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Invited Review Article

# Scope and challenges of organic wheat cultivation in Bangladesh

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**Abstract**

Due to continuous health awareness of the consumers towards organic food, organic wheat is being popular globally. Western Europe, North America, Japan and Australia are considered major markets for organic wheat where there to be few export opportunities for developing countries like Bangladesh in these markets. On the other hand, Bangladeshi farmers are producing organic wheat by default as many of them do not have affordability to costly chemicals. Moreover, the country has a wide range of wheat varieties those are tolerant to disease and insect pests, surplus labors, and an abundance of indigenous knowledge to manage their farm organically. However, there is no active initiative from the public sector extension organizations to promote organic wheat cultivation among the general farmers. Organic farmers are organized here by the initiatives of some NGOs and there are no controlling systems and certification bodies for organic produces except organic shrimp and tea. Despite of having these sorts of major challenges, Bangladesh has good prospects in organic wheat cultivation. Our study reveal that the key to translate the possibilities into realities is the better partnership and cooperation among organic wheat farmers, NGOs, certifiers, marketing people (both local and export), state and the programs that will support organic wheat cultivation and ultimately it will contribute in reducing poverty of the poor farmers of Bangladesh.

**Keywords:** wheat, *Triticum aestivum* L., scope, challenges, organic cultivation.
**Abbreviations:** ACS, Abacus Consulting Services; BARI, Bangladesh Agriculture Research Institute; BBS, Bangladesh Bureau of Statistics; BCSIR, Bangladesh Chemical Scientific and Industrial Research; BER, Bangladesh Economic Review; BINA, Bangladesh Institute of Nuclear Agriculture; DAE, Department of Agriculture Extension; FAO, Food and Agriculture Organization; FFS, Farmers' Field School; IAEA, International Atomic Energy Agency; ICP, Inter Country Program; IDCOL, Infrastructure Development Company Ltd; IFRI, International Food Policy Research Institute; IGC, International Grain Council; IPM, Integrated Pest Management; LFSR, Labour Force Survey Report; MOA, Ministry of Agriculture; m ton, Metric Tons; NGOs, Non Government Organizations; SDNP, Sustainable Development Networking Programme; USDS, United States of Department of State; WFS, World Food Summit.

## Introduction

Wheat (*Triticum aestivum* L.) is a worldwide cultivated grass from the Fertile Crescent region of the Near East. In 2007 world production of wheat was 607 million tons, making it the third most-produced cereal after maize (784 million tons) and rice (651 million tons). Wheat grain is a staple food to make flour and livestock feed (ACS, 2004). However, wheat is not a traditional crop in Bangladesh, and in the late 1980s little was consumed in rural areas. In the first half of the 1980s, domestic wheat production rose to more than 1 million tons per year but was still only 7 to 9% of total food grain production. By comparison, wheat output in 2005-2006 was 0.9 million m tons (USDS, 2009). Currently about 1.0 million tons of wheat is being produced in Bangladesh from 0.40 million ha against the national demand of 3.0-3.5 million tons and the country needs to import about 2.0-2.5 million ton wheat every year (BARI, 2010). However, it is clear from the above mentioned table that both acreage and production of wheat is declining in the country in recent times.

## Brief history of wheat in Bangladesh

After freedom, in 1971, Bangladesh faced an acute food shortage. Production of rice, the main crop, declined because of the disruptions of virtually all agricultural activities during the War of Liberation, and also due to various natural calamities, such as floods, droughts, cyclones, and rapid population growth. It was realized that though about 80% of the total cropped area of Bangladesh is devoted to rice cultivation, rice alone could not meet the food requirement of the country (Banglapedia, 2006). Wheat was therefore chosen as an alternate food crop in the winter season, which remains mostly free from natural calamities. In 1975 the government imported 4000 m tons of seed. Prior to 1975-76, wheat was grown sporadically and was almost an unknown crop in Bangladesh (Banglapedia, 2006). Today, among the cereal crops, it is next to rice in importance. It occupies about 4% of the total cropped area and 11% of the area cropped in the Rabi season, and contributes 7% to the total output of food cereals (BBS, 2008).

**Table 1.** Acreage, production and yield of wheat in Bangladesh (2000-2007)

| Year | Acreage (in 000 acre) | Production (in 000 m.ton) | Yield (kg/acre) |
|---|---|---|---|
| 2000-01 | 1909 | 1673 | 876 |
| 2001-02 | 1833 | 1606 | 876 |
| 2002-03 | 1746 | 1507 | 863 |
| 2003-04 | 1586 | 1253 | 790 |
| 2004-05 | 1380 | 976 | 707 |
| 2005-06 | 1184 | 735 | 620 |
| 2006-07 | 988 | 737 | 746 |

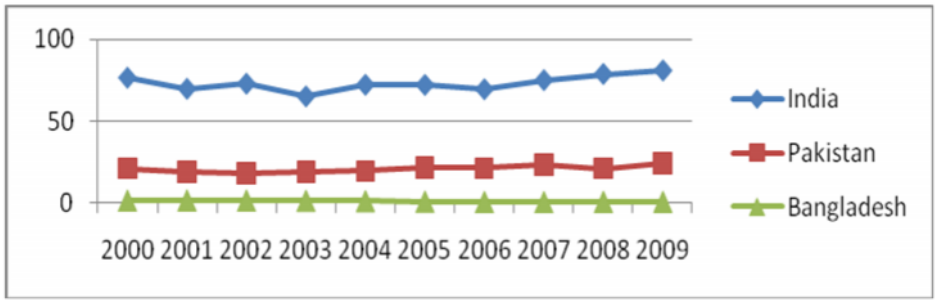


**Fig 1.** Production trends of wheat in India, Pakistan and Bangladesh (2000-2009)
Source: BER (2010) & IGC (2009)

Though, almost 50% of the total world production of grain crop is occupied by wheat. Although wheat is less important than rice and it is now recognized as the second alternative cereal crop in Bangladesh (IFRI, 1997; Hasan et al., 2008).

**Cultivation of wheat in Bangladesh**

Wheat is grown under a wide range of climatic and soil conditions. It grows well in clay-loam soils. In Bangladesh it is a crop of Rabi season, requires dry weather and bright sunlight. Well distributed rainfall between 40 and 110 cm is congenial for its growth. Depending on variety and weather conditions, 100-120 days are required from sowing to harvest (BARI, 2009). Farmers in Bangladesh grow wheat fitting the crop in their intensive rice-based cropping systems. About 80% of wheat area is planted in a three-crop rotation, 60% being *aush* rice, transplanted *aman* rice-wheat and 20% being jute-transplanted *aman* rice-wheat. About 2 million farmers have benefited from wheat cultivation; about 0.6 million people are employed for a period of 120 man-days during the wheat season, and 20 million m tons of wheat worth US$ 3.4 billion has been produced in a period of 20 years (1975/76-1995/96). The production trend of wheat in Bangladesh is relatively declining compared to India and Pakistan (shown in Figure 1) (IGC, 2009).However, statistical information on organic wheat production in globally (FAO, 2003) as well as in Bangladesh perspective is limited. In absence of the wheat program, the country would have had to import on an average about 0.9 million tons more food grains annually. Thus, wheat cultivation is saving some foreign currencies.

**Popular wheat varieties in Bangladesh**

Wheat varieties released from Bangladesh Agricultural Research Institute (BARI) are popular among the wheat farmers in Bangladesh. In recent time, most commonly used wheat varieties are Shatabdi (BARI wheat 21), Sufi (BARI wheat 22), Bijoy (BARI wheat 23) and Prodip (BARI wheat 24). A brief description of the above mentioned wheat varieties are given in Table 2.

**Scenario of organic wheat in global perspective**

Due to rising consumer demand for organic pasta, cereal, and bread products signals a need for more organic flours and oils. Organic wheat prices are less volatile in the world than prices for conventional wheat, and premiums for organic wheat have remained steady for several years, at about 50% more than conventional (Nancy, 2004). As the organic bread industry is expanding very rapidly in Europe, Australia and North America. Thus, the demand for organic wheat is also increasing day by day.

**Scope of organic wheat cultivation in Bangladesh**

Organic wheat cultivation is a holistic system that focuses on improvement of soil health, use of local inputs, and relatively high-intensity use of local labor, fits admirable for rural Bangladesh in many ways. The rural Bangladesh offers much remuneration that would make organic cultivation (rice, wheat, vegetables etc.) methods relatively easy to implement (Sarker & Itohara, 2008).

***1. Rich varietal diversity***

Varietal diversity is a distinctive characteristic of organic wheat cultivation. In Bangladesh there are a wide range of wheat varieties like Sonalika, Kanchan, Balaka, Ananda, Akbar, Barkat, and Aghrani etc. In addition, Bangladesh Agricultural Research Institute has also developed 26 high yielding wheat varieties in the country (BARI, 2009).

***2. Surplus labor forces***

Due to special characteristics, organic agriculture requires more number of manual labors. Bangladesh has a surplus labor force of more 2 million among which nearly one and a half million live in rural areas. Moreover, every year the

country is adding fewer than 2 million fresh workers into the labor market (LFSR, 2003).

**Table 2.** Description of commonly used wheat varieties in Bangladesh

| Character | BARI wheat 21 | BARI wheat 22 | BARI wheat 23 | BARI wheat 24 |
|---|---|---|---|---|
| Images |  |  |  |  |
| Identifying character | It is a semi-dwarf variety with good tillering ability and high yield. The leaves are broad, recurved and light green in color. Flag leaves are also broad and droopy. The plants are light green in color with very weak glaucosity in the spike, culm and flag leaf sheath. Lower glume beak is long and the lower glume shoulder shape is elevated. | It is a semi-dwarf variety with good tillering ability. The leaves are broad, recurved and light green in color. Flag leaves are also broad and droopy. The plants are light green in color with very weak glaucosity in the spike, culm and flag leaf sheath. Lower glume beak is long and the lower glume shoulder shape is elevated. | It is a semi-dwarf variety with good tillering ability. The leaves are broad, recurved and light green in color. Flag leaves are also broad and droopy. The plants are light green in color with moderate glaucosity in the spike, culm and flag leaf sheath. Thousand-grain weight is very high (47-52g). | It is a semi-dwarf high yielding ability and heat tolerant variety. The leaves are broad, recurved and light green in color. Flag leaves are also broad and droopy. The plants are light green in color with weak glaucosity in the spike, culm and flag leaf sheath. |
| Crop duration | 105-110 days | 105-110 days | 103-112 days | 102-110 days |
| Yield (ton/ha) | 3.6-5.0 | 3.6-5.0 | 4.3-5.0 | 4.3-5.1 |
| Major insect pests | No major insect problem | No major insect problem | No major insect problem | No major insect problem |
| Major diseases | Highly tolerant to *Bipolaris* leaf blight and resistant to leaf rust diseases. | Highly tolerant to *Bipolaris* leaf blight and resistant to leaf rust diseases. | Highly tolerant to *Bipolaris* leaf blight and resistant to leaf rust diseases. | Highly tolerant to *Bipolaris* leaf blight and resistant to leaf rust diseases. |

Source: BARI (2009)

The intensive promotion of organic farming can create new employment opportunities for these surplus labor forces. The study of Gupta and Sharma (1996) also supported that as a labor-intensive enterprise, organic agriculture can contribute to local employment and to proper utilization of human resource.

***3. Abundance of local inputs***

The central focus of organic wheat farming is to maintain and improve soil health, avoid pollutants, and to rely on local inputs and labor. In terms of input supply, Bangladesh is very rich in local resources suitable for supporting organic farming. Appropriately handled animal and human wastes are the best organic fertilizers that are rich in many essential plant nutrients (shown in Table 4). In Bangladesh, animal populations are also growing by 0.63 % per year and poultry populations are growing by 6.86% per year (Table 4) for the last decade. The cattle dung is still a principal source of fertilizer in Bangladesh. The total cattle dung production in the year 2000 was estimated at 80 million tones, of which only about 60% is used as fertilizer in the field (IDCOL, 2006). Most of the farm households raise livestock like cattle and buffalo. Livestock is mainly kept for milk, meat and fertilizer in rural Bangladesh.Farmers in Bangladesh are traditionally accustomed to compost preparation by using local input like water hyacinth, cow dung, fodder leftovers, weeds, ash, fallen leaves, used tea granule, kitchen wastes, slaughtered house waste and organic wastes collected from municipal areas. Moreover, the Government of Bangladesh has promoted bio-gas technology in rural areas through a pilot project by BCSIR during the period of July 1995 to June 2000 (1st phase) and during the period July 2000 to June 2004 (2nd Phase). During this period, as many as 21,858 fixed dome plants were put forth throughout the country (IDCOL, 2006). The bio-gas technology has already gained popularity among the affordable farmers since it meets their energy demands and at the same time providing them with good quality slurry that increases crop yield and reduces production cost. According to Grameen Shakti (2006), a sister organization of Grameen Bank, Bangladesh has the potential to build 4 millions of such bio-gas plants. Also worth nothing, the poultry industry has expanded drastically in many regions of Bangladesh, and the poultry farms are highly interested in biogas technology since it helps them to get rid of poultry wastes, to meet their energy needs and to earn extra income by selling biogas and slurry. Farmers from the poultry production regions are becoming more interested in buying slurry from biogas plants because this reduces their farming costs and increases their crop yield (Grameen Shakti, 2006). The increase of population has made land scares in Bangladesh. Therefore, cultivation of green manure, a tradition mean of increasing soil fertility, has become an uneconomical to majority of the farmers. Even though, some farmers across the country still continues to cultivate green manure crops for increasing soil fertility. The commonly used green manure crops in Bangladesh are sunhemp (*Crotalaria juncea* L.), dhainch (*Sesbania rostrata* Bremek. & Oberm.), black gram (*Vigna mungo* (L.) Hepper), cow pea

**Table 3.** Unemployed labor forces (in million) in Bangladesh

| Types | 1995-96 | 1999-2000 | 2001-03 |
|---|---|---|---|
| Total | 1.3 | 1.8 | 2.0 |
| Urban | 0.4 | 0.6 | 0.6 |
| Rural | 0.9 | 1.2 | 1.4 |

Source: LFSR (2003)

(*Lathyrus sativa* L.) etc. Moreover, Bangladesh Institute of Nuclear Agriculture (BINA) has developed bio-fertilizer (inoculums of the symbiotic bacteria Rhizobium) for grain legumes crops which can fix atmospheric nitrogen using the nodules formed in legume plants that can increase 15-40% yield of grain legumes (like lentil, chickpea, ground nut, mungbean, soybean etc.) (BINA, 2010). Due to the promotion of BINA in collaboration with the Department of Agricultural Extension (DAE), this bio-fertilizer has been getting popular among farmers of Bangladesh (IAEA, 2006). At present, a number of public companies are producing bio-fertilizer commercially by using *Azotobacter* spp. and *Azolla* spp. to meet the demands of the farmers. On the other hand, several sources of bio-pesticides, like neem (*Azadiracta indica* L.), bishkanthali (*Hydropiper polygonum* L.), and Calatropis spp, garlic (*Allium sativum* L.) and tobacco (*Nicotiana tabacum* L.) are abundant in all most all regions of Bangladesh (BBS, 2007). For controlling pests in both rice and a vegetables crop; the uses of integrated pest management (IPM) is also becoming popular day by day in Bangladesh.

IPM was first introduced in 1981 under the first phase of FAO's inter-country program (ICP) in rice crops. Later in 1987, IPM activities began to expand and it became a popular topic among people of the farming community. From 1989 to 1995, the ICP played a strong catalytic role in promoting the IPM concept and approach among the government officials and donor communities. This program provided support to build the training capacity of the Department of Agricultural Extension (DAE) and introduced Farmer Field Schools (FFS) for training of farmers (MOA, 2006). A number of persons from the non-government organizations (NGOs) were also given training on IPM. The success of the program and the need for IPM in Bangladesh have prompted the introduction of a number of IPM projects in rice and vegetables are building the farmers' capacity to control insect, disease and pests without using pesticides. Now, DAE has been promoting IPM through initiatives like developing community IPM through farmer-farmer training, incorporating IPM issues in school curriculum and forming IPM club/ IPM congress etc. The knowledge of IPM may be beneficial for the organic farmers in controlling pests in their organic method of crop cultivation (Schonbeck, 2007).

**Challenges for organic wheat cultivation in Bangladesh**

The most serious constraints to organic wheat production in Bangladesh is a biotic stresses, the unusual warming trends during grain filling period are causing yield declines. There are other challenges that are specific to the highly productive rice–wheat cropping system predominant in the Gangetic flood plains. The total factor productivity of this system is declining due to depletion of soil organic carbon. Addition of organic matter to soil through green manure and crop residue recycling, balanced fertilization, integrated nutrient management, diversification of rice-wheat system are some of the possible remedial measures to improve total factor productivity (Chatrath *et al.*, 2007). Another major challenge for expansion of organic wheat in Bangladesh is policy problem. Organic farming movement was launched in Bangladesh in the early 1980's, but unfortunately, the sector has failed to draw the proper attention of policymakers. With a huge population to feed, the policymakers in the area of agriculture were more concerned about food security through increased production. But the actual definition of the term "food security" covers more area than to the increase in food production (WFS, 1996), According to World Food Summit (1996), "Food security" not only means the availability of foods but also the physical and economic access of all people, at all times to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. However, the policy area of Bangladesh generally views food security in terms of some important components like availability, access and utilization of foods. The Government is committed to the continued development of agriculture in order to maintain food supply to the growing population, provide income and employment for rural people, and protect the environment. With this goal the Department of Agricultural Extension (DAE) has developed New Agricultural Extension Policy in 1996 where one specific policy objective was to reduce environmental degradation from July 1995 to June 2010. But the policy never got translated into programs and actions.

DAE did not yet take sufficient initiatives to promote organic farming which has already become popular to scientists and researchers throughout the world, and has already got considerable attention from both government sectors and the NGOs of many South Asian countries like India, Nepal, and Sri Lanka. Though, few NGOs are promoting organic farming in Bangladesh but their attention is focused on high value vegetables and aromatic rice. Thus, for expansion of organic wheat cultivation proper attention is needed by the agricultural policy makers. In addition, due to the lack of certification, farmers in Bangladesh have been missing the real essence of price premium of organic produce. Thus, similar to other organic crops it is essential to develop certification system for organic wheat that will ensure easy access of Bangladesh's organic wheat in the developed countries where it has high demand. As the Government of Bangladesh does not have any patronization for organic farming, the concerned NGOs can develop private certification bodies providing the option of individual and group certification as recommended by IFOAM.

In this regard, careful attention must be paid to the ability of farmers in determining the cost of certification. The concerned NGOs can also make a bridge between the organic wheat farmers and exporters for smooth marketing of the organic wheat. They can even lobby with the exporters to pay a percentage of the certification costs. This type of certification program may create a good environment of exporting organic wheat to the developed countries and help in poverty reduction of the poor farmers in Bangladesh.

**Conclusions**

In spite of having a wide range of wheat varieties, surplus labors, and an abundance of indigenous knowledge, many Bangladeshi farmers have been cultivating wheat organically by default. Regardless of having some major challenges including the lack of political recognition, Bangladesh has good prospects in organic wheat cultivation. By updating these age-old organic systems with modern research and

**Table 4.** Nutrient availability per year in the excretions of animals and human

| Source | Extract/unit/yr (kg) | Urine/unit/yr (liter) | Available Nitrogen (kg) | Available Phosphorus (kg) | Available Potassium (kg) |
|---|---|---|---|---|---|
| Cow | 6000 | 2000 | 36 | 8 | 16 |
| Bullock | 8000 | 2500 | 44 | 11 | 23 |
| Sheep/goat | 500 | 160 | 26.5 | 3.6 | 6.3 |
| Human | 110 | 400 | 14.3 | 8.9 | 7.7 |

Source: Sharma (2005)

**Table 5.** Livestock population (in million) in Bangladesh

| Types | Agricultural Census, 1996 | Agriculture Sample Survey, 2005 |
|---|---|---|
| Bovine animal | 22.29 | 25.13 |
| Sheep & goat | 14.61 | 17.46 |
| Poultry | 126.66 | 188.4 |

Source: BBS (2004 & 2006)

technologies we may open the door of endless possibilities of improving soil health, taking care of environment, and providing sustainable livelihoods for the peoples of the farming community in Bangladesh through organic wheat cultivation. The key to translate those possibilities into realities is the better partnership and cooperation among organic wheat farmers, NGOs, certifiers, marketing people (both local and export), state and the programs that will support organic wheat cultivation. By working together it may easily achieve the goals of promoting organic wheat in the country and can create markets for organic wheat locally, regionally and globally and ultimately it will contribute in reducing poverty of the poor farmers of Bangladesh.

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