

Good Seed Initiative (GSI) in South Asia

Survey Report:

Assessment of Farmers' Need for Vegetable Seed Information

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Summary

It is well accepted that “seed” is the single most important input in any plant-based agricultural production system. Seed quality determines the upper limits of crop yield potential and therefore the productivity of all other inputs is constrained by the viability of the seed ingredient. Accordingly, improved seed can frequently make a substantial, incremental contribution to overall agricultural productivity; doing so at relatively little incremental cost.

Farmer retained and farmer-to-farmer exchanged seed continues to provide more than 95% of the total seed materials requirement (2.0 million MT) for all crops in Bangladesh. Poor farmers need better and more affordable access to quality seed in order to improve their livelihoods.

The "Good Seed Initiative" intends to communicate new ideas and activities that will encourage farmer to farmer networking and sharing of concepts that identify the common interests and common knowledge needed to facilitate their interactions. The focus of GSI is on participatory learning and farmer-centered-seed systems. The activities proposed for South Asia will build on the capacities, networks and experiences of CABI, UK and their partner organizations in Bangladesh. A participatory farmer information need assessment (PFINA) for vegetable seed production, processing, preservation and quality control is an integral activity of the project in Bangladesh.

Accordingly, a study was conducted (i) To identify the existing vegetable crops for which information is needed; production; (ii) To identify the problems encounter by farmers during seed production, processing, preservation and quality control; and (iii) To assess the farmer's need for information about production, processing, preservation and quality control of vegetable seed.

Accordingly, a need assessment was conducted with 223 farmers at 11 communities of 9 upazilas under the 6 districts in Northwest and Southwest regions of Bangladesh using the established process of focus group discussion (FGD). This was done during August-December 2006. The facilitators collected and recorded the relevant information during FGD at each selected community. The Collected farmer information on vegetable seed is compiled and presented in tabular form. These tabulated results have been further summarized for easier interpretation of the findings.

Accordingly during focus group discussion, farmers in each site were asked about the vegetable crops and varieties that they had grown for consumption as well as seed production. The findings on these vegetable crops and varieties have been further summarized for easier interpretation. Thus, a total of 48 varieties of 17 different vegetable crops were recorded from production in 11 communities under 9 upazilas of six districts in Northwest and Southwest Bangladesh. The highest number of varieties was Brinjal (13) followed by country bean (4). The remaining 15 crops were found to have 1-3 varieties each.

An important indicator for assessing the performance of farmers' traditional vegetable seed production system was the problem encounter by farmers. During focus group discussion, farmers in each site were asked about the problems they encountered in the seed production of various crops. They provided a list of seed production, processing and preservation problems

they had encountered in the production of their existing vegetable crops at each study site. Later, the study team summarized the problems of all 17 of the enlisted vegetable crops.

From the study on Assessment of Farmers' Need for Vegetable Seed Information regarding production, processing, preservation and quality control in the Northwest and Southwest regions of Bangladesh, 9 principal needs for farmer information on vegetable seed were found. They are: Seedling production, Seedling transplanting, Disease and Insect management, Fruit Seed selection, Fruit Seed collection, Fruit Seed harvesting and Post-harvest handling of seed; i.e., processing, preservation and quality control.

The farmers in the Northwest and Southwest regions expressed a total of 301 needs for different information about 17 vegetable crops. The total farmer information need is somewhat inflated due to a duplication of information needed in connection with vegetable crops in 11 study sites of six districts. Out of the 301 different needs for various information, 191 related to information concerning seed production. 76 of the expressed needs for information related to processing issues and 17 concerned needs for information needs about seed preservation and quality control. The highest demand for information concerned the production of Brinjal (33) followed in order by Onion (26) Papaya (22) and Country bean/Bitter Gourd/Pumpkin (19). The need for information concerning the remaining 11 vegetable crops ranged between 11-17 for each of them.

Out of 191 needs for information regarding **seed production** the greatest need was for information related to seedling production (60) followed in order by harvesting and processing (42), insect and disease management (41), fruit seed selection (27) and planting of seed materials (21). The greatest need for seed production information was for Brinjal (27) followed in order by Onion (19) Papaya (15) and Country bean/Bitter Gourd/Elephant Foot Yam (12). The need for information about the other 11 vegetable crops was between 6-11 in number.

Introduction

Improvements to the genetic make-up of seed are done through the use of modern hybridization techniques. The resulting improvements can be expected to provide the potential for higher yields, greater pest resistance, improved quantity and quality of the harvested crop, etc. The route for overall seed improvement relates to the physical and physiological properties of the seed itself; including size, physical purity, storability, and germination, etc. Such improvements are derived from more effective cultivation, harvesting, post-harvest handling, grading/quality control, and storage resulting in an overall higher quality seed product. Hereafter improved varieties of seed and their higher quality will be collectively referred to as improved seeds. The potential benefits deriving from the spread and use of improved seed are enormous, both for individual farmers and for the national economy.

Farmers risk declines in productivity if the genetic and physical purity of the seed is not maintained or as varieties become susceptible to new types of diseases and insects. Varietal deterioration in farmer retained seed is generally very low in the case of self-pollinated crops which are produced in the context of moderate cross-pollination and very high in the case of hybrids which tend to quickly lose their hybrid vigor as the seed produced from F_1 is multiplied as F_2 , making it totally impractical for farmers to retain the F_2 seed. Likewise, It is generally inappropriate for farmers to retain seeds for crops, which are typically propagated vegetatively (cuttings), e.g. cassava, potato, sugarcane because of a high risk of spreading disease.

In contrast with formal seed systems (FSS), which operate at national or state level, informal seed systems (ISS) operate mainly at the community level. The informal seed systems are typically quite flexible, involving a variety of different exchange mechanisms, which facilitate the distribution of seeds between participating households (eg. cash, barter). Seed transactions are generally quite small compared with seed sales in the formal seed sector. Informal seed systems can be regarded as traditional in that they normally involve long-standing, well-established practices and links between seed products and consumers. Thus, farmers undertake seed multiplication, processing, storage and exchange within their own communities.

In Bangladesh some 9.1 million ha of land is under multiple-crop cultivation annually (index 1.6 or 14.56 million ha), with rice (76% of the total area) in successive cropping seasons or in rotation with other crops such as wheat, oil seeds, pulses, vegetables, spices and potatoes during the winter (Rabi), Jute, pulses, maize and vegetables in summer season or with sugarcane. At present, of the total rice seed requirements of 4,00,000 MT True Seed, only 20,000 MT are supplied as improved seeds and mostly through the public sector (BADC). On the other hand, total seed materials requirement is about 2 million MT for all crops per year in the country. The estimated farmer-retained or farmer-to-farmer-exchanged seed continues to provide up to 95% of the total seed requirement for all crops except wheat, vegetables and jute. This applies also to potato. Sugarcane supplies are reasonably satisfactory in the mill zones. For rice, it is only about 5% of total requirements. On the other hand, the supply of improved seed is quite high for wheat (22%), Jute (16%) and vegetables (42%). The supply of improved seed is lower for onion seeds and so on.

Farmer retained and farmer-to-farmer exchanged seed continues to provide more than 95% of the total seed materials requirement (2.0 million MT) for all crops in Bangladesh. The total estimated annual value of seed in Bangladesh is about Tk. 4200 crore (USD \$ 600 million). This includes the 95% of Bangladesh's seed requirement, which is met from "farmer-retained or

farmer-to-farmer exchanged" sources. Of course, poor farmers have a special need and interest in having better and more affordable access to quality seed in order to improve their livelihoods.

Participatory learning processes and local action research (LAR) can greatly accelerate a farmer's willingness to take up new ways of producing, processing, storing, and distributing/procuring quality rice seed. Farmers are fully aware of the benefits of quality seed. They simply lack access to such seed. That is the problem. Farmer awareness of good seed practices and the value attached to good seed can catalyze the development of local seed production and trading infrastructures. Such infrastructures support a stronger interaction between the informal and formal seed sectors; an interaction that draws on and enhances their comparative strengths. In the process, smallholder farmers are empowered to judge for themselves the quality of the various vegetable seed varieties on offer.

The practical implementation of the "Good Seed Initiative" (GSI) begins in the local context with the relevant stakeholders who have a vested interest in quality rice seed. The intension of GSI is to establish a region-wise, sharing and learning process on farmer-led informal seed supply system of various crops throughout the country. Swiss Development Cooperation (SDC) funded and coordinated CABI, UK's efforts to facilitate GSI activities globally and to initiate pilot activities at the national level in Bangladesh from 2005. This was intended to communicate GSI ideas and activities, to encourage networking and sharing of concepts, identify common interests, and knowledge and facilitate building a basis for action on farmer-led informal seed supply system for various crops including vegetables. The focus of GSI is on participatory learning and farmer-centered-seed systems, the activities proposed for South Asia will build on the capacities, networks and experiences of CABI, UK and their partner organizations in Bangladesh.

A participatory **Assessment of Farmers' Need for Vegetable Seed Information** on the production, processing, preservation, quality control and exchange is an integral part of the GSI project in Bangladesh.

Objectives

- (i) To identify the vegetable crops for which information is needed;
- (ii) To identify the problems encountered by farmers during vegetable seed production, processing, preservation, quality control and exchange;
- (iii) To assess the farmer's need for information on the production, processing, preservation and quality control of vegetable seed at the community level.

Methodology

Communities and farmers

Accordingly, farmer information need assessment (FINA) on vegetable seed was conducted at 11 communities of 9 upazilas under the 6 districts in Northwest and Southwest regions of Bangladesh. Out 6 districts, 3 districts were from each region. Out of 9 upazilas, 6 and 3 upazilas were from Northwest and Southwest regions of the country respectively. Farmer information need assessment was conducted at 11 communities, of which 6 and 3 were in

Northwest and Southwest regions respectively. The sites (communities) were selected based on the recommendations of various collaborative partners, as they know where vegetable crops are being grown in large scale. A number of criteria and factors have been considered in selecting those sites, which include cropping systems, land type, soil quality, geographical location, and scale of production. Thus, eleven sites where various vegetable crops are cultivated in large scale were selected for the study in the Northwest and Southwest regions of Bangladesh.

The assessment of Farmer's need for information about vegetable seed was conducted with 223 farmers from 11 communities in Northwest and Southwest regions of the country using the "focus group discussion" (FGD) method. Out of 223 participants in 11 FGDs, 143 were male and 80 were female. The survey sites are shown in the map (Fig.1). Participants and venues of FGDs and their upazilas, districts and regions are provided in the following Table 1.

Table. 1: Participants and Venues of FGDs, Upazilas, Districts and Regions

Region	District	Upazila	FGD Venue	Participants		
				Male	Female	Total
Northwest	Natore	Baraigram	Manuir Bottola	25	2	27
			Sangrampur Bazar	12	-	12
		Gurudaspur	Courtyard of Khodeza	10	12	22
	Rajshahi	Putia	Courtyard of Angura Begum	3	22	25
			Courtyard of Abdus Salam	4	18	22
		Durgapur	Courtyard of Zohura Begum	9	15	24
	Pabna	Sadar	Courtyard of Zahidul	15	9	24
		Ishurdi	Krishnadear Primary School	12	2	14
	Southwest	Kushtia	IB	Courtyard of Azizul Mondal	15	-
Jhenaidah		Kotchadpur	Lakhikundu Mor	10	-	10
Magura		Sadar	Toshildar (Land) Office	28	-	28
Total				143	80	223

Focus group discussions

A total of 11 focus group discussions (FGDs) for collecting data regarding the need of farmers' for information about vegetable seed were conducted in 11 communities in two regions with 223 farmers during August-December 2006. The project used facilitators' teams to conduct 11 FGDs at 11 communities in 6 districts. These were conducted in collaboration with Partner NGOs, DAE, Community Based Organizations (CBOs), Agri-input dealers etc. Focus group discussions provided wide opportunities for a large number of farmers to discuss their information needs at each of the selected sites. On an average, 20 farmers participated in the discussion meeting at each site. Farmers were asked about their existing vegetable crops and varieties. They were asked about problems they encounter during vegetable seed production. They were also asked about their information needs on regarding seed production, processing, preservation and quality control of various vegetable crops. The facilitators collected and recorded the information gathered during each FGD.

Data analysis/compilation and report preparation

The Collected data regarding the need of farmers' for information about vegetable seed production, processing, preservation and quality control was compiled in tabular form. The results were further summarized for easier interpretation of the findings

Key moments

During each FGD, the facilitators collected farmers' innovative knowledge and methods used for vegetables and rice seed production, processing, preservation and exchange. The list and brief description of the farmers' innovative knowledge and practices once documented, was submitted to the coordinator, GSI, South Asia.

Limitations

1. Most of the female participants were reluctant to spend time at FGDs. This is because, as members (both male & female) of farm families including resource poor farm families, they are always busy with their daily workload and have little time for idle chit-chat that yields no immediate benefit for their families.
2. The members of some groups asked for compensation for their time spared for the FGD. But this was avoided through various means and motivation from the project staff.
3. Duration of focus group discussions was found to be too short to collect the full details regarding the need of farmers' for seed related information.

Findings

Existing vegetable crops and varieties

At the beginning of each focus group discussion (FGD), the facilitator team identified and documented the existing vegetable crops and their varieties. Accordingly during focus group discussion, farmers at each site were asked about the vegetable crops and their varieties that they had grown for consumption as well as seed production. The findings about various vegetable crops and their varieties were summarized for easier use and interpretation. Thus, a total of 48 vegetable varieties of 17 crops were recorded. The highest number of varieties was Brinjal (13) followed by country bean (4). The remaining 15 crops had from 1-3 varieties each. 48 varieties of 17 vegetable crops were found open pollinated, traditional cultivars. The participating farmers produced seed using traditional practices. A List of the 17 vegetable crops and their 48 varieties are provided in the following Table 2.

Table. 2: Vegetable Crops and Varieties

SL #	Crop	Variety	Nr.
1	Brinjal	IRRI, Chapta, Shada, Chela, Lafa, Shola, Tal, China, Bhora, Dasuria, Mukta Jhuri, High-irate, Jessori	13
2	Bottle Gourd	Sada Lomba, Shobuj Lomba, Golakar	3
3	Country Bean	IRRI, Chapta, Shada, Kalo	4
4	Bitter Gourd	Guti Karola, Rangpuri, Shaita	3
5	Papaya	Local, Local improve	2
6	Khira (Cucumber)	Bhaturi, Chaita	2
7	Spinach	Lal, Shada	2
8	Indian Spinach	Bombai Pui, Shadapui	2
9	Pumpkin	Local	1
10	Okra	Local	1
11	Elephant Foot	Bilati, Jessori	2
12	Ash Gourd	Local	1
13	Yard Long bean	Shada, Lalkhaeri, Motakhaeri	3
14	Snake Gourd	Kazla Shada Shoru, Kazla Mota	2
15	Ridge Gourd	Local, Local improved	2
16	Onion	Taherpuri, Faridpuri	2
17	Dantha (Amaranthus)	Bhutan, Katoa, Deshi	3
Total			48

Problems encounter

An important indicator to assess the performance of the "Farm based" traditional vegetable seed production system was the development of a comprehensive understanding of the various problems encountered by farmers. Farmers encounter various problems related to vegetable seed production, processing and preservation. We need to know what those problems are? During focus group discussion, farmers in each site were asked about the problems they face during seed production, processing and preservation of their existing vegetable crops. From this discussion the facilitators developed a list of the most serious problems encountered in these areas. Later, the study team summarized the problems discussed in each of the FGD. Invariably there was a "thread of similarity" regarding the most common problems being encountered in all of the study areas. The summarized problems articulated in the various FGD's are presented in Annex. II.

Information need on vegetable seed technology

During focus group discussions a big effort was made to assess the need farmers' have for information about vegetable seed production, processing, preservation and quality control in each site. In every site, farmers were asked about the information they needed in these areas. Crop-wise information needs provided by the farmers in two regions are presented in Annex. III. Tables 3 and 4 present the summarized, crop-wise information that farmers require.

From the survey we find that farmers' have a need for information in 9 areas of interest. These are: Seedling production, Seedling transplanting, Disease and Insect management, Seed fruit selection, Seed fruit collection, Seed fruit harvesting and threshing, Seed processing, Seed preservation and Quality control of seed. Under these 9 major information headings, 49 specific information needs were identified (Annex III).

The farmers in Northwest and Southwest regions needed 301 separate pieces of information on 17 vegetable crops. Out of 301 pieces of information needed about 17 crops; 191 related to seed production, 76 related to seed processing and 17 related to seed preservation and seed quality control. The greatest need related to Brinjal (33) followed in order by Onion (26), Papaya (22) and Country bean/Bitter Gourd/Pumpkin (19). The information needed for the remaining 11 vegetable crops ranged between 11-17 each (Table. 3).

Out of 191 expressed needs for information, **seed production** registered (60) followed in order by harvesting and processing (42), insect and disease management (41), seed fruit selection (27) and planting of seed materials (21). The highest information needs demanded for seed production was found with Brinjal (27) followed in order by Onion (19) Papaya (15) and Country bean/Bitter Gourd/Elephant Foot Yam (12). The demand for information on the remaining 11 vegetable crops was between 6-11 each (Table. 4).

Table.3: Farmers information need (Nr.) on seed production, processing, preservation and quality control of 17 vegetable crops

SL #	Crop	Production	Processing	Preservation	Quality Control	Total ¹
1	Brinjal	25	6	1	1	33
2	Bottle Gourd	9	4	1	1	15
3	Country Bean	12	5	1	1	19
4	Bitter Gourd	12	5	1	1	19
5	Papaya	15	5	1	1	22
6	Khira (Cucumber)	9	5	1	1	16
7	Spinach	8	4	1	1	14
8	Indian Spinach	9	5	1	1	16
9	Pumpkin	11	5	1	1	18
10	Okra	10	4	1	1	16
11	Elephant Foot	12	3	1	1	17
12	Ash Gourd	10	4	1	1	16
13	Yard Long bean	8	4	1	1	14
14	Snake Gourd	10	4	1	1	16
15	Ridge Gourd	6	3	1	1	11
16	Onion	19	5	1	1	26
17	Dantha (Amaranthus)	6	5	1	1	13
		191	76	17	17	301

¹ Duplication of the information needs with enlisted crops at 11 sites.

Table. 4: Farmer information need (Nr.) on seed production of 17 vegetable crops

SL #	Crop	Seedling Production	Planting	Insect and Disease	Seed fruit selection	Harvesting and Threshing	Total ¹
1	Brinjal	7	6	3	4	5	25
2	Bottle Gourd	5	1	2	1	0	9
3	Country Bean	4	0	4	2	2	12
4	Bitter Gourd	5	0	3	0	4	12
5	Papaya	6	4	2	1	2	15
6	Khira (Cucumber)	4	0	2	1	2	9
7	Spinach	3	0	2	2	1	8
8	Indian Spinach	1	0	2	2	4	9
9	Pumpkin	3	3	2	1	2	11
10	Okra	4	0	2	3	1	10
11	Elephant Foot	3	0	3	4	2	12
12	Ash Gourd	3	1	2	2	2	10
13	Yard Long bean	2	1	2	0	3	8
14	Snake Gourd	2	1	3	2	2	10
15	Ridge Gourd	2	0	2	0	2	6
16	Onion	5	4	3	2	5	19
17	Dantha (Amaranthus)	1	0	2	0	3	6
		60	21	41	27	42	191

¹ Duplication of the information needs with enlisted crops at 11 sites.

Recommendations

Details concerning the selected, seed technology (production, processing, preservation and quality control) practices should be collected and documented from innovative farmers in Northwest and Southwest regions and used to produce and disseminate seed production training video. The training video should give most emphasis to the seed production of Brinjal.

AAS should be called upon to collect and document vegetable seed technology information from innovative farmers; incorporating the information gathered into the training video on vegetable seed technology.

The resulting video should be validated with the participating innovative farmers.

The validated video should be multiplied and distributed for showing in markets and Hat Bazaars throughout the vegetable growing areas of Bangladesh. The content should be regularly revisited and updated as farmers' need for information evolves through time.

Annex. I: Participants, Date, Time, Venue and Address of focus group discussions

Date	Time	Venue	Address	Participants		
				Male	Female	Total
6.8.06	9 am -11 am	Courtyard of Ms. Khodeza	Gopinathpur, Gurudaspur, Natore	10	12	22
17.8.06	1 pm - 3 pm	Manuir Bot tala	Manuir, Baraigram, Natore	25	2	27
17.8.06	3 pm - 5:30 pm	Sangrampur Bazar	Sangrampur, Baraigram, Natore	12	-	12
28.8.06	10 am -12 noon	Lakhi Kundu Mor	Lokhikundu, Kotchadpur, Jhenaidah	10	-	10
28.8.06	2 pm - 4 pm	Toshildar (Land) Office	Ishakhada, sadar, Magura	28	-	28
29.8.06	10 am-12 noon	Courtyard of Mr. Azizul Mondal	Hatia Abdalpur, IB, Kushtia	15	-	15
24.12.06	9 am - 12 noon	Courtyard of Zahidul	Uttarpara, Bharaimari, Ishurdi, Pabna	15	9	24
24.12.06	3:30 pm-5:30 pm	Krishadear Primary School	Krishnadear, Sadar, Pabna	12	2	14
25.12.06	9 am - 12 noon	Courtyard of Ms. Angura Begum	Chakvitapara, Bhalukgachi, Putia, Rajshahi	3	22	25
25.12.06	1 pm - 3 pm	Courtyard of Abdus Salam	Chakdomodi, Bhalukgachi, Putia, Rajshahi	4	18	22
25.12.06	3:30 pm-5:30 pm	Courtyard of Ms. Zohura Begum	Hoza Ananta Kandi, Durgapur, Rajshahi	9	15	24
Total				143	80	223

Annex. II: Crops and problems encounter during seed production, processing and preservation

SL #	Crop	Problem encounter
1	Brinjal	Production: Insect damage, Bird damage, Stealing of seed fruit, Disease damage, Varietal mixture
		Processing: Dryness (moisture content) testing of seed
		Preservation: Poor germination of seed, Deterioration seed colour due to disease infection, Poor storage method
2	Bottle Gourd	Production: Rotting inside of the matured fruit, Disease damage, Varietal mixture
		Processing: Lack of knowledge about proper seed drying
		Preservation: Poor germination of seed
3	Country bean	Production: Insect and Disease damage in the field
		Processing: Lack of knowledge about proper seed drying & testing
		Preservation: Insect damage, Bad quality seed with poor germination, Poor storage
4	Bitter gourd	Production: Fruit borer, Bird damage, Stealing of seed fruit, Varietal mixture, Disease damage
		Processing: Lack of knowledge about proper seed drying
		Preservation: Bad quality seed with poor germination
5	Papaya	Production: Too many male plants, Bird damage, Varietal mixture Disease and Insect
		Processing: Lack of knowledge about seed sorting, Male and female seed separation
		Preservation: Bad quality seed with poor germination & poor storage method
6	Khira (Cucumber)	Production: Rat damage, Seed fruit rotting, Bird damage, Seed dryness testing, Varietal mixture
		Processing: Seed separation from seed fruit (Male & female)
		Preservation: Poor germination of seed, Seed color change due to disease infection, Poor storage method
7	Spinach	Production: Lack of knowledge about crop seed maturity
		Processing: Difficult in filled seed sorting, Seed dryness testing
		Preservation: Bad quality seed with poor germination & Bad storage
8	Indian Spinach	Production: Matured fruit sell as vegetable with higher price, Bird damage, Uniform harvesting time
		Processing: Mixture of mature and immature seed, Seed drying, Seed dryness testing, Seed sorting
		Preservation: Bad quality seed due to poor storage method

Annex. II: Contd.

9	Pumpkin	Production: Fruit borer insect, Fruit rotting due to diseases infection, Rat and bird damage, Varietal mixture
		Processing: Seed dryness testing, Proper seed drying
		Preservation: Bad quality seed due to poor storage method
10	Okra	Production: High disease and insect infestation
		Processing: Separation of diseased seed, Seed dryness testing
		Preservation: Bad quality seed due to poor storage method
11	Elephant Foot	Production: Virus disease, Insect infestation, Over irrigation
		Processing: Seed drying
		Preservation: Lack of knowledge about storage of seed/dormancy
12	Ash Gourd	Production: Fruit rotting for long duration storage, Insect infestation, stealing seed fruit
		Processing: Lack of knowledge about proper seed drying
		Preservation: Bad quality seed due to poor storage
13	Yard Long bean	Production: Disease and insect infestation
		Processing: Lack of knowledge about proper seed drying, Seed drying testing
		Preservation: Bad quality seed due to poor seed storage
14	Snake gourd	Production: Rotting seed, Bird damage, Stealing seed fruit
		Processing: Lack of knowledge about proper seed drying
		Preservation: Bad quality seed due to poor storage method
15	Ridge gourd	Production: Disease infestation, Lack of knowledge about selection of fruits for seed, Stealing seed fruit
		Processing: Lack of knowledge about proper seed drying & testing
		Preservation: Lack of knowledge about seed storage method
16	Onion	Production: Insect and disease infestation, Irrigation methods and techniques, Lack of knowledge about planting method, Storm, Hail storm, Bad weather
		Processing: Harvesting, Threshing, Cleaning, Drying and Separation/sorting, Dryness testing
		Preservation: Lack of knowledge about improved storage method for onion seed, Seed quality control
17	Dantha (Amaranthus)	Production: Storm and hailstorm
		Processing: Seed drying problem due bad weather, Seed dryness testing
		Preservation: Bad quality seed due to poor drying and storage, Seed quality control

Annex. III: Farmer information need on seed of 17 vegetable crops

Information need	Crop (Nr.) (✓)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
I. Production																	
A. Seedling production																	
1. Seedbed size and shape	✓						✓										✓
2. Distance between seedbeds (D/S)	✓																✓
3. Seed rate for seedbed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4. Pit-pit distance (D/S)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
5. Nr. of seed per pit					✓	✓											
6. Seed sowing technique on raised pit (Dhibi)			✓														
7. Modern seedbed preparation technique	✓											✓					
8. Seedling care/management	✓	✓		✓	✓	✓	✓		✓	✓						✓	
9. Fertilizer management on seedbed	✓			✓													
10. Irrigation management	✓	✓	✓	✓	✓										✓	✓	✓
11. Planting distance										✓	✓						
12. Seedling raising in polybag		✓			✓												
B. Seedling transplanting																	
1. Pit-pit distance	✓								✓			✓	✓	✓			
2. Seedling uprooting technique	✓				✓												✓
3. Improved transplanting method	✓	✓														✓	
4. Nr. of seedling per pit	✓				✓				✓								
5. Seedling age for transplanting	✓				✓											✓	
6. Seedling health/quality	✓				✓				✓							✓	
C. Disease and Insect																	
1. Insect and disease management	✓		✓	✓		✓	✓	✓	✓	✓	✓			✓		✓	
2. Virus disease control measures											✓						
3. Aphid management				✓													
4. Fruit/flower borer management			✓														
5. Leaf borer insect management			✓														
6. Leaf dieing and yellowing		✓															
7. Health hazard free pest management	✓				✓				✓			✓	✓	✓	✓	✓	✓
8. Pesticides and their use	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Crop list: 1= Brinjal, 2 = Bottle Gourd, 3 = Country bean, 4 = Bitter gourd, 5 = Papaya, 6 = Khira (Cucumber), 7 = Spinach, 8 = Indian Spinach, 9 = Pumpkin, 10 = Okra, 11 = Elephant Foot, 12 = Ash Gourd, 13 = Yard Long bean, 14 = Snake gourd, 15 = Ridge gourd, 16 = Onion, 17 = Dantha (Amaranthus)

Annex. III: Contd.

Information need	Crop (Nr.) (✓)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D. Seed fruit selection																	
1. Seed fruit colour	✓						✓	✓		✓	✓	✓				✓	
2. Seed fruit size and shape	✓	✓	✓		✓	✓				✓		✓		✓			
3. Age of the plant for seed fruit selection	✓		✓				✓	✓		✓						✓	
4. Seed fruit condition and type	✓								✓		✓			✓			
5. Age of seed fruit											✓						
6. Seed fruit weight											✓						
E. Seed fruit collection																	
1. Seed fruit harvesting/collection time	✓			✓				✓				✓	✓	✓	✓	✓	✓
2. Seed fruit collection equipment	✓		✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓
F. Seed fruit harvesting and threshing																	
1. Improved method for seed collection/harvesting and threshing	✓		✓	✓			✓	✓								✓	✓
2. Seed fruit cutting equipment	✓				✓				✓	✓						✓	
3. Time gap between fruit collection and seed separation	✓			✓		✓		✓					✓			✓	
4. Separation of seed corm from main corm of Elephant Foot yam											✓						
II. Processing																	
A. Seed cleaning and sorting																	
1. Improved method for cleaning & sorting	✓	✓	✓	✓		✓	✓	✓					✓			✓	✓
2. Male-Female seed sorting					✓												
3. Disease infested seed sorting	✓							✓	✓	✓							
B. Seed drying																	
1. Improved method for seed drying	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2. Improved seed drying technique	✓				✓						✓					✓	✓
3. Seed dryness (moisture content) testing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4. Nr. of seed drying			✓	✓	✓				✓			✓		✓			
5. Duration of seed drying	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
III. Preservation																	
A. Seed storage method																	
1. Improved storage method (container)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
B. Seed container placement																	
1. Ideal place for container placement	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IV. Seed quality control																	
1. Maintenance of seed quality	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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Fig.1: Location Map

