funds are available, while access of road may not be always be possible access to knowledge, technology and services will be provided to the best of ability. Market will be the key to development based on organic farming for immediate action and efforts will be made to seek markets, support marketing and link production to market as high priority areas.

Paragraph 20: The areas to achieve the promotion of Organic Agriculture:-

A National organic programme Co-ordination Unit (NOPCU) may be created by the Ministry of Agriculture with sufficient resources and representation from the relevant organization under the ministry to take on the planning, development and advocacy function required to advance the organic sector nationally. In addition, a Technical Working Group (TWG), consisting of representative from public private NGOs and also progressive farmers, which will be responsible for guiding the development of the organic industry, and coordination the stake holders involved in policy matters, programme development, assessment, regulation and trading. The Organic Agriculture community body may be farm included farmers, professional, small & medium size enterprises working with organic production & processing, retailers, researchers, specialists & organizations that have interests in Organic Agriculture.

A Government body proposes Bangladesh Agriculture & Food Regulatory Authority (BAFRA) with the consultation of TWG to approve definition and standard grant accreditation to national certifiers may be established. Besides, resources should be allocated to secure enforcement to protect the integrity of organic standards. In this connection, a national symbol system for organic farming owned and defined by the TWG should be implemented and promoted among the consumers.

Paragraph 21: Support for organic seeds and seedlings and planting materials; soil fertility management, disease management. Programme should be developed to subsidize the transitional costs and rewarded the environmental services provided by farmers who stop the use of agro chemicals; 2) Credit and crop insurance schemes should be designed to ensure that farmers have a continued income if their net income from farming falls during the conversion period until their production can be sold as certified organic; 3) Certification and accreditation schemes should be designed with appropriate assistance measure to ensure that farmers can participate; 4) Establish advisory services to support the adoption process and assist farmers and organic processors with quality assurance.

Paragraph 22: Development of organic standards internal control systems and group certification for exports: 1) Bangladesh organic standards should set out minimum requirements for production, processing, transport, storage and list inputs that are permitted in the production, post-harvest, processing and handling of organic labelled products with certification procedures for export; 2) An international control system that permits group certification especially for export should be developed. The system will reduce certification cost and thereby promote involvement of small farmers in certified production.

Paragraph 23: Farming of agriculture is an intense man-made culture to fulfil the day-to-day demand of directly or indirectly needed commodities. To achieve this goal, different technologies are evolved in different ages, areas or locations by using the best knowledge of human being and exploiting the nature. For their interest, sometimes quick and short cut methods are followed to get easy and quick return seldom bothering the long term implications or their sustainability. Many adverse effects resulted badly on the nature, climate and the health of lives and soil. Some losses and damages are not repairable. Effect of some cultural practices, chemicals and radiations etc will persist for the centuries to come. Therefore, it is the right time to think about our health, habitat and for the future generations. Considering this we need to introduce eco-friendly culture, technologies and sustainable farming system without further delay. So we should synchronize the nature's harmony for the mankind as well as for the benefit of all living beings, and for the continuity in favour of mankind. We are fortunate enough that we are the supreme creation and we can think for the good and can identify the bad ones although it becomes difficult sometimes. Therefore, organic farming is something by which we can utilize the nature in favour of mankind as well as the living world. Exploitation is a human behaviour, but it can easily be done humanly through organic culture or farming.

(Repeated answers are not included here. The important exceptional discussions are translated)

G7:

Rice Research Institute

(His view has been taken from website)

Paragraph 1: Some seven years back, when I was shopping at a vegetable market in Habiganj when an unexpected sight came to my view. In a shop, I noticed a basket of tomatoes which were labelled with stickers imprinted with a local grower's name and address from Nabiganj, an Upazilla town not far from Habiganj. We are used to see this kind of sticker for imported fruits. Therefore, some interest aroused within me. Some time later, my colleague and I really produced ourselves at his farm office. Yes, it was a well-decorated office. Just a while after, a middle-aged man, the farmer showed him up across the tomato field. We were a bit surprised to see his visionary eyes. He described all about his farm of 60 bighas. A few bighas of land belongs to him; he hired the rest from his relatives. Like many other Sylhetis he had some experience of London. However, he came back and wanted to do something of his own. We saw his staffs working in the field having dressed with some sort of field uniform. He used to follow the expensive method of cultivation. He was well acquainted with the latest tomato variety released by Bangladesh Agricultural Research Institute (BARI). I found him talking just like an expert. Moreover, he had hired an agricultural expert from the Monipuri community, who were traditionally well versed in growing horticultural crops. He was familiar with the grafting technology between a wild eggplant stock with a tomato (variety of choice) top to avoid some serious soil borne tomato diseases. The technology was a discovery of BARI and yet to be popularised that time. At that stage, the farmer was using that technology with the help of that Monipuri expert. When we were visiting the farm, it was in its third year of life. The initial investment was huge. Therefore, his farm simply suffered losses during the first two years. However, he was expecting a significant return from the third year. Thus, we came to the end of our discussion. He said good buy to us with a big basket of shiny and fresh tomato just picked up from the field.

Paragraph 2: During our discussion I found him quite concerned about the insecticides he was using. In fact, he was worried about the increased rate of insecticide required to control insect infestation in his farm. He complained us about the effectiveness of the insecticides too. The same is the case with other farmers too. This is not only true for vegetable farmers but also for others. Insecticides and other agrochemicals are one of the main culprits polluting soil and water. We (human being) are the ultimate target via soil and water. When insecticides are applied to vegetables, we become direct target as many of the vegetables are eaten raw. If even those are cooked, I do not consider them safe. All the insecticides have their residual effect around seven days after application. It means the ingredients of the insecticides remain in active form as poison for seven days. What is fatal to an insect must also be so to human beings. However, the fatality depends on the nature and dose of the chemicals. In most of the cases, farmers do not wait for seven days before harvesting. Even after application in the morning, they get their vegetables to the market in the afternoon. So, there is every possibility of accumulating more and more residual insecticide in our body with our everyday vegetable intake. This is alarming news for us.

Paragraph 3: The rate and amount of insecticide used is increasing day by day. We might not know that imprudent use of insecticide helps build up a group of resistant biotype from the same insect species. Then farmers are allured to use more and more insecticides to control the desperate insects. Excessive application of insecticide destroys the natural predator (beneficial insect feed on the harmful insect for their survival) of the target insects. That is another opportunity of the resistant insects for their population boom. Then the pest resurgence is obvious. Had we some yield that must be impregnated with more residual insecticide! Does it mean that our everyday vegetables are contaminated with insecticides? BSTI (Bangladesh Standard and Testing Institute) can identify contaminated food through some simple tests. But the appropriate technology (simple technique) for the identification of insecticide in vegetable is yet to be developed. So I am sure, BSTI authority has little to do with the maintenance of the quality of vegetables available in the market.

Paragraph 4: Is there any way to get rid of this problem? Some suggestions are as follows. There are some instructions imprinted of the packet or bottle as prescribed by the researchers. We must motivate the farmers to follow the instructions exactly. We must seek the farmers to be more humanitarian when they are dealing with insecticide. An

alternative approach is to identify insecticides having a little or no residual existence. In reality that is quite difficult to an insecticide like that. Some bio-insecticide may be used for the purpose but it also has some residual effect. However, more research is necessary in this field. Integrated pest management is another approach to suppress insects most reasonably. The better approach is to develop crop varieties having insect resistant traits. The best approach is to make farmers aware of the harmful side effect of insecticide.

Paragraph 5: Kidney diseases, cancer etc. have assumed almost epidemic proportions in the country nowadays. Is there any relationship between this outbreak and the vegetable intake impregnated with higher percentage insecticides? The doctors and statistician might join hand to find out the relationship.

Paragraph 6: In conclusion, I must say that farmers are habituated to applying more insecticide to get more yields. It does not mean that all farmers are using increased amount of insecticides. There are many pocket areas in the country where farmers are growing vegetables using minimum amount of insecticides or they are following other alternative methods like IPM (Integrated Pest Management), Pheromone trap (sex attractant for the opposite sex) etc. to control the insects. They are well-motivated and intelligent farmers, no doubt. May I ask them to motivate others for the sake of the whole nation?

D₁:

Time: 50 minutes

Paragraph 1: Ques: with which motive, did you start ecological agriculture programme in your farm?

The concept of organic farming is critical in Bangladesh because when we raise the issue of organic farming, the word ‘certification’ always comes to the next. For certification, we need more time, money and preparation. According to Mr. Hasibur Rahman, “we try to follow the rules of organic. But we don’t know that the inputs we use as fodder for dairy cows like maize, soybean; and there are also other ingredients of food which we need to buy from market – these are organic or not, how these are produced. In that sense, we are not organic. But we don’t use antibiotic, agrochemicals, urea treated straw. But production is not less. In near future, when we will collect all fodder from our integrated farming, then we can think farm is organic. But until now **the concept of green or eco-friendly farming is more appropriate.**” My emphasis is on: healthy food, not medicine. My slogan is: “Prevent disease, not medical treatment.” My neighbour farmers are not following me. They think: I am doing research. It is my hobby. They are doing conventional easy practices.

Paragraph 2: The Dhamrai dairy started its’ activity from 1992. Actually Mr. Rahman get concept of organic farming from Professor Dr. Chihiga, from Rioki University in Japan. His concept was: using inorganic agrochemicals cannot sustain for longer. Farmers must move to the organic way. He used a product named “Effect micro-organism”. After studied the literature for many years and working with Dr. Chihiga, Mr. Rahman motivated and thought how to apply it in Bangladesh by modifying this method and also to utilize the farm waste. The farm process cow dung and make safe compost and these are applied to next crop e.g. to produce grass, maize, rice. These are also produced to get fodder for the dairy. The farm is managing cow dung and by products from crop farming as well as from livestock instead of using chemical fertilizer and pesticides. Sometimes vermi compost is also used. For that it can be said green products or chemical free products. Mr. Rahman is rearing one hundred thousand broilers; he found that it is possible to rare poultry without any agro chemical or antibiotic. These products are sold in Agora (a mega shop or super market) as green products. Besides dairy, fish, rice, grass, different summer and winter vegetables are also produce from compost.

Paragraph 3: Pest management: In case of insect or pest control, the farm follows mainly IPM method like mechanical control (using net) and sometimes Neem oil is also used. Mr. Rahman thinks that in terms of using agro chemicals, the position of Bangladesh is better than many other countries those are use more and dangerous chemicals. Our farmers accept three fertilizers and some pesticides. There are some trails from pesticide companies for adopting powerful pesticides like Nogos, Diagonin which residual effect can be remained for many years – but they could not introduce for large scale using. Many agrochemicals, our farmers cannot afford. So, we are organic by default and advantage is: we don’t need to do very hard work to go to organic. Whatever, some of our farmers are doing in terms of eco friendly farming; this is one step of organic farming. Our ecosystem is until now so good that if we put bamboo stick or branches of trees, then birds and other predators come. These birds and predators eat the harmful insects. If we can create the environment, then they control the pests and insects.

Paragraph 4: Soil fertility: For using chemical fertilizer, soil health is spoiled on the one hand and at the other hand, where we leave the wastes of household and farm, there is emission of Mithen gas, which we cannot control. So for the problem of management, ecological imbalance is happening from two sides and we are wasting our valuable resources. Zero tillage is very effective.

Paragraph 5: Our main challenge is: we need to control our population growth rate. Our land is limited. We must produce much food from small amount of land. Most of the people think that if we follow organic way, there is a possibility of food shortage as our previous generation sometimes faced famine. But it is not entirely true. We should know that three types of farming are practicing in Bangladesh: Traditional, conventional and eco-friendly /organic. In traditional farming, farmers didn’t use chemicals but there was no management. Farmers couldn’t give back organic matter to the soil due to lack of knowledge. But population was very less. So, farmers could produce enough food with some exception. In conventional farming, farmers are using more and more agrochemicals which are very dangerous.

We cannot sustain in future, if we follow this practice. But ecosystem and management are included in the organic or eco friendly farming. In the air, 78% element is Nitrogen. So, Nitrogen is available everywhere. But we need to know how to fix it in the soil. We should know how Rhizobium, algae etc. add organic matter in the soil. These were absent in traditional farming. Traditional farmers only used cow dung but not efficiently or scientifically. We have to reach the technology to the farmers how they could produce compost scientifically. We have to collect nitrogen fixing bacteria, algae, photo synthetic bacteria, lactic acid bacteria, sterilizing bacteria from the nature. Organic farming is not traditional. Production is less in traditional farming. We have to add resource management and scientific technical knowledge with traditional farming.

Paragraph 6: Marketing: We are getting the same price like conventional products. As we don't have certifying authority, we cannot say as organic product and we don't get more price. Our situation is far from international market. We must follow **standard** – either national or international. Before thinking of export, we need to establish a strong local market where farmers can sell their product where there will be very less middleman. We should give the first priority on: to provide healthy life for our next generation. In Bangladesh, our all fruits and vegetables are coming to the market ripening with Carbide that may contain arsenic and phosphorus which is illegal in many countries. Fish is preserved by formalin – for this effect, our next generation might be born as disabled.

Paragraph 7: Role of government should be facilitator and should provide the environment to work on organic farming. The authority should not control the private sector. There should be a section for organic farming in Ministry of agriculture.

(Many answers are already repeated; therefore the same discussions are not translated into English)

P4:

Time of discussion: 50 minutes

Paragraph 1: The informant is 32 years old and he joined in Proshika 8 years ago as technical field worker in Ecological Agriculture Programme. The aim of Proshika was to develop farmers in the field level to reduce chemical fertilizer. To implement this, at that time, he leased 1 hectare of land from a farmer for 3 years and used it as experiment plot. The plan was to make 120 farmers in the field level through this worker. It was not possible in one day. In this Kuragacha, we have 120 farmers under my supervision. I am here for 1 and half years. Own farm has before. Keep lease 2-4 bigha. The aim of Proshika was to make 120 farmers in the field level through this farmer. The aim of Proshika was to develop farmers in the field level, to reduce chemical fertilizer. It was not possible in one day.

Paragraph 2: At first, I joined to Proshika in Belabo, Narshingdi station. I started trial. Firstly, they trial in 10 farmers in 3 plots. 3kg, 6kg, 9kg quick compost was applied in each plot, also use fermented juice. They visit every plot every two days intervals and noted down. At the end of the season, the result was that 4 kg yield in 3 kg compost plot, 8 kg in 6 kg compost, 2 kg where 9 kg compost, then we determined in which plot yield is highest. I advised 120 farmers that if they use such amount organic they get such amount of yield. Organic farmers get more yield than others. In this way, Proshika developed their organic project. The other farmers also started to come to our umbrella after watching this demonstration. But the Proshika listed farmers get more production. Since 1 and half years, I joined in this station, Kuragacha, Madhupur. The station was organized but with little less farmers. I made here a group of 120 farmers. Primarily Proshika gave me 15 days training in head office, Manikgonj.

Paragraph 3: Farmers use urine of cow and neem leaf, jaba leaf, FPJ, bishkatali, mehagani fruit as pesticide. I went to farmer's home of this area and teach them practically. After this, I told farmers please cultivate 1 pakhi (birds) land in my way for one season and others in your own way. After the ending of season, they found, they have received more production in my way and quality is also better. After ending the season, they found, the fruiting season is longer in organic way. Then they started to attract on Proshika. We arranged training on organic. Some farmers cannot follow our method. Proshika duty is 8am to 5 pm. But I also go to the farmers after evening. Organic farming is 99%. However, we are successful in this area. BADC, BRRI, Japanese team came to visit our organic vegetables is 100% or not. They wanted to import our vegetables. The chief of BFA came and he said, farmers don't get maximum production in organically. Proshika officials also came with him. But farmers didn't believe it. Because, they are only telling and I am teaching learning by doing, how they prepare everything. The Japanese told we are 100% organic now. I am trying to organize in this way. If I transfer from this station, the farmers will not forget. He farmers are responding very well.

Paragraph 4: How do you provide training to manage fertilizer? Our main goal is to remove chemical fertilizer from agriculture. If farmers want to produce vegetables, at first, they prepare quick compost. One time in a year, green manuring is must. We sell quick compost taka 6 per kilo. If only quick compost doesn't work, we use old cow dung, compost, FPJ.

Paragraph 5: How do you suggest farmers to manage pest? Cow's urine (for 25 days) + water, juice of bishkatali, jaba. We don't need anything.

Paragraph 6: Which standard do you follow? Our own guide - own standard. We have book. We don't have international certification. I work in the field. I feel; we should have standard. We encourage the foreign consumers.

Paragraph 7: How products of contract growers are sold in Kuragacha? Proshika has listed farmers. We buy from them. We cannot buy from all of them due to space in wagon. We bring it to Dhaka. Though production cost is less, but due to transportation costs, price is higher. As every person do not understand the importance of organic products. So

farmers cannot get higher price in the market. So, we need local consumers. If you want to export, you must follow packaging. If the vegetables are not 100% organic, it cannot be export. Proshika has future plan to maintain international classification.

Paragraph 8: Farmer in this area decided to avoid completely chemical fertilizer from the field level. They applied compost and poultry litter in the field. They meet demand for chemical fertilizer by compost, dhaincha, maskalai (black gram) etc. it make juice with cow dung then success result 100%. The trained farmer practically visit the individual farmers home for the purpose of trained themselves to use the compost. Many farmers cannot apply these techniques in the field level. So there are some trained farmers who take the responsibility to teach them practically. 95% people are practicing organic farming in this area. Farmers are responding to the Proshika. To develop organic farm, government policy should be changed. Field level officers should monitor regularly to develop this practice.

(So many answers were repeated. Therefore, these are not translated into English.)

FPJ:

Time: 50 minutes, place: Nearby his field

(While discussion, 5 farmers were sitting together, some they were also talking)

Paragraph 1: He is practicing organic farming from 6 years. He and his 3 sons are working in his farm. He cultivates vegetable with organic inputs, but produce rice with little bit chemical fertilizer. Main vegetables of those fields are: papaya, brinjal, different gourds, pumpkin, amaranth, cabbage, data, lalshak (red amaranth) etc. Most profitable vegetables are – papaya and eggplant. We use quick compost for vegetable production. He said “my rice farm is on lease land and I need to get maximum production. But I am applying very little amount fertilizer and I will stop it within two years and I am trying to manage my landlord and other neighbour land owners”. His vegetable field and rice field are not adjacent. Vegetable field is located near to house. His neighbours are also cultivating vegetables adjacent to his field. But nobody is using chemical fertilizer and pesticide.

Paragraph 2: He said 20 neighbour farmers have made group not to use chemicals in the vegetable farm from 5 years and he is the leader of that group. While interviewing this respondent, 4 other members of that group were present there. He receives training from Proshika many times – how to produce compost and other fertilizers, bio- pesticides and then he disseminates his knowledge to group members. He expressed that without maintaining group, it is not possible to cultivate organic vegetables. Within this group, we exchange knowledge and discuss what vegetable is suitable for which season and for which soil, which vegetable can be profitable in this season, collecting good seed etc. Proshika buy vegetables from the listed farmers.

Paragraph 3: This farmer received all training and information from Proshika. He said that there is no training from government level in this area. Recently, an IPM club has formed from govt. level. But what they discuss, I heard, we know these since last five years, they just started. He and other group members share information and experience with other farmers (especially Proshika farmers). Group is necessary. Now we do not have problem. Previously, there were some problems: people didn't want to understand the difference and organic products.

Paragraph 4: While asking what the reason behind starting organic farming is. All the farmers raised their voice as: they started to think about organic farming from 10 years. They felt that “we are small farmers. As a profession, agriculture is not so more profitable for us. Because we are applying more and more fertilizers and other chemicals but we are getting less and less production over the time. Trees are died with chemical fertilizers and it reduces soil fertility also”. At that time, 3 farmers got training from Proshika of making compost. Then they started to apply compost with less amount of fertilizer. After some years they decided to stop to use all types of chemicals.

Paragraph 5: Mr. Islam said if all farmers become conscious then production will increase, no health hazard, especially next generations will live with good health. Proshika first give idea about organic farming. When we started organic farming, production decreases firstly, but then increases, more profit because of low cost. Now we don't need to buy fertilizer and pesticides. All farmers should be conscious. Soil fertility will increase. Organic fertilizer, quick compost etc. are applying to increase soil fertility. Dhaincha, cow dung, household waste, trees leaf are use as green fertilizers. Cow urine, Neem leaf, FPJ, mehogany leaf, Biskathali leaf, ata leaf etc are used control insects and pests. Weeds are controlled by hand, nirani etc. Irrigation is done by machine sometimes. But for vegetable production, very low irrigation is needed. If it is felt that irrigation is necessary, then the group members do it collectively. All farmers are practice mulching. The purpose of mulching is: to keep the soil soft, fewer weeds can be grown up, more earth worm can work inside the soil – those increase soil fertility. They don't practice mulching in the rainy season; it is done when sunlight is available.

Paragraph 6: If we produce one crop again and again, then crop burn. We produce green manure. We all have cow. We make compost all time in a hole. They follow crop rotation like: amaranth – pumpkin – bottle gourd – cabbage /cauliflower/ squash. They collect seed from Proshika, BADC, and maximum time they use home made seed in previous year from the best fruit of a tree. The seed quality is better in case of home made seed. When it was asked to them what type of farming they are practicing. They said they are practicing organic farming not ecological farming. They follow Proshika standard – they learnt from Proshika training. This standard is the most suitable for the soil of that area.

Paragraph 7: He expressed the main problem of organic farming is: “consumers don't understand about organic and non-organic products. But recently, people understand these, so demand is getting high. Because of developed communication system, wholesalers come from outside. Processing is done in the near markets; normally no major

processing is done. Processing is necessary for abroad market. If Proshika setup a processing plant in that locality, then it would be better. Proshika truck cannot bring from all growers. Natural disasters are the most **challenging** issues (draught, over flood, cyclone, sidr etc). Government should come forward towards organic farming through policy. We sell to Proshika and local market. Now, paikers collect our product as organic. Now marketing is not so much problem because of good infrastructure. We do not pack.

(So many answers were repeated. Therefore, these are not translated into English.)

F_{P2}:

Time: 45 minutes

Paragraph 1: Engage with Proshika: 8 years. Amount of organic land: 2 acres, inorganic: less than 1 acre. Source of organic farm: Proshika, provide training and information.

Paragraph 2: Motivation to organic farming: chemical fertilizer needs higher amount year by year, soil fertility decreases, crop plants die, yield reduces and the quality of product develops in case of organic fertilizer, low cost. After comparing with other field, I understood without bio fertilizer, soil becomes acidic. But we have understood, chemical fertilizer cannot sustain for long time. We use –cow dung, Vermicompost, juice etc as fertilizers. Besides these, we use chemical fertilizer for rice. If TSP 1 kg given with 6 kg compost, then it work well. I don't use only bio fertilizer for rice. But every year, the dose of chemical fertilizer is decreasing. Before, 10 years, whereas we needed 50 kilo, now we need 5 kilo. Previously we used to increase, but now we are decreasing the dose. But we can produce vegetables organic fully.

Paragraph 3: We get information from Proshika. Govt. officials always say in favour of chemical fertilizer but less pesticide. But Proshika always tell us no chemicals, practice green manure, mulching, compost. Organic fertilizer helps in mulching, so less irrigation needed. In this way, fertilizer and irrigation- both are managed.

Paragraph 4: Reason for organic farming: Environment is degrading severely due to using chemicals. Now a day, we don't get enough fertilizer and in most cases, these are not original, very low quality. Price is increasing day by day. We also need more and more times. Moreover, chemical fertilizers reduce soil fertility. For example, we produce brinjal. Previously, the price of brinjal is taka 12 per kilo, now it is taka 16 per kilo. But we have to use four times more fertilizer but it doesn't work like before. We had to face loss. But now after using bio fertilizer, we are struggling. However, we are becoming accustomed slowly. If we want sustainable use of land, we have to come back in this system. To save agriculture, to save farmer, we have to use bio fertilizer. In our area, from 10 year old children to 80 year old people will say, if you want to engage in agriculture, stop the use of chemicals and use biological inputs. Some farmers use still, but they are reducing the amount of chemicals. **When chemicals came into our agriculture, that time, people didn't want to take, even these inputs were free. After that, farmers started to use, now to come back, farmers need to adjust slowly.** But people have changed their belief. Eighty percent people are now against chemicals. **Once I produced half of my banana land with chemical fertilizer and half land was with bio fertilizer. I received double amount of production with biological inputs (compost) and mulching.**

Paragraph 5: *20 years before, farmers stopped to rear livestock, now they again started. There are some farmers who didn't know the use of cow dung in agriculture. Now they started to buy and rear cow.* We don't have power tiller. Production has increased. **Some people say, "Production will decrease" – it is a wrong concept.** But it is laborious to convert conventional land to organic. After conversion, if farmers maintain land fertility, in our way, they will get production like with chemical fertilizer. Attack of insecticides in case of organic is less. **There is positive relationship between chemical fertilizer and pest.** In organic way, plant becomes harder and very less pests attack. Weeds are control by hand and bio pesticide (nim leaf + urine of cow, biskatali). When we applied pesticide, it was very bad smell – which is very much harmful for health specially for children. Weed is controlled by hand. Irrigation needed 5 days intervals in the time of draught, if mulching, need 15 days intervals. Mulching is very much beneficial for the soil: 1) it makes the soil soft, 2) it reduces the necessity of irrigation, 3) compost or bio fertilizer utilized fully, no leakage or leaching.

Paragraph 6: We follow crop rotation: Bean-gourd-ladies finger-data-potato-radish-cabbage. If same pattern is following over the years, then yield reduces.

Paragraph 7: Importance of group: discuss with other farmers in case of unclear matters and get the solution. we share the knowledge. The trained farmers can disseminate their knowledge.

Paragraph 8: Farmers give chemical fertilizer initially. Taste is more in organic products. **The sources of seed are** BADC, Proshika and own made. Sometimes, technical workers supply to the farmers at free of cost. Products are selling in Proshika and local markets. Price is more in case of organic.

Paragraph 9: It is needed to change agriculture policy. Government is emphasis on chemical fertilizer. It should reduce. Government should introduce monitoring system in the time of production and marketing. I have never seen any govt official, or supervisor. Govt always say, we have less manpower, but those who are govt. field workers, they never

come to us. But company people are going everywhere to sell their chemical products. And Proshika workers come to stop to use chemicals.

Paragraph 10: We don't take credit from Proshika, but they are giving us advice. Proshika has sympathy for their farmers, they work for farmers. Government officer do not go to the field level, it is necessary to increase the use of organic for sustainable production. Government activities in case of marketing control in valueless. Field level officers should active and goes to the field. He is working with Proshika up to 8 years and land for organic is 2 acres. Now, people realise the importance of organic fertilizer, 80% people now use it, cow dung is selling as a fertilizer. In case of rice, chemical fertilizer also applied besides organic. If farmers are concern about chemical fertilizer, they are not interested to use it. It destroys 'earth worm' which is very important for soil fertility. I produce dhaincha. I use it for fuel purpose and the leaves as green fertilizer. We need to introduce this technology in whole Bangladesh.

Paragraph 11: Major vegetable: gourds, bean, potol, pumpkin, potato etc. All should concern like as them.

Experience: When at first, Faruk bhai advised us to practice organic farming, we told, "it will not work. Nothing is possible to produce without fertilizer." Faruk bhai told, let us try. Please practice on 5 decimals of land this year. According to the advice of Proshika, I produced pumpkin. When I make the hole in absence of Faruk bhai, I followed what we were doing since long time very densely. Then he came and told, don't plant so closely. You have to maintain more distance. I was so worried for number of plants. I applied compost in each hole and then planted. After 3 months, I found, the yield is better than with chemical fertilizer. It was very much laborious. I applied 2 kilo urea without his concern and in secret. After 3 days, we found, the plants are growing too fast. Faruk bhai told, the growth should not be like that. What did you do? Then I had to tell that in secret, I have applied 2 kilo of urea. I thought, bio fertilizer may not work. Therefore I have done this. He told, "what have you done? The applied amount of fertilizer was in balanced dose. If the plants grow, then there will be no fruiting." then we applied little bit compost. These vegetables were very tasty. We can cook these vegetables very quickly.

Paragraph 12: There is no problem to cultivate organic. Only laborious. We get little more prices for organic products. Small no. of pests attack. *The land is our source of food, if we destroy this land, how will we survive.*

Paragraph 13: I have two cows. These give milk. Sometimes, we need tiller to prepare land for one crop. We all are small farmers. We don't have power tiller. We need to bring it from far place. Then the owner of the tiller asks for more oil. It becomes costly for us. Also sometimes very difficult to get PT because, everybody needs to till the land same time. If we have cow, then we can prepare land any time, may be after wake up in the morning and before taking breakfast.

Paragraph 14: If farmers and consumers could understand, how they are affecting soil and human health, they would not use it. We use chemicals due to our illiteracy. **Earth worm is very useful for good soil health. For using pesticide, the worms die and soils become harder. If earth worms exist, soil becomes soft. If earth worms destroyed, in how many ways are we following to destroy the soil? Land is our future. We have to conserve for our next generations.** We produce lau, potol, lalshak, pointed gourd, sweet gourd, potato.

Paragraph 15: We are not rich but we are happy. Proshika help us for any purpose of our cultivation. If we produce in organic way, it is beneficial for all.

(So many answers were repeated. Therefore, these are not translated into English.)

Fu1:

Time: 45 minutes

Paragraph 1: A historical flood occurred in 1998, when my house, agricultural crops – everything washed away. An UBINIG worker named Kaikobad came to visit our village. I discussed with him without knowing anything. He proposed me, "please come to our office, I will give you some seed and some rice plant for sowing. I thought which variety of rice he will give because the varieties that our previous generations produced are no more available. I asked, "Brother, if you give hybrid variety seed, how I will manage money to buy fertilizer". Then he told me, „I will give you the seed which variety your father and grandfathers were cultivating. You will not need fertilizer and pesticide". I was very happy to hear that and I went to UBINIG office. They gave me 30 kilogram of rice seed, some rice plants and seeds of some vegetables. Mr. Kaikobad also told me, I will tell you how to produce – I will show you. He also showed me to produce compost and teach me other technological issues. When the water went down far away, I started to plant vegetables around the homestead area. After producing, I kept some rice for seed and some vegetables seed. Some seed, I gave to other farmers. They also started to plant those indigenous varieties in some portion of their land, some of them in 5 decimal, some of them 10/15 decimal of their land. I and other farmers – all of us found that if we produce these varieties, we can produce without chemicals (*Shar-bish chara-Fertilize-, pesticide-seed*). We found, our cost of production is very less than previous. In one of my plot, I planted rice with compost (from cow dung, water hyacinth, leaves of all trees and household green wastes) and my neighbour farmer planted with chemical fertilizer. I found my plants are very weak and his plants are very strong and glassy. I thought what to do? UBINIG workers told me, "all that

glitters is not gold". At the time of harvesting, I found my production is little bit less but cost is near to zero. He had to apply pesticide but I didn't need. I planted Dhaincha tree, at the surroundings of the rice field. May be, therefore, pests didn't attack. Birds came, sat on the trees and ate the insects. We believe, "*Jibon nash – pran nash – kitnashoke shorbanash* (Life will be gone for Pesticide)" there are many organisms in each inches of soil. When we apply pesticides, those organisms die. If we kill all beneficial things, after death, people will not demolish due to lack of organism. After thinking these issues, we all farmers of this village thought, we will never use pesticide. Now our village, Babupur is a chemical pesticide free village. 2/3 farmers still use little amount of fertilizer. We all now rear cows and prepare compost and apply as fertilizer. Before 15/20 years, nobody of us had cow. When farmers apply pesticide, it also affects the grass, on that, the cow lives on. Now we get back fish in our water bodies and we have cow. UBINIG sometimes gave loan (without any interest) to some very poor farmers. If we produce some crops together like, Raddish, chilli, coriander, sweet coriander, then we don't need fertilizer. Sweet coriander is very good for pest control. If we produce rice after jute, jute leaves, roots etc. rot in the field and become fertilizer, which creates very good environment for rice production. If we follow crop rotation, the pests will never- ever attack. If we face pest in any time, we use ash or juice of neem leaf (7 days in water) to take away from the field. We don't kill them.

Paragraph 2: After following, our method, govt has started IPM. Now they tell farmers to produce bio fertilizer which we are practicing since 10 years. They (govt. officers) are now learning from us. (They laughed.....) They are saying to remove the pests; you can use mechanical (hand net) or biological control. We told them, we don't need. The beneficial insects eat the harmful insects and they control pest in our field. They try to learn from us: how much yield we are getting from using compost, how others are getting after using urea, what happened without chemicals, how the micro organisms and earth worms die, are they really die, how much profit or loss we receive after using chemicals, how much are the costs in different methods – now govt. officers started to calculate. Farmers need to calculate the profitability. For example, we produce rice in 1 acre of land and the yield is 50/60 maunds. Our costs of production is equivalent to the price of 45/50 maunds of rice, we will get very less profit. On the other hand, in the same amount of land, we are producing local variety and yield is 45/50 maund. Our cost of production is equivalent to 10/15 maunds of rice price. Which one is beneficial for farmer? – We have to calculate. I practice Nayakrishi method to my entire land. While practicing modern agriculture, the hens and ducks were also affected from disease. Now I am self sufficient. I have to work hard, but I am healthy, disease free, self sufficient and getting better environment. I have no problem. Mustard- rice is a good crop rotation. After producing pulse or leguminous crop, the yield of rice is more but cost is very less. My family is helping me too much. Seed processing, compost making. They know they are very badly affected fro poison.

Paragraph 3: Our group consisted with 30 members. The name is Shapla. To get the information about when to produce what, what I will produce, what is better for you, to whom the seed is available? We exchange our views and solve our problem. We believe, "10 heads can think better than 1 head".

Paragraph 4: What kinds of problem do you face? We need more cows but local variety. So, research is also need on local variety cow.

Paragraph 5: Where do you sell? We have Nayakrishi shop. The sells man sells and if something left, he sends to prabartana. Our product is not perishable too much.

FU2:

Time of discussion: 1 hour

Paragraph 1: Why did you start Nayakrishi andolan? I joined to this movement 10 years before after a devastating flood of 1998. Ten years before, there was an UBINIG worker. He told me if I cultivate in this method, less fertilizer and pesticides will be used, soil fertility will be maintained, environment will be safe, cost of production will be less and production will be more. Production would be less for some period, but our health and everything will be better. But I didn't believe that I could produce without chemical fertilizer and pesticide. He told, "No, it is possible." I told how is it possible? They arrange a meeting with some farmers. We sit together. Then they told, "You can prepare compost by yourself, it will work as fertilizer, slowly, you will see, no fertilizer and pesticide will be needed". They taught us how to prepare compost and told please cultivate 10 decimal of your land with this compost. You can produce either rice or vegetables or anything.

Paragraph 2: *I cultivated 10 decimal of my land ploughing with cow and I didn't use chemical fertilizer and pesticide. I found, the plants were not so healthy (so thin and small) as compared those I produced with chemical fertilizers. The fruits were also small. The buyers didn't want to buy. I told to my sellers that I produced those without chemical fertilizers and pesticides (Shar- bish chara). Please buy these and check how these are tasty. They thought, these are not good looking. These may not be so tasty. But after 2 days, the consumers came and asked about me to other sellers, did you see that seller who produce and sell Shar- bish chara products? Then my neighbour farmers told me that the buyers are looking for you. Because you sold the vegetables that produced without chemicals (Shar- bish chara). The buyers now believe that these are tasty and healthy.*

Paragraph 3: After following this, we, many farmers started to produce crops without chemicals (*Shar- bish chara*). From that situation, I have formed 8 groups. I received several trainings from UBINIG and now, I show the other farmers what I learnt from training. All farmers don't practice Nayakrishi. The large farmers don't want to prepare compost and apply to their land. They think, they have labour, their cost will be more and production will be less, they will face loss. Therefore, they want to practice chemical agriculture. So, all farmers don't follow Nayakrishi (*Shar- bish chara krishi*). But vast numbers of farmers in many areas want to practice Nayakrishi. We have discussed and now they agree that *Shar- bish chara chashabad hoi (Agriculture is possible without chemicals)*.

Paragraph 4: Now a day, farmers who face crisis of fertilizer, or can understand the harmful effect of poisonous chemicals, they can feel: how people are affected by disease, how is the situation of our country for using chemicals in agriculture, how water is contaminated by arsenic, how fish has been destroyed from our water body, how our soil has been destroyed. After following these situations, people are now so conscious that they are telling, those who practice Nayakrishi since 10 years are now in a better position. They tell, **"We are spending our own money on chemicals and are destroying our health. Why do we cultivate our land with chemical fertilizer and pesticide (Shar- bish dia)? May be we will get 70 maund after using chemicals, but without chemicals, we will get 10 maund less. The price of that 10 maund will go for chemicals"**. So, the conventional farmers have started to rear cows, so that they can prepare compost. Now they say, "if we follow the way, our health will be better, the soil will be healthier, environment will be safe.

Paragraph 5: Now, our every fruit tree has affected from pests. "We are applying so much pesticide, but those are not working. Due to use of these chemicals, farmers are now affected from cancer, ulcer, vomiting and many other diseases. If we go to doctors, we cannot get the serial. What we are taking in the Nayakrishi village, if people consume like this, they will be healthier." **The pests are now born after eating chemicals. Therefore, these are not afraid from pesticides and pesticides are not harmful for them.** In my area, Aman is producing in 200 acres of land. Within this area, no land is cultivated by using chemicals. We don't need irrigation, fertilizer, pesticide. It is grown naturally. If water level increases due to flood, the rice plants can be 4- 5 meters. Now large farmers, who are the owners of more land, are telling since 2 years that we will start Nayakrishi slowly. How? "They will apply lesser amount of fertilizers but no pesticide. It is way to proceed for without chemicals. Then, after 4/ 5 years, farmers can stop all chemicals. Due to use of chemicals, the micro organisms are destroyed. If we apply fertilizer, pest will come and we must apply pesticide, soil will become harder; the roots cannot enter to the soil. How crop will be produced?

Paragraph 6: Though I am less educated and farmer in profession, since 4 years, I am doing research on 28 varieties of rice Aman production. Is it possible to get other variety, whether the yield is increasing or decreasing, what is the colour, how is the final rice, how many foods could be produced from it, how long it takes to grow leaf, how grows the leaf in one day, 2 days, one week, how many days it needs to ripe, etc. I could able to found two new varieties. The name of one variety is Nutashail and another is Kalokut. My research is going on. I planted those seeds in different seed bed. How much will be the yield and what the problems to cultivate it are, I can tell after 4 months. Yesterday, one farmer came to know from me, "how I can produce potato without fertilizer. Fertilizer is very costly, I am not able to afford now. Please teach me the method". I asked him, "Do you have cow? He said, "I have two cows". I told him, so, it is possible to cultivate without fertilizer for you.

Paragraph 7: If we mix cow dung, water hyacinth, all leaves from trees, (without bamboo leaf, date leaf, nut leaf, coconut leaves), straw, oilcake together in a hole for 40- 45 days in proper way, then we can make compost. If we have compost, we don't need to think for chemical fertilizers. But we have to work hard in the field, now a day, farmers don't want to work hard, they want only to buy fertilizer and apply these.

Paragraph 8: Where did you get information? From UBINIG (Nayakrishi Andolon-New Agricultural Movement). You are doing this from environmental sense, isn't it? In our area, nobody use pesticides. Little number of farmer use only urea, who are taking advice from the department of agriculture. But we controlled them from using pesticides. We told, if you apply, it will come to our field. Please don't destroy our land. **There are so many pests those are beneficial, and very less numbers are harmful. In natural way, beneficial pests will kill the harmful insects. Some pests could stay there, those will not be so harmful, as we are seriously applying pests and destroying our environment.**

Paragraph 9: If pests attack in any case, we spray juice with seed of jute or neem leaf. But, if variety and quality of seed is good, there is no possibility of pest attack. If we use and plant hybrid seed and tell, we will not apply chemical fertilizer and pesticide – we cannot do this. These seeds are born with fertilizer. When we plant hybrid, we have to apply fertilizer, the plant will be healthier with so many leaves and pests will attack and we have apply again chemical pesticides. If we plant indigenous or local variety seed and compost as fertilizer, pest will not attack.

Paragraph 10: *There is difference between urea and compost. From urea, plants only get nitrogen but there are many micro and macro nutrients exist in compost. There urea make plant only healthy and full of green leaves and compost make the plant as hard, less leaves grown, work for fruiting, and many useful steps.*

Paragraph 11: Cropping pattern: If we produce one crop every year, the yield will not be good. If I produce rice this year, next year, we have to produce jute or leguminous crops. But we produce some mixed crops together, we don't need to follow hard and fast rule of cropping pattern. For example, in one field, we can produce 5 or 7 crops together

for 5 years, it is not a problem. If we produce single crop, then the crop intakes the required nutrients from soil. Therefore, cropping pattern is must. It is also necessary to control pest.

Paragraph 12: We have group. We form group to save and discuss about problems. We need to be conscious together. Nayakrishi farmers should have cow- goat-land- duck-hens- seed everything. Farmers are always busy with their diversified activities. If I buy seed from market, I cannot be Nayakrishi farmer. We have 10 principles. We follow those principles.

Paragraph 13: Problems faced by Nayakrishi farmers: Availability of hybrid seed is problem. Because, if any farmer produce hybrid rice, he will apply fertilizer and pesticide. It will come to our land through water blowing. So, we cannot be free from chemicals.

Paragraph 14: Seed: Previously I had 4 rice and 5 vegetables seed (10 years before).I have 28 varieties of rice seed and 100 varieties of vegetables. Every farmer conserves seed according to their ability. I collect seed from my seed store and after harvesting, I again store it. When anybody wants to produce any crop, we give them free with a condition, that he will give it back at a double rate, after the season. It works very well after natural disaster. Last year, many farmers took Aman rice seed from me after flood. Seed conservation is our one of the main activity.

Paragraph 15: How do you keep it? We are farmers; we must conserve indigenous and local varieties to protect environment and ensure food security. Local varieties can cope with climatic changes and natural disasters. Farmers know the characteristics of the variety which they know from long time. If we use and plant hybrid seed and tell, we will not apply chemical fertilizer and pesticide – it is not possible. These seeds are born with fertilizer. When we plant seeds, we have to apply fertilizer, the plant will be healthier with so many leaves and pests will attack and we have to apply chemical pesticide. We keep inside the pot made of soil, glass, bottle etc.

Paragraph 16: Where do you sell? We sell to UBINIG shop. We have sells centre in local areas, sometimes, we sell to wholesalers.

Paragraph 17: How do you manage money for agriculture? We face fewer problems than conventional farmers. If we take credit, problem increases. If I prepare land with tractor, I need money. If I prepare with domestic cow, I don't need money. In this way, if you use chemicals, you need more cash money again and again.

Paragraph 18: Example: *There is a man who sprayed pesticide in all of our fields. He used to receive taka 200 for each acre of crop spraying. Now he is so sick that everyday he needs taka 500 to buy medicine (problem in breath). Now he understood the health problems of chemicals. There are so many examples, we know.*

F_{U3}:

Time: Approximately: 45 minutes

Paragraph 1: She started this movement after the dangerous flood of 1988. All the tube wells went down under the water and tube well water was polluted. The female members of UBINIG used to come to visit the villagers. They asked us, "What is your main problem? How do you cultivate your land?" We told, "We cultivate how others are doing. We follow the same way. We use fertilizer and pesticide. We don't have seed at our hand. We have to buy seed from market." UBINIG provided some tube wells in our village. Nayakrishi workers organize meeting about agriculture and health issue that time at every week or every 15 days and showed how to make compost. They asked us, "Why you don't have seed? Why you don't store the local variety of seed?" They discussed with us what the benefits are and loses of HYV rice production. Many of us sold cow, big trees to buy fertilizer. Some of us took credit from bank and we became poorest. The quality of soil was so bad that soil became red. Without fertilizer, nothing was possible to produce. The UBINIG workers showed us to produce compost. We didn't have cows that time because, we already sold cows to apply fertilizer. We started to buy cows. UBINIG also helped us.

Paragraph 2: I have ducks, hens and cows, not goat. I don't apply any chemical. In every house we have at least, one compost hole and cover it. Now it is rainy season, we don't use compost now because; rain water will wash away everything. After, this season, we will apply. Now land is so fertile, after using compost from many years, so that we don't need to apply too much. We apply it to keep the soil healthy.

Paragraph 3: We cultivate the crops with changing. For example, rice – jute – vegetables. We practice mix crop cultivation. I have planted different gourds, brinjal, beans and many other vegetables in our homestead area. We don't buy vegetables. Our price is always higher. Why? It doesn't rot quickly. Some consumers come to buy vegetables at our home. They tell, "Your vegetables are tasty and never rot before 8 or 15 days." Those who were producing hybrid rice, they started to rear cow. They will start Nayakrishi farming within one or two years. Last year, the price of fertilizer was very high. Farmers are thinking, this year, the price could be more. So, again if they produce hybrid rice, they cannot buy fertilizer. Therefore, they become conscious and thinking to prepare compost. They are coming to us to learn our methodology.

Paragraph 4: We understand now, how useful the fertilizer is. Chemicals damaged our indigenous fish. Now, we get back it. Sometimes, local government agriculture office suggested to use low amount of fertilizer but to avoid pesticide. Without the help of female family members, Nayakrishi movement cannot be successful. They have strong role in seed preservation and preparing compost. We can keep our seed at our hand. Previously, we had to run to the market for getting good quality seeds. Once, there was a time, govt. officers came to farmers and told them, to go to the market in the evening to take tea. At night, the male members of our village came back with some hybrid seed, fertilizers and

pesticides. They distributed free of cost. Now, that fertilizer has become expensive as well, farmers face severe crisis. If we were not conscious, what would happen? We have found our way. Now we can prepare fertilizer at home and we also teach others, how to be self sufficient in terms of input.

Paragraph 5: My hope is: if all the farmers of our country would come forward and follow Nayakrishi, we will be happy. We have to save our health, our soils health, our future generation and keep environment the safe. We came to follow Nayakrishi because of increasing input price, and production was going down at an increasing rate. We had to work hard many years to have the good quality of soil. Once our land was fertile, we destroy by ourselves, now we have again got back the soil quality. How can I apply fertilizer for a second time? I will never apply.

Paragraph 6: Women are facing more problem than man for using chemicals in agriculture. Previously, while giving birth, women didn't need to go to hospital. Now it is too complicated. We are very much worried about our health. Now many people are disabled. If we apply chemicals, as soil affected, as mother affected. We should avoid chemical food and take Nayakrishi food. We went to buy mango tree in Chapainawabgonj.

Paragraph 7: The farmer said, *we apply huge chemicals on most of the trees, we don't eat mango from there; because, we know, how harmful these mangoes are. We have some plants in one corner that we don't apply chemicals. We said, why do you do this? They told, "If we don't apply pesticide, the fruits don't look glossy. Normally our buyers are rich and they live in city areas. If these are not good looking, they don't want to buy. They are not conscious about what are they buy and eat".* So, the rich and educated consumers need to be conscious. They should know what and how farmers are producing. They should help the farmers to protect them from using chemicals. If farmers are well, everybody will be well.

Paragraph 8: Govt has responsibility to do this. Govt should stop the pesticide business. I don't know what you will feel. But I have to tell something against government. Why govt import so much hybrid seed? They should be against hybrid and poison. She strongly said that for taking chemically produced things, women are severely affected specially in giving birth child. Women's maternal health was better before using chemicals in agriculture. Previously we took medicine from medicinal plant. Now we always go to doctor to take chemical medicine.

FG1:

Time: 45 minutes

Paragraph 1: Why did you start organic farming? At first, we started chemical free vegetables at the corner of the homestead place in 3 beds. We felt that we are attacked from severe critical diseases through eating chemical fertilizer and pesticide used vegetables. Farmers mainly produce organic farming to eat fresh, chemical free products. They cultivate tomato, cabbage, radish, ladies finger egg plant etc. One farmer reported that he cultivate data with both chemical and organic way separately. But chemical free data was fresher and soft he reported than other plot where he cultivates with chemicals. He also reported that organic products are tastier.

Paragraph 2: How do you manage soil fertility? We prepare bio or organic fertilizer by mixing poultry manure, household waste and water hyacinth.

Paragraph 3: How do you control pests? For pest control, if pest infestation is less, mechanical method is used and if pest attack is severe, in most cases, we spray neem oil or mixer of raw milk and water (10 litres of water + 10 gram of milk). Sometimes, we use, bio pesticide, trycogramma. But this year, we didn't use. In case of tomato virus, we spray raw (unprocessed) milk. We don't need to apply insecticide. Last year, tomato was destroyed. But this year, production is very nice.

Paragraph 4: Which crops do you cultivate in your organic land? We cultivate different types of vegetables in different beds and follow crop rotation. So, we can change our taste and soil also become resistant from pest and diseases. We cultivate tomato, different leafy vegetables, spinach, cabbage, radish, ladies finger, brinjal etc. Bitter gourd, bean etc. are also produced as boundary crops – otherwise poultry birds destroy the vegetables. One cropping pattern: Onion – jute – Transplanted Aman is a very nice combination in field. We produce three / four types of vegetables to change the taste. Tomato- data – spinach is another cropping pattern. Last year, in one piece of my land, I produced onion in organic way. The yield was neither better nor worse, but profit was more. After that I planted jute and then broadcasted Aman. The yield of both jute and rice was vast more. Last year, I also planted cauliflower with bio fertilizer. I have never seen this type of large size cauliflower. So, production is more in all cases.

Paragraph 5: Do you think that you are getting less production? The yield from chemical free production is more than chemical used system. I have grown data (amaranth) with both chemical and organic way separately. Chemical free data was more fresh, tasty and soft than other plot where I applied chemical fertilizer. If we don't use chemicals, then cost is also become less but production is not less. We believe that organic farming is good management of resources.

Paragraph 6 :Are you getting more prices for organic product? The price of organic products in the market is not more than others because peoples don't believe it is a organic product, since it is not looking very fresh than chemical uses products and they also don't know, what is organic.

Paragraph 7: Do you have future plan to cultivate your entire land in organic way? We already started to use organic fertilizer. Last year, I applied in half of my land. This year, I will cultivate my 100% land. I have thought that I will not even go to the shop of chemical fertilizer. You know that our soil should content 5% organic matter, but it has less than 1%. If we continue this, do you think that we can survive? But in case of pesticide, we have to learn more. Last years, my neighbour applied organic fertilizer, but due to shortage, I couldn't apply, I bought TSP, MP and Gypsum. Both of us planted maize and BR- 26. But my production was less than him. Organic fertilizer has the quality to give all kinds of food to the soil as well as plant. But for organic cultivation, we must raise, cow. Otherwise, we cannot apply good quality compost.

Paragraph 8: If we want to apply chemical fertilizer, then cost is Tk. 4 – 5000, soil become hard, earthworms die. But with compost cost is Tk. 2000 and yield is also more. The supply as well as price of fertilizer is increasing day by day. Previously, we could buy 25 kilo in one time, but now it is hardly possible to buy 5 – 7 kilo. Now we are no able to buy as we need. The qualities of fertilizers are also not good. But now we are not worried. We are receiving more production in organic way.

Paragraph 9: The main problem of organic farming is: farmers are very lazy. Those who are rich, who have money, they don't want to work. They need demonstration and training. But our opinion is: when they will not get fertilizer, their laziness will go away. Now we tell the other farmers, if you don't get fertilizer, come to us. We will teach you, how you can produce without fertilizer. The main problem to spread this type of farming is the lack of knowledge. Farmers are facing so much problem with fertilizer (like, higher price, illusory or low quality fertilizer etc.), but it is not known why they are not become conscious.

Paragraph 10: From where, do you receive knowledge of organic farming? At first, I received knowledge about this farming from Bangladesh Agricultural Research Institute. Besides this, agricultural extension officer teaches them to make super compost which is more useful and profitable, but its raw materials are not available. But the department of agricultural extension is busy with selling fertilizers and pesticides. But now they are little bit conscious. They advised us to put stick and branches of trees in our land after planting crops. They don't have time to come to visit the field.

Paragraph 11: We have a group named PCCS (producer-consumer's cooperative society). Here we sell our products and consumers come. We sell to them with less price than the existing market price (but, more than farm gate price). Our consumers also provide us the information, where we can get organic inputs and sometimes they also supply us their cow dung, household and poultry wastes.

Paragraph 12: Production with organic fertilizer is increasing. One farmer reported, firstly he cultivated Maize with organic and after that he cultivated rice. He said that he got more rice than previous years though he did not use chemical fertilizers. On the other hand, the price of chemical fertilizer is increasing day by day and also it becomes very scarce. Farmers are not getting enough fertilizer in the market he also said.

Paragraph 13: What kinds of difficulties do you face? We face many difficulties. For example, 1) It is very difficult to get good quality local variety seeds. It is our main problem. Our main crop is maize. We don't get the amount that we need. 2) Irrigation in Summer time; 3) Shortage of supply of organic fertilizers and pesticides; and 4) If all farmers produce organic, it would be better for us and them.

(Some information are repeated. Therefore, everything is not translated)

G₆:

Time: 1 and half hour

Paragraph 1: Ques: When and with which motive eco-friendly farming/ ecological farming programme was started in your organization? Do you think that organic farming is possible in Bangladesh?

Bangladesh Agriculture was predominant to organic practices upto 1950. The petroleum based green revolution offered to contribute significantly to increased agricultural productivity as to feed the ever growing population. Almost, all the farmers are relied on synthetic products due to their quick responses. But in some cases, farmers are cultivating organic

products unknowingly; for example: indigenous people & Tribal people of Hill Area are producing vegetables organically from long ago due to their ignorance about chemical fertilizer, pesticides and herbicides. Bangladeshi farm families rear domestic animals and birds at their home. They make farm yard manure from animal's excreta from historical age. However, at present, with rising awareness and consciousness on environmental, ethical and welfare issues, consumers now expect their food to be produced and processed with greater respect for the environmental safety and the consumers are increasingly looking for safety and quality in food products. Organic practices are the right option to fulfil the demand of the consumers. In Bangladesh, existence of organic farming can be discussed from two different sides:

1. **Homestead cultivation:** Traditionally this cultivation is organic and different vegetables are grown in the homestead under complex multiple cropping system. Usually farm families grow vegetables using local varieties and indigenous technologies mainly for family consumption and surplus to sale. Women play the dominant role in this system. Fruits in the homestead may include in this system.
2. **Commercial cultivation:** There is an ample scope and potentials organic production. Vegetables having high market potentiality can be grown on commercial scale in the field to meet the demand of domestic and export market

Paragraph 2: Ques: What are the crop varieties your contact farmers are growing in eco-friendly practices?

Ans: as we are engage with BARI and there is an independent research institute for rice, our target is all crops except rice, specially vegetables and horticultural crops.

Paragraph 3: What types of practices do you suggest for ecofriendly/ organic farmers to follow for soil fertility management?

Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. The primary aim of organic farmer's should be to provide crops nutrition by implementing practices that nurture the soil, stimulate soil life, and conserve nutrients. This involves developing both long-term and short-term strategies to improve soil health and to supply crop nutrition. Organic farming began with the soil and amendment must be done to improve its physical, chemical and biological properties of the soil so that it can provide plant nutrient as and when needed. The selection of properties for use in soil quality evaluation includes physical (texture, rooting depth, infiltration rate, bulk density, water holding capacity), chemical (pH, EC, SOM, total C and N, nutrient level) and biological (C and N microbial biomass, potentially mineralizable N, soil respiration, enzymatic activities). Therefore, strategy has to set for achieving conversion phases.

Paragraph 4: Organic conversion is not just about replacing a high-chemical input system with a no-input, or every low 'alternative' input, system. The organic soil-building process goes through three critical stages, which can be referred to as the 'adjustment phase', the 'comfort phase' and the 'maintenance phase'. The adjustment phase involves developing a system that reduces the crop's reliance on artificial chemicals. During this phase some farmers have observed that crop yields can decline as the system converts from a chemical to a biological one and is starved of its regular 'fix' of readily available, chemical fertilizers. The comfort phase coincides with an increase in biological activity and a corresponding release of previously 'locked-up' or unavailable nutrients. During this phase, optimal crop yields are reached. This is more likely to occur in intensive horticulture systems, where application of compost and green manuring are common practice. Maintenance phase refers to attain the soil nutrient status at the same level while supporting sustainable crop production. When a soil reaches its optimum nutrient status, further increases in nutrient status will be uneconomical and no further capital applications of fertiliser will be required.

Paragraph 5: Basically, organic conversion begins with a process that encourages increased activity by microbes and arthropods in the soil. The elemental composition, structure and organic matter content of the soil need to be favorable if biological activity is to be increased. Biological activity in the soil begins with the break-down of organic substances. During the decomposition process, the organic molecules in organic substances are either broken down into simpler organic molecules that require further decomposition or converted into mineralized nutrients. Organic substances can be improved of green manure crops, crop refuse and in addition of compost. Most organic materials (including compost) do not contain nutrients in balanced amounts as needed by plants. In particular, many nutrients from animal sources (e.g., manure, poultry refuse etc.) have an excess of phosphorus and potassium relative to plant demand for nitrogen. The use of other sources of plant nutrients may help to correct imbalances levels (eg, legume green manure crops contribute nitrogen without increasing phosphorus and potassium). Green manures are crops that are turned into the soil at vegetative stage. They can be grown for different purposes: adding nitrogen to the soil, suppressing weeds, scavenging nutrients left in the soil, or increasing the soil organic matter content. Organic matter serves beneficial functions, including minimizing soil temperature fluctuations, serving as a nutrient warehouse, buffering the soil to changing pH, and increasing the ability of the soil to hold nutrients. Additionally, soil structure can be improved along with the ability of the soil to hold water and air. Organic matter can also provide habitat for beneficial soil microorganisms. A soil with optimal organic matter content is better able to tolerate adverse conditions. Added of nitrogen is varies in type of leguminous crops. They are able to establish relationships with soil borne bacteria that are

capable of extracting nitrogen gas from the atmosphere that plant can use. Relationship between soil borne bacteria and legume roots, the tissues of leguminous plants have a lot of nitrogen relative to the amount of carbon, which helps to decomposing and quickly turned into the soil. Leguminous crops differ in the amount of nitrogen they can add to the soil. Other sources of nitrogen added to the soil from a green manure crop that are more discerning for biomass production are available (mugbean, sunhem). Composts can be an important part of managing nutrients. As long term effect soil quality may be improved by adding organic nutrient. Crop reflection will be good when compost used in combination with other nutrient management strategies including green manures, crop rotations etc.

Paragraph 6: An experiment result shows that when compost applied at the rate of 20t/ha, soil organic substances at first did not increase significantly but after 8 years it started to increase remarkably to reach a value three times as high as that of the initial level. Continuous application of rice straw and compost increased the total carbon and nitrogen content to a great extent. In the absence of chemical fertilizer, large amount of inorganic nitrogen and biomass nitrogen remained in the soil. The effect of long term application of organic matter found that after 10 years markedly improved the soil physical properties, such as bulk densities, plasticity and slightly improved the soil porosity, hydraulic conductivity, hardness and aggregate stability.

Paragraph 7: Ques: What methods do you suggest farmers for organic pest management?

To get rid from this measurable pest management system, some new avenues or some alternatives of synthetic pesticides are very much needed. Now-a-days organic vegetable cultivation is becoming popular throughout the world, which is eco-friendly and sustainable production system that are gaining credence for use in sustainable agriculture development. It involves the integration by farmer of the most appropriate management strategies for pest control where sole dependency on pesticides can be avoided. Organic pest management packages are mainly dependent on 'Biopesticides' which refers to products from natural sources such as animals, plants, and microorganisms, including "natural ingredient pesticide," "microorganism pesticides" and "biochemical pesticides." Biopesticides offer several advantages over traditional synthetic chemical pesticides. They are safer and less toxic to human and animals than chemical ones. These will not endanger birds or other non-target animal, which make them safer to the habitat and environment, rather than perform targeted activity against a desired pest.

Paragraph 8: The potentiality of biopesticides has increased substantially throughout the world in recent years, as extensive and systematic researches have enhanced their effectiveness. But, in Bangladesh, use of bio-pesticides for pest management is very much limited. Recently scientists of Bangladesh Agricultural Research Institute (BARI) have developed bio-rational based IPM packages against several destructive insect pests of different vegetables crops. However, initiatives of different private companies on different bio-rational products development and marketing have been started from 2005 in collaboration with BARI. During that year, only around 140 ha vegetable lands were cultivated using pheromone and bio-control agent. However, the coverage of bio-pesticide increased several folds thereafter and during 2009-10 the coverage extended to more than 16,000 ha with a sale value of more than 2 crore taka (increased 120 time within 5 years period). However, during that period only two types of biopesticides were marketed, pheromone and bio-control agents like parasitoids and predators. Between the two types of biopesticides marketed during 2005-10, three different types of pheromone are in a leading position (62% of the total volume) than the bio-control agents (38% of the total volume). However, during the initial period, only pheromone had good demand among the farmers, because farmers convinced very quickly by its practical and visual actions. Later on the popularity of different mass-produced parasitoids and predators are also being increased due to mass campaign by different GO and NGOs and due to establishment of Farmers Field School (FFS) and activities of IPM clubs, demonstration block set up by different research & extension projects. Some of the toxic pesticide free management packages used in different organic vegetable production system are: sanitation (weekly removal and destruction of pest-damaged shoots and fruits that harbor brinjal shoot and fruit borer (BSFB) larvae from the field), use of sex pheromone, artificial release of bio-control agents, mechanical control, spraying of soap water, community based IPM approach etc.

Paragraph 9: Organic farmers often depend on biological pest control, the use of beneficial organisms to reduce pest populations. To avoid pest and disease occurrence, the following agricultural practices should be taken into consideration under "Prevention is better than cure" ideology. When these practices are insufficient to prevent or control pests an organic farmer may apply a pesticide. With some exceptions, naturally occurring pesticides are allowed for use on organic farms, and synthetic substances are prohibited. Pesticides with different modes of action should be rotated to minimize development of pesticide resistance.

Paragraph 10: Do you think that crop rotation is important for organic farming?

Organic farming is the form of agriculture that relies on techniques such as crop rotation, green manure, compost and biological pest control to maintain soil productivity and control pests on a farm. At the one hand, crop rotation is a soil improvement technology; on the other hand, it reduces insect and pathogen infection.

Paragraph 11: Ques: How the domestic animals are rearing that are using for eco-friendly farming?

I think, in context of Bangladesh, cow is an important domestic animal in context of organic farming, because, cow dung is an important element of soil fertility management.

Paragraph 12: Ques: Are you working for spreading eco-friendly farming? Or, in your knowledge, what measures have been taken by govt., or what could be done in future?

There is no policy that directly supports organic farming, but in every policy, there are some issues for environment, sustainability in agriculture. For example, at this moment, National Agriculture Policy 2011 (draft) is under process of approval. The important points about organic practices in this policy are:

- Imbalanced use of chemical fertilizer is causing land degradation, excessive mining of plant nutrients resulting in the decline of soil fertility on the one hand and reducing in the potential yield on the other.
- The Government will encourage use of organic compost and bio-fertilizer at farmers level
- Awareness will be built to follow suitable cropping patterns to maintain natural balance of soil nutrients
- Necessary support will be given to farmers to encourage use of balanced and organic fertilizer
- The Government will promote modern eco-friendly technology and infrastructure for a safe and sustainable future
- Integrated Pest Management (IPM) and Integrated Crop Management (ICM) will be promoted for conservation of biodiversity and sustainable land and water management

The Government recognizes agricultural Extension as a service delivery system which will assist farmers through appropriate technical and farm management advice and information, new technology, improved farming methods and techniques aimed at increasing production efficiency and income. For this, there is an increasing need for strengthening agricultural extension services to ensure production system on a sustainable basis.

Paragraph 13: What measures have you taken for your contact growers that they can products on farm for marketing?

I think, govt still needs to do more on production. But for export, it is necessary to develop better marketing system. This initiative can be taken from private level. Observing the benefits of cultivating organic crops by the NGO farmers, a small number of non-NGO conventional farmers have started to cultivate organic crops. Among the few private companies that have started to invest in organic farming, Kazi and Kazi Ltd. is a leader. They have established an organic tea garden at Tetulia, in the Panchagarh district. This tea is certified by the SGS organic production standard in accordance with the EU Regulation 2092/91, and it is marketed as “Meena Tea”. This company also produces fresh organic vegetables and herbs for sale in their supermarket, “Meena Bazar,” in Dhaka city.

Paragraph 14: Bangladesh’s contribution to world vegetables trade is insignificant. Yet, it is one of the fastest growing export sectors in Bangladesh. About 50 different vegetable crops is presently being exported to as many as 31 markets of which 7 markets comprising UK and the Middle-East countries lifting about 95% of the total export of this sector. The market is confined to ethnic people and fetches low prices due to supply of low quality produces in poor packaging. Recently, the market has faced barrier of certification. Different exporters expressed the demand for the organic food in the global market. Since Bangladesh is a developing country and purchasing capacity of peoples is low, as a result people living in rural and urban areas mostly cannot afford organic foods. Farmers in general grow vegetable and other consumable foods without pesticide and fertilizer for their own household consumption and these are not sold in the markets. Production and marketing system of organic agricultural products mainly are done by contract farming for private organizations/companies / chain shops and does not ensure fair price for the producing farmers.

Paragraph 15: Constraints to organic farming: lack of technical knowledge, to evolve commercial productivity by organic cultivation method, Scarcity of fire wood in rural areas which limits the organic material like cow dung, rice husk, leaves, saw dust & crop residues, legislative principles for organic vegetable production and certification agency is absent, low productivity & higher price of organic vegetables, farmers face difficulties in marketing.

Paragraph 16: Steps of BARI

There is no standard, inspection and certification system exists in the country. Organic growers, promoters and sellers are working scattered. Due to lack of standards, organic products cannot compete or enter into the world market and failed to get confidence of internal consumers also. But presently organic agriculture is the reality worldwide. Being a national research organization Bangladesh agriculture research institute (BARI) has initiated research and development activities since 2006 following the IFOAM rules. In addition to this, BARI has join one international program namely, ANSOFT-AFACI- BARI project where 11 developing countries are involved and the goal of the program is to promote informational exchange among ANSOFT member states as well as to develop working groups including researchers, international organizations and national authorities. Therefore, a network is needed to form to fulfill the desired goal, the endeavor. The network may contribute to scientific information and production improvement in organic agriculture and agribusiness activities. Therefore, BARI wish to spin an umbrella among the stakeholders, where researcher, planners, extension workers, donor, universities may work together with an unique approach.

Paragraph 17: What recommendation would you like to forward for expansion of organic farming in Bangladesh?

Organic farming is a complex issue in the high input-high production concept. It is also crying needs for sustainability of agriculture production. This is the task that will require long term technological, institutional, management and policy intervention. Medium term planning with homestead and field for vegetable production should form the core program of agriculture sector, if organic vegetable production is to be ensured. Around this core program, time bound project/ program should be designed and implemented to support the core program. The plan will identify the areas, where specific project/ program will be needed for special thrusts. It will also identify areas, where more investments and policy and organizational changes will be required. The following points also may be considered in favor of organic farming.

- A Govt. guideline to produce organic vegetable should be brought in effect.
- A Govt. standardizing and certifying body is required.
- Marketing policy for organic vegetables production should be developed.
- Government should make collaboration with international bodies to promote organic vegetables production.
- Marketing system should be developed by Govt. and Private enterprises.

Examples of How Farmers are Applying Pesticides

Paragraph 1: On 20th of March, 2008 in Jhalokathi: Farmer Anowar Hossain was applying pesticide in his Boro rice field. He wore a half shirt and his pant was above knee level. His nose and mouth were open. Anowar told that his rice field was infested by Stem borer (Majra poka). Some pesticides were coming to his body due to wind. It was Malathion class insecticide. According to specialists, Malathion is very harmful for human body. It is an insecticide from Organo phosphorus group. A group of US scientists applied Malathion on rats. They found that malathion applied rats are suffering from liver tumour. Use of Malathion makes the favourable environment of Cancer.

Paragraph 2: Another farmer Abdus Satter: He was going to his home from the market. He was bearing two bags in his two hands. There was urea fertilizer in one bag and soya bean oil, salt, potato, onion and one packet of pesticide in another bag. He expressed, "I planted Boro rice two months before, but Stem borer attacked my rice field. I will mix the fertilizer and pesticide together. Then I will apply to rice field. When it was asked, "do you know how dangerous is to bring pesticide with food items?" Abdus Satter replied, "we are watching and doing this from our birth". In fact, he was bearing "siren 20 EC" which is applicable to control Cut Worm (local name, Katui poka) of potato and jute, not at all for rice stem borer. Abdus Satter is illiterate. He said, "the farmers of our area need insecticide; we come to Matin (salesman). We take medicine according to his advice. Matin is a great entomologist as well as pathologist for us". While interviewing Matin, interviewer came to know that the person from company told him to sell this medicine. Matin is engaged in his business since last 17 year and his educational qualification is class V. He has no training on pesticide but he has licence from department of Agriculture.

Paragraph 3: Muslim is a 60 years old farmer in Kishoregonj district. It was in 5th March, 2008. He was spraying pesticide in his Chili field. He said that chillies were falling down in immature condition. He went to district agriculture Officer for advice. He advised to eradicate all trees and to plant again after drying the field. Because virus has attacked in his field. No pesticide will work. But Mr. Muslim didn't like the advice. He went to pesticide dealer. That dealer suggested applying pesticide and he is applying it everyday and selling chilli every two days. It was asked to him that are you getting any benefit for applying the pesticide. He told, "not so much, still chillies are falling down."

Paragraph 4: Another farmer is Khokon from Mymensingh district. He planted jute and one kind of green insects finished all jute leaves. One dealer advised him to apply pesticide. He was spraying everyday but not working. It was communicated with one entomologist. He said, "pesticide is not useful for this insect. It is better to use water that is mixed with tobacco leaf for 1 day."

Paragraph 5: An intelligent (!) farmer Mostafa from Narshingdi district: He sowed Boro rice and flowering was happened in right time. On 10th April, 2008, he was doing intercultural operation in his field. Different coloured polythene and plastic bottle were hanging over the branches and sticks. Mostafa said that these were the empty packets and bottles of pesticides which he applied in field. It was asked to him that whether any insect or pest attacked his rice. He answered, "no, but any time insects and diseases can attack. So, these are preparations in advance. According to agriculturists, "these are only loss of money and degrading the environment". Some of the farmers complained that they don't meet any agricultural extension worker in the field. There is no suitable pesticide for quick growing vegetables like okra, cucumber, chichinga, brinjal, beans, cucurbits, tomato etc. – those needs to harvest every 2 days. If farmers need to apply pesticide in any case, then they need to wait to harvest after finishing pre harvest interval. But 95% farmers don't wait in our country."

Paragraph 6: Kamal is a farmer of Narshingdi district who cultivate vegetables for last 20 years. It was asked to him that how is his cost. He was disappointed and answered that he finished all of his money for applying medicine

(pesticide). He sprayed pesticides in brinjal two times in a week and also sold two times in a week. In case of cucumber, once in a week needs to apply pesticide and harvest three times in a week.

Paragraph 7: Showkat (41) is a farmer from Pirganj, Rangpur district. He cultivates *Potol* in that year. According to the production method, he said, "I spray medicine once in a week and harvest every three days. I have to harvest crop at least one time in a week after spraying medicine. Otherwise, crops become hard."

Paragraph 8: Zahidul Islam is a farmer of Bogra district. He said Chichinga is a so quick growing vegetable that farmers need harvest it every alternative day. In the crop field, we need to apply pesticide in every 8- 10 days. If not, insects destroy the crop. The next day of every pesticide spraying, farmer need to harvest chichinga one time. These examples are same for other vegetables and the same situation was prevailing in case of 95% of farmers.

Paragraph 9: Ratan Das is a farmer of Jessore district who is engage in farming for 35 years. He left brinjal production 2 years before. He sprayed pesticide at least 2 times in a week in brinjal. Before two years, he felt that his skin was burned, indigestion and vomiting problem and sometimes fever. After going to doctor, he advised to leave spraying pesticide.

Paragraph 10: In World Bank survey, all farmers were asked that "Do you know how many days you need to wait for vegetable harvest after applying pesticide? More than 95% of them answered 'no'. They think all poisons loss effectiveness after cooking with fire. 99% farmers don't know about using musk and don't take any security to save their health and 545 farmers told that dealers are the pesticide related source of knowledge

Paragraph 11: Pesticide is selling everywhere: There is a rule from Department of Agriculture that pesticide must be sold in a different shop. But salesman Zaman in Mymensingh district is selling rice, pulses, wheat, flour, oil, salt, soap and many things in his departmental store 'Bhai bhai traders'. In the same market area, Rahman traders are selling Rice bran, oilcake and pesticide. These are the images of whole country.

Paragraph 12: Abdul Mannan, a farmer in Boilpur village in Jessore, told that "earlier 10 to 20 kilograms of brinjal per maund (37.5 kg) were damaged despite use of pesticides. On the advice of BARI scientists, 32 farmers in our area used pheromones, which we got free of cost on an experimental basis, in brinjal fields in the last two years. This brought the crop damage to 3-4 kilograms a maund." But now that the project period ends, they want the government to make that available in the markets.