

Toward Alleviating Poverty of Rural Potato Farmers by Strengthening the Potato Seed System in Bangladesh: A Rapid Rural Appraisal

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The majority of people in Bangladesh live below the poverty line on an income of less than US\$1 per day. Increased productivity of food crops, such as potato (*Solanum tuberosum* L.), would help to alleviate poverty. Farmers can increase potato productivity by using good quality seed, but poor potato farmers can afford to buy only poor quality seed from informal sources. Seed produced through the formal certified seed system meets only 5–6% of the seed requirement. Potato growers and extension workers are not familiar with improved agro-techniques for on-farm production of high-quality seed. Strengthening technology for on-farm seed production and diffusion through the informal seed system could increase income and enhance the social status of poor farmers.

Most people in Bangladesh make their livings from the land, either as small-holders with an average farm size of 0.76 ha (Hossain et al., 2001) or as landless agricultural laborers. Poverty alleviation in the rural sector depends on increased productivity of major food crops such as wheat, rice, and potato, using high yielding varieties (HYVs) and improved agro-techniques. More efficient use of resources and increases in productivity would release land for other important crops to feed the poor. Although the area devoted to tuber crops has not changed much (BBS, 1998), potato production has been increasing over the past 2 years (BBS, 1999).

Potato is one of many crops that could help alleviate poverty of resource poor farmers. It ranks third in area after rice and wheat, and is cultivated in almost all agro-ecological regions of Bangladesh. Bangladesh produces about 2.7 million t of potatoes annually on 240,000 ha. National average potato productivity is not good because low-yielding (5-7 t/ha) traditional varieties still occupy around 35% of the total potato production area.

In recent years, potato has become an important food security crop, especially during extreme flooding during the monsoon. Potato is the only crop for which seed stocks are kept in cold stores ready for immediate planting after floods. Increased productivity of potato, even on a small scale, is possible with efficient management of available resources and good quality seed.

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Lack of good quality seed at prices affordable by small and marginal farmers is, however, a major constraint to increased productivity. Certified seed from the formal system meets only 5–6% of the total seed needs and its production through field multiplication takes a long time. Only elite farmers can afford this expensive certified seed. The balance of the seed requirement is supplied by the informal system that is managed by seed producers, ware potato producers, and traders. Many farmers still use ware potato production technology for producing seed. Seed available through the informal system is of poor quality and of unknown origin and generation number. Most potato growers are unaware of optimal management practices for seed production.

A rapid rural appraisal was done in February 1998 to gather baseline data to analyze existing potato seed systems. The goal of the study was to identify constraints to potato productivity and to develop strategies to provide marginal potato growers with good quality seed at affordable prices. The specific objectives were to:

- identify existing strengths and weaknesses of the existing seed systems and
- document characteristics of seed systems, analyze working linkages among organizations involved in seed production, and document the importance of the formal seed producers to the informal seed producers.

Methods

Rangpur District in northern Bangladesh (Figure 1) was identified as the area with the agro-climatic conditions most suitable for potato seed production. The area under potato in Rangpur is about 15% of the total potato area of Bangladesh. A rapid rural appraisal was used to gather information from farmers on farmers' seed sources, number of generations of seed used from different sources, seed quality, varieties used by farmers, disease incidence, yields

of different seed types (certified seed of HYVs purchased from BADC, seed purchased from traders/cold store owners, farmer's own seed, and seed of indigenous varieties), and farmers' agronomic practices. Information was also collected on the formal seed system concerning breeder seed production and supply by the Tuber Crops Research Centre (TCRC) to the Bangladesh Agricultural Development Corporation (BADC) and others, and certified seed production and supply by the BADC.

Results

More than 80% or more of the farmers in Rangpur grow potato as a cash crop during winter (November–March). Comparatively rich farmers buy certified seed from the BADC and use this seed and a part of their subsequent production for three or four generations. Most resource-poor farmers buy degenerated seed from cold store owners, farmers, and traders. Cardinal, a pink-skinned variety, is the main HYV grown by farmers in Rangpur and other northern districts. A few farmers plant Diamant, Kufri Sindhuri, and Heera varieties. Diamant is more popular in the central and southern districts, like Munshiganj near Dakha. Other varieties such as Multa (obtained from Munshiganj District) were seen on some farms, but the produce was diseased with common scab and bacterial wilt.

Traditional varieties, introduced about a century ago, were the only potatoes grown in Bangladesh until 1960 when HYVs were introduced (Siddique, 1991). They are still widely grown and, although they are low-yielding, bring premium prices above those of Cardinal and Diamant. They are still popular among growers and consumers, primarily because of their good keeping quality in farm potato stores, relatively low costs of production, reasonably high yields with low inputs and under stress, and the high market demand due to better taste. The area grown to traditional varieties is, however, decreasing as more

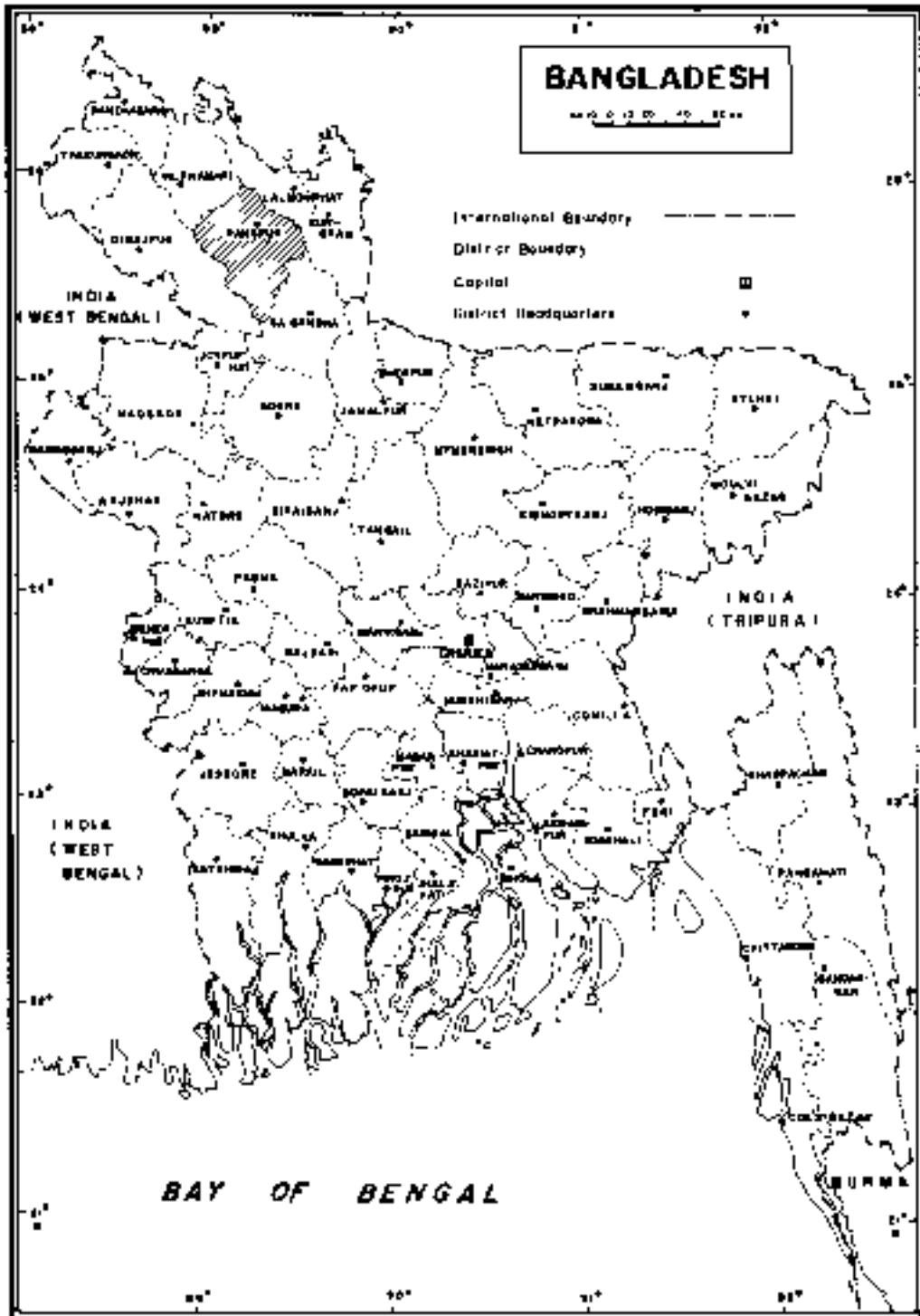


Figure 1. Proposed district  for base line study.

area is grown to HYVs. The low yield of traditional varieties is mainly due to degeneration of seed stock and sub-optimal production practices. The comparative performance of traditional varieties and HYVs as recorded by Siddique and Rashid (1990) is given in Table 1.

Bangladesh has both formal and informal potato seed systems. In the formal seed system, high quality seed is produced in an organized program by multiplying disease-free planting material over several generations. The TCRC maintains germplasm in vitro and produces breeder (pre-foundation) seed for BADC. As much as 823 t (1995-96) of breeder seed has been produced by the TCRC. Of this, 307 t went to BADC and 30 t to NGOs and the private sector. The remaining breeder seed was sold to the farmers (Table 2). Breeder seed is planted at BADC seed farms for one or two multiplications before being supplied for certified seed production to contract growers. Certified seed produced and supplied by BADC is approximately 9000 t annually and meets about 5% of the total seed requirement. The existing sources of quality planting material produced by contract farmers and sold by the BADC are beyond the reach of poor farmers. The sale price of different categories of seed varies from US\$0.16 to US\$0.38, as shown in Table 3. In general, the BADC price of certified seed is about 20–25% higher than for ware potatoes.

Farmers who cannot afford or do not have access to BADC seed have no option but to turn to informal systems, which are mostly of poor quality. A majority of seed comes from this informal farmer seed system.

Seed quality control and seed certification

The health status of the standing crops of BADC contract growers is monitored regularly. The quality standards given in Table 4 have been established for certified seeds procured from contract seed growers and sold to farmers.

Table 1. Performance of three traditional, one high yielding, and farmers' own varieties grown with improved agronomic practices in farmer fields.

Variety	Yield (t/ha) ¹	
	Average	Range
Challisa (traditional)	23.2	14.7 - 29.1
Lal Pakri (traditional)	17.3	12.4 - 21.5
Pakri Lalita (traditional)	16.4	12.8 - 20.1
Diamant (high yielding)	27.1	19.6 - 32.6
Farmers' own varieties	6.8	4.8 - 12.2

Source: Siddique and Rashid, 1990

¹ Average of 20 farmers' fields.

Table 2. Production and supply of breeder seed to recipients by Tuber Crops Research Centre (TCRC), Bangladesh, from 1992/93 to 1996/97.

Year	Breeder seed produced (t)	Seed supplied (t)	
		To BADC ¹	To others ²
1992/93	119	14	-
1993/94	302	78	-
1994/95	481	168	22
1995/96	823	307	30
1996/97	605	81	20
1997/98	-	130	45

Source: Annual Report, 1997-98, Breeder Seed Production Center, Debiganj, Bangladesh.

Note: Seed not supplied to BADC or others was purchased by farmers; - = information not available.

¹ Bangladesh Agricultural Development Corporation.

² NGOs and private seed companies.

Table 3. Sale price of different categories/generations and standards/grades of seed produced by TCRC and BADC.

Seed categories/generations	Seed grades (mm)	Price (US\$/kg)
Breeder seed (G4) ¹	28-40	0.22
(Sold by TCRC to BADC)	40-55	0.21
Foundation seed (G5/G6) ¹	28-40	0.38
(Sold by BADC to certified growers for one multiplication)	40-55	0.33
Procurement of certified seed by BADC back from certified growers	28-40	0.17
	40-55	0.16
Certified seed sold by BADC to farmers	28-40	0.31
	40-55	0.27

Source: Tuber Crops Research Center, Bangladesh.

¹ Indicates seed generation, e.g., (G4) = fourth generation.

Table 4. Maximum tolerance limit for diseases (infected plants (%)) and other defects allowed in a seed crop by BADC.

Disease/defect	Maximum tolerance (%)
Late blight	0.0
Ring rot	0.0
Mosaic	1.0
PLRV ¹	2.0
Variety mix	2.0

Other defects: Bruised, cut, or damaged tubers and those with secondary growth are unacceptable.

¹ PLRV = potato leaf roll virus.

Role of cold stores industry in development

Due to Bangladesh's tropical climate, potatoes have to be stored in cold stores during the off-season. There are 276 cold stores with a capacity of more than 1.2 million t. The cold storage industry has helped potato growers and landless people in many ways (Choudhury, 1990), including making it possible to import and introduce present day HYVs. Poor farmers who cannot afford expensive seed every year store part of their produce in cold stores to be used as seed for the following season. And cold stores allow farmers to hold some of their produce until market prices are higher during the off-season.

Discussion

Increases in production of breeder seed by TCRC and certified seed by BADC to meet the requirements of a large number of resource poor farmers is not possible under present circumstances of limited resources and inadequate infrastructure. This is partly because the lack of extension personnel leaves a serious void in public sector support to future seed production programs. Also, present linkages between the private sector, non-government organizations, the BADC, and research and extension organizations are almost nonexistent.

The formal seed production system of multiplication is lengthy and takes 6 or 7 yr to reach farmers. Therefore, improving

the existing informal seed system would fill an essential niche. Some of the factors to be considered in this improvement are that sub-optimal management practices are a major factor for low productivity and both potato growers and extension workers are unfamiliar with and have limited access to modern agro-techniques for seed production at the farm level. If farmers could maintain healthy seed over generations for their own use, this would reduce seed cost and increase total productivity.

It is also important to consider that some traditional varieties have the potential for higher yields if cleaned through tissue culture, and then given optimal conditions during the growing period. Traditional varieties are still grown on a large area; therefore, there is a strong reason for improving them.

Conclusions

Research strategies to strengthen the formal and informal seed production systems include the following.

- Develop strong relationships between the public sector, private sector, and strong NGOs for the production and diffusion of healthy seed of improved potato varieties.
- Provide intensive training on improved agro-techniques at seed production sites for seed/ware potato production to farmers, extension personnel, NGOs, and the private sector. Farmer field schools for integrated pest management presently operated by developmental organizations and NGOs in Bangladesh would be useful for disseminating proper seed flow management in the informal seed system.
- Reduce seed multiplication generations from six to two at government seed farms, followed by two multiplications in farmers fields. After two multiplications at the farm level, farmers can sell the produce as certified seed to other farmers.

- Conduct farmer participatory research to evaluate and diffuse improved technology for good quality seed production at the farm level in major potato growing areas of the country.

References

- BBS (Bangladesh Bureau of Statistics). 1998. Statistical pocketbook of Bangladesh, Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, Dhaka, Bangladesh. 432 p.
- BBS. 1999. Statistical pocketbook of Bangladesh, Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, Dhaka, Bangladesh. 466 p.
- Choudhury, A.R. 1990. Role of cold stores in the improvement of seed potato. In: Proceedings of the International Seminar on the Seed Potato held from 8-10 January in Dhaka, Bangladesh. p. 133-138.
- Hossain, M., B.M. Lal, and A. Chowdhury. 2001. Changes in agriculture and economy in the flood-prone environment in Bangladesh, 1998-2000: Insights from a repeat survey of 16 villages. Paper presented at the Workshop on Flood-prone Rice Systems held from 9-11 January 2001, at BRAC Center for Development Management, Rajendrapur, Gazipur, Bangladesh, organized jointly by BRRI, Bangladesh, and International Rice Research Institute (IRRI). IRRI, Metro Manila, Philippines. (unpublished)
- Siddique M.A. 1991. Production of indigenous potato varieties in Bangladesh. In: Plenary papers and abstracts, Proceedings of Asian Potato Association, Third Triennial Conference, held from 17-22 June in Bandung, Indonesia. p. 3-4.
- Siddique, M.A. and M.M. Rashid. 1990. In: Proceedings of the International seminar on the seed potato, held from 8-10 January in Dhaka, Bangladesh. p. 160-171.