

Decentralized Common Bean Seed Production and Delivery System

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Abstract

In Ethiopia, the formal seed sector meets only less than 10% of the total seed demand of our farmers. Given such a huge difference between supply and demand, the development of alternative seed sources such as farmer based seed production in addition to existing formal seed sector cannot be considered optional. This paper summarizes the experience of impact oriented decentralized seed system and farmer based seed production and dissemination. The experiences include demand creation for improved bean varieties, multiplication of farmer preferred varieties, initiating localized seed production and decentralized recovery and redistribution of seed to wider seed beneficiaries. Partnership, monitoring and evaluation and capacity development were the cornerstones of all the activities designed in these projects. The strengthening of farmers' association/union is indispensable in providing conducive marketing environment for informal seed sector and ensuring localized as well as sustainable seed supply. To maximize out of their complementarities, the need to integrate the informal with the formal seed sector cannot be over emphasized. Proper training of farmers on quality seed production, market information network, coordination and linkage among important stakeholders as research, agricultural offices, local administrative bodies, formal seed sector and unions/farmers association are also necessities.

1. Introduction

Despite the presence of extensively operating formal seed sector in Ethiopia, with no exception, its capacity to satisfy the demand of millions of farmers is far below satisfactory. Nearly half of the farmers in the Central Rift Valley (CRV), where most of the physical, market, institutional and technological infrastructures are relatively better off, for example, use own maize seed and 15% percent purchased seed from traders (Dawit et al 2007). During the 2004/05 season, the supply of seed through the Ethiopian Seed Enterprise (ESE) was 304 000 q, i.e., 73% short of official demand for seed based on estimates developed by woreda and regional bureaus of agriculture. In particular, the supply from the same source and season for haricot bean was 79% less the official demand (Ibid). This simply underlines the fact that, given the infrastructural and resource limitation, the country cannot fully rely on the formal sector alone.

Analyzing the contribution of the formal and informal seed system Zewdie et al (2008) indicated that out of potential annual seed requirement (estimated 150, 000 tons), the share of formal seed system is estimated to be about 10-20% while the rest (80-90%) is covered by the informal seed system. The Ethiopian Seed Enterprise (ESE) takes the lion share (80-90%) of the amount supplied by the formal sector. The experiences and empirical evidences to date, by and large, clearly justify the need to strengthen the informal seed sector. In recognition to such need to revitalize informal seed supply for local crops and varieties, ESE has made a move to improve the seed supply by working with farmers through contractual seed production with Farmers' Producers Cooperatives and through Farmer-Based Seed Production and Marketing Scheme (FBSPMS) (Yonas et al., 2008). The move helped in improving the seed supply of less profitable crops both in terms of local availability and access by resource poor farmers. Accordingly, of the certified seed produced by ESE, the FBSPMS accounted for 25% (in 2005) and 35% in 2006. Whoever initiates a farmer participatory decentralized seed production, the fact that the opportunity can simultaneously be used to introduce improved

Decentralized seed production and delivery

management practices which can contribute to improved productivity of small farmers is real double advantage (Endeshaw et al., 2009).

Looking into the diversity of the seed supply during 2000-2007, Yonas et al., (2008) showed that wheat and maize accounted for more than 90% of the total seed sales of ESE demonstrating that the informal sector remains a major supplier of improved and local land races of diverse crops grown by small farmers. They also indicated that of the total seed being circulated by the informal seed sector, the share of improved seed is only about 10%.

The concentration of the formal seed sector, ESE in particular, mainly on production of certain cereals has generally devoid the potential attention the bean farmers' require, among others, in terms of availability and access to improved seeds. Though there existed a number of varietal options (more than 30) with food and market class, most bean farmers had little, if any, or no access to seeds of improved varieties. Hence, unavailability of quality seeds of improved bean varieties in time, space, and required quantities is among the major factors that contributed to low access to improved bean varieties/technologies thereby remained as limiting factor for production and productivity. For instance, the national average productivity of the crop is estimated at 1.04 t ha⁻¹ (CSA 2008) against the potential 2.7 t ha⁻¹. Small scale poor farmers in drought prone areas of the country have, particularly, much lower access to seeds of improved varieties.

Not all farmers cultivate crops that are commercially important and thus, hardly attract the interest of formal seed sector. Even when, seeds of interest to the small farmers in the hard to reach areas are being produced by the formal seed sector, access and affordability becomes another face of the problem. Generally speaking, public supported commercial seed enterprises have not provided options attractive for poor farmers. By implication there is a need for new avenues to provide access to seeds of improved varieties that respond to the choice and demands of poorer farmers. Therefore, the development of the informal sector (decentralized seed production and

delivery) as an alternative and reliable seed source, in such cases, cannot be optional. Towards this argument, various projects targeted to address the needs of poor farmers with little or no access to improved seeds through partnership with key actors have been implemented in order to stimulate policy attention and thereby ensure a formal support to the informal seed system.

This paper presents the experience of two distinct projects (Impact Oriented Decentralized Seed System in Tropical Legumes II project (TL II) and Farmer Based Seed Production and Dissemination in Strengthening Technology Development, Verification, Transfer and Adoption through Farmers Research Groups Project (FRG) on decentralized bean seed production and delivery with farmers and other important partners in bean growing region of Ethiopia. The prime purpose of the projects were identifying farmers preferred (adapted, stress tolerant and good yielder) common bean varieties and improve availability and access to those farmers preferred varieties by poor farmers through decentralized seed production and distribution approach. The challenges as well as important lessons drawn from these experiences are also summarized.

Structure and Evolution of Seed Systems

The formal and informal seed systems are differentiated based on who is responsible for conservation of genetic resource, breeding/improvement and seed supply as well as in terms of level of integration in the seed system (Table 1). While the formal seed system has a specialized actor for each component as gene bank for genetic resource conservation, research institutions for breeding/improvement, and seed parastatals/seed companies for seed supply, in the informal seed system all are carried out by the farmers who do all the maintaining of the genetic resource, selection in combination with natural processes such as genetic mutation and serve as seed source for self and others. Obviously, the latter is highly integrated than the former. Of course, the current position of the two systems evolved over time as a result of policy directives and actions taken in responding to varying scenarios in the last four decades (Table 2).

Decentralized seed production and delivery

Table 1 Distinction between formal and informal seed system

	Formal seed system	Informal seed system
Conservation of genetic resource	Gene bank	Farmer
Improvement	Breeding programs in research institutions	Farmer
Seed supply	Parastatals/ private companies	Farmer through exchange in the local system
Operation level	National (potential areas)	Community
Integration	Less	More

Adapted from Walter et al., (2008)

Nowadays, in addition to farmers, many other actors (such as NGOs, research institutions, seed parastatals) have taken interest in the informal seed system mainly because it is a low-cost source of seed, reliable, efficient and accessible channel to provide resource-poor farmers with seeds of improved varieties (which are of less interest to the commercial sector). Such an interest in the informal seed sector was triggered by the limitation of the formal seed sector to deliver seeds of different crop varieties to the diverse farming community.

2. Approach and Methods

The first most important step in the seed production activity was creation of awareness as well as potential demand for particular variety. Once farmer preferred variety is identified the mechanism to satisfy the demand was designed in such a way that reasonable access to seed is ensured through localized/ decentralized/ farmer based seed production and delivery endeavors. Though, in terms of the methods used at different levels (Table 3) and in the design, there was certain distinctions between the two projects, there were four important stages common to both (Fig 1). Nevertheless, capacity development on seed production practices was an important common denominator in these projects.

Table 2 Evolution of the formal and informal seed sector

Decades	Directions and Developments	Actions pursued	Issues
1970	Significance of quality seed recognized by African governments and donors	Establishment of highly subsidized formal seed sector- seed parastatals	<ul style="list-style-type: none"> • Limited financial sustainability • Limited involvement of small-farmers in variety development and seed supply chain
1980	Recognition of the significance of private sector role	A policy shift to disbanding parastatals and encouraging private sector development	<ul style="list-style-type: none"> • Focus limited to hybrid maize, high value crops, high potential area • Minor crops and hard to reach community were marginalized
1990	Interest in seed sector by NGOs and Rural development agencies	Support to community -based seed production and supply	<ul style="list-style-type: none"> • Access to seed in remote areas and to poor farmers improved • Transforming community seed producers into producers of high quality seed
2000	Renewed effort to improve seed access	Focus on supporting the private sector (small & medium agro-dealers); establish seed business friendly regulations	<ul style="list-style-type: none"> • Companies focus on more profitable crops/varieties rather than wide range of crop species which determine the resource-poor farmers' food security

Adapted from Rubiyogo et al., (2009)

Demand creation

The target community/farmers are exposed to new varieties with management practices. This stage adopts variety of methods including participatory variety selection (PVS), participatory evaluation and demonstration, field days, training, sales of new varieties via small packs for farmers to try themselves in small plot of land and use of promotional materials. Consequently, the varieties for which farmers show preference would be identified jointly.

Multiplication of preferred varieties

Once the preferred variety is identified, this is a preparation stage where the variety (basic seed) is being multiplied on research station in proportion to targeted seed producers in selected weredas.

Localized seed production

The basic seed produced is distributed to seed producing farmers through respective weredas, farmers' cooperative unions, NGOs, and private firms. The selected seed producers shall produce a certified seed that can be made available to the local farmers through local networks or farmers' association. This activity engages a number of partners in monitoring and evaluation of the production activity.

Decentralized recovery and redistribution of seed

The seed produced by selected farmers is partly recovered either in kind (same size of seed provided to the farmer) and/or through sales to the partners involved, usually farmers cooperative unions. The same seed recovered is redistributed to new batch of farmers as seed and the cycle continues with introduction of new varieties. This is expected to build the capacity of partners in dealing with seed business.

Though both share important similarities, the two projects had distinctness in terms of the scale and purpose pursued in bean seed production. The seed production in the FRG project is an activity that is embedded in the testing of different management practices for farmer preferred varieties. It is carried out simultaneously with the on farm evaluation of improved and local management practices (for instance, land preparation and planting method, weeding techniques and so on) which help in identifying the best management option that ensures maximum gain from the variety. The purpose of farmer based seed production, here, was to respond to the demand of the farmers in the wereda who developed interest to the varieties due to exposure during field days and information from neighbors and extension workers. The starting/foundation seed is provided from the research center both to the FRG farmers directly (with the knowledge of the Woreda Agricultural and Rural Development offices-WARDO) and to the WARDO who in turn distribute to other non FRG potential seed producing farmers. Whereas the decentralized impact oriented bean seed production and delivery project (TL II) tries to identify and establish a decentralized seed production and delivery modes that are tailored to various clients thereby

generate information on the ideal model for different scenario of seed production and delivery. Accordingly, it was framed in such a way that the research centre plays the role of capacity building on seed production and provides foundation seed in different pack sizes to primary partners whose main role was distributing the same to selected individual/group of farmers through collaborative partners (WARDOs and NGOs). Private farms directly receive seed from research centre and produce seed themselves as per the agreement.

Table 3 Similarities and differences in methods used between the two projects (FRG and TL II) in decentralized seed production

	FRG (2005-2007)	TL II (2008-2009)
<i>Demand creation for new varieties</i>	Group based participatory planning, evaluation and demonstration, training, field day, promotional materials	Participatory Variety Selection (PVS), training, demonstrations, using small packs, promotional materials
<i>Multiplication of basic/ certified seed</i>	On research station	On research station, in addition, the seed is packed in to different sizes (5, 12.5 and 25 kg) customized to the capacities of seed producers with the end to stimulate development of agro seed enterprises
<i>Seed distribution to seed producers</i>	Planning with FRG member farmers and respective Weredas Agricultural and Rural Development Offices (WARDO); seed production embedded in field demonstrations of crop management practices; respective WARDOs does distribution to FRGs and copy farmers	Decentralized planning with all partners (<i>Primary partners</i> : Farmers cooperative unions (FCU), NGOs and <i>Collaborative partners</i> : Farmers, Extension experts, NGOs, private farms)and distribution is done through FCU, WARDO and NGOs
<i>Seed recovery and redistribution</i>	Recovered in kind by weredas and distributed to other farmers; Redistribution is mainly left for local networks (cash or non cash based exchange)	Recovered in kind and via cash through primary partners (FC Unions + NGOs) and redistributed by the same and through local networks (cash or non cash based exchange)
<i>Scale</i>	Selected weredas in Central Rift Valley (CRV)	Bean growing areas in the country
<i>Actors engaged</i>	Research, WARDOs, farmers	Research, WARDOs, FC Unions, NGOs, private farms, farmers

In the impact oriented bean seed production and delivery project (TL II), joint review is organized annually, and the roles of partners are

Decentralized seed production and delivery

redefined in response to meeting emerging challenges. This was found useful in modifying the models to fit the purpose of effective seed production and delivery.

3. Result and discussion

3.1. Demand Creation

The creation of demand for new improved bean varieties is one of the core activities in the decentralized seed production. The projects introduced different varieties of bean to farmers in a range of bean growing weredas. Various promotional materials (posters, leaflets, clip charts) and tools were also utilized in stimulating interest in new varieties as well as evaluating and demonstrating the varieties with participating farmers (Table 4).

Table 4 Varieties, target sites and promotional materials and tools used in creating demand

The projects	Varieties used	Number of Weredas	Promotional materials (types)	Tools
FRG (2005-2007)	15	3	2	<ul style="list-style-type: none">• Participatory evaluation and demonstration with FRGs• Field days• Training• Promotional materials (<i>Clip charts, leaflets</i>)
TL II (2008-2009)	12	34	3	<ul style="list-style-type: none">• Participatory Variety Selection (PVS)• Demonstrations• Small packs (8562 packets of different sizes and varieties)• Promotional materials (<i>posters, seed production manuals, leaflets</i>)

In addition to joint evaluation and demonstration of new varieties,

capacity development (training) on the production of quality seed of preferred bean varieties were carried out side by side with development of promotional materials as a reinforcement to continue production and improve localized access to the varieties (Table 5).

Table 5 Capacity building (training) activities on seed production

	Number of participants	Target districts	Types of Participants	Remark
FRG (2005-2007)	36	3	Farmers, Extension workers	Farmer to farmer experience sharing
TLII (2008-2009)	136	21	Extension workers (DAs + Experts)	ToT who in turn trains farmers

As indicated earlier, introduction of the new varieties was not a standalone activity. It was accompanied by a decentralized seed production and dissemination of the varieties for which the target community exhibited special preference. Various actors/partners were organized along the production and distribution chain to ensure better access to the new technologies.

3.2. Local Availability of Demanded Seeds

Once farmers' preferred varieties are identified, a decentralized seed production and distribution is effected with keen involvement of partners. Simultaneously, introduction of new varieties continued to unreached production areas. As it can be observed from Table 6 quite a number of partners were engaged in the production and distribution activity. The seeds of varieties already introduced and preferred by the farmers (popular varieties) were packed into bigger pack sizes (50, 100 kg) in 2008 and later modified to commercial pack sizes (5, 12.5, 25 kg) in 2009 were distributed to 1609 and 2740 seed farmers in respective years through the primary partners. The packaging was done at the research center after agreement was reached with partners on the ranges of pack sizes, particularly in 2009. Of the total seed distributed to farmers a total harvest of 377 and 126 tons seed of different varieties in respective years, was reported. This data was not complete because it refers to only the harvest from part of the total seed planted by seed producers. However, with all its limitation, so

Decentralized seed production and delivery

much seed was produced and made available to local farmers as well as others from surrounding/neighborhood districts, zones, and regions. Side by side new varieties were also demonstrated on farmers' field as well as distributed through small pack sizes of 0.2, 0.5, 1.0, and 2.0 kg to stimulate new demands and trigger the supply of the same using the most suitable mode of localized delivery by partners.

In the FRG project as well, in three districts both FRG farmers in 2006 and non FRG ones in 2007 were involved in production of seeds of five varieties (Table 7). In addition to the farmers, the actors actively engaged in the community based seed production were district agricultural and rural development offices as well as Melkassa research center. The former, besides distributing the seed to participant farmers, played the role of revolving the seed produced to new batch of farmers by recovering (after harvest) the amount they distributed in kind and providing information for other farmers about who and where the seed is available.

Table 6 Decentralized seed production, distribution, and introduction of new varieties by TL II project

Year >>			2008	2009	Remark
Number of Primary partners (FC Unions, NGO, Pvt farms)			17	14	4.
Number of Districts involved			27	34	5.
Quantity of popular varieties	In bigger pack size (50, 100kg)	Distributed (ton)	44.6	45.15*	Out of the total distributed few tones were left undistributed to farmers, hence, not planted
		Planted (ton)	40.2	41.9	
	Distributed using commercial packs size (5, 12.5, 25kg)(ton)		-	34.55	6.
Quantity of new varieties	Distributed in small pack size (0.2, 0.5, 1.0, 2.0 kg) (ton)		-	5.50	7 varieties; 8562 packs distributed through 9 Primary partners
	Distributed for demonstration (ton)		1.32	-	13 varieties on 1316 demo plots in 30 districts
Number of farm HH (participant)			1609	2740	More than 18500 farmers got access to seed from seed producing farmers as a spill over to other areas
Total harvest (ton)			377	126	The total harvest data is only from part of the total planted in the respective year. Remaining was not reported from partners

N.B. *The seed distributed in 2009 includes the seed that is recovered from 2008 by partners (4 t) and the one provided by MARC (41.5 t)

Partners involved: *Central Rift Valley (CRV): Agriculture and Rural Development Offices (ARDO) (6 Zonal and 20 Woreda), CRS (HQ and two churches: Wonji and, Meki), ELFORA Agro Industry PLC, Farmers Cooperative Unions (Lume Adama, Uta Wayu , Hitosa, Silte Melik), IPMS-ILRI (Alaba and Dale), ACOS Ethiopia, CIAT , Ethiopian and Oromiya Seed Enterprise.*

West Haraghe: CARE, WARDO (Chiro, Gemechis and Goro Gutu), EIAR-MARC

East Haraghe: HCS, WARDO (Kersa, Meta and Goro Gutu), EIAR-MARC, FCU (Afran Qallo), Haramaya University

Decentralized seed production and delivery

Table 7 Decentralized seed production and distribution by FRG project

Years	Districts	Varieties	No participant farmers	Basic/ certified seed in tone (source) @	Quantity produced (ton)
2006	3	5	30	(Farmers' Own)*	12.1
2007	3	5	135	6.5 (MARC+Own)	92.2

** The trial on variety selection was in progress from 2005 that the seed farmers used for 2006 seed production activity was the one harvested from the trial plots*

@ Refers to the seed used for seed production the original source being the research center and partly the distribution to farmers was taken care by respective WARDOs (Shala, Adamitulu-Jido-Kombolcha, and Bora)

6.1. Decentralized Recovery and Re-distribution of Seed

The seed produced by the farmers in both projects was recovered and redistributed either in kind or through different forms of exchange (through gift, seed credit, and exchange in kind and, cash sale). It was attempted to trace the fate of the farmer produced seed in the case of TL II project. The result from the recovery and post harvest utilization of seed by participant farmers implied that farmers' hardly return the seed given in kind, and in contrast the recovery through purchase looked better. However, there was no consistency from 2008 to 2009. The slipping of quite sizeable quantity (21-22%) of the seed produced to the grain market sounds absence of attractive seed price that can justify the investment on seed production (Table 8). If seed price is not well differentiated from that of grain, farmers would definitely lose interest in seed production for lack of incentive for the higher cost requirement compared to grain production.

In the FRG project, on the other hand, it was simply assumed that the seed shall reach to the target community in the weredas through local seed networks (exchanges, sales, gifts) in addition to what is being resolved through the facilitation of respective weredas, that is, agreement was reached with participant farmers to return the same amount of seed they were given at the beginning in kind to the weredas and the same is to be redistributed to new farmers in the wereda. Accordingly, it was recorded in two of the districts out of the

92 tons of seed produced in 2007, only 2.7 tons was reported to be recovered in kind and distributed to 57 new farmers. With no exception, in this project too, recovering the seed in kind from farmers was not that satisfactory. With all the irregularities in recording as well as returning the seed in kind, it was somehow recognized that localized access to seeds of farmer preferred bean seed varieties was created. Given the increased popularity of the farmer preferred improved bean varieties in the respective weredas, it is also believed that the farmer produced seed reached other farmers through exchange of seed (in different form) mainly as a result of frequent field day events that arose keen interest among visiting as well as informed farmers from different kebeles of those weredas.

Table 8 Recovery and post harvest utilization of seed produced by farmers (TL II)

Years >>		2008	2009	Remark
Total seed distributed from MARC through primary partners (ton)		40.6	41.5	The same amount is expected to be returned in kind to primary partners
Total seed produced (as reported) (ton)		377	126	At least 30% of the total produce is expected to be sold to primary partners
Recovered by primary partners (%)	Kind	3	9	7.
	Purchase	29	7	
Temporarily stocked by farmers (%)		15	17.8	8.
Sold/given to Other farmers /kept for self sowing as seed (%)		9	17.9	9.
Consumed (%)		6	1.2	10.
To grain market (traders + farmers) (%)		21	22	11.

Source: National Bean Research Project M & E data, 2009

In general, the two projects which depended on the engagement of range of partners in the decentralized seed production and distribution have been instrumental in both gaining practical experiences of producing seed with farmers and narrowing the potential supply gap that comes out of the wider demand created in the process. The fact that beans are hardly produced by the seed

Decentralized seed production and delivery

parastatals justifies the later. The experience was not all smooth. There were challenges, many ups and downs which left valuable lessons for setting up a successful decentralized seed production and delivery.

11.1. Challenges in the Decentralized Seed Production and Delivery

The following were some of the challenges encountered during the implementation of the two projects in general

Inputs availability and affordability

There were no clearly stated criteria used to select farmers who would participate in the production of seed. Thus, the foundation seed was provided to those farmers (picked by the extension workers) who had different level of access and purchasing power to necessary inputs. Therefore, it was not possible both to ensure the availability and/or affordability of input, particularly fertilizer, for the participant farmers. Some of the farmers' did not have either access or capacity to purchase the required fertilizer.

Management practices

At times farmers tend to manage the seed multiplication plot no differently from the normal grain production activity due to competition for limited resource (labor/capital) and/or reluctance by sticking to the traditional practices where beans field are hardly weeded. This affected not only the yield but also the seed quality

Monitoring and evaluation

It was found difficult, particularly after harvest, to trace the fate of the seed produced. This is because once farmers' threshed and the seed is ready, how much will be retained, exchanged, consumed, sold as grain/seed does not take place at a specific time. In addition, with the intention of not returning the seed given in kind farmers sometimes manipulate the actual harvest data that will undermine the total seed produced. On the other side, the small seed packs which were distributed on cheaper (affordable) price with the end of introducing new varieties, basically, require the registration of buyers with their profile for tracing where the seed went and what was the farmers' experience. Collection of buyers' profile was difficult because the buyers were rushing in number and the selling was done by research staff and there was hardly any support from some partners who were supposed to play this role. Over and above this, the incidence of frequent transfer as well as work over load of extension staff coupled with poor information sharing tradition created information gap and weakened the monitoring and evaluation activities.

Partners' commitment

Though there was a memorandum of understanding signed with partners, commitment was totally dependent on good will and understanding. There was no any enforcement/incentive mechanism to ensure commitment. Some partners had hard time owning the activity. This was reflected both in M & E as well as timeliness in distribution and recovery of the seed. The risk behind this could be that it can create the impression that partnership oriented decentralized seed production and delivery is hard to realize

Seed recovery

There was both delay in recovery of seed as well as less attractive seed price which forces farmers to send the seed to the grain market, and on the other hand farmers have hard time returning the seed provided in kind. When they do, they may do it with poor seed quality or do not return at all. They tend to confuse it with free offer/aid.

Storage problem

Farmers do not have appropriate storage facility/technology that can maintain the seed quality up to the next season. Since many farmers hardly purchase seed early enough before planting, the farmers who produced the seed had little option to extend the storage life and were forced to sell it as a grain. Moreover, the fact that beans mature early before other crops, makes it to be marketed early to fill the cash shortage that will be needed to pay for the labor cost of harvesting and threshing other crops. Coupled with storage the later is a real challenge in beans seed production. There is a critical need to work on development of appropriate bean seed storage technology to ensure local seed production and supply of best preferred varieties

Cash and marketing problems

Farmers are tempted to sell the seed as a grain when the grain market gets even more attractive than the seed price early before following planting season. Some siphon all to the market and do not even maintain seed assuming they would again receive the same seed. This, despite the potential demand, also limits the dissemination/availability of the seed to other farmers in need just because they lack the cash in time to secure the seed.

12. Lessons Learnt

The decentralized/farmer based seed production and delivery, through the two projects, had left important lessons that should be considered in establishing and improving informal seed production with partners:

- Seed production is an investment. It requires higher level of management compared to grain. Accordingly, farmers who would be engaged in seed production need to be food secured, capable to efficiently manage the seed production plot and absorb some shocks related capital. Or they will be tempted to poorly manage the crop and siphon the seed into the grain market to fill their cash requirement. Small and poor farmers in drought prone areas need to be beneficiaries of decentralized seed production than being a seed producers

- Unless there exist a differentiated price between seed and grain (which was a bit abnormal during the project period), it may force seed producing farmers to lose interest in seed production. There must be a price reward for seed.
- The quality of seed produced by participant farmers was variable. This suggested that there should be a mechanism to measure the quality level and set the price accordingly. Constant and organized engagement in ensuring as well as rewarding good quality seed produced by farmers is necessary. It can stimulate other interested farmers to be sensitive to quality.
- Farmer based seed production scheme demand some basic institutional arrangement beyond getting quality seed produced locally. There should be: involvement of local/community leaders, service cooperatives as well as administrative bodies; input and credit arrangement, market information network and incentive for quality, and storage facility which can be managed by collectively owned institutions as farmers' association/union
- The dissemination of low quality seed, through revolving or whatsoever, may check the adoption of well performing variety and can damage trust between farmers and other stakeholders involved. Hence, caution must be taken not to revolve seeds of lower quality.
- Potential connection of seed producing farmers with the formal seed sector as well as strengthening the link with projects/institutions working on seed business can enhance their complementarities and provide for exchange of experience and building of local capacities towards developing seed business. Furthermore, systematic and strategic integration of the informal and formal seed sector would be instrumental in enhancing and sustaining the production and delivery of quality seed.
- Seed multiplication activity can be a very good opportunity to evaluate and introduce/demonstrate various improved management practices with farmers
- Packaging of seeds- commercial pack for popular and small pack for new varieties- in to different sizes proved their worth in providing access to /introduction of new varieties and maximizing the option to acquire seeds of popular varieties by small farmers with low purchasing power. It encouraged them to acquire new varieties, take

Decentralized seed production and delivery

modest risk, and even to pay for small seed packs. Similar marketing strategy can be, even beyond this, applied to other inputs such as fertilizer.

- Capacity development both technical and institutional is crucial if farmer based seed production has to thrive and sustainably address the demand for seed. Farmers' and extension workers' need to be equipped with all the necessary knowledge and skill for production of quality seed. Besides, farmers' association/unions and other small scale entrepreneurs' capacity to deal with marketing of farmer produced seed including storage facility should also be developed. Establishing important quality parameters and sharing the same with farmers through developing their technical capacity and setting seed quality standards together with corresponding premium is crucial to ensure availability and sustainability of quality seed. Besides, this may facilitate the growth of small scale entrepreneurs in the informal seed sector. The interest developed with some institutions, particularly NGOs, with regard to enhancement of small scale entrepreneurs in the informal seed sector need to be exploited as an opportunity.
- While planning decentralized seed production and delivery business with partners, it is important to give equal emphasis to both the production and marketing aspects. Particularly, setting up clear seed distribution procedure/system and creating shared understanding of the same early enough in the planning stage would be useful to reduce the tension at the end.

13. Conclusion

Given the present huge difference between supply and demand, the development of alternative seed sources such as farmer based seed production in addition to existing formal seed sector cannot be considered optional. Yet, even establishment of informal seed multiplication capacity does not just happen; proper training of farmers, market information network, incentive mechanism, linkage among important stakeholders as research, agricultural offices, local administrative bodies, formal seed sector and unions/farmers

association are requisites. It is also necessary to set up a clear distribution procedure as well as mechanisms to control the quality and accordingly sustain the supply. In general, the experience in these projects suggested that beans seed multiplication, among other, demands a storage facility to ensure its availability at planting time with acceptable quality; coordination among key partners and proper institutional arrangements to avoid sales of seed as a grain. The strengthening of farmers' association/union is indispensable in providing conducive marketing environment for informal seed sector and ensuring localized as well as sustainable seed supply. To maximize out of their complementarities, the need to integrate the informal with the formal seed sector cannot be over emphasized. Last but not least, use of buyers' friendly packaging both for commercial and new varieties has significant role in improving access to seed as well as awareness to new varieties to a range of small farmers with variable purchasing power.

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