

INTRODUCTION

Organic farming is a method of crop and livestock production that involves much more than choosing not to use pesticides, fertilizers, genetically modified organisms, antibiotics and growth hormones. (<http://www.omafra.gov.on.ca/english/crops/facts/09-077.htm> access in 17-12-17). Organic agriculture is developing rapidly; its share in agricultural land and farms continues to grow in many countries. According to (FiBL-IFOAM, 2015) Currently 43.1 million ha. Oceania holds 40 per cent of the world's organic land, followed by Europe (27 per cent) and Latin America (15 per cent). Crop land area 10.9 million hectares. Global demand for organic products remains robust, with sales increasing by over five billion US dollar per year. Currently North America and Europe are the regions with high concentration of market for organic products. Within Asia also market for organic is more on fined in affluent countries such as Japan while others have export-oriented sectors (FiBL & IFOAM, 2014). Organic food is a niche segment, has been evolving in the urban area in favor of organic food. The new market segment is searching for healthy and safer sources of food and they could believe that organic foods are the solution to it (Mukul *et al.*, 2013). Bangladesh is one of the most densely populated countries in the world with more than 160 million people. The total cultivated land under conventional practices is 8.51 million hectare (MOA, 2015). Therefore, the estimated area used in Bangladesh for organic production (including aquaculture) is about 68660 hectares which 0.19% of total land (FIBL 2015). The land area is steadily decreasing due to its population growth, rapid industrialization and infrastructural development. More than 70% of the population depends on agriculture. The total amount of fertilizer used in Bangladesh has increased by about 1.55 million tons from 1994–95 to 2006–07, although the use of urea fertilizer has only increased by about 0.95 million tons over this period (BER, 2008). The use of pesticides increased from 7,350 metric tons in 1991 to 16,200 metric tons in 2001 (MoA, 2005), more than doubling over the course of a decade. Among this huge amount of pesticides, insecticides accounted for about 90%, and are generally used for vegetables and Boro rice (UNDP, 2006). This huge consumption of chemical fertilizers and pesticides applied to 7.32 million hectares of cultivated land (BBS, 2008) represents an over-use of agrochemicals and a waste of foreign currency reserves, as the country imports most of the applied agro-chemicals, except for urea fertilizers. Given the challenges that arise from the over-use of agro-chemicals, a key policy intervention for sustainable agriculture is to encourage the adoption of agricultural technologies that rely to a greater extent on local or renewable resources. Organic farming (OF) is one such technology that can reduce the

harmful impacts of agro-chemicals, and is considered by many scientists to be the best form of agriculture in terms of maximizing cost-effectiveness and minimizing pollution (Christian et al. 2005). Before the advent of “GREEN REVOLUTIN” during 60s’ Bangladesh farmers did not use any chemical fertilizers or pesticides. Since then the farmers gradually increased the use of chemicals in their farms. As the consequences the chemical farming was emerging. However, the extent of organic farming is too low till today. Horticulture crops are the major organic production in Bangladesh. (www.barcikbd.org access in 17-12-17). Organic agriculture avoids nutrient exploitation and increases soil organic matter content. In consequence, soils under organic agriculture capture and store more water than soils under conventional cultivation (Niggli *et al.* 2008). The farming system is the main component of organic farming, but the major trusty sector is crop which including crop rotation, maintenance and enhancement of soil fertility through biological nitrogen fixation, addition of organic manure and use of soil microorganisms, crop residues, bio-pesticide, biogas slurry, waste etc. Vermi culture has become a major component in biological farming, which is found to be effective in enhancing the soil fertility and producing large numbers of horticultural crops in a sustainable manner (Uddin, 2015) The market for organic food in Bangladesh is at an early stage and has huge opportunity of growth. There is rapid growth in the demand for healthy as well as tasty food products, which are safer than industrially produced goods, follow the rules regarding animal and environmental welfare, have a sustainable approach towards production and are also high in nutrition values (Ahamed *et al.* 2015).

The present review paper, was undertaken with a view to achieve the following objectives -

- i) To Review the Components of organic farming in Bangladesh.
- ii) To figure out the problems associated with the expansion of organic farming in Bangladesh.
- iii) To find out the prospects of organic farming in Bangladesh.

Materials and Methods

This seminar paper is exclusively a review paper so all of the information has been collected from the secondary sources. During preparation of this paper I went through various relevant books, journals, proceedings, reports, publications etc. Findings related to my topic have been reviewed with the help of the library facilities of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) and Bangladesh Agricultural Research Institute (BARI). Information also collected from Department of Horticulture, Proshika and Hortex foundation. I have also searched related internet web sites to collect information. I got valuable suggestion and information from my course instructors and other resource personnel. After collecting all the available information, I myself-compiled and prepared this seminar paper.

RESULTS AND DISCUSSION

Present status of organic Farming in Bangladesh

In Panchagarh, the North-western tip of Bangladesh, nearly 80 percent of the population is considered poor. Kazi Shahid Foundation (KSF) emerged as an independent Socio-economic venture promoting a dairy cow rearing model that linked with commercial organic tea farming and livelihood improvement of the poor women and their family.

The farmers of Pairabandha of Mithapukur upazila in Rangpur use compost, crop residue, water hyacinths and other perishable items instead of chemical fertilisers and pesticide in their field. Some farmers of Kaunia are producing vermi-compost (contains high quantities of nitrogen, phosphorous and potassium) by cultivating earthworm at their home (Nazrul Islam, The Daily Star, 16th May, 2008). In a recent research (Dasgupta *et al.*, 2008) showed that Integrated Pest Management (IPM) rice farming is more profitable than conventional mechanised rice farming.

Farmers of Bangladesh use huge chemical inputs for getting the more production. Therefore, government and 14 NGOs have been encouraging and training farmers to introduce organic farming. About 440,000 farmers were given season long and practical training in IPM during that period. With the joint effort of government and NGOs, Bangladesh became the 2nd country in Asia under organic management (177,700 hectare – 2% of total area) (IFOAM, 2006). In Bangladesh, NGOs are helping more than govt. to adopt organic farming in Bangladesh. Proshika and Nayakrishi farmers converted their land into organic from 12 to 15 years while BARI contact farmers from 7 years, Kazi tea – 5 years. DAE farmers are using less quantity of chemicals from 4 to 7 years. Proshika, Nayakrishi, BARI farmers, Kazi and Kazi tea don't apply any chemical fertilizer. Choice of appropriate varieties, mulching, crop rotation, mixed cropping, cover cropping, green manuring, composting, mechanical eradication of weeds, traps and barriers for pest control a package of techniques are practicing for soil fertility, disease, pest, weed and growth management (Hoque *et al.*, 2007). Kazi and Kazi Tea Estate (KKTE) the only company producing world class organic tea, vegetables and herb to their 1400 hectares certified land both for domestic and export market. Recently, Sahbazpur Tea Company was joined the organic club. Organic shrimp now a days is the leading and growing sector in Bangladesh and WAB Trading Int. (Asia) exporting organic shrimp to global market especially Europe. Therefore, the estimated area used in Bangladesh for organic production (including aquaculture) is about 68660 hectares which 0.19% of total land (FIBL 2015).

Adverse effects of Fertilizer and pesticide Application

Applying nitrogen fertilizers in excess amount removed each year with the crop can lead to loss of nitrogen from the soil environment. Because nitrate is negatively charged. This contaminates the wells and nitrates the drinking water pose a health problem to animals and people who use such wells.

Chemical Fertilizer use pattern in Bangladesh: Uses of synthetic fertilizer are being started from mid fifties of the last century.

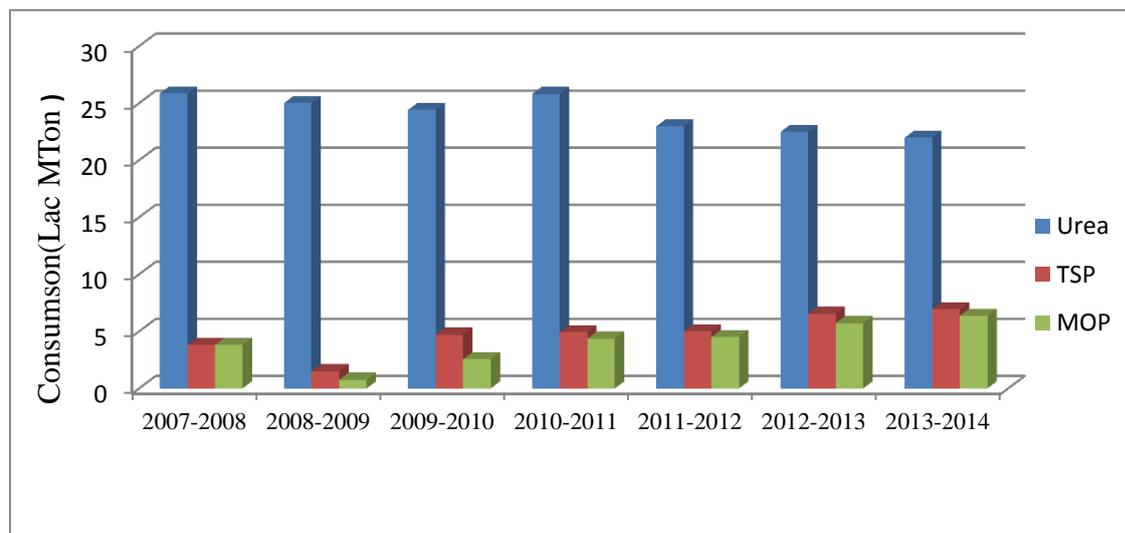


Figure 1. Synthetic fertilizer use pattern (Lac M Ton) in Bangladesh during 2007-2014.

(Source: Fertilizer Association of Bangladesh, 2015).

The application of urea fertilizer was 26.85 Lac M Ton during 2007-2008 and it has 21.97 Lac M Ton by the year of 2013-2014. The application of TSP was 3.8 Lac M Ton during 2007-2008 and it has 6.94 Lac M Ton during 2013-2014. The application of MOP fertilizer was 3.8 Lac M Ton during 2007-2008 and it has 6.36 Lac M Ton by the year of 2013-2014. Urea fertilizer use decreases day by day but TSP and MOP use increase. Dependency on chemical fertilizer is due to rapid absorption of the nutrient and getting increased yield (Figure 1).

Pesticide use pattern: Pesticide poisoning is more widespread in developing countries compared to developed countries. It was reported that fish resources had been reducing and water pollution occurred due to wash-out of agrochemicals from agricultural farms. It was documented in another research study that soil nutrient were decreasing alarmingly in the northern areas of Bangladesh due to chemical fertilizer and harmful pesticides. In Figure 2, 48.4% of the farmers used pesticides to control weeds while majority (81.3%) of the vegetable farmers used pesticides to control insects and most (93.8%) farmers used pesticides

for fungi and mould control. Only 6.3% used pesticides to control rodents. This implies that farmers cultivating vegetables in the study area used pesticides at different levels (Abubakar *et al.*,2015) .

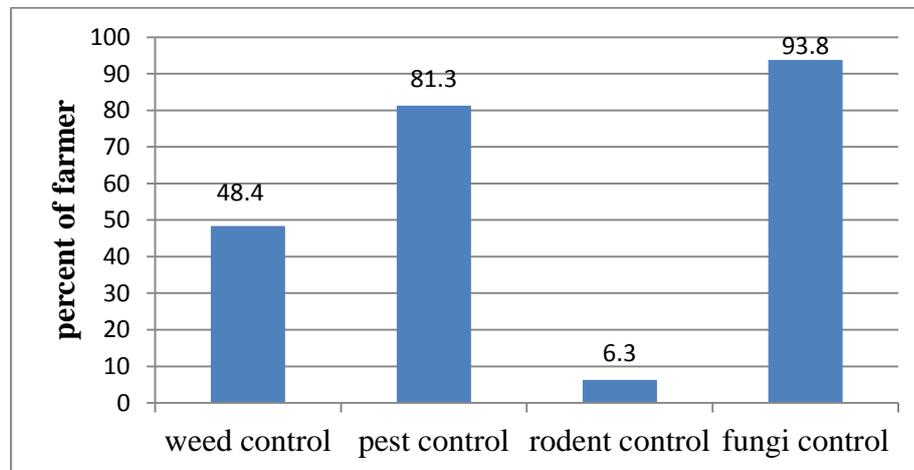


Figure 2. Chemical pesticide practices of farmer. (Source : Abubakar *et al.*,2015).

Components of organic farming

The farming system is the main component of organic farming, but the major trusty sector is crop which including crop rotation, maintenance and enhancement of soil fertility through biological nitrogen fixation, addition of organic manure and use of soil microorganisms, crop residues, bio-pesticide, biogas slurry, waste etc. The various components of organic farming have been discussed in details below. (Musa *et al.*2015)

1. Crop rotation

It is a systematic arrangement for the growing of different crops in a more or less regular sequence on the same land covering a period of two years or more. The selection of optimal crop rotation is important for successful sustainable agriculture. To maintain soil fertility, manage weed, insect and disease crop rotation is a effective tool. Legumes are essential in any rotation and should 30 to 50 percent of the land. A mixed cropping and livestock system is desirable or even essential for the success of sustainable agriculture. (Musa *et al.*2015)

2. Crop residue

There is a great potential for utilization of crop residues/ straw of some of the major cereals (rice, wheat), oils (mustard) and pulses (lentil, mungbean etc.). About 50% of the crop residues are utilized as animal fed, the rest could be very well utilized for recycling of nutrients. Adequate care is required to use the residues after proper composting with efficient microbial inoculants. While the incorporation of crop residues e.g. Rice straw, as such or inoculated with fungal species (*Trichoderma*, *Azotobacter*, etc.) have beneficial effects on crop yields and important in physico-chemical properties of soil. (Musa *et al.*2015)

3. Organic manure

The organic manure is derived from biological sources like plant, animal and human residues. Organic manure act in many ways in augmenting crop growth and soil productivity. The direct effect of organic manure relates to the uptake of humic substances or its decomposition products affecting favorably the growth and yield of plants. Indirectly, it augments the beneficial soil microorganisms and their activities and thus increases the availability of major and minor plant nutrients. Examples: a. Bulky organic manure: Farm yard manure ,Compost, Green manuring b. Concentrated Organic Manure (Musa *et al.*2015)

4. Waste

a. Industrial waste: Among the industrial by products, spent wash from dertilisers and molasses and pressmud from sugar industry have good manurial value. It is important to use only well decomposed pressmud at 10 tonnes ha⁻¹. Addition of pressmud improves the soil fertility and enhances the activity of microbes. Coir waste is the by-product from coir industry and can be used as manure after proper decomposition. (Musa *et al.*2015)

b. Municipal and Sewage waste: It also forms an important component of organic waste. In the urban and rural areas of Bangladesh every day around 1 kg organic waste are being produced. Organic waste collected from urbn area might be contaminated with heavy metals and these pose hazards to plants, animals and human beings. (Musa *et al.*2015)

5. Bio fertilizers

It has been observed that there is decline in crop yield due to continuous apply of inorganic fertilizers. Therefore, increasing need is being felt to integrate nutrient supply with organic sources to restore the health of soil. The beneficial microorganisms in the soil that are greater significance to horticultural situations are biological nitrogen fixers, phosphate solubilisers and mycorrhizal fungi. Example: Rhizobium, Azospirillum, Blue Green Algae. (Musa *et al.*2015)

6. Bio-pesticide

Bio pesticides are certain types of pesticides derived from such natural materials as animals, plants and microorganisms (bacteria, fungi etc.) including natural ingredient pesticide, Bio pesticides are certain types of pesticides derived from such natural materials as animals, plants and microorganisms (bacteria, fungi etc.) including natural ingredient pesticide, microorganisms pesticide and bio chemical pesticides. Natural plant products belong to the so-called secondary metabolites, which include thousands of alkaloids, terpenoids, phenolics and minor secondary chemicals. These substances have usually no known function in photosynthesis, growth or other basic aspects of plant physiology; however, their biological

activity against insects, nematodes, fungi and other organisms is well documented. (Musa *et al.*2015)

7. Vermicompost

It is organic manure produced by the activity of earthworms. It is a method of= making compost with the use of earthworms that generally live in soil, eat biomass and excrete it in digested form. It is generally estimated that 1800 worms which is an ideal population for one sq. meter can feed on 80 tonnes of humus per year. These are rich in macro and micronutrients, vitamins, growth hormones and immobilized microflora. The average nutrient content of vermicompost is much higher than that of FYM. (Musa *et al.*2015)

Use of Organic Method

Insect Management

Use of resistant variety: Brinjal shoot and fruit borer is a common insect in Bangladesh but now ESFB resistan variety is available. In case of shoot infestation, the varieties/lines Katabegun WS, and Marich begun S were found to be tolerant while the varieties/lines Amjuri, Borka, Dharola, Deembegun, ISD 006, Kajla, Khatkhatia BAU, Laffa S, Singnath, Thamba and Uttara were found to be moderately tolerant.

Table 1 . Shoot and Fruit borer resistance brinjal varieties in Bangladesh.

Types of infection	Level of resistance	Varieties
Shoot infestation	Moderately tolerant	Amjuri, Borka, Dharola, deembegun, ISD006, Kajla, Khatkhatia BAU, Laffas, Singnath, thamba, Uttara.
	Tolerant	Katabagun, Marich Bagun
Fruit infestation	Moderately tolerant	Amjuri , BL-118, Islampuri BADC, ISD 006, Irribegun, Kajla, Khatkhatia BAU, Laffa S, Singnath
	Tolerant	Thamba, Katabegun WS

(Source: Ahmad *et al.*, 2008).

In case of fruit infestation, the varieties/lines Thamba and Katabegun WS were found to be tolerant while the varieties/lines Amjuri, BL-118, ISD 006, Islampuri BADC, Irribegun,

Marich begun S, Kajla, Khatkhatia BAU, Laffa S and Singnath were found to be moderately tolerant (table 2).

Mechanical control: In this approach, no insecticides are used during the life cycle of the crops. Leaf eating caterpillars in Cabbage is the serious pests in Bangladesh. Two pests like Diamond back moth and armyworm are involved for damaging the Cabbage. Farmers indiscriminately use insecticides without knowing the nature of damage. However, only 4-5 handpicking during head formation stage can minimize the infestation (Figure 3). Results revealed that through handpicking it was possible to keep the infestation 5.6 % where as using frequent insecticide application the infestation percentage raised up to 20.4%. Handpicking ensured high yield (67.5 t/ha) of cabbage compared to control with 25 % increased income.

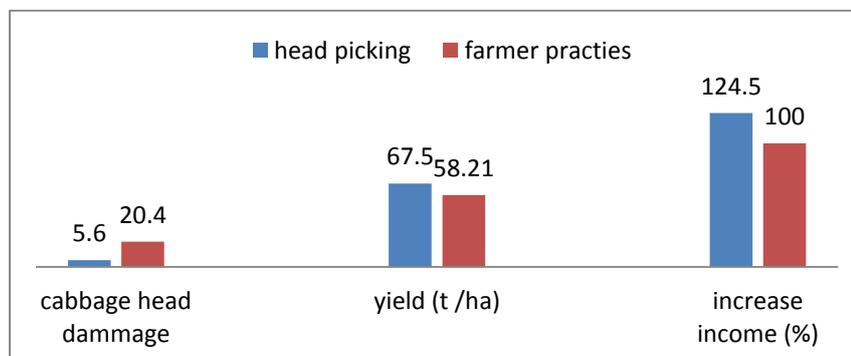


Figure 3. Consolidated results of hand picking and Farmers practice to control leaf-eating caterpillar during 2011-2012. (Source: Uddin *et al.*, 2013).

Pheromone trap: Afield study was conducted at Sher-e-Bangla Agriculture University farm to find out effect of different traps on the incidence and management of cucurbit fruit fly, *Bactrocera cucurbitae* during November 2012 to April 2013. The treatments of the experiment were Pheromone trap (Plastic pot), GME pheromone water trap, Sticky trap, Bait trap, Funnel Pheromone trap, Light trap, Bait trap + Pheromone trap (Plastic pot) and Untreated control. The highest number of healthy fruits/plot (6.33) was recorded from Bait trap + Pheromone trap (plastic pot) treated plot followed by 5.67 in Funnel Pheromone trap with no significant difference between them. The intermediate number of healthy fruits/plot (4.33 - 4.67) was recorded from Pheromone trap (Plastic pot), Bait trap and GME pheromone water trap (4.67) having no significant difference among them. Sticky trap, Light trap and Untreated control plot which was significantly lower than other treatments. Similarly in case of percent increase of number of fruits over control, Bait trap + Pheromone trap (plastic pot)

gave the best result (111.1%) having no significant variation from that of Funnel Pheromone trap (88.89%) (Table 3) but significantly differed from others. On the other hand, no increment occurred in Sticky trap and Light trap. Further, 55.55% increase of fruit over control was obtained from Pheromone trap (Plastic pot), and Bait trap which was statistically similar that of GME pheromone water trap (44.44%) but other are low. The lowest number of infested fruits/plot (1.00) was recorded from Funnel Pheromone trap which was statistically identical to that of Bait trap + Pheromone trap (plastic pot), Bait trap and Pheromone trap. The highest number of infested fruit/plot (3.33) was recorded from untreated control plot.

Table 2. Effect of different traps on the production of healthy and infested fruit caused by cucurbit fruit fly during total cropping season.

Treatments	Number of healthy fruit/plot	% increase of healthy fruit over control by number	Number of infested fruit /plot	% decrease of Infested fruit over control By number
Pheromone trap (Plastic pot)	4.67	55.55	1.33	61.11
GME pheromone water trap	4.33	44.44	1.67	47.22
Sticky trap	3.00	0.00	2.67	16.67
Bait trap	4.67	55.5	1.33	61.11
Funnel Pheromone trap	5.67	88.89	1.00	69.44
Light trap	3.00	0.00	2.67	19.44
Bait trap+ Pheromone trap	6.33	111.1	1.33	61.8
Only water in plastic pot	3.00	-----	3.33	-----

(Source: Islam *et al.*, 2013).

Biological control

Eggplant fruit and shoot borer, *Leucinodes orbonalis* Guenee (Lepidoptera: Pyralidae) is a destructive and first ranked insect pest constraint of eggplant production in almost eggplant growing areas of the world (Mainali *et al.*, 2013). In (table 3) we see that *Trichogramma* have 11 species, *Bracon* have 3 species and others have 2 species. Bollworm is control by *Trichogramma*, *Bracon*, *Chelonus*, and *Chrysoperla*. Pod borer can control by *Trichogramma*, *Bracon*, *Chelonus* and *Chrysoperla*.

Table 3. Some Species and number of bio-control agent.

Bio-Control Agents	No of species	Pest
<i>Trichogramma</i>	11	Bollworms, Borers, Codling moth
<i>Bracon</i>	3	Bollworm, Pod borer, fruit borer
<i>Chelonus</i>	2	Bollworm, Pod borer, fruit borer
<i>Chrysoperla</i>	2	Sucking pest, bollworm
<i>Neochetina</i>	2	Weed
<i>Encarsia</i>	2	White Fly, Scale insect

(Source: Asre *et al.*, 2014) (Modified).

Disease management

Integrated diseases management needs to address different aspects of a disease for successful control. Resistant variety, Soil amendment, different physical and botanical needs to be used in the organic vegetables production, which is effective and economic, and environment friendly.

Mechanical control of virus: Okra is an important summer vegetables in Bangladesh, severely affected by yellow vein mosaic virus. As BARI has developed of resistant variety, which are now being susceptible to that virus. Soil mulching with polyethylene sheet and hanging of its strips over plants found effective to control those diseases. The diseases incidence was reduced and yield and quality of fruits were increased by both polythene mulch and hanging of polythene strips over the plants. The performance of blue polythene was better than white polythene.

Soil amendment for controlling the nematode diseases: Organic and synthetic amendment can have large effects on plant-parasitic nematodes dynamics. A field experiment was

conducted in two consecutive years to find out the efficacy of poultry refuse (PR), mustard oilcake (MOC), and Furadan 5G for the management of root-knot disease (*Meloidogyne incognita*) of tomato. Among the treatments tested in the present study, The highly effective four treatments increased fruit yield to 71.1-82.5 t/ha in first year and 60.8-82.0 t/ha in second year. The fruit yield of tomato was directly and linearly correlated with gall indices in tomato gall.

Table 4. Effect of soil treatment with two organic amendments and one nematicide on fruit yield of tomato in soil inoculated with *Meloidogyne incognita*.

Organic amendments and Furadan with dose	Fruit number/plant		Fruit yield (t/ha)	
	1st year	2nd year	1st year	2nd year
Control	27.67	23.47	50.90	47.63
Furadan 5G @ 40kg/ha	43.13	34.53	64.50	54.65
Poultry refuse @ 5 t/ha	51 .67	46.40	82.00	72.72
Poultry refuse @ 3 t/ha	44.73	37.07	73.00	63.83
Poultry refuse @ 3 t/ha+Furadan 5G @20 kg/ha	50.93	44.87	82.50	69.72
Mustard oilcake @0.6 t/ha	39.20	42.13	69.35	66.50
Mustard oilcake @ 0.3 t/ha	36.67	35.60	63.45	57.78
Mustard oilcack @ 0.3 t/ha+Furadan 5G @ 20 kg/ha	38.80	39.20	71.15	60.78

(Source : Faruk *et al.*,2011).

Biological control: An experiment was conducted in the field laboratory, Department of Plant pathology, Bangladesh Agricultural University, Mymensingh to evaluate the efficacy of compost tea and poultry litter extract in controlling late blight of potato and tomato under natural infection condition. Here T1(Control with no spray), T2 (Control with fungicide spray), T3 (Compost tea or extract as foliar spray), T4 (Compost tea or extract as soil drenching), T5 (Poultry litter extract as soil drenching), T6 (Compost as soil application), T7

(Poultry litter (soil application), T8 (Biopesticide as soil application), T9 (BAU Biofungicide as foliar spray) and T10 (Mustard Oil Cake as soil application). However, the suitability of compost tea as a technology to control plant diseases needs to be evaluated against wide range of pathogens in other crop plants as compared to other biological means of plant disease control (Islam *et al.*, 2013).

Table 5. Effects of different organic management approaches on the yield parameters of potato and tomato.

Treatments	Yield per ha (t/ha)	
	Potato	Tomato
T1	12.20	43.40
T2	22.40	53.70
T3	28.50	49.70
T4	17.40	90.60
T5	20.80	65.60
T6	25.50	57.60
T7	22.00	49.40
T8	18.00	47.00
T9	23.00	55.00
T10	26.43	48.80

(Source: Islam *et al.*, 2013).

Problems associated with the expansion of organic farming in Bangladesh

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 analyzing those information, the problems will be

identified that will guide us to forward recommendations. However, the major barriers have been presented in Figure 4.(Hoque, M. N. 2012)

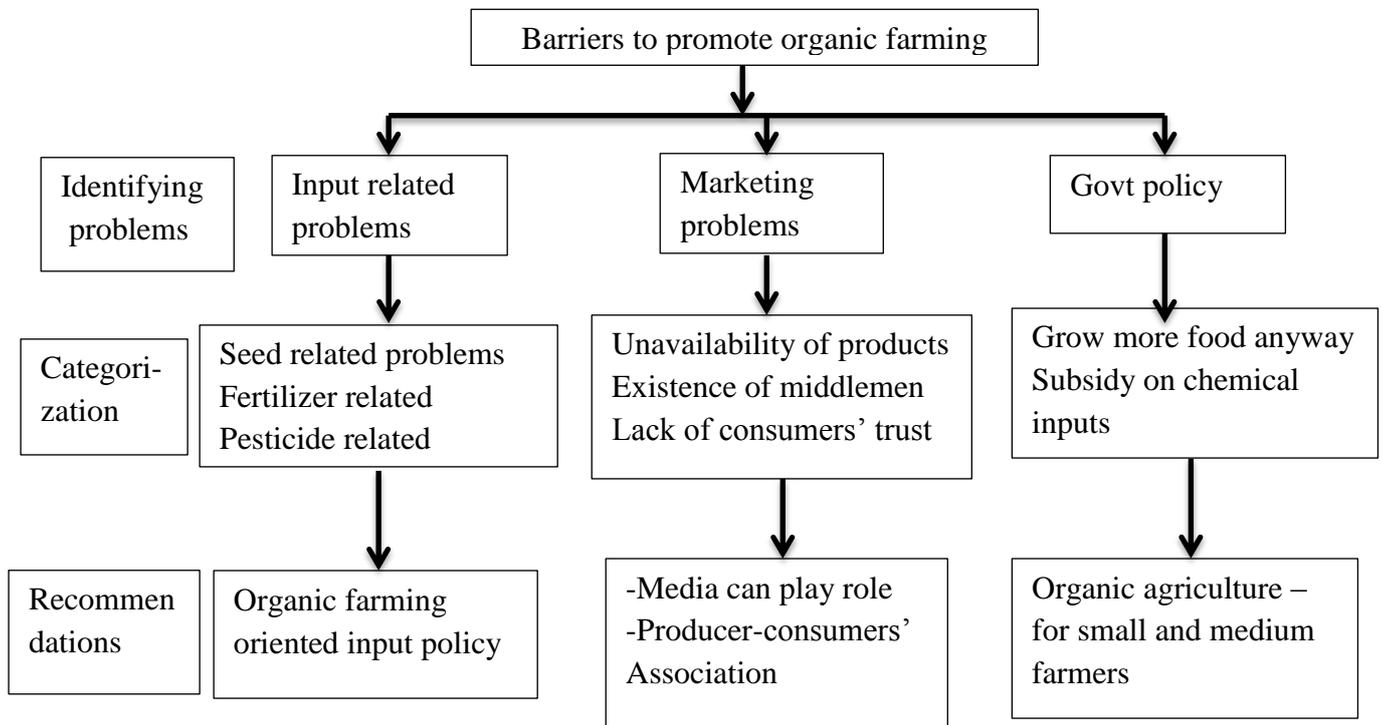


Figure 4. Major barriers of organic farming (Source: Hoque, M. N. 2012)

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 fertilizers 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). 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).

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).

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. 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 'commercialization' of hybrid seed. At the same time, hybrid seed companies are getting power to dictate the

Ministry of Agriculture. The extreme commercialization of hybrid seed could be detrimental to food security, both at the household as well as national level (UBINIG, 2008).

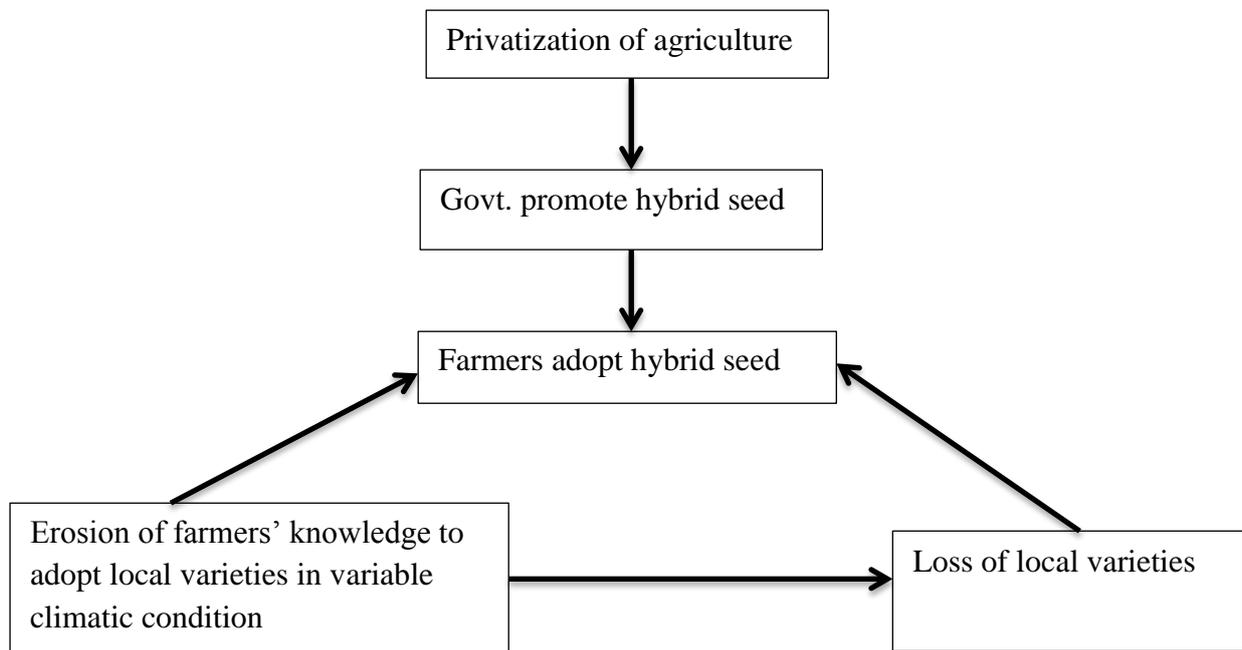


Figure 5. Influence of govt. policy on farmers' decision to use hybrid

(Source: Hoque, M. N. 2012)

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 works 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).

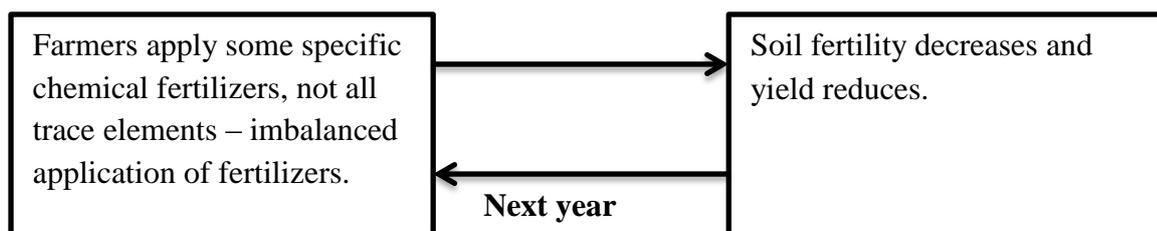


Figure 6 . Vicious circle of imbalanced fertilizer application and decrease in production
(Source: Hoque, M. N. 2012)

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. 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.

Prospect of Organic Farming

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). 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.

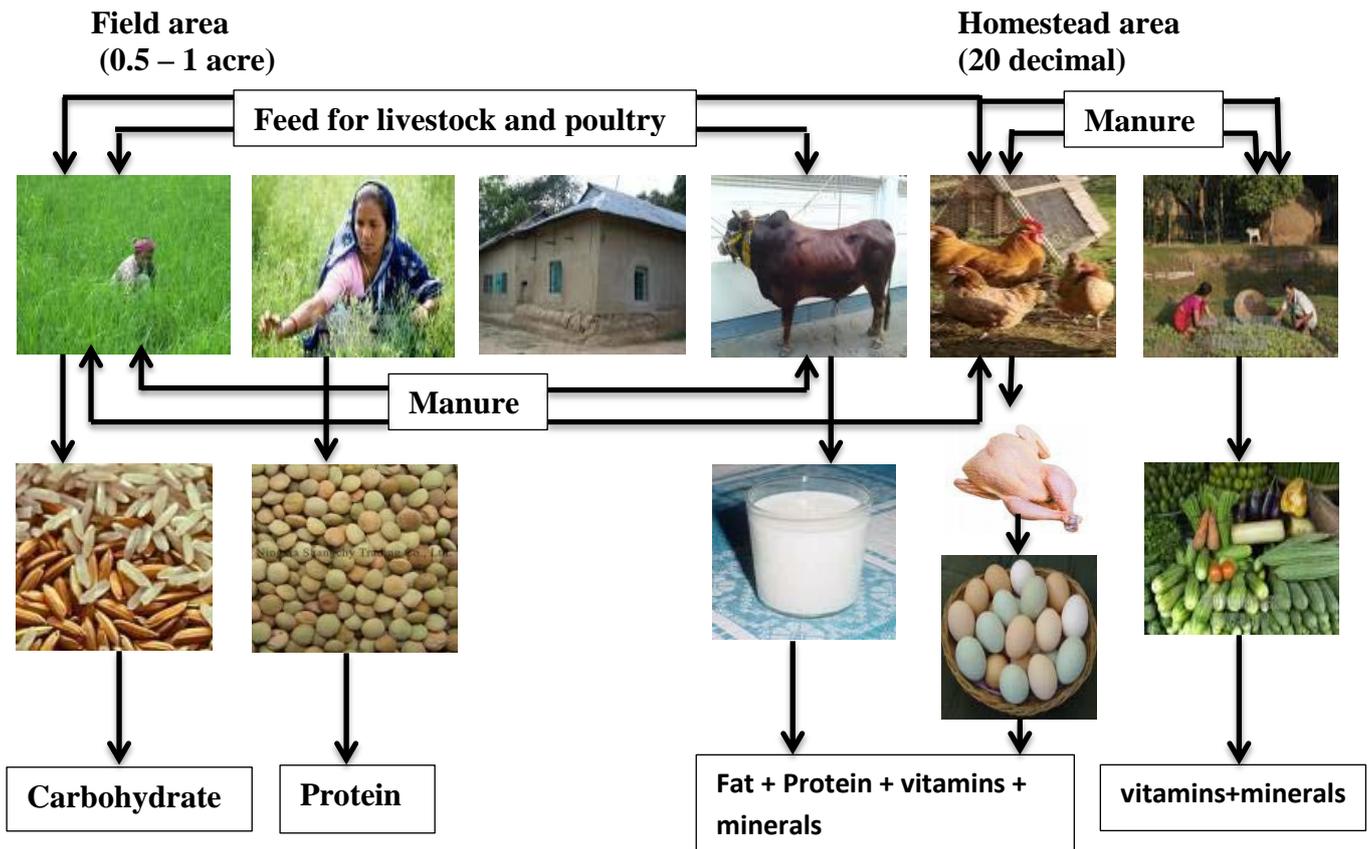


Figure 7. A way to food security through organic farming (Farm family will get all necessary items whole of the year (Source: Hoque, M. N. 2012)

2. 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. (Hoque, M. N. 2012).

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. (Hoque, M. N. 2012)

4. Commercial Organic Fertilizers Government of Bangladesh is giving registration to the company for commercial fertilizers on basis of some set characteristics (Table 6).

Table 6 .List of five Organic fertilizer Factories Registered with DAE

Sl No.	Name of Organization & Address	Registration No/ Brand	Registration No and Issue date
1.	M/S Northern Agro Services Ltd Pulhat, Ramsagor Road Mohorompur, Dinajpur	Northern organic fertilizer	M-65 Date-24/05/2003
2.	M/S Faruque Fertilizer Ltd 116/C, Monipuripara, Krishibid Institution, Farmgate, Dhaka	Chuk Chuk-102	M-10 Date-02/05/2005
3.	M/S Faruque Fertilizer Ltd 116/C, Monipuripara, Krishibid Institution, Farmgate, Dhaka	Chuk Chuk-150	M-11 Date-02/05/2005
4.	M/S Annyapurna Agro Services Ltd	Annyapurna organic fertilizer	M-348 Date-5/11/2006
5.	M/S Waste Concern A H M Maksud Sinha Vulta, Rupgonj, Narayangonj	Waste Concern organic fertilizer	M-462 Date-20/05/2009

(Source: FSW, DAE 2015)

5. BARI developed organic fertilizer (BAOFER)

Olericulture Division of Horticulture Research Center, BARI, Gazipur has developed a organic fertilizer namely, Biologically active organic fertilizer (BAOFER) is constituted of rice bran, mustard oil cake, fish debris, poultry refuse, ash, water, agricultural soil and half composted cow dung. (Source: Musa *et al.*2015)

6. Intercropping

Organic farming does not advocate monoculture rather it encourages the multiple cropping in the same field. The main crops cultivated in organic system paddy, potato, mustard, masur (*Ervum lens*), khesari (*Lathyrus sativa*), blackgram (*Cicer arietinum*), and vegetables. According to Rasul and Thapa (2004), cropping intensity, crop diversification and mixed cropping have significant variation with organic in Bangladesh (Table 7).

Table 7. Cropping intensity, crop diversification and mixed cropping

	Index values	
	Ecological system	Conventional system
Cropping intensity ^a	2.0	1.8
Crop diversification ^b	14.2	19.8
Mixed cropping ^c	0.3	0.1

(Source: Musa *et al.*2015)

7. Developing proper marketing system

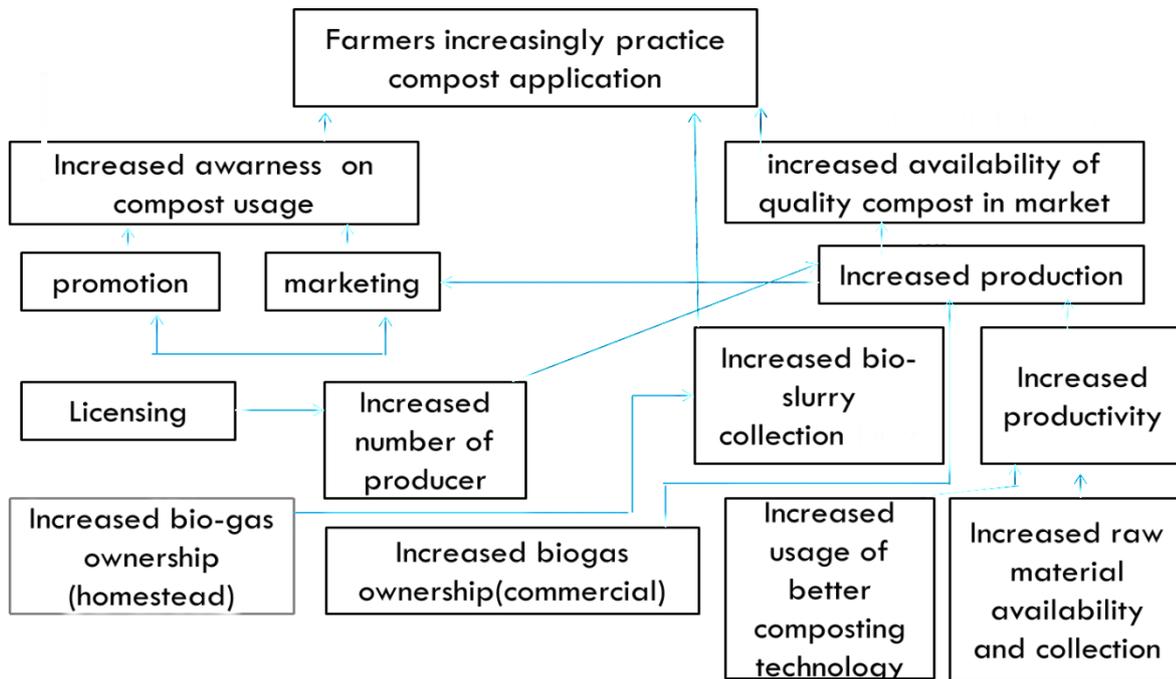


Figure 8. A sketch out of the prospects of increased compost usage and its market promotion in Bangladesh agriculture (source: Rashid, 2011)

Organic farming and trade/ market analysis in Bangladesh

Bangladesh having 68660 hectares of certified organic lands (FIBL 2015). 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. Situation is different among the well off conscious elite persons living in urban areas. This awareness compels to initiate organic food shops like Probortana, PROSHIKA, Meena Bazar and others to sell these commodities at a higher price, which is beyond the capacity of general people.

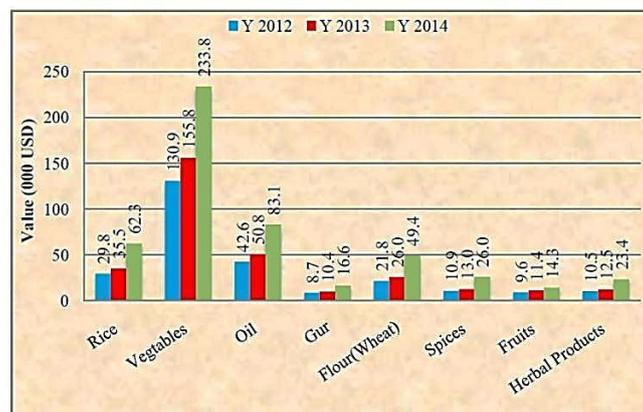


Figure 9. Local market scenario of Mena Bazar during 2012 to 2014 (Source: Musa *et al.* 2015)

Organic Farming World Wide and Overview of Global Market

According to(FiBL-IFOAM, 2015) Currently 43.1 million Hectares land under organic farming worldwide. The market for organic products is also growing, not only in Europe and North America (which are the major markets) but also in many other countries, including several developing countries. Currently, the countries with the greatest organic areas are Australia (17.2 million ha), Argentina (3.2 million ha) and US (2.2 million ha) (Figure 10)

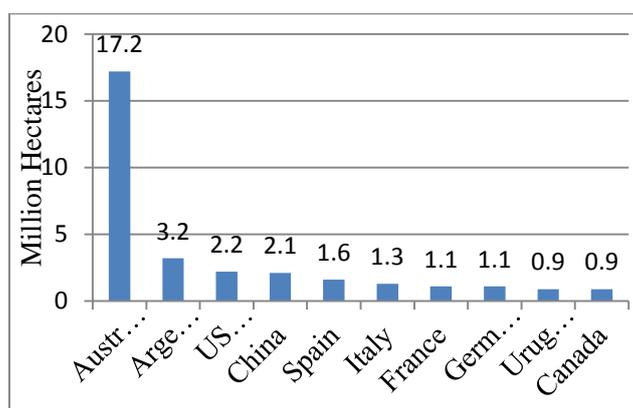


Figure 10. The ten countries with the largest areas of organic agricultural land 2013.
(Source : FiBL-IFOAM, 2015)

In total Oceania holds (40%)of the worlds organic land, followed by Europe (27%) and Latin America (15%) (Fig. 11).

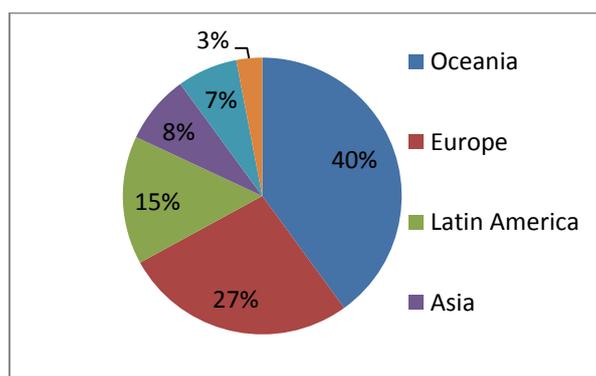


Figure 11. Total area under organic management- share for each continent.
(Source : FiBL-IFOAM, 2015).

CONCLUSION

- Brinjal FSB can be controlled using organic amendments, pheromone, intercropping and barrier crop successfully. In cucurbits, fruit fly can be effectively controlled by using funnel pheromone without spraying directly to the fruits. Only 4-5 handpicking during head formation can minimize the infestation of leaf eating caterpillars. Poultry refuge is the promising and effective organic resources can contribute increase organic matter in the soil as well as diseases management. Pheromone, *Trichoderma* could be the effective bio agent for the various pests.
- Organic farming in Bangladesh has four core problems: poor farmers, poor farmer knowledge of organic farming and its benefits, insufficiency of organic inputs, and poor marketing of organic foods.
- The market oriented applied research is important to popularize an efficient composting technology at the field level.
- India, our neighbour, produces and exports a wide range of fresh and processed organic fruits, vegetables, nuts, oil crops, grains, coffee, sugar cane, herbs and spices, although it is best known as an exporter of organic tea. Other Asian countries, including China, the Republic of Korea and Sri Lanka, are also active producers and exporters of organic foods. Like other developing countries, Bangladesh has the capacity to realize a significant share of the global organic market. This offers an opportunity to increase farmers' incomes, thereby making a significant contribution towards reducing poverty for among poor farmers.

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