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The art and myth of organic agriculture for nature conservation and sustainable food production: perspective of Bangladesh

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Abstract Bangladesh has really plenty of opportunities to promote organic agriculture in producing safe food for its huge malnourished population and maintain the sustainability of agricultural systems as well as conserve the nature. Moreover, due to having pro-poor attributes, organic agriculture of Bangladesh can provide better income for the smallholder organic growers through lowering production costs and ensuring premium prices. However, public sector research and extension agencies need to have some massive programme to remove farmers' confusion and link organic farmers with market. In addition, Ministry of Agriculture and Ministry of Commerce need to work jointly for introducing certification for organic produces that might create quicker access of Bangladesh's organic produces in global organic market that will ultimately contribute in national economy and wide spread rural poverty reduction through export earnings.

Keywords: Organic agriculture, Nature conservation, Sustainable food production

Introduction

Bangladesh is a small miracle country in the world map. The total area of the country is 0.147 million km^2 with 160 million people (BBS, 2017). It has the highest population density in the world and about 1252 people live in per sq. Km area (BER, 2016). Bangladesh is located in South Asia and land locked by India from three sides (East, West and North) and mighty Bay of Bengal is in the southern part of the country. It's a reverine delta country having more than 700 rivers flows all over the country (Wikipedia, 2018). Due to its special location the country become flooded every year which makes its soil fertile for cultivating diversified crops like paddy, wheat, maize, jute, cotton, potato, vegetables, fruits, spices, pulses, oilseeds, sugarcane, tea, tobacco, rubber etc from time immemorial (Crop-Banglapedia, 2015). On the other hand, Bangladesh is highly vulnerable to Natural Disaster because of its Geographical location. The adverse effect of climate change, especially, high temperature, sea level rise, cyclones and

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strong surges salinity intrusion, heavy monsoon downpours etc. has aggravated the national food production as well as overall economic development of the country to a great extent (Anne-Katerien, 2012). In addition, growing population of the country has also been putting additional pressure on food production for last several decades. Having all sorts of limitations the country has been producing sufficient amount of food (except few heavily disaster affected years) for its huge population after introduction of Green Revolution in 1980s. Over the last three decades, food production and availability has increased at a good pace in Bangladesh as well as entire South Asia. Food production grew annually by 1.2% between 1980 and 2010 regionally. This food increase was attributed to the impressive performance of Bangladesh, where per capita food production increased by 1.1% (Daily Star, Feb 04, 2016). Right at the moment Bangladesh is a case of success as far as producing food is concern, particularly rice, the staple. But, is it safe to have food in Bangladesh remains a big question. Food contamination and food adulteration remain a nagging problem here. Thus, the demand for safe and organic food is increasing sharply among the consumers having health awareness both urban and rural Bangladesh.

Green revolution vs. organic agriculture in Bangladesh

Bangladesh agriculture was traditionally organic since time immemorial. It was the religious believes to all farmers in Bangladesh beyond their religion that chemicals should not be added in farming. It was the myth to them that if you use agrochemicals in soil then the nature will punish back the mankind for harming the nature. Honestly speaking, people were any way happy that time with the low production though there was huge food insecurity during 1970s to 1980s. However, to resolve this food insecurity problem "Green Revolution" was introduced in Bangladesh in early 1980s for growing more food for the growing population. It was really successful to doubling the food production within a short span of time (FAO, 2005). However, the non-judicious use of agro-chemicals by the farmers for long time has destroyed natural habitats and species. It has also led to soil nutrient depletion, loss of bio-diversity, imbalance of nutrients in the soil, unintended destruction of natural enemies of pests (i.e., beneficial insects and predators), emergence of pest resistance and secondary pests, potential health hazards for human and animal, environmental pollution and other socio-economic problems (Shamannay, 1999). Moreover, this huge use of agro-chemicals has increased farmers' crop production costs to several folds which led farmers to go in debt (Sarker and Itohara, 2008).

Considering this rude reality people of the civil societies first started working with organic agriculture movement in Bangladesh. The name of PROSHIKA (a renowned national NGO in Bangladesh) will be in top of the

list forever for their enormous effort for promotion of Ecological Agriculture Programme since 1978. Later on *Naya Krishi Andolon* of UBINIG, BARCIK, Bangladesh Organic Product Manufacturers Association (BOPMA), Bangladesh Safe Food Movement and many other association also join with this movement and transformed this movement into national agenda. CARE- Bangladesh and World Vision also played a vital role and give a momentum in this organic journey in Bangladesh. Few corporate companies like Kazi and Kazi, Zemcon group, Ispahani Bio-Tech and BOPMA has direct contribution in organic agriculture sector development in the country in recent years. On the contrary, public sector research and extension system has not yet given proper attention for patronizing organic agriculture in Bangladesh (Sarker and Itohara, 2008a). In a nut shell organic agriculture can be summarized in the following way:

- Still dominated by NGOs & private companies
- No standards & regulations
- Struggling for standards and certification
- Public sector research & extension is still absent
- Have third party certification for corporate and PGS for smallholders
- No specialized market yet
- Launching year:1978
- Organic land area :6860 ha(0.7% of total cultivable land) (IFOAM, 2015)

Global organic arket and share of Bangladesh

Increasing consumer awareness of health and environmental issues has been an important driving force for the recent growth in sales of organic food: 17 to 22% annually, compared with 2 to 3% for conventional foods. "The worldwide organic market was worth an estimated US$ 25 billion in 2003" (IFOAM, 2006); while global organic sales has reached 90 billion US$ in 2016. The market research company intelligence (former Organic Monitor) estimates the global market for organic food to have reached 89.7 billion US$. Among the global big organic markets USA continued to be the leading market with38.9 billion Euros, followed by Germany with 9.5 billion Euros. Furthermore most of the major markets continued to show double-digit growth rates in 2016 (FiBL, 2016).

The benefit of share of this global organic market is going to the three million producers globally. It is reported that throughout the world, over 100 countries are producing certified organic products on a commercial basis majority of them for developing world. It is reported the book "World of Organic Agriculture" that 2.7 million organic farmers have already been registered with a growth of 300.000 new producers in comparison to 2.4 million in 2015. However, the highest number organic producers (0.8

million from India our neighboring country. Next to India, Uganda, Mexico, Bhutan, Kenya are also getting the lion share from global organic food market. On the contrary, due to lack of proper policy, having lots of potentials in organic sector, Bangladesh has failed to get anything from global organic market except only exporting a small amount of organic tea in European market (Ferdous *et al*., 2020).

Organic agriculture of Bangladesh has the following potentials:

- Huge crop diversity;
- Surplus labor forces;
- Increasing number of cattle and poultry population;
- Farmers having IPM experience;
- Wide range of indigenous knowledge and practices for insect and disease control; and
- Growing urban consumers (Sarker and Itohara, 2008a).

However, there is not yet any specialized market for organic food. Only there is a small corner in few super markets of big cities. Bangladesh has already good amount of export of vegetables and fruits in Middle Easter countries like Qatar, Saudi Arabia, Arab Emirates etc. However, it is required some policy interventions from concerned ministries to support the exporters of exporting organic products through certification process. As the National Organic Agriculture Policy has been formulated in 2017, thus it would be easier to establish certification bodies and take further necessary action to export certified organic vegetables, organic spices, organic fruits and wild honey from *Sundarban* that might provide a significant amount of foreign exchange earnings from global organic market.

Art of organic agriculture in Bangladesh

Organic agriculture is an age old practice in Bangladesh. Our fore fathers were used to manage their farming practices following organic philosophy. This philosophy has been transferred from generation to generation without few exceptions during the era of green revolution. Even, during the time of chemicals dependent agriculture majority of our farmers have used these sorts of age old eco-friendly practices along with agro-chemicals as their own practice of arts (Farouque and Sarker, 2018). Few notable practices followed in by the farmers in organic management systems are shown in this section.

Composting

Farmers of Bangladesh are used to with using different types of compost in order to improve the soil fertility. As soil nutrient management is one of the challenging tasks in organic farming system, in this regard many

of our farmers use kitchen compost, quick compost, vermi-compost and tricho-compost. Among these composts vermi-compost has got the highest popularity among the organic farmers in the recent time (Murshed and Uddin, 2020).

Vermi-compost is the product of the composting process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a mixture of decomposing vegetable or food waste, cattle dung, bedding material, and vermicast. The vermicast is the end-product of the breakdown of organic matter by earthworms and used as the vermi-compost in crop fields.

The entire process takes 21-30 days to make the compost as vermicast. Usually, organic farmers using this vermi-cast during final land preparation in crop field. However, many of them have got good results even through topdressing during standing crops in the field.

Figure 1. View of preparation and use of vermi-compost in rural Bangladesh

Advantages of vermi-compost include enriching soil, increasing harvest yields and suppressing plant diseases. Moreover, it reduces farmers' cost of production as it can saves money for costly chemical fertilizers used in crop production (Sarker and Itohara, 2009). Organic farmers of Bangladesh also use green manure and biogas slurry as measures of improving soil fertility. However, due to rapid increase of poultry industry in rural Bangladesh starts using poultry litter (after fermentation) as good quality manure in organic crop cultivation (Sarker and Itohara, 2008a).

Botanical pesticide

Botanical pesticides are naturally occurring chemicals (insect toxins) extracted or derived from plants. They are also called natural insecticides, in some cases, over synthetic organic materials. However, organic farmers in Bangladesh prepare botanical pesticides from locally available plant materials. They usually follow water extraction methods. A list of the commonly used plants for preparing botanical pesticides is shown in Table 1.

Table 1. Plants used for preparing botanical pesticide

Name of the Plant	Picture	Plant parts used
Azadirachta indica (Neem)		Leaves and seeds
Polygonum tomentosum *(Knot weed)*		Leaves
Adhatoda vasica (Basak)		Leaves
Phanmixis polystachya *(Pithraj)*		Leaves and Seeds
Swietenia mahagoni *(Mahogoni)*		Leaves and seeds

Organic farmers of Bangladesh usually collect all these plant materials as mentioned in Table 1 in their free time, and then they chopped them properly and boil with water for 30-45 minutes up to change the natural colors of those plant materials. After that they keep this mixture for cooling. When the mixture become cool then they airtight the pot using mud and keep them for fermentations for 2-3 weeks. It takes 2 weeks in summer and 3 weeks in winter season for fermentation. After fermentation they extract the botanical pesticide and use it for controlling insect and diseases in their crop fields. Farmers usually use 50 ml of botanical pesticide with 10L of water and spray in their crop fields to protect their crops from attack of insect pests. It was reported that they have used this botanical pesticide both in paddy rice as well as vegetable crops (Sarker *et al.,* 2018). Figure 2 has shown the sequential process of preparing botanical pesticide by the organic farmers of Bangladesh.

Figure 2. View of preparing botanical pesticide by the farm families

This botanical pesticide requires no cost involvement; they can make by themselves and use in time of need, eco-friendly and no associated health hazards. Thus, over time it is getting popularity in many areas of Bangladesh (Sarker and Chowdhury, 2012).

Perching

Perching is a practice of clean cultivation and to use perching in the rice field which will act as a seat for the birds as a means of biological control of insects. Farmers erected bamboo poles or branches of trees in their paddy field at a particular distance. In search of food, birds perch on the poles/branches and eat pests those are usually harmful for the plants, thus protecting crops and making the use of pesticides redundant, he added. There are two types of perch—i.e., live and dead perch.

Figure 3. View of Perching in organic rice paddy

Perching is really an inexpensive method of controlling insect pests and termed as a biological control method of pests. However, initially the community farmers were reluctant not to use this simple practice. But over time, it has gained popularity and the Department of Agricultural Extension (DAE) the mainstream extension organization in the country has adopted perching as a promising practice in pest control and has taken massive programme to promote perching over the country.

Myth of science based organic agriculture

"When health is absent, wisdom cannot reveal itself, art cannot manifest, strength cannot fight, wealth becomes useless, and intelligence cannot be applied."

— Herophilus

There is a growing body of evidence that shows some potential health benefits of organic foods when compared with conventionally grown foods. "Potential benefits include the following:

- ✓ ***Nutrients:*** There is enough evidence that organic food have shown small to moderate increase in some nutrients. The best evidence of a significant increase is in certain types of flavonoids, which have antioxidant properties.

- ✓ ***Omega-3 fatty acids:*** There is strong evidence that organic livestock feed with organic grass and alfalfa can provide higher levels of omega-3 fatty acids, a kind of fat that is more heart healthy than other fats. These higher omega-3 fatty acids are found n organic meats and eggs.

- ✓ ***Toxic metal:*** Cadmium is a toxic chemical naturally found in soils and absorbed by plants. However, there is proved that organic grain has lower cadmium. The lower cadmium levels in organic grains may be related to the ban on synthetic fertilizers in organic farming.

- ✓ ***Pesticide residue:*** Compared with conventionally grown produce, organic foods have lower detectable levels of pesticide residue. Organic produce may have residue because of airborne pesticide contamination from conventional farms.

- ✓ ***Bacteria:*** Meats produced conventionally may have a higher occurrence of bacteria resistant to antibiotic treatment" (Mayo Clinic, ND).

Thus, it can be concluded that the myth of organic agriculture is for better human health as well as better animal and environmental health.

Problems of organic agriculture in Bangladesh

Having all sorts of potentials organic agriculture in Bangladesh is growing slowly compared to expected rate. However, it has still some strong problems those need to be resolved for rapid expansion and really flourish

as a successful sector for getting a share from the global organic market. A study of Sarker and Itohara (2008a) identify the following problems for organic agriculture development in Bangladesh. The problems are as follows:

- Poor technical knowledge of the farmers' on organic practices;
- Insufficient organic inputs;
- Poor research and extension support for organic agriculture from public sector;
- No specialized market for organic produce; and
- Lack of institutional structure for certification.

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