

Market-led Initiatives for Seed Production and Product Processing in Bangladesh

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1. INTRODUCTION

The growth of the market-oriented agriculture is dependent on the sustainable growth and development of an organized production, processing and marketing system. The farmers are usually not organized as groups of specialized agricultural producers. Therefore, the producers of different agricultural products need stable markets to sustain production using more and more advanced technology. In organizing the agribusiness aiming at sustainable development of agriculture one has to plan for organized production of the commodity within an appropriately diversified production system (Rahman, 1977, 1995, 2001). This will help development of a processing and marketing system for a product in any given area with ensured price.

Agricultural production system is highly dependent on quality seeds. This is the sub-sector where we are in extreme disorder and totally dependent on a concept that importation of seeds can do the best, a concept that does not support the agricultural production system of Bangladesh in the years to come. It is possible to have this sector organized to help development of sustainable agriculture in Bangladesh. We have a very resourceful plant genetic base in this country, which are eroding fast due mostly to unplanned development of infrastructures, houses, population pressure, over exploitation of plant species for medicinal business, etc.

With the spread of high yielding varieties of crops, a market for improved quality seed has emerged. Side by side with the growth of seed trade in the private sector, farmers took up production of quality seeds in response to market demand. Despite notable initiatives towards seed production at a commercial scale, farmers face constraints in respect of processing, preservation and marketing of seed. Lack of quality control and efficient seed certification arrangements often put the

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farmers at disadvantage. Farmers do not necessarily get higher prices for better quality seeds. This paper attempts to discuss the seed development issues with emphasis on farmers' initiatives to take up seed production and plant nursery development as commercial ventures. The paper also discusses the issues related to processing of soybean, a high value oilseed crop that has huge market potential.

2. SEED BASE AND THE BUSINESS

There are more than 163 cultivated crop species in Bangladesh (Rekhi et al. 1996), the seeds of which are in fact very important ones in the system of production. The yields and the quality of the agricultural commodities are highly dependent on the quality of the seeds, be that a plant variety, or a tree species or livestock and poultry birds or the fish species. The crop seed production and supply in Bangladesh as shown in the Table 1 clearly indicates that there is high demand and very low supply of high quality seeds of the varieties under cultivation, with exceptions to imported seed items of vegetables and high input crops like maize, and hybrid rice. The issues of sustainable development of agriculture do consist of development and maintenance of different varieties of crops in different areas of the country as practiced in China. The demand and supply situation indicate that the scope for organized business with quality seed production and marketing even at regional level is high provided effective monitoring of the market is done as per seed rules and laws of the country.

The basic problems in seed production, processing and marketing in Bangladesh are that the production system is not organized, the contract growers are not trained as required, the private sector companies and traders lack commitment of maintaining quality, dealers control the quantity in the market thereby the price of the seeds and packaging are not appropriate. There is no protection for the farmers against any unscrupulous activities of the seed dealers or companies. Moreover, government has no effectively organized control systems for seed market price, general product price and purchase system after the harvest. These result into low price of the products produced using high price seeds as well as inputs and labour. Considering these issues the farmers need to save and their own seeds for four major reasons. These are:

- (i) They know the variety, the characteristics of the seed, their own system of processing and preservation and they also know that it may be difficult to get such quality seeds from the market at the time of their sowing.
- (ii) The organized competitive seed markets have not been developed, so the price and the variation in quality found during the sowing season could cause difficulties in getting seeds of the crop for which they have planned

- (iii) During sowing season they can market the extra quantity of their seeds for a good price.
- (iv) The low seed replacement rate is also due to the lack of availability, affordability and accessibility of high-quality, dependable seeds.

A large portion of the agricultural population of Bangladesh is directly and indirectly involved in the seed production and marketing system. There are farmers producing seeds for own use, for BADC, NGOs and Private companies as contract growers. Therefore, many of the farmers do know about the seed crops, their production and processing systems. It is interesting to note that when the farmers use their own seeds or sell their seeds to relatives / neighbours, the germination is better and the crop is good than when seeds from the general markets are used (Rahman et.al., 1992). In a study of BRAC (Hossain et al, 2002), it was observed that the rice yield of 5.5 tons/ha was obtained with the farmers' saved seeds while yield from private company seeds, BADCs seed, DAEs seed and fellow farmers' seeds were 5.24, 5.86, 5.23 and 5.6 tons per ha. This indicates that the farmers own saved seeds are in no way less productive than those of others. Then why not we train more farmers to produce high quality seeds for their own use and encourage development of small-scale seed market within their neighbourhoods.

3. PRIVATE SEED INDUSTRY DEVELOPMENT ISSUES

The private seed sector needs to grow faster so that it can play a major role not only in producing and marketing quality seeds to satisfy the demand (Table 1), but also in conducting seed-related research and development activities in Bangladesh with participation of the farming community. It is a challenge for any country to develop a demand-driven seed industry capable of timely production and marketing of a perishable product such as seed. But for Bangladesh, the challenge is even more complex than in developed countries. Here, seed industry pioneers face many problems like:

- i) A hot and humid climate, usually not suitable for quality seeds of many varieties/crops.
- ii) Land fragmentation, which limits the amount of large agricultural landholding available at the private level.
- iii) A lack of contract growing groups with capabilities of growing quality seeds on their own.
- iv) Inadequate govt. policies for supporting seed processing and marketing groups.
- v) Dominance of economically disadvantaged small and medium farmers, and sharecroppers in the farming community.

Table 1: Total quantity of seed need of different crops, quality seed supply and recommendation for supply for 2003-2010 (Task force report 2003)

| Sl. Crops & Ecotypes # | Acreage* 000 | Total Demand Seed (Toal)* | Total seed supplied (T)* | Supply as % of demand | % Seed supply recomm ended |
|--------------------------|-----------------|---------------------------|--------------------------|-----------------------|----------------------------|
| 1 Rice Total | 10243 | 434340 | 12518 | 2.89 | 4-8 |
| Modern Varieties | 5832 | 174960 | 12518 | 7.16 | 8-15 |
| Aus Total | 1495 | 117790 | 633 | 0.54 | 1-2 |
| Modern Varieties | 453 | 13590 | 633 | 4.66 | 5-10 |
| Aman Total | 5627 | 222920 | 5416 | 2.43 | 3-7 |
| Modern varieties | 2503 | 75040 | 5416 | 2.71 | 9-16 |
| Boro Total | 2131 | 93630 | 6469 | 6.91 | 8-78 |
| Modern Varieties | 2876 | 86280 | 6469 | 7.49 | 9-20 |
| 2 Wheat | 786 | 94320 | 19758 | 20.95 | 22-26 |
| 3 Maize | 9 | 270 | 800 | 185.17 | 100 |
| 4 Jute | 486 | 3888 | 963 | 27.06 | 30-48 |
| 5 Oilseeds | 511 | 11609 | 301 | 2.59 | 4-8 |
| a. Mustard/Rapeseed | 338 | 6760 | 152 | 2.25 | 3-5 |
| b. Sesame | 71 | 567 | 2 | 0.35 | 1-2 |
| c. Linseed | 56 | 672 | 0 | 0.00 | 1-2 |
| d. Groundnut | 35 | 3500 | 105 | 2.99 | 5-12 |
| e. Sunflower | - | 110 | 22 | 20.00 | 70-100 |
| 6 Pulses | 655 | 25740 | 335 | 1.30 | 1.4-2.0 |
| a. Grass pea | 221 | 8840 | 0 | 0.00 | 0.05-0.10 |
| b. Lentil | 198 | 5940 | 60 | 1.01 | 1.34-1.85 |
| c. Chickpea | 71 | 2840 | 36 | 1.27 | 2.0-2.8 |
| d. Black gram | 57 | 1710 | 14 | 0.82 | 1.57-2.63 |
| e. Mung bean | 55 | 1650 | 22 | 1.33 | 2.42-3.90 |
| f. Field pea | 18 | 1250 | 3 | 0.24 | 0.30-0.40 |
| g. Soybean | 35 | 3500 | 125 | 3.57 | 4-5 |
| 7 Vegetables | 509 | 1923 | 814 | 42.31 | 50-65 |
| Total true seeds | | 572090 | 36550 | 6.39 | 7-11 |
| 8 Potato Total | 178 | 231608 | 9969 | 4.41 | 6-17 |
| Modern varieties | 107 | 160344 | 9969 | 5.94 | 9-24 |
| 9 Sugarcane Total | 174 | 850000 | 206000 | 24.23 | 25-32 |
| a. Mill Zone | 94 | 45000 | 205740 | 4572 | 41-56 |
| b. Non-Mill Zone | 80 | 400000 | 260 | 0.07 | 0.75-2.0 |
| Grand Total | | 1653698 | 252569 | 15.28 | 16-30 |

*All data are based on the average of 5 years from 1995 to 2000)

Some of the challenges can be addressed directly; others will require some intermediate development activities. For example, farmers can be provided with training in high quality seed production technology, and can be organized by

private seed industries to become contract seed producers. But individuals, groups and NGOs trying to produce and market quality seeds are doing their works in isolation leading to questionable quality and aiming at variable profit margins. They will need to be brought under one national organization having capability to monitor and control quality. This will coordinate the collective efforts of the companies involved in the seed business along with extending help to plan and execute the programmes of quality seed replacement system. Otherwise, the possibility of low quality - high priced seeds inundating the market cannot be avoided.

It appears that the development of a true private sector seed industry from a collection of seed trading houses is taking long time since the process began in 1990, when a new seed policy was developed and adopted in 1993 to liberalize the regulatory environment surrounding private seed production and marketing. So, the Seed Industry, as we call them, still consists mostly of traders who import high-value low-volume seeds in large quantities and sell them in the market with high profits. This they do considering that the farmers' seed base is likely to remain the biggest source of crop seeds for some more years to come. This attitude is creating dependence on imported seeds. This is why an effective planning for establishing a successful seed business in Bangladesh is necessary. Any business venturing to establish and develop a stable market niche in the seed industry in Bangladesh will need careful study and monitoring of the seed base, and develop a well-defined variety replacement schedule using the techno-managerial knowledge and skills. Based on the situation prevailing now, the following support will be needed to encourage investment in private seed industry development:

- i) Land leasing
- ii) Longer tax holidays
- iii) Maintenance of Plant Genetic Resources (PGR)
- iv) Support for plant variety rights as per rules framed by Bangladesh
- v) Support for breeders' and foundation seeds
- vi) Support for research and development of production technologies
- vii) Support of public sector experts for advancing the technology even by using Biotechnology
- viii) Organizing training on seed technology
- ix) Promotional activities on seed use for farmers
- x) Support for visits to other countries to get experience for stages of development
- xi) Support for establishing effective linkage between farmers and market for product marketing at good price to help stable seed demand.

For a number of years there have been a number of donor-supported and loan-funded programmes to support seed industry development in Bangladesh. Many of their activities are complementary, however, some avoidable duplications of effort exist. There is no organized center through which the information on seed sector industries can be obtained. To avoid these gaps the government has very recently established 'seed industry development project' with support from the DANIDA. This programme is required to help understanding the needed activities in developing an appropriately designed Private Seed Industry with capabilities of effective technical, managerial and physical facility to serve the seed sub-sector. But any attempt of developing seed industry and not helping better price of the products or ensured market at fixed price will not stand the test of time.

4. WHY FARMERS' SEED?

The Bangladeshi seed industry is evolving within the context of a traditional agrarian society. Ninety-four per cent of the seeds used for crops are collected, processed and preserved at the household level. Unfortunately, many of the traditional methods used not only fall below the commercial production standards, but are also sometimes deleterious to the farmers' own crops. The overall quality of seeds has been deteriorating over time. The Bangladesh government has been aware of the need for organized seed production, processing, storage and marketing of quality seeds. They have been trying for the past 30 years through BADC to find ways to ensure the wider availability of high quality seeds at a reasonable cost. Bangladesh Agricultural Development Corporation (BADC) is in the forefront of these efforts. Despite these efforts, their production levels have consistently fallen short of the increasing needs of the farmers. They have never been able to meet more than six per cent of the country's annual seed needs.

If more market research with self-produced seeds could be conducted, we could better determine how to encourage faster adoption of not only hybrids and open pollinated varieties, but also of different varieties of the same crop developed especially for specific Agro-Ecological Zones. It may also encourage greater investment in the seed industry. The efforts of self-production are contrary to the intention of the farmers purchasing seeds from companies but with effectively organized programme, which may be integrated into industrial production system with appropriate training and motivation to maintain quality. This situation is common in many developing countries (Tripp, 1995). Even in India, the amount of truthfully labeled seeds being used has increased only to a limited degree, and that also only recently.

Currently, farmers are replacing about 5.8 per cent of their seeds each year. Some nearby countries such as Pakistan have a similar rate of replacement. India's replacement rate varies between one and 62 per cent; major crop seeds vary within the range of 7 to 35 per cent (Asian Seeds 5 and 6, 1994). Seed replacement rates in Indonesia are 0.8 per cent for maize, but 24.7 per cent for rice (Asian Seed 5, 1994). In UK, during late '80s, about 30 per cent of seeds used were of farmers' own saved ones (Kelly and Bowing, 1990). In the USA, more than 50 per cent of the wheat, barley and oats sown are from farmers' saved seeds (Jafee and Srivastava, 1994). In many tropical countries, however, the proportion of farmers' saved seeds is much higher, reaching up to 90 per cent (Goosman *et al.*, 1990). This is the case in Bangladesh too. And the quality of the farmer' saved seeds are also not bad as has already been observed through studies (Rahman, et al 1992 and Hussain et al, 2002)

Table 2: Growth and characteristics of rice seeds from different sources (Asian seeds 4(1): 4, 1997)

| Indicators | Government seed | Farmer's seed | Miller's Grain |
|--|-----------------|---------------|----------------|
| Quality of seed samples | 98.05 | 96.30 | 90.65 |
| Germination (%) | 99.52 | 94.35 | 93.91 |
| Vigor (%) 93.10 | 90.00 | 87.30 | |
| Inert materials (%) | 0.48 | 5.64 | 6.09 |
| Moisture content (%) | 11.85 | 12.13 | 12.38 |
| Off-types (%) Nil | 2.13 | 4.26 | |
| Growth rate: Number of Tillers/hill | 14.10 | 13.64 | 12.31 |
| Panicle/m ² | 166.41 | 147.20 | 157.60 |
| Yield and yield components | | | |
| Number of good seeds/panicle | 144.0 | 122.00 | 113.00 |
| Weight of 100 seeds (g) | 2.63 | 2.62 | 2.59 |
| Yield (Kg/ha) | 5.01 | 4.59 | 4.51 |
| Off types (%) | 0.01 | 4.92 | 6.96 |
| Rice quality: Head rice (%) | 45.40 | 42.80 | 42.00 |
| Amylose content (%) | 14.90 | 16.28 | 16.42 |
| Gel consistency (%) | 89.00 | 84.40 | 82.60 |
| Disintegration lye (mm) | 7.00 | 7.00 | 6.98 |
| Level of aroma (0-4) | 1.80 | 1.80 | 1.60 |
| Selling price: Miller's price (\$/ton) | 222.80 | 219.40 | 218.40 |
| Gross income (\$/ton) | 1,119.00 | 1,008.00 | 984.00 |

A comparative study on the performance of the seeds of government, farmers and mill sources indicate that the variations are not much in respect of yield, quality and returns from the products (Table 2). Rahman *et al.* (1992) also found that farmers' retained seeds tested as good as BADC's seeds – but only when those were used by the farmers themselves or their relatives and not when that was purchased/ sold through general market and used as seed. The information given in the Table 1.2 clearly indicate that giving necessary training to the farmers for production and maintenance of quality seeds.

The farmers of different areas can be trained on crops of their interest along with the endangered ones for seed production, processing and storage in small to large quantities for making those available at the market during the period of need. This pattern will also make available quality seeds closest to the farming community and thereby; the uses of such seeds will increase in short space of time. And replacement rate of quality seeds will be higher. This will increase the production by increasing the yield per unit of area where data suggest very high gaps between the average national yield and the potential yields obtained by some farmers in some years (BBS 1992, FAO 1992, Hamid 1993). This will also ensure high quality products of similar nature over years so that commercialization of the crop producing become easier. The action plan should include participatory breeding, training for easy seed production, development of attitudes of sharing the good seeds in time of the needs, extending facilities for production, processing and storage of seed crops in different areas of the country, the bank support for quality seed production, seed crops, as well as helping the farming community in getting good price of their products produced using high tech and high quality seeds.

5. VILLAGE NURSERIES: A BUSINESS AND SUSTAINABLE PGR MAINTENANCE

5.1. The Potentials

There are about 5000 angiosperm species of Plant Genetic Resources (**PGR**) in Bangladesh (Khan 1994), many of which are being eroded due to population pressure, alleged development processes, unplanned housing and industrialization, unscrupulous business of herbal medicines and many other factors. In the recent past, during 1987-88 Swiss Development Cooperation (SDC) in collaboration with NGOs and Bangladesh Agricultural University (BAU) introduced plantation in crop fields, roadsides, homestead and other community places. This attempt did raise the awareness about the development of a system whereby the villagers got interested in nursery business. They were helped to develop nurseries of many different species wherefrom the villagers

could get the seedlings of their choice for planting, including developing woodlots and orchards. They were trained to take care of different issues related to agro-forestry and nursery. Through this programme, BAU did participate in developing the model and appropriate methods to raise seedlings of diverse species and those of endangered type.

Gradually, the nurserymen of various areas of the country started realising that the species of endemic nature are also valuable and can fetch better price; while the commercial types are required in large numbers and can be produced to support large scale needs of timbers, fruits and other needs. Now, these nurseries are the safe places for diverse plant types and their preservation areas. These are also the collectors of many different species including those, which many a times are considered to be weeds in crop fields, but are highly valued for medicinal purposes and also needed to be preserved for the sake of protection of the ecosystem. If and when the plant species of special purposes or of one particular purpose are grown in large numbers in one or the other areas, the potentials of their higher market facilities grow. This is more important to sustain the programme as well as help commercialisation of the production system leading to increasing the income of the people involved in the process and in the area without undermining the natural resource base. The study (Rahman and Siddique, 1997) observed that most of the NGOs working in the agro forestry programmes of SDC have raised and marketed a large volume of seedlings in most of the northern zones of the country.

Table 3: Yearwise number of tree saplings marketed by the nurseries of BSF Mymensingh belt (BSF annual report 2000 7p)

| Year | Homestead | Crop Field | Woodlot | Orchard | Total |
|--------------|-----------|------------|---------------|------------|-----------|
| 1994-5 | 78728 | 21819 | 8725(76) | 1235(31) | 1,10,614 |
| 1995-6 | 69372 | 21772 | 14114(109) | 6108(62) | 1,11,537 |
| 1996-7 | 74662 | 58284 | 12230(87) | 6215(47) | 1,51,525 |
| 1997-8 | 2,72,952 | 2,18,551 | 96763(416) | 10822(135) | 5,99,630 |
| 1998-9 | 3,25,201 | 2,66,139 | 97434(412) | 11765(126) | 7,01,077 |
| 1999-2000 | 5,32,992 | 4,28,396 | 1,49,256(642) | 40325(517) | 11,50,969 |
| Total | 13,53,907 | 10,14,961 | 378522 | 96470 | 28,23,860 |
| Sale outside | | | | | 8,57,780 |
| Stock 2001 | | | | | 22,76,379 |

Annual turn over @ Tk 5/sapling for '99-'00 was >20,00,000 =Tk.100,00,000 by about 125CF

Without much serious attention or approach by the government there has been considerable change in the patterns of production of vegetables, fruits and timber

trees in the areas lying on either sides of the highway from Mymensingh to Dhaka. This indicates that the market facilities opened with the opening of the highway and the fresh agricultural products and inputs have opened the possibilities of the farmers to do the production. They were however, motivated and trained for taking up programmes of vegetables, fruits and timber trees of special type by the Bangladesh Agricultural University as well as the Bangladesh Seed Foundation (BSF) during the period from 1987 to 2000. After the completion of the BAU's programme on agroforestry, there has been serious emphasis by BSF, on village based nursery development in Mymensingh belt with support from the SDC. During the end year of the project intervention (1999-2000), a total of 9 Upazilas of Mymensingh (Sadar, Trishal, Bhaluka, Muktagacha, Fulbaria, Phulpur, Gauripur, Iswarganj and Gafargaon) were covered by Agro-forestry programmes of BSF. In these areas it covered 1606 Mouzas of 118 unions, where there were 422 DAE blocks through 125 Village and Farm Forestry blocks. They directly served through training and motivation of 12,700 farm families in these areas with 125 nurseries.

However, the spillover effects of the nursery system were much higher than expected. In 1999-2000 alone there were plantation of 11,34,644 saplings in Bariland, crop fields, and wood lots in different unions of 9 Upazilas (Table 3). The rate of plantation increased by 67.55 percent over that of the previous year, where the number planted were 6,88,782 with a survival rate of 83.02. These indicate that the people have realized the importance of tree plantation not only in homestead, but also in crop field (Khetland) and making orchards and woodlots in their land area available. This was also visible during the last Tree Fair 2003 in Mymensingh town hall area, where except for the government nurseries; all others were established in this profession by intervention of BAU and BSF in this area. Just to note that in the year 1999-2000, the 125 nurseries of the area sold a total of 16,76,659 saplings and had a nursery stock of 22,76,379 for the next year. These information indicate that a huge business can be done by many of the people of the villages at their own level while serving the cause of sustainable development of the area, agriculture and the preservation the Plant Genetic Resources of high value of the country and they can easily be supported by the experts like us. The data in the Table 3.1 indicate that the resource may be limited but the potential is high. The need is the devotion and sincerity of purpose. This effort does not only help generation of employment at the rural level, but also help the development of the area through participation of women in great number and thereby many endangered species can also be protected by sharing the genetic materials available in the area or from outside.

5.2. Measures to be Taken to Exploit the Potentials

There are some specific problems of these nurseries that need to be addressed by both GO-NGO initiatives in the sector. A few of the important ones are given below:

- i) The owners of the nurseries need to be given adequate credit facilities to organize the programmes and to collect and preserve more of the species that are becoming lost in the process of development;
- ii) They need coordination of their programmes so as to share materials of interest for the country and of the region;
- iii) They need training and motivation to keep themselves in the line of their activities with networking of nurseries for achieving better market facilities with ensured price from those buying seedlings in large volumes for different programme areas; and
- iv) They need research and development support of the organizations like the BAU and the NARS, DAE as well as the large NGOs, (who would help the small NGOs) to organize local area based nurseries where more of the endemic materials can be preserved.

6. PRODUCTION AND USE OF SOYBEAN: AGRO-PROCESSING PERSPECTIVE

6.1. Introducing the Issue

The experience with soybean in Bangladesh in respect of production research, production, product utilization research, development studies, process leasing, technology testing and transfer are manifold as were obtained through field research starting from 1975. In fact the crop has its third time presence in Bangladesh since 1975 when the BARC organized a coordinated research project covering 11 departments of 7 organizations of four ministries. This time the introduction was made with short duration photo-insensitive soybean varieties that can be grown round the year, taking about 100-130 days depending on areas and seasons. Within 1981-82 the major thrust on both adaptive and some basic research works were completed with release of two varieties. Subsequently, the BAU and MCC took up the major works and by the year 1992-93, Crop Diversification Project (CDP) came into the programme with production and promotional activities on soybean.

Usually, a crop like soybean has many diverse uses ranging from use in the traditional food chain of the human being to the highly industrialized items like

the meat analogues, oils and proteins as well as high quality phospholipids for medicinal uses. Because of the relatively longer time required in the adaptation process, the crop took almost 20-25 years to reach acreage of 35,000 (average of 1996-2000) as reported by MOA (Task Force, 2003). Today's position with soybean has been possible because of the consistent approach for its expansion of production and use in the country by the BAU, MCC, NGOs like the BSF and private companies like Shilpee, NAPL, AFTAB and Paragon and many others who always tried to stabilize the market. The present coverage of the acreage is not sufficient for soybean requirement for human food, poultry and fish feed, so, many business houses are importing oil meal from India. The potentiality of extracting oil in Bangladesh is also high and there should be some one coming for this program with in-country produced soybean. In addition to the present large scale production in Noakhali, Comilla and Mymensingh, intervention in other areas are required. The present price is about Tk.15/00 per kg fresh soy grains and seed price of Tk. 30-35/00 per Kg may help development of good seed business also. Considering that the production per hectare is about a ton only, which is a low level of yield, current total production may be as high as 35,000 tons.

The grain price of soybean is about Tk.10-11 per kg. at farmers' level and about Tk.14-15 at Aratders level. The price starts to increase from August and continues upto October every year due to low production period and storage by Aratders. The crop was first planned for use as pulses for making nutritious biscuits, breads, flours, etc. This was followed by plan and action for large-scale use in the poultry feed. With the increasing use in poultry feed, there has been the start of using these in the human food in large volumes. The suggestion was made to the WFP for using 5% soyflour in the biscuits of the school feeding programme. This is now being modified to include 10% soy fortified wheat flour in the general market. There has been the technology and tests done at the Phulpur station of the BAU-USDA soybean project for such soy fortified wheat flour and found to be good for taste and much better for nutrition. Now the technology is available with the BAU for transfer to any one interested in such production and marketing. The very recent use of soybean as could be traced out is that during 2002-2003 WFP alone planned to purchase more than 30,000 tons of biscuits with 5% soyflour that would require 1500 tons of soyflour in 2003 alone. This is in addition to its large scale use in poultry feeds and the recent use in fish feed. However, the issues are getting changed with larger involvement of producers of soybean in different areas of the country. The crop has the following potentials, which automatically help development of sustainable production programmes at the rural level and also help the poor and poorer farming community with possible nutrient-rich grains to be available at the homestead level for any time use in their food chain.

6.2. Potentials of Soybean in Bangladesh

1. The crop is highly liked by farmers of many areas as their soil improving cash crop of short duration.
2. The by-products are not only suitable for livestock feed, but also for production of high quality composts.
3. The farmers can have cash flow better in soybean than in rice during the crisis periods because of its higher price round the year.
4. The yield of grains, high quality oil and protein per unit area is higher than that of rice, but the cost of production is much lower than rice.
5. Production of soybean does not require irrigation that saves water and improves both soil and general environment.
6. The crop is highly valued for having many different uses including production of Bio-fuels, high quality phospholecithin for medical purposes, as well as binding materials of human food and different feedstuffs.
7. The crop can be grown in any land types in different times of the year. Less fertile soil type can be improved by growing this crop.
8. The products like; soy milk the only substitute for cow's milk, milk beverages, milk products of different names and types, soy oil, soy protein isolates of various names and types, the feeds with soy high protein grits for poultry and fish have all been tested and found to have potentials for use.
9. The products that can be made using the grains of soybean are important not only for internal consumption but also for export.
10. The crop is highly valued for its diversified commercial potential all over the world (Rahman, 1978 and 2001).

7. CONCLUSIONS

The issues that we want to impress upon the policy makers of this country on the sustainable development of agriculture are that there must be small to medium level commercialization of agriculture- an approach where organized market facilities for quality crop seeds, grains and products of different agricultural activities are present. There exists a strong case for developing network of nurseries not only for commercially important species, but also for endangered species to help sustain the development process without damaging the natural resource base. In the field of intensive cropping programme there is need for crops to sustain the soil fertility along with provisions for nutritious food for the farm families at their household level. The issues that are more important for commercialization of agriculture are maintaining sustainability of the production system and productivity of the small and medium farm holders at rural level.

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