Technology Dissemination to Boost Pulse Production and Human Nutrition in Bangladesh

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Abstract

Pulses occupy about 4% of cropped area in Bangladesh but play a significant role in rainfed agriculture. Among the pulses lathyrus, lentil, chickpea, black gram and mung bean are the important ones. Their cultivation is mainly concentrated in the Gangetic calcareous floodplain with soil pH 6.5-7.5. In recent years, there has been substantial progress in pulses research and development in Bangladesh. Although systematic research on pulses began in the mid-sixties a total of 39 improved varieties of pulse crops have been released. Yield potential of theses varieties is much higher than the local ones. A substantial endeavor was made from 1997-2003 to expand the cultivation of modern varieties to replace old and degenerated varieties and the attendant production technologies, through a special pilot project. In five years the project resulted in increased annual production of 28,000 m tonnes of lentil and 37,000 tonnes of mungbean. This represented a replacement of about 60% of the lentil production area, and 75% of mung bean varieties. A substantial increase in black gram production has also been achieved by replacing 41% local varieties (contributing to a production increase of 15,000 tonnes). It is estimated that a cumulative increase of 80,000 m tonnes of these three pulses has been achieved by intensive efforts of technology dissemination.

Media Summary

Technology transfer mission vastly increases pulse production and improves human nutrition in Bangladesh.

Key Words

Technology dissemination, pulses, Bangladesh

Introduction

Pulses are important plant protein for human nutrition, although they cover only around 4% of the total cultivable land in Bangladesh (BBS 2002). The country produces a total of 0.55 million tones, of which lentil (*Lens culinaries* Medic.) contributes 38%, mung bean (*Vigna radiate* L. Wilczek) 12% and black gram (*Vigna mungo* L. Hepper) 5%. The present production can meet not more than 30% of total national demand. There is high good potential for increasing pulse production as improved varieties together with cultural techniques have been developed.

Until 1969 agricultural research and extension services were integrated. Bifurcation of the then Department enhanced activities and accelerated the pace of technology development. But dissemination of research results to the end users took longer than necessary. Until recently pulses received little research and extension thrust. In the face of increasing food demand and dwindling area under pulses, it was realized that special effort is necessary to increase and sustain production of major pulses in Bangladesh. Around 1997 Government launched a multi-institutional project on lentil, black gram and mung bean, jointly implemented by Bangladesh Agricultural Research Institute (BARI), Bangladesh Institute of Nuclear Agriculture (BINA) and Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Bangladesh Agricultural Development Corporation (BADC) and Department of Agricultural Extension (DAE). Within six years the project has had major impact on the production of the three main pulse crops in the major pulse growing region. The project brought together the researchers, extension

personnel and other development partners of several NARS institutions, extension services and non-governmental organizations to intensify pulse production both in traditional and non-traditional area. Therefore, special efforts were taken to develop an effective mechanism for technology dissemination and thereby boost pulse production and improve human nutrition.

Available technology

Farmers in Bangladesh have been growing pulses over generations. In the traditional growing areas, farmers adopted age-old practices with no inputs and with little care. Traditionally, local varieties with low yield potential were cultivated in Bangladesh. To enhance the yield, BARI, BINA and BSMRAU developed 39 pulse varieties with high yield potential during recent years (Table 1). These varieties are resistant to main diseases and can yield at least 35-60% higher than local varieties (Afzal and Bakr 2002).

Table 1: Pulses varieties released in Bangladesh

Crop	Variety	Year of released	Crop	Variety	Year of released
Lentil	Barimasur-1	1991	Black gram	Barimash-1	1990
	Barimasur-2	1993		Binamash-1	1994
	Barimasur-3	1996		Barimash-2 Barimash-3	1996
	Barimasur-4	1996			1996
	Binamasur-1	2001			
Grasspea	Barikhesari-1	1993	Cowpea	Barifalon-1	1993
	Barikhesari-2	1996		Barifalon-2	1996
Mung bean	Barimung-1	1982	Chickpea	Barichhola-1	1990
	Barimung-2	1987		Barichhola-2	1994
	Binamung-1	1992		Barichhola-3	1996
	Binamung-2	1994		Barichhola-4	1996
	Barimung-3	1996		Barichhola-5	1996
	Barimung-4	1996		Barichhola-6	1996
	Barimung-5	1997		Barichhola-7	2000
	Binamung-3	1997		Barichhola-8	2000
	Binamung-4	1997		Hyprochhola	1981
	Binamung-5	1998		Binachhola-2	1994
	Barimung-6	2002		Binachhola-3	2001
	BUmug-1	2002		Binachhola-4	2001
	BUmug-2	2002			
	BUmug-3	2003			

Methods followed in technology dissemination

The project followed a participatory approach involving all partners in every step of planning, execution and evaluation. First activities involved organizing a broad-based planning workshop with the key personnel of all the partner organizations, NGO's and farmers' representatives. In the second step regional workshops are organized to discuss methods and strategies for effective implementation of the planned activities. Extension personnel of the DAE took on the major responsibility in implementing the plan. Action plans were projected to the grass root level extension workers – block supervisors as well as

participating farmers, in the form of orientation training, where technology package and implementation methods are explained and new implementation strategy is developed. In the technology transfer mission, the project employs demonstration as a tool for boosting production and education in farmers' fields. The demonstrations are held in clusters, each cluster being of 1.25 ha. Quality seeds of improved varieties particularly suited for the location and fertilizers required for each demonstration are supplied free to the farmers. Necessary inputs are given directly to the participating farmers. The setting up of the demonstrations is supervised by the front-line extension workers of DAE located in the village and the scientific assistants of the project. The project personnel monitor the activities at least twice during the growing season – once at pre-flowering and then at maturity. The monitoring tour provides opportunity to project personnel and farmers' to interact and exchange ideas and experience in growing crops in a given ecosystem. Following the monitoring tour, a formal mobile workshop is organized during the growing season, where senior members from all partner organizations take part. The team visits the farmers' plots, evaluates crop performance in the demonstration plots as well as farmers' crops beyond the demonstration area. The mobile workshop gives an opportunity to identify the constraints in the transfer of technology. At the time of the workshop the best performing farmers and the extension workers are identified, based on the crops and the methods they followed. The project rewards the outstanding farmers and extension workers in recognition to their works.

The farmers' 'rally' or 'field day' is another important tool used in technology dissemination, and is generally organized toward maturity of the crop on successful demonstration blocks. Farmers from surrounding villages as well as distant places are invited to participate, and observe and learn from the successful demonstrations. Apart from exhibiting the variety performance the improved production technologies and methods adopted in growing the crop are highlighted in the discussion. These field days involving farmers, scientists, extension personnel and village leaders have been shown to be a useful vehicle of technology transfer in pulse production.

Motivating farmers in adopting improved technology

To make farmers aware of the improved pulse technologies, a number of steps were taken. Farmers in the demonstration block are invited to participate on training session that are usually held in the office of the Upazila Agricultural Officer of the DAE. Upazila is the lowest level of administrative unit where the agricultural extension personnel can plan and implement development programs. Farmers are given attractive posters and leaflets describing the varieties with explanation of improved production technology in simple language. The training session is followed by distribution of packages of seeds and other inputs. The participating farmers return their seeds after the harvest of the crop and seeds thus collected from the farmers are again distributed to the neighboring farmers free of cost. This not only creates awareness but also enhances dissemination of modern varieties among the farmers. Demonstrations were set in well-marked fields to expose the technologies to other farmers. All the above steps coupled with a 'farmer to farmer seed exchange program' created a high degree of awareness among the pulses growers about new and improved variety and technologies of pulse production.

Achievements

Pulses are among a group of risky crops that face strong competition from major crops like rice, wheat, oilseeds, and vegetables. There is consequently a scarcity of land suitable for expansion of major pulses. Despite this situation the LBMDPP has expanded lentil area by 26,000 ha, mung bean area 48,000 ha and black gram area 16,000 ha, with a corresponding production increase of 30,000, 45,000 and 15,000 t during the project period of 1997-2003. It has also been estimated that during this period about 45, 65 and 40% of the total lentil, mung bean and black gram area, respectively, has been replaced by the improved varieties. This was possible with the production and distribution of 35, 60 and 20 t of seed of improved lentil, mung bean and black gram varieties, respectively, by the project for demonstration to farmers.

Adoption of improved mung bean varieties provided the additional advantage of extra biomass, which farmers have been trained to incorporate with the soil. This enriches soil fertility of exhausted land. Secondly, the adoption of asynchronously maturing mung bean cultivars created opportunity for income generation for poor women through employment for pod picking.

Socio-economic status of pulse cultivation

The LBMDPP has conducted several thousand block demonstrations in collaboration with the DAE during the last few years. Data on agronomic practices, cost of inputs and local market price of the produce were collected from participating farmers, and were analyzed to calculate the profitability of each crop on the basis of five indicators (Table 2).

i) Yield Performance

Yield of the three pulse crops in demonstrations was quite high compared to the crops under farmers' own management. The average yield of black gram varieties (Barimash) was 1,088 kg/ha in demonstration plots, which constituted about a 36% higher yield than the local variety under almost the same management. The average yield of improved varieties of lentil (Barimasur) was 1,073 kg/ha, a yield increase of about 25% in the demonstration plots. The average yield of improved varieties of mung bean (Barimung) in demonstration plots was 1,225 kg/ha, which was about 28% higher than in plots under farmers' own management (Table 2).

ii) Economic analysis

Gross return of Barimash-1 was about 19% higher than the local variety ($353.00/ha improved and $ 273.00/ha local respectively) (Table 2). Hence, gross margin for Barimash-1 was about 35% higher than for the local variety. Gross return, gross margin and benefit cost ratio of Barimasur cultivation were higher in the demonstration plots under farmers' own management (Table 2). The cost of cultivation was $185.00/ha in demonstration plots and $ 177.00 ha in plots under farmer's own management. Cost of mung bean cultivation was $240.00/ha for demonstration plots and $ 191.00/ha for farmers' plot, as the farmers managing demonstration plots used higher rates of inputs (Table 2). However, gross return and gross margin were also higher, at 33 and 39% respectively, in the demonstration plots.

Table 2: Economic performance of the improved pulse varieties in LBMDPP demonstration

Indicators	Demonstration	Farmers' management	Change (%)
	Barimash (*Vigna mungo*)		
Yield (kg/ha)	1,008	806	35.99
Gross return ($/ha)	353.00	273.00	29.36
Gross cost ($/ha)	109.00	92.00	18.75
Gross margin ($/ha)	244.00	181.00	34.74
Benefit: cost ratio	3.24	2.97	9.09
	Barimasur (*Lens culinaries*)		
Yield (kg/ha)	1,073	857	25.20
Gross return ($/ha)	389.00	311.00	25.17
Gross cost ($/ha)	187.00	177.00	4.46
Gross margin ($/ha)	204.00	134.00	52.47
Benefit: cost ratio	2.10	1.76	19.32

Barimung (*Vigna radiate*)

Yield (kg/ha)	1,225	956	28.13
Gross return ($/ha)	554.00	416.00	33.23
Gross cost ($/ha)	240.00	191.00	25.99
Gross margin ($/ha)	314.00	226.00	39.36
Benefit: cost ratio	2.31	2.18	5.36

Conclusion

In attaining self-sufficiency in pulses in Bangladesh, the LBMDPP has made a remarkable contribution. It has created a momentum in pulse production in the country. The activity pattern of the project can be taken as a model in attempting any new legume development program. The project has made a great deal of progress in coordinating research, development and NGO activities. Further expansion of such activities could lead the country towards increasing pulse production many fold, thereby increasing daily intake of pulses and improving human nutrition.

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