

## **Developing seed systems with and for the marginalized: case of common beans (*Phaseolus vulgaris* L.) in East, Central and Southern Africa**

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### **1. 0 Introduction**

Seeds are basic agricultural input. More importantly quality seeds of any preferred varieties are basis of improved agricultural productivity since they respond to farmers needs for both their increasing productivity and crop uses (Pelmer, 2005). Currently, small scale farmers increasingly face many challenges including both biotic and abiotic and must respond to market demands. Local landraces alone do not constitute solution to all these multiples constraints. Therefore improved and formally bred varieties can contribute to meeting some of those challenges. However, their seed accessibility and availability to farmers are determined by many factors including the crop breeding systems, institutional/organizational arrangements and socio-economic conditions of farmers.

In Africa, the majority of farmers mainly get their seeds from informal channels which include farm saved seeds, seed exchanges among farmers or/and local grain/seed market. These channels contribute about 90-100 % of seed supply depending of the crop (Maredia *et al.* 1999). Despite the importance of this system; unlike the formal (regulated) seed systems, the informal is rarely supported. Subsequently, its improvement has been very limited or non existent. Therefore, this has negative effects on agricultural productivity and income of farmers and more particularly to poor and marginalized farmers. Nevertheless, it has been proved that once well supported and linked to sources of improved varieties, the informal seed sector can be a reliable and efficient way to access improved varieties of crops whose seeds attract a very limited interest of commercial seed sector. Using the successful results of beans in Africa, this paper illustrates an example of process and results of an integrated seed systems being carried in east, central and southern Africa by National Agricultural Research Systems (NARS) and partners with support from the International Centre for Tropical Agricultural (CIAT) and regional bean research networks under the umbrella of the Pan Africa Bean Research Alliance (PABRA).

### **2. 0 Historical background of seeds sector development systems in Africa**

During 1970s, the African government and donors recognized the importance of quality seeds and all their supports went to the establishment of highly subsidized formal seed sector mainly seed parastatals (Lyon and Afiko-Danquah, 1998; Zerbe, 2001). However, their successes were limited due to several reasons including financial sustainability and lack of small scale farmers' orientation in both variety development and seed supply chains. In 1980s, there was a policy shift of disbanding the parastatal and encouraging private sector development. Being a profit driven undertaking the commercial seed companies were limited mainly on seed of hybrid maize and vegetables targeting high potential areas (Zerbe 2001; Jones *et al.* 2001; Daniel and Adetumbi, 2004). Therefore seeds of grain legumes like beans or other minor crops such as sorghum and vegetative propagated crops were rarely supplied by this sector unless when they were purchased in bulk by development and/or relief operations. As results of this situation, during 1990s, NGOs and rural development/relief

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agencies became interested in seed sector by supported community owned/based seed production and supply (Seboka and Deressa, 2000). Their aim was to transform local community farmer seed producers into formal seed producers of certified seeds (Tripp, 2001). Though the sustainability was limited; the approach was very successful in accessing seeds to remote and poor farmers (Maredia *et al.* 1999; Seboka and Deressa, 2000). In 2000s, there is a renewed effort to improve seeds accessibility with focus on supporting private sector (small and medium enterprises) and also the establishment of seed business friendly regulations such as harmonized seed regulations across sub-regional organizations e.g. east and central Africa region, southern Africa region and western Africa region (Rohrbach *et al.*, 2004). Despite all these good efforts, Tripp (2003); Rubyogo *et al.* (2007) indicated that these companies tend to focus more on profitable crops/varieties e.g. hybrid maize and other high value crops (vegetables) rather than a range of crops species which constitute the backbone of their poor resource farmers' food security/cash e.g. pulses, small grains and tubers and roots.

### **3. Who are the clients and their conditions?**

In Africa, the majority of food crops including beans are mainly grown by small scale farmers. The majority of them are resource poor farmers and more particularly women. In case of beans, they grow beans for both food household consumption and cash for households' expenses and /or for their owned investment e.g. small stocks (ATDT-CIAT/ISAR/IITA-FOODNET and PEARL Project – Rwanda, 2002; Kalyebara, Mugisha and Nasirumbi, 2004). These farmers are facing many various constraints in both bean production and post harvest including marketing. Some of the constraints include (i) decreasing farm size (ii) location on marginal land and with decreasing soil fertility (iii) unavailability and/or inaccessibility of farm inputs including seeds of the variety of their choices (iv) inexistent research and extension support services (v) inadequate integration in market. Penrose–Buckley (2007) indicated that increasingly farmers are organized in cohesive self help groups/producer organizations whose membership comprise both female and male as well farmers with different productive economic assets (land, farm implements and stock etc.) and human and/or social capital (skills and social network). More often these organized clubs and self help groups are supported by local extension or large farmers' organizations, NGOs or linked to traders who are interested in commodities.

### **4.0 Linking target group seed demands, crop breeding systems and seed supply of improved varieties**

At the household farmer level, seed security is defined as the state in which a farmer has access to the sufficient quantities of seeds of their preferred varieties with adequate physical quality, at the right time of planting (Sperling and Cooper, 2003). As the majority of small scale farmers (poor and marginalized) operate in low input systems, their seed security is guaranteed when they produce enough food and put some in reserve to be use as seeds for the next season. In Tanzania, it was found that, farmers recycled their bean varieties six times. Nevertheless they are very much interested in testing and acquiring new crop varieties to respond to ever-changing agro-ecosystems and also for meeting the every increasingly differentiated market (David and Sperling 1999; Almekinders *et al.* 2007; Rubyogo *et al.* 2007). Table one illustrates some of the factors which may influence the demand of fresh seed which is bedrock of any commercial seed sector development.

**Table 1: selected crop characteristics affecting demands for fresh seeds**

Crop	Pollination systems	Varietal deterioration	Loss of desirable genetic quality traits	Carry over of seed based diseases	Commercial interests
Maize	Hybrid	High	High	Low	Very high (season supply)
Maize	Open pollinated variety	Medium	Medium	Low	Medium (every 3 seasons)
Beans	Self pollinated	Low	Low	Low –medium	Low unless a relief operations
Cassava	vegetative	Low	Low	High	Very low

Source: Rubyogo *et al.* (2004)

Even though the public support has been geared towards the commercial seed sector, the chances/success of establishing it beyond the hybrid maize is very minimum (Zerbe, 2001). For instance, commercial (certified) bean seed costs 2 to 4 times what farmers would pay for seed obtained in local markets and yield gains are not commensurate (Rubyogo *et al.* 2007 ). The supported commercial seed enterprises in place have not provided options attractive for poor farmers. That is why there is a need to devise other avenues to avail seeds of improved varieties of their choices.

### 5. Importance of beans and its seeds accessibility.

Beans are food/nutrition security crop and source of cash income in east, central and southern Africa. As a short-duration crop (2.5 -4 moths), they are also a key for helping to shorten the hunger periods and for providing quick cash. Their early maturity and capacity to provide a range of food products (leaves as well as, fresh pods and dry grain) also helps provide a more balanced diet to vulnerable community members (the under five, pregnant mothers and chronically ill people. In some countries of the Great Lakes Region namely Rwanda, Burundi and east Democratic Republic of Congo (DRC), the bean consumption is estimated at 40 kg per year per person (Spilsbury *et al.* 2004). In the recent years, bean consumption is on the rise as result of the increasing scarcity of animal proteins and increasing poverty among the urban and rural poor. In the region, beans are mainly grown by small scale farmers with a very minimum input use except seed. Despite a slight increasing yield trend, beans productivity and yield levels at the farm level have remained relatively low and even decreasing in some areas (FAO, 2005). This contributes to lower bean availability and accessibility to the majority of households. Farmers are increasingly interested in improved bean varieties which respond to their priority needs to increase productivity (i.e. drought and disease/pest tolerance) and also with good marketability, good cooking/eating qualities.

One way to address this situation is to carry out participatory bean breeding with farmers, facilitate them to identify their preferred varieties and ultimately access seeds of these varieties. Bean research in the region is still mainly carried out by the National Agricultural Research Systems (NARS) through their national bean research programs (NBRPs). With support from the regional bean research networks and the International Centre for Tropical Agriculture (CIAT) NARS have developed and still developing varieties with farmers. Some of the newly released varieties have potential for wider adaptation and use, and others are adapted to micro agro-ecologies and/or for market niches and other users. As previously discussed, beans seeds hardly attract commercial seed sector interest unless it is a relief operation contract. It would be unrealistic to assume that bean varieties adapted to these micro –agro-ecologies would be channeled through the formal seeds sector as certified seeds.

## 6. Steps followed to develop an efficient seed system for the poor

### 6.1. Engaging the end users in bean participatory variety selection

As results of long term interactions and partnership between CIAT-NARS in the region, bean scientists have been developing varieties with end users. Elements of this strategy include: decentralizing variety selection to target zones (different agro-ecologies), selecting genotypes under conditions of real farmer input, bringing farmers (men women, of different wealth levels) early in the selection process; and giving farmers real choice based on their agro-ecologies and bean uses. This has resulted in an impressive number of highly appreciated varieties being released or highly used by farmers in the vicinity of testing sites. Some of these genotypes have a wider or localized utilization. Once farmers identify the bean genotypes they preferred, they are named based on their characteristics and also their uses. Table 2 illustrates the how farmers viewed the bean varieties they selected in Ethiopia. Between, 2003-2007; 60 bean varieties have already released and some of them used by farmers. More recently with dwindling role of traditional cash crop such as coffee, farmers are increasing relying on beans as cash (ATDT-CIAT/ISAR/IITA-FOODNET and PEARL Project – Rwanda, 2002), subsequently the breeders have expanded this approach to systematically bring bean traders into the screening process. The approach also facilitates interactions between farmers and traders and ultimately opens market opportunities for the farmers. This has further accelerated impact by opening up new and previously unknown market niches, as well as hastening the commercial use of varieties.

Once farmers identified the genotypes of their choices, they started the process of ownership of the varieties by giving local names (see Table 2). Subsequently farmers started set of activities aiming at seed multiplication and dissemination.

**Table 2: Farmer labels for bean varieties selected in participatory plant breeding programs in Ethiopia**

<b>Pedigree Names</b>	<b>Farmers variety names</b>	<b>Meaning</b>
Dor 544	Dimosange (Red Bull")	fat and tasty;
white navy-s	"Bank"	these varieties bring real money;
sprawling types	Gombobundu ("umbrella")	Variety covers the ground and helps with moisture stress.
AFR 222	Ibbado (abb. fresh milk)	delicious as fresh milk;
AFR 702	Bussuke (well-fed calf)	plump, meaty; also, as many other improved varieties are fast cooking, they are referred to as: "fast food for the hungry

As farmers advanced in multiplication of seeds of bean varieties of their choices, the next steps would be to assess the seed systems which would take the new bean varieties to more farmers.

### 6.2. Participatory assessment of existing bean seed channels and testing alternative seed channels

Since farmers acquire seeds from different sources, it is very important take inventory of the existing seed systems and assess the efficiency considering different parameters in function of diverse socio-economic categories of the target groups (rich, poor and middle, men or women), types of genotypes vs. reach, time of seeds of availability, cost and seed quality (desirable genotype, diseases, physiological quality). An example of the seed systems assessment carried out by the farmers in east Africa is summarized in the Table 3.

**Table 3: Advantages and setbacks of bean seed supplied by decentralized (local) and commercial seed systems**

Important comparison criteria in seed systems	Local/decentralized system	Commercial systems
Bean genetic diversity	Supply several genotypes	Only fewer, already popular and widespread varieties
Agro-ecological suitability	Adapted to micro-ecology e.g. intercropping	Wider adaptation
Means of procuring/accessing seeds	Horizontal diffusion: through seed gifts, seed exchanges vs. grains/labor, cash	Absolutely cash and often higher price (three times the local seed price)
Access to information about new varieties/techniques	Horizontal information exchanges: neighbors farmers, demonstration, field days, social networks	Very minimum promotion by seed stockists or agents
Types of Clients	Farmers based on their interests and needs (varieties, quality and quantity)	Non/and Government/Organizations (seed aids)
Shaping research agenda	Immediate feedback to scientists e.g. identification of farmers' selection criteria	Late and interested in already popular varieties
Accessing new genotypes	Interested and possibility to accelerate access to preferred genotypes	More of 'wait and see' attitude
Building partners' (farmers, extension agents) capacity	Strengthening farmers' skills and organizations development e.g. experimentation/seed systems	Only seed stockists and other formal suppliers
Amount of seed supplied	About 98%	2%

Source: Rubyogo *et al.* (2007)

In general, seeds sources/systems which score higher were adopted and used in supplying seed of new varieties. However, in all the sites where the assessment was carried out, farmers identified the decentralized seed systems (see Table 3) as the most appropriate way to access improved bean varieties. The decentralized seed system entailed the production of seeds by local seed producer with reputation of producing and supplying local community either directly or through the local market. The dissemination was carried through the local channels –farmer-to-farmer (local seed producers or beneficiary farmers) or from local traders. The impact study in Tanzania found that, in average 82% of farmers reported that home saved seed was their most important source of seed and only 2% of farmers obtained certified seed. In addition to supply of the seeds of new varieties, those farmers were considerable source of skills and knowledge about the variety adaptation and management. The majority of these bean seed producers were women.

### **6.3. Limitation of local seed systems**

Even though the decentralized seed system seemed more appropriate, it also had some shortcomings (see Table 3) which might delay its efficiency in the diffusion of improved varieties. These included the inadequate linkages to sources of improved bean varieties such as the National Agricultural Research Systems (Bean Research Programme and/or Research farms), inadequate quantity and quality of seeds, information about the new varieties to the surrounding farmers and beyond and their slow of speed with which those varieties could move.

### **6.4. Addressing limitation by integrating formal and informal seed systems**

Since the objective of the intervention was to improve farmers' income and food security by speeding up the seed access of new and preferred varieties to the majority of farmers who are scattered over a wide geographic area, with different agro-ecologies and with different socio-ecological conditions. It was the perspective of improving those shortcomings that NARS with support from CIAT and regional bean programme devised alternative seed systems which integrate some elements of the formal seed systems and use them to improve local seed supply systems. However this required multi-institutional/intersectoral approach beyond the NARS. Some of partners involved in the approach included extension agents from NGOs and government services/development programmes, grain traders and some seed companies, farmers' organizations, national seed services. The partnership members carry out different but complementary seed activities ranging from the variety development, availability of foundation seeds, skills/ and knowledge enhancement and promotion including the dissemination of quality of new bean varieties. As a few of the varieties promoted through informal sector gained popularity (a period of 5-10 years), few seed companies got interested in the seed production and supply for both relief seed operations and normal seed supply through stockists. For instance in Uganda, where three medium size seed companies operate, their supply is limited only to two varieties viz. NABE 4 and K132 out 16 varieties released by the national programme. Nasirumbi *et al.* (2007) indicated that the total seed supply is about 5% of national seed requirement. The seed supply through both the village agro-dealers and relief organizations amount at 20% and 80% respectively. The seed relief operations targeted internal displaced, disaster affected areas and refugee rehabilitation including neighboring countries such as Sudan or Democratic Republic of Congo and other countries in the Great Lake Region. Due to high cost of producing seeds in large scale, the seed companies also usually contract small scale seed producers supported by either NGOs/GOs and farmers' organizations. This approach is now increasingly taking place in many bean producing countries such as Ethiopia, Malawi, Kenya and Uganda etc.

### **6.5. Farmers' skills and knowledge enhancement**

With to regard to farmers skills and knowledge enhancement, the NARS and development partners were carried out training of trainers in bean pre and post harvest management (agronomy, pest and disease control, seed post harvest handling and seed/grain marketing and organizational development- technology promotion). The trained farmers also served as trainers to other farmers. For instance in Uganda, between 2005-2007, 105 trainers including farmers who were trained also imparted similar skills and knowledge to 1005 other farmers both seed/grain producers and rural traders where farmers purchased 'seeds' (Nasirumbi *et al.* 2007). In Ethiopia, starting 2004 NARS trained 150 development agents from districts and partners organizations and leaders of farmer cooperative union. By the end of 2006, about 10500 farmers where trained by those trainers. This had a tremendous impact of the spread and use of improved technologies especially for the white pea beans (Rubyogo *et al* 2007).

## 6.6. New bean variety demand creation and their promotion

One of the weaknesses of farmer to farmer seed supply is the slow move of the varieties. To address this issue, some aspects of promotion through a multiple mass media approaches were used. Those mainly include very decentralized demonstrations located in selected farm sites; field days are organized from national to very decentralized farmer lead at the farmer group level and regular radio and/or TV clips. During those field days, both written and oral information about varieties pre and post harvest management were discussed with field days participants. The trained farmers (seed/grain producers) took the lead in passing that information to the field day participants. The period of field days were generally set to facilitate the discussions on the modalities of acquiring seeds from local seed and formal seed producers. Exchange visits and study tours were also organized to exchange experiences and information.

## 7. Some of the decentralized seed systems results

Two major factors hindering the use of the improved bean varieties were the lack of awareness about the right varieties and the inaccessibility of seeds of these varieties to farmers especially the poor and marginal located in remote areas. This approach addressed the two aspects by facilitating the decentralized participatory varieties, followed both by local seed production/supply and promotion/demand stimulation. Using this approach in Uganda, between 2002-5, the accessibility of seeds to farmers improved in their neighborhood and beyond as illustrated in Table 4. Considering that each farmer who received seeds also passed a certain amount to four his/her four neighbors (average in Uganda case), in less than three years improved varieties had reached about 50,000 farmers in three districts without including the seeds sourced by farmers from the local traders and seeds sold outside the target communities amount to the quarter of seeds produced (Nasirumbi *et al.* 2007)

**Table 4: Amount of bean seed produced/supplied in kg by 89 farmer seed produced in three districts (assorted varieties).**

Year	Amount produced	Amount of sold outside the groups	Amount of marketed in the group
2002 (One season)	3,400	-	3,400
2003	25,485	11,350	14,137
2004	11,622	-	11,620
2005	18,799	-	18,799
Total	59,306	11,350	47,954
<b>Estimated households reached</b>	-	-	<b>11,989</b>

Source: Nasirumbi *et al.* 2007

Similarly in Tanzania in Babati district, a study conducted by Kasambala *et al.* (2007) found that of the 120 farmers who started growing different bean varieties in the last five years, (33%) of them acquired seed from their parents/brothers/sisters, (38%) from neighbors or other members of the community and 28% from outside of the community. This indicates that it is more frequent that seed is interchanged within (71%) rather than introduced from outside the community (28%). One male farmer whose name is John Peter, of Gjedaboshka village distributed bean seed to 55 other farmers. Majority were from his own village and few from other neighboring villages the same community (see Figure one). The same study revealed that that the minimum distance that farmers share these improved variety is about 3 km while the maximum distance is 42.1 km. Moreover, the majority of first seed providers stayed between 18 and 22 km.



- Develop partnership with other services providers include traders and development partners so that various seed related activities are shared among partners;
- Encourage complementarity among formal and informal seed sector and more importantly sharing of seeds horizontally (farmer- to- farmer). However, sometimes one must be aware that early maturing bean varieties are prone to being consumed or sold and therefore creating a shortage of seeds.
- In order to improve the quantity produced to meet the demand and increase local stock of the varieties, other yield enhancing technologies are also required, therefore the interventions should go beyond the seed aspects and other non seed technologies (agronomic practices);
- In local decentralized seed systems, the grain/seed merchants are key stakeholders in the seed dissemination and outlets for seed producers, thus their engagement and linkages to seed producers will pay a great dividend

## References

- Almekinders C.J.M., Thiele G. and D.L.Danial (2007). Can cultivars from participatory plant breeding improve seed provision to small scale farmers? *Euphytica* 153: 363-372
- ATDT-CIAT/ISAR/IITA-FOODNET and PEARL Project – Rwanda (2002). Bean sub-sector market survey (Draft Report) Pp 17-19.
- Daniel I.O. and Adetumbi J.A. (2004) Seed supply for vegetable production at small holder farms in south western Nigeria. *Euphytica* 140: 189-196
- David S. and Sperling L. (1999). Improving the technology delivery mechanisms: lessons from bean seed systems research in east and central Africa. *Agriculture and Human Values* 16: 381-388.
- Food and Agriculture Organization (FAO). 2005. Crop production statistics data. Link: <http://faostat.fao.org/site/340/default.aspx>. (accessed August 4, 2007).
- Jones R.B., Audi P.A. and Tripp R. (2001). The role of informal seed systems in disseminating modern varieties: example of pigeon pea in semi-arid area of Kenya. *Experimental Agriculture*. 37:539-548.
- Kalyebara R., Mugisha K.S., Nasirumbi L (2004). The Impact Improved Bean Varieties in Uganda (Draft Report). Pp 1-3
- Kasambala, S.; Rubyogo J.C.; Ngulu F.; Massawe K. and Peter .X. Assessment of bean seed dissemination channels in Babati district, Tanzania. Submitted for the publication in “*Farmers’ Seeds and Varieties: Supporting Informal Seed Supply in Africa*” To be published in 2008.
- Lyon F. and Afikorah-Danquah (1998) Small scale seed provision in Ghana: a social relationship, contracts and institutions for micro-enterprise development. *Agricultural Research and Extension Network* 84: Pp16
- Maredia M., J. Howard, D. Boughton, A. Naseen, M. Wanzala and K. Kajisa. 1999. Increasing Seed System Efficiency in Africa: Concepts, strategies and issues. Michigan State University International Development Working Paper. Department of Agricultural Economics- MSU East Lansing Michigan, pp 12-13.
- Nasirumbi Losira, Rubyogo, J C. Ugen, M, Namayanja A. and G. Luyima (2007) Reaching remote farmers with improved bean varieties: Lessons from Uganda. Submitted for the publication in “*Farmers’ Seeds and Varieties: Supporting Informal Seed Supply in Africa*” To be published in 2008.
- Pelmer D.P. (2005) Agriculture in the developing world: connecting innovation in plant breeding research to down stream applications. *PNAS* 102 (44) 15739-15746.
- Penrose–Buckley, C. (2007) Producer Organizations: A Guide to Developing Collective Rural Enterprises. Oxfam GB, Oxford, UK.
- Rohrbach, D. Minde I. and Howard J. (2004) Looking beyond national policies: regional harmonization of seed market. In Rohrbach D. and Howard J. eds *Seed Trade*

- Liberalization in Sub-Saharan Africa-Workshop Proceeding Dec. 5-6<sup>th</sup>, 2002 Pp 14-35 Matopos Research Station, Bulawayo, Zimbabwe. ICRISAT- Bulawayo Zimbabwe.*
- Rubyogo, J.C., Sperling L. and T. Assefa (2007). A new Approach for facilitating farmers' access to bean seed. *LEISA Magazine* **23 (2) 27-29**
- Rubyogo, J.C.; T. Remington and R.Jones (2005) Seed Systems for Reaching a broad range of users quickly and efficiently. Proceeding of the Harvest Plus Reaching End Users meeting. Rome Italy (IPGRI-Macaresse) May 5-7<sup>th</sup>, 2004
- Sperling L. and H.D. Cooper (2003) Understanding seed systems in seed security. In Improving the effectiveness and sustainability of seed relief. Proceedings of a stakeholders' workshop in Rome 26-28 May, 2003. Rome: Food and Agriculture Organization.
- Spilsbury J., Kagwe J. and Wanda K. (2004) Evaluating the Marketing Opportunities for Beans and its Products in the Principle Beans Growing Countries of ASARECA. International Insitute of Tropical Agriculture –Foodnet. Pp 12-14.
- Tripp, R. (2003) *How to cultivate a commercial seed sector?* Paper prepared for the symposium on sustainable agriculture in the Sahel. Bamako Mali December 1-5<sup>th</sup> pp 12.
- Tripp R. and D. Rohrbach. 2001. Policies for African seed enterprise. *Food Policy* **26 :147-161**
- Seboka B. and A. Deressa. 2000. Validating Farmers' Social Network for Local Seed Supply in Central Rift Valley of Ethiopia. *Journal of Agri. Educ. Ext.* **6 (4): 245-254.**
- Zerbe N (2001) Seed of hope, seeds of despair: towards a political economy of the seed industry in southern African. *Third World Quarterly* **Vol. 22 (4) 657-673.**