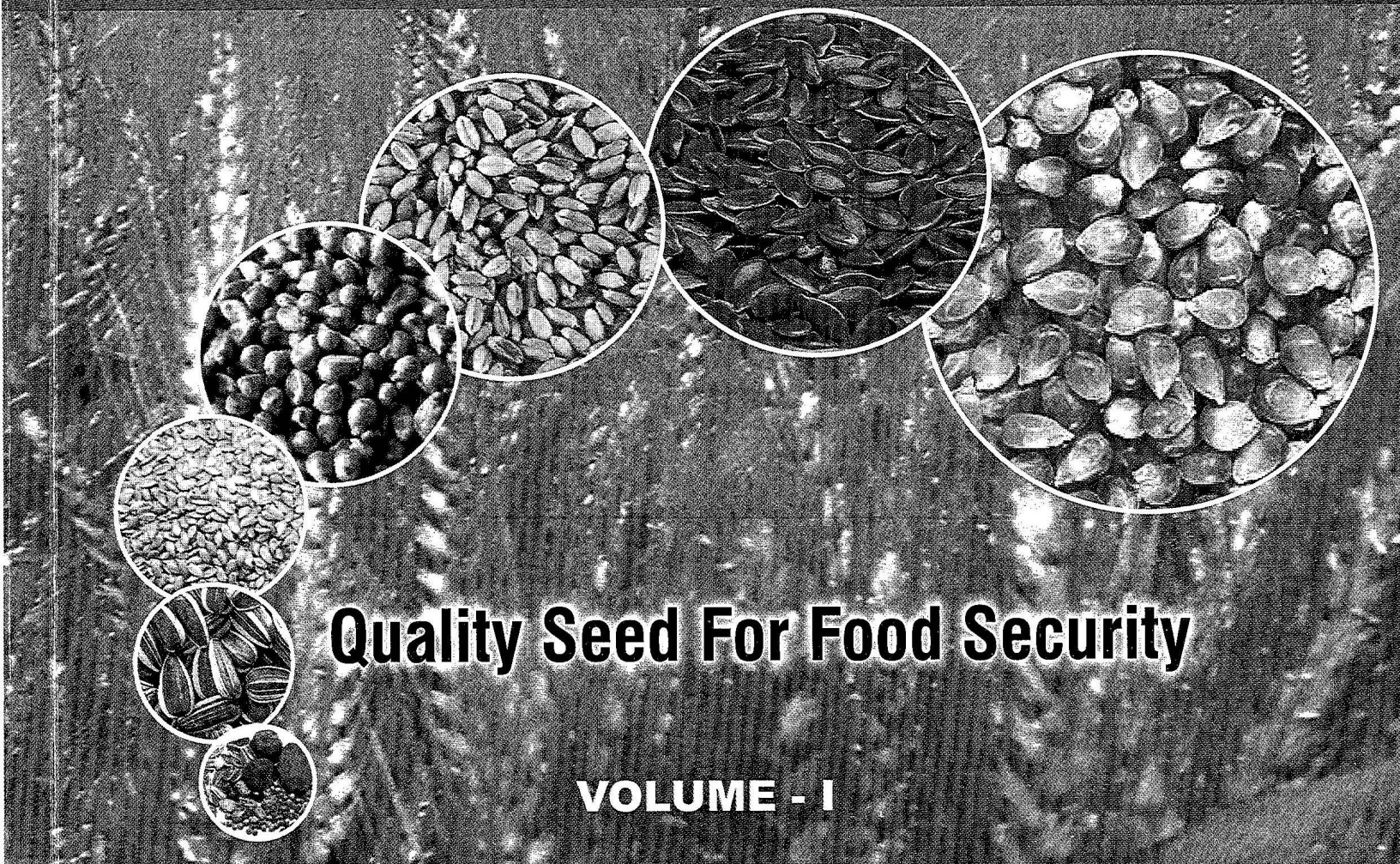
NATIONAL SEED CONGRESS 2012



Quality Seed For Food Security

VOLUME - I

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Contents

Farmer Enabled Village Seed Banks as the Edifice of Integrated Seed System for Improved Access, Production and Supply of Groundnut Seed in India –A Case Study

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Seed is an important basic input for the enhancing the productivity of any crop species. The availability of quality seed of improved cultivar is the foundation for food production security. A goal perceived by many governments in the semi-arid tropics (SAT) of Andhra Pradesh was to meet the groundnut seed requirements of small-scale farmers, but was never met successfully to meet their requirements. National agricultural research institutes and International research centers have worked together to develop new, stress tolerant varieties that are well adapted to smallholder farmers conditions, especially open pollinated varieties. Private seed sector is reluctant to produce open pollinated varieties and market the varieties of groundnut crop because, varieties do not fetch good price and it is not feasible for commercial sector. Even if they produce, it may not reach to small farmers in the remote rural areas. The baseline studies in the project area have identified key problems related to groundnut seed supply system. These encompass timely availability of good quality seeds of high-yielding varieties, lack of storage facilities, problem of pod borer (storage pest), and farmers believe that using their own seed repeatedly year after year is detrimental and that repeated use of their own saved seed. However, most farmers in these regions have little or no accesses to seeds of improved varieties and they continue to recycle the same old verities for decades together has led to stagnated yields, resulting in low yields and poor livelihoods of small-scale farmers. These constraints were addressed in the project funded by Society for Elimination of Rural poverty (SERP), of Department of Rural development (DRD), Govt. of Andhra Pradesh. The main issues addressed were: how will farmers be assured of quality seed? How can informal seed enterprises and farmers be assured of their integrated role in the seed production and supply systems to enable timely availability of best quality seed at their door-step? Further, the project also attempted to illustrate alternatives to existing system by proposing a science based integrated seed systems model – "Village seed banks" for enhancing productivity. The existing seed multiplication and delivery systems in Mahabubnagar district of Andhra Pradesh, India were surveyed and documented. Based on the existing informal seed systems in the project villages, model village seed

solid case for strengthening alternative seed systems and seed delivery models that address the needs and vulnerabilities of small farmers in the ever-changing political and socio-economic scenario at the national and international fronts. This paper is an attempt to review and document the successful results of the Village Seed Bank model tested in Mahabubnagar district of Andhra Pradesh in India. The outcome of the interventions are discussed in this paper, which calls for

efforts to improve the performance of the agricultural sector through seed production, storage and delivery system at village level by farmer enabled village seed banks.

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Introduction

A seed system is said to be well functioning if it has an appropriate combination of formal, informal, market and nonmarket channels to efficiently meet farmers' demand for quality seed. Rules and regulations such as variety release procedures, intellectual property rights, certification programs, seed standards and contract laws influence the structure, coordination and performance of a seed system. Given the critical role that improved varieties play in increasing agricultural production – both crops and livestock – a key question is how to facilitate the development of a seed system that is capable of generating, producing and distributing seed varieties that meet the needs of resource-poor small-scale farmers in a cost-effective and timely manner. Developing a seed system based on greater integration, broader participation and decentralization is an attractive, technically interesting and purposeful strategy.

It is only in the last 10 years that farmer seed systems have gained recognition as valuable elements of agricultural development. There exists comparatively little literature that systematically describes farmer seed systems. Only a handful of studies have closely examined such systems for any particular crop. Yet their significance to agricultural production cannot be overlooked. The farmer seed systems – also referred to as local seed systems or the informal seed sector – provide over 80 per cent of the total quantity of seed sown in both developed and developing countries (Almekinders 1994; Cromwell 1996).

The overall objective of the project was to improve access to and availability of good quality seed of farmer-preferred improved varieties at affordable prices and at the right time to enhance income and household food security. The main assumption embedded in the programme was that if the knowledge system with all its relevant stakeholders is better understood at every level, concrete actions would be more appropriate and their impacts on management of village seed systems become more sustainable. The developmental research will improve the capacity of different stakeholders, rural women and men, decision makers, service providers, researchers and policymakers to examine, analyze and comprehend local seed management systems with a view to developing more appropriate responses to seed security problems.

Background and rationale

Depending on farmers' mode of procuring seed for their own use, several kinds of informal seed systems exist in villages. Firstly, farmers select own-saved seed from their fields, grade it and store and reuse it in the next season in their own fields or share it with other farmers. Another major source of seed is the village shandy where seed are not signified as per any variety/cultivar; rather, grain is graded to some extent and sold as seed during sowing time or just after the first shower. Thirdly, seed are sourced from local markets in nearby towns. Seeds here are sold by fertilizer and pesticide dealers. They sell unnamed seed of local varieties and

branded seed produced by seed companies. Another source of seed are market yard middlemen (grain brokers) who procure grain and sell it as seed. Oil mills which procure grain for oil extraction also sell it as seed during sowing time. Further, fertilizer dealers play an important role in the distribution of groundnut seed and are the main source of supplying inputs (fertilizer, pesticides, seeds, etc) on credit. Small-scale farmers depend largely on such dealers for input needs, which are sold to them on a credit basis with repayment after the harvest but at exorbitant rates of interest (sometimes 36%). Sometimes input dealers procure produce from the farmers' fields but at lower than market rates and after deducting the cost of the inputs lent.

Baseline studies done under a joint venture project between the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) and the Department of Rural Development (DRD) identified key problems related to seed supply systems in groundnut. Timely availability of quality seed of high-yielding varieties was found to be one of the major constraints contributing to stagnant groundnut yields in the project area – which was characterized by postrainy-season cultivation in under irrigated conditions. The question addressed in this project – funded by the Society for Elimination of Rural poverty (SERP), DRD and the Government of Andhra Pradesh – were: How can farmers be assured of quality seed supplies? How can informal seed enterprises be integrated into seed production and supply systems to ensure timely availability of quality seed at the farmer's doorstep? The project also attempted to illustrate pathways to a science-based integrated seed supply system geared toward enhancing productivity. With increasingly rapid changes taking place in the technical, socioeconomic and policy environments, how these innovations are implemented forms an important issue.

An ICRISAT-led consortium has demonstrated in other projects areas that farmers can produce high quality seed using foundation seed material. It found that farmers can be involved in production, grading, storage and distribution of seed, and this would lead to increased productivity and employment opportunities in the villages. Self-help groups (SHGs) can manage village-based seed banks, and it was found to be possible to generate more income at the village level, along with increased productivity of grain and fodder in large rainfed areas (Ravinder Reddy et al. 2006; Roothaert et al. 2006). Interventions and capacity building activities relating to establishment of village-based seed banks in Madhya Pradesh, Rajasthan and in Andhra Pradesh during the last 5-8 years yielded significant results (Sreenath Dixit et al. 2005). Community-based organizations (CBOs) were empowered to manage the village-based seed banks in groundnut, chickpea, sorghum and soybean (Ravinder Reddy et al. 2006; 2007).

Overview of seed systems

Seed systems can be grouped into two types: 1. Formal seed systems, and 2. Informal seed systems. Informal systems are also referred to as local, traditional or farmer seed systems. Both systems have their own limitations.

i) Formal seed systems

Formal seed systems are easier to characterize as they are deliberately constructed, involving a chain of activities leading to clear products – certified seed of verified varieties (Louwaars 1994). The chain usually starts with plant breeding and selection, resulting in different

varieties, hybrid parents including hybrids and materials leading to formal cultivar release and maintenance. In practice, these systems may be constrained in their capacity to meet the diverse needs of farmers in developing countries. The framework for a performance analysis of a formal seed sector has been discussed by several authors (Pray and Ramaswami 1991; Cromwell et al. 1992; Friis-Hansen 1992). The guiding principles in the formal system are maintenance of varietal identity and genetic purity and production of seed with optimal physical, physiological and sanitary quality. The central premise of the formal system is that there is a clear distinction between seed and grain. This distinction is less clear in informal seed systems.

Limitations of formal seed systems

- The varieties developed are often not adopted by small farmers due to complex environment stresses and low input conditions.
- The formal seed sector has difficulty in addressing the varied needs of small farmers in marginal areas.
- They offer only a limited range of varieties
- The formal seed sector is reluctant to produce and market varieties of the major millets, pigeon pea and groundnut because they may not be commercially feasible. Even if it does produce such varieties, they may not reach small farmers in remote rural areas.
- The interest of the private sector may cease to be served once the varieties are sold to farmers because the latter tend to save their own seed for the next season and hence will not buy again.
- Prohibitive seed prices are a limitation for resource-poor farmers.
- Poor logistics in seed diffusion and high seed demand constrain formal seed programs.
- Formal seed systems are sensitive to natural disasters and political or other turmoil.

ii) Informal seed systems

Village seed systems or farmers' seed systems or local seed systems are different names for the informal seed system, in which farmers procure seed by different methods and practices depending on the situation and location. In an informal seed system, farmers themselves produce, disseminate and access seed directly from their own harvest, through exchange and barter among friends, neighbours and relatives; and through local grain markets. Encompassing a wide range of variations, local systems are characterized by their flexibility. The varieties disseminated may be landraces or mixed races and may be heterogeneous. In addition, the seed is of variable quality in terms of purity and physical and physiological parameters. While some farmers treat seed specially, there is not always a distinction between seed and grain.

Limitations of informal seed systems

- The seed quality is often suboptimal due to biotic stresses and storage problems.
- Seed exchange is limited to a geographical area and governed by cultural barriers
- Crop failures or low yields have a tremendous affect on the availability of seed and local prices.

- When a local seed system collapses, it is not easy to restore it in a short time. In such a situation, local varieties (land races) are easily lost and replaced by relief-supplied seeds.

Targeted thrust areas

Farmer-to-farmer seed exchange and local seed markets do function in villages but are not adequately linked to systems engaged in improvement of seed quality. Locally operating institutions such as NGOs, extension services, Krishi Vigyan Kendras (KVKs), social organizations and farmers' associations could play an important role in improving farmers' access to quality seed. If given an appropriate enabling legal framework, such organizations can help in linking Village Seed Banks (VSBs) (Ravinder Reddy and Wani 2007) to research institutions and, importantly, small commercial seed companies working in similar agroecosystems locally and regionally. Traditional seed systems (informal seed sector) and corporate and cooperative sectors (formal seed sector) are currently not adequate to meet farmer needs in the case of groundnut seed in selected project villages studied by ICRISAT.

To disseminate improved or national varieties, links between VSBs and sources of foundation seed are important. Even more critical are linkages that give VSBs access to new varieties that are not available from traditional seed producers. Moreover, there is little awareness (Table 1) of improved groundnut varieties in project villages where groundnut is a major crop grown in the postrainy season. Farmers grew an unknown variety called "local "with an average yield of 2000-2400 kg pod ha-1 under irrigated conditions in the postrainy season.

Table 1. Farmers' knowledge of improved groundnut varieties in project villages

Farmer group	Awareness of improved varieties
Smallholder farmers (<2 ha)	***
Medium-scale farmers (2-5 ha)	***
Large-scale farmers (>5 ha)	**

**** >90% of farmers not aware of improved varieties; ** >70% of farmers not aware of improved varieties.*

Farmers' associations, SHGs, NGOs, KVKs and social organizations have the potential to promote improved production, marketing and distribution practices in traditional/farmer seed systems. This may need forging linkages between research organizations for supply of breeder seed and seed systems. For such integration to be sustainable, these organizations need training and market development support.

Integrated seed supply systems

In the context of this presentation, integrated seed supply systems are mechanisms to supply seed of new improved varieties to farmers by combining the methods of both formal and informal seed sectors (Ravinder Reddy et al. 2007). Variety use and development, seed production, seed quality and storage by farmers under local conditions, and seed exchange

mechanisms are the three principal components of a dynamic integrated seed system that forms the most important groundnut seed source for small-scale farmers in the project villages. In fact, the strengths and weaknesses of local seed systems indicate that they and the formal system are complementary. Integrated approaches to seed production and distribution have proved to be promising in improving seed supply to small-scale farmers. The formal seed sector has shown little or no interest in seed multiplication for high-volume, low-value crops like groundnut because bulkiness of the seed, high transportation costs and processing, bagging and certification costs make the seed expensive for farmers and less profitable to the private sector.

Innovative, community-based seed production through village-based seed banks (Ravinder Reddy 2007) and community seed banks (Lewis and Mulvany 1997) are the alternative options, and distribution strategies coupled with supportive policies will have a positive effect on smallholder farmers' access to the products of international centers and national programs. Hence an alternative integrated seed system incorporating village seed banks has been developed (Fig. 2 & 3) to mitigate the constraints of postrainy-season groundnut seed availability to farming communities in the project clusters in Mahbubnagar district in Andhra Pradesh, India. Small and medium farmers with landholdings of 2-5 ha formed the majority of farmers (Table 2) growing postrainy-season groundnut in these project villages.

Table2. Composition of farmers in terms of landholdings in project villages, Mahbubnagar district Andhra Pradesh, India

Mandal/cluster	Village	Percentage of farmers*		
		Small farmers	Medium farmers	Large farmers
Wanaparthy	Khassim Nagar	66	24	8
Gopalpet	Jayanna Thirumalapur	68	28	4
Peddamandadi	Mojerla	78	13	9
Pebbair	Kambalapur	69	26	5
Ghanapur	Malkapur	63	31	5
Average		69	25	6

* Small farmers : <1 ha; medium farmers : 2-5 ha; large farmers: >5 ha.

Village seed banks

The concept of village seed banks envisages village self-sufficiency in production of quality seed by and distribution to farmers. Many attempts have been made to revive the age-old concept of seed self-sufficiency. Village seed banks operate under peer supervision with utmost transparency, mutual trust and social responsibility toward fellow farmers. Though this is not an entirely new concept to villagers, it is being promoted to reduce their dependence on external nonreliable sources, including government subsidized seed distribution. Village seed banks as a micro seed enterprise at the village level can be efficient. Some will have the potential to expand into specialized, small- or medium-sized local seed enterprises. Against this

background, an attempt was made to promote the concept of village seed banks in the project cluster villages (Table 3).

Earlier experiences with village seed systems and successful community initiatives were documented by in-depth studies at ADB and TATA-ICRISAT sites in Vidisha and Guna districts in Madhya Pradesh, India, and by ICRISAT-APRLP projects (Ravinder Reddy et al. 2007; Sreenath Dixit et al. 2005) in Andhra Pradesh. This provided an insight into the concept and helped identify gaps so that the concept could be refined and implemented in this project.

Process

a. Reconnaissance survey
i) Existing groundnut seed systems
ii) Constraints of seed systems
b. Developing a model
c. Sensitization of stakeholders to the concept
d. Formation of village seed bank committees
e. Farmer-participatory selection of varieties
f. Capacity building of stakeholders on seed production, processing and storage management and seed distribution/marketing
g. Institutional linkages
h. Funding (mainly sourcing the revolving funds for the seed bank)
a. Reconnaissance survey

The initial baseline survey and analysis of existing seed systems, seed multiplication and seed delivery modules for groundnut in the project villages (Table 3, Fig. 1) brought out the constraints to making them viable and dynamic in the long run (Parthasarathy Rao et al. 2010). Strategies to address these constraints were formulated to arrive at suitable solutions. The distinction between the problems of seed availability and seed access to small and medium-scale farmers was assessed, and seed access emerged as a tough issue to answer. Most of the constraints were found strongly linked to information relating to poverty. Agricultural technologies for groundnut such as crop production, cultivation aspects, pests and diseases, storage pests and their control strategies were identified as crop-specific constraints in the local seed system.

Table 3. Cluster villages selected for establishing village seed banks.

Mandal/cluster	Nucleus village*	Satellite villages
Wanaparthy	Khassim Nagar	Appaipalli Dattaipalli Chimangutapalli Ankur-Venkatapur
Gopalpet	Jayanna Thirumalapur	Munnanur Polikpad Chennur Budharam
Peddamandadi	Mojerla	Peddamandadi

		Manigilla Alwal Dodaguntapalli
Pebbair	Kambalapur	Kanchiraopalli Sriramgapur Nagarala Tatipamula
Ghanapur	Malkapur	Manajipet Shapur Rukkannapali Mohd Hussainpali

* **Seed bank established in the nucleus village.**

To get an overall picture of the existing groundnut seed systems in the project area, a survey was conducted by interviewing informal farmer groups using the Rapid Rural Appraisal (RRA) method in selected cluster villages in each mandal. Informal group discussions were conducted with farmers who were classified into small (<2 ha), medium (2-5 ha) and large (>5 ha) farmers on the basis of their landholding. Further, individual interviews were conducted with village leaders, NGOs and progressive farmers. A good representation of small, medium and large farmers engaged in livestock and agriculture as their main occupation were thus identified and informal farmer groups were created. The project area had an average of 69% small farmers, 25% medium farmers and 6% large farmers (Table 2). It was evident from the farmers' responses that sourcing of seed was predominantly from the local markets. Many were not even aware of the varieties they were procuring (Table 4).

Table 4. Groundnut varieties grown by different farmer groups.

	Percentage of farmers	
Farmer group	Local varieties (unnamed)	Named varieties
Small	100	nil
Medium	100	nil
Large	97	<3

Based on the survey findings, the characteristics and constraints of the village seed supply systems relating to groundnut (Table 5) were recorded.

Table 5. Characteristics of groundnut seed supply systems in project villages.

Characteristics	**Prevailing seed supply system**
Seed supply channels	- 97% of farmers procure seed from local markets (oil mills; grain brokers) and formal public sector (subsidized seed) - <3% used own-saved seed
Formal public sector	- State seed development corporation; - Cooperative sector - HACA

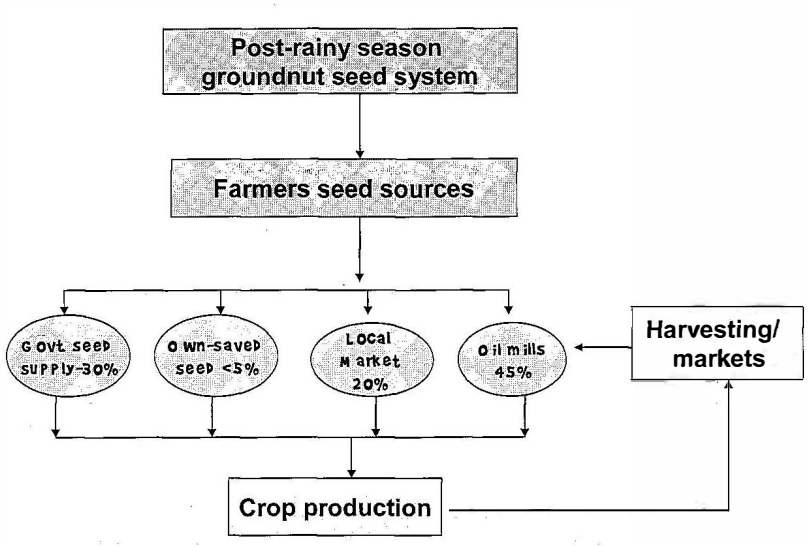
	- State agriculture universities - International research institutes - MARKFED - Oilseeds Federation
Formal private sector	Absent
Informal	- Market middlemen (grain brokers) - Oil extracters - Fertilizer dealers (not branded products)
Seed replacement	- High - Preferred every year because of belief that seed produced elsewhere yields a good crop
Seed to grain price ratio	1.6

ii) Groundnut seed systems in the project area

Informal seed systems for postrainy-season groundnut in Mahabubnagar district have shrunk due to various factors. The state government has had to step in with its subsidized seed supply through different formal seed supply agencies like the AP State Seed Development Corporation (APSSDC), the Hyderabad Agricultural Cooperative Association (HACA), MARKFED and the Oilseeds Federation. Seed sources are related to wealth status. Big and rich farmers, comprising 6% of the community, maintain their own seed stocks, and small farmers have to buy seed every year. A generalized representation of the groundnut seed delivery system operating in the project villages is given in Figure 1. The situation in project villages, where storage and borrowing of farm-saved seed has declined due to recurrent drought, has been further aggravated by poverty and prevalence of storage pests such as the groundnut bruchid (*Carydon serratus*) apart from farmers' lack of knowledge of safe and scientific storage practices.

There is a blind belief among groundnut farmers in the project villages that seed produced in other areas yields better than seed produced in their own land. Hence, a majority of farmers in these villages, irrespective of the size of their landholding, have become dependent on the government's subsidized seed supply. Sixty to seventy percent of farmers depend on this source but it meets only 30-40% of their total seed requirement. The government supplies a fixed quantity (90 kg) of seed (pods) to each household irrespective of their need. Therefore, farmers look to other sources including oil mills and local groundnut traders, or buy seed within the village from better-off farmers to meet their seed requirement.

Fig. 1. Existing seed systems operating in Irrigated Post -Rainy season groundnut cultivation in five clusters of Mahabubnagar district - AP



Framers use a high seed rate (80-100 kg kernels) while the normal seed rate is (60kg kernels), leading to close planting (the Chikku method) with a high plant population. The high seed rate is meant to compensate for poor germination and seedling mortality due to seedling rot/root rot disease. The cost of seed input constitutes 50% of the cost of production (excluding family labor) given in Annexure 2. The government's seed distribution is carried out through the formal supply system. The process adopted by public sector corporations for seed distribution is to call for tenders from seed traders to supply groundnut seed in a particular area and the lowest bidder gets the supply contract. However, as there are specifications laid down by the government regarding the variety to be supplied in a particular agro climatic zone, the contract supplier usually procures the seed as per availability from the unorganized markets, oil mills, groundnut traders and even individual farmers. The seed is cleaned, graded (sometimes), packed and supplied to farmers without specifying the name of the variety. This often results in farmers receiving and sowing a mixture of several varieties. With this situation aggravated by frequent droughts and other constraints in the seed supply chain, efforts to increase farmers' productivity and income are not meeting success in the project area.

iii) Constraints of groundnut seed systems in project villages

Constraints against own-saved seed

- Farmers feel storage is a serious problem because of pod borer (storage pest) and other biotic factors. They feel it is safer to dispose their produce and procure seed every year from the local market or depend on the government's subsidized seed supply.

- Farmers also have financial and debt-servicing pressures which contribute to distress disposal of produce soon after the harvest.

- Farmers believe that using their own seed repeatedly year after year is detrimental and that seed from an outside source yields better than their own-saved seed.

iv) Constraints to government seed supply

- The government supplies only 90 kg of seed per farmer irrespective of the extent of landholding.
- The government subsidised seed supply program meets no more than 30-40% of the total seed requirement of farmers.
- This system does not differentiate between varieties. It is likely that the seed supplied is a mix of different varieties.
- Given the bulk of groundnut pods, logistics are expensive and difficult to organise. Accordingly, the quantities supplied to different parts of the district do not always match local demand.
- Given the high costs and other overheads, government supply is not sustainable.
- Farmers feel the seed supplied by the government is a mixture of varieties and of poor quality with a significant percentage of small and shrivelled seeds.
- Timely supply of seed is not assured

v) Constraints of local seed suppliers

- Farmers procure grain sold as seed from local market agents or oil mills. This is usually a mixture of varieties and of poor quality.
- Local agents sell kernels and not pods. During shelling there is damage to seed, which affects germination.
- The average seed rate used by farmers is high (80-100 kg kernels per acre) because the seed lot is a mixture of broken, shrivelled and seed coat-damaged seeds. Generally, farmers are habituated to go for closer spacing coupled with thick planting (chikku method).
- Local suppliers do not grade or treat the seed.
- Lack of knowledge of seed health: There is no practice of seed treatment by local suppliers nor farmers. Seldom do big farmers take up seed treatment with Dithane M 45 recommended by seed dealer is a wrong choice.
- Local seed suppliers, especially oil mill owners, procure grain for oil expulsion, but, during the rainy season the same grain is sold as seed for a higher price.

The model

The alternative seed system model envisages integration of formal and informal seed systems to achieve the objective of providing quality seed of improved groundnut varieties at the right time and at reasonable prices to small-scale farmers. The model was implemented in two steps.

Step 1

This involved farmer-participatory selection of improved varieties (Fig. 2). Interested and resourceful farmers were identified (Annexure 1) in the project villages to take up demonstration of improved varieties under the guidance of scientific staff from the consortium institutions.

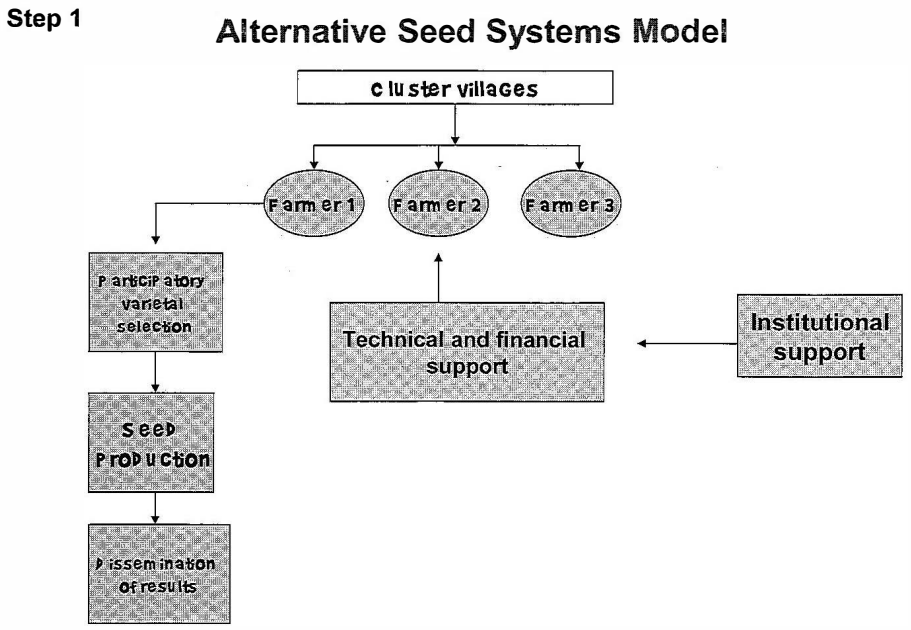


Figure 2. Step 1 for the alternative seed system model.

The premises of step 1 were: (i) Resourceful farmers are capable of imbibing technology faster – along with the capacity to absorb shocks, if any – than small-scale farmers; (ii) External finance is not required, and resourceful farmers can absorb expenses pertaining to seed production; iii) Resourceful farmers can afford to take a risk in conducting the trials; (iv) The general tendency of small farmers is to follow examples set by big farmers and village leaders; and (v) The word of resourceful farmers on improved varieties and yields spreads easily in the village, and hence dissemination of results is faster and more effective.

Step 2

The experience gained in Step 1 relating to the performance of improved varieties was discussed in village assemblies (grama sabhas). The activities to be carried out in Step 2 were discussed in focus group meetings in all the nucleus villages. Seed produced in the summer season (Step 1) were distributed to other interested farmers to grow in the postrainy season on the principles of the village seed bank concept, (Step 2; Fig. 3). Village seed bank committees (VSBCs) selected seed growers (farmers) for the postrainy season in the nucleus villages. The ICRISAT team conducted a couple of focus group meeting with self-help groups (SHGs) to create awareness and explain the objectives of the village seed banks (VSBs). They were invited to invest in the VSBs as a micro seed enterprise for procuring seed produced in the village and storing it in the village seed bank for sale next season. This had two-pronged benefits to the communities: a dividend for the SHGs and good quality seed supply to farmers.

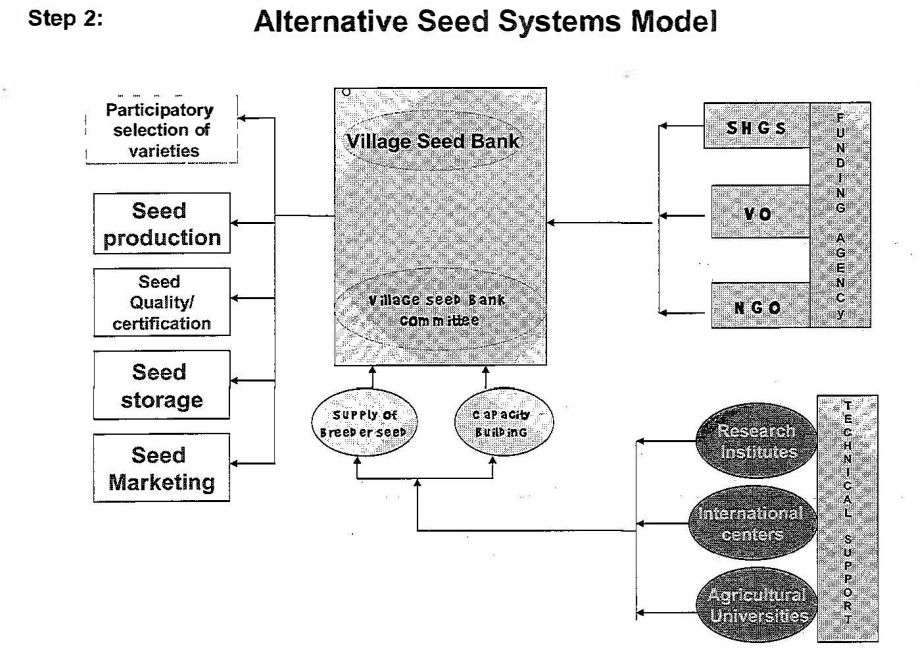


Figure 3. Flow diagram showing the organization of a village seed bank.

c) Sensitizing stakeholders

The concept of village seed banks was discussed elaborately in grama sabhas to sensitize the stakeholders. Farmers were mostly positive about the improved varietal trials, but felt uncomfortable when the model spelt out self funding for procurement of seed and storage of seed.

d) Formation of village seed bank committees

The main function of these committees is to help reduce seed production and delivery costs of groundnut seed and at the same time help farmers reduce their individual cost of production, processing and marketing. Once they become self-reliant, the associations serve as useful mechanisms to broaden the outreach of development programs at little or no additional cost. They help build rural social capital by establishing self-help linkages and encouraging broad-based collective action on village level seed enterprises. Our attempt at institutional

development of farmers' associations or village seed bank committees in the project areas yielded a number of lessons and possibilities for future expansion.

The tasks of the village/cluster-level activists, drawn from the donor organization (SERP), included mobilization of farmers and training of local facilitators. The following guidelines were used for developing and strengthening seed bank committees.

- Make farmers understand the advantages of associations.
- Allow all sections of the farm community to join the project.
- Understand small farmers' strengths, potentials and weaknesses in procuring seed.
- Empower women farmers (SHGs) to join the association to increase their potential in organizing and investing in developing micro seed enterprises.
- Link farmers' associations to research institutions/organizations for procuring foundation seed for seed production.
- Build capacities of farmers in crop production, production of quality seed and scientific storage methods.

The concept of village seed banks (VSBs) was received with enthusiasm by the self-help groups (SHGs), village organizations (VOs) and farmer groups. The proposal for constituting a village committee to manage the seed bank was taken forward by the village sarpanch (village head) by conducting a grama sabha for electing the seed bank office-bearers and members. Initially grama sabhas were conducted to sensitize farmers to the seed bank concept, followed by focus group meetings in nucleus villages. Self-help groups participated actively to undertake the procurement of seed from farmer seed producers to store in the seed bank as a business model. Presidents of SHGs became members of the village seed bank committees (VSBCs) with 30% representation and participated in the selection of the other members and office-bearers. The committee members were trained in various activities of cooperative societies (such as rules and regulations, book-keeping, accounts, audit, electing the executive body and tenure of the committee, etc). The roles and responsibilities of the VSBCs were charted out during the gram sabhas. These included: (1) Selecting seed producers; (2) Procurement of seed from seed producers; (3) Selecting proper storage space in the village; (4) Fixing the procurement and selling prices of seed; and (5) Mobilizing funds by promoting memberships and investment in the VSBs. The VSBC passed a resolution to ensure the quality of seed and redistribution of procured seed to the village member farmers. Their responsibilities also included decisions regarding allocation of seed quantities to each farmer in the nucleus village and satellite villages (four villages around the nucleus) in the cluster.

e) Farmer-participatory selection of varieties

To promote uptake of improved groundnut varieties having farmer-preferred characters and market traits, foundation seed of selected varieties of groundnut was procured from various research institutions (consortium partner institutions) including ICRISAT. The seed was provided at subsidized rates to selected farmers (Annexure 1) to take up on-farm trials in the summer season of 2009 with their local varieties used as control with the assistance of the village

and cluster representative of SERP. A total of 15 farmers were identified, three from each village, and given seeds of five improved varieties – ICGS 44, ICGV 00350, Kadiri 6, APNL 888, ICGV 91114 – in March 2009. These varieties were to be evaluated along with the local variety in farmers' fields in the nucleus villages. Seed produced in the summer season was shared with other interested farmers for sowing in the 2009 postrainy season.

At the end of the season, VSBCs, VOs and the farmers were involved in the evaluation of the varieties based on yield, fodder value, tolerance to moisture stress and other varietal characters like tolerance to pests and diseases. These trials provided an opportunity for the selected farmers to evaluate the varieties under their management conditions and to make a selection using criteria determined on the basis of their preference for specific traits. Regular monitoring visits were undertaken to the trial sites during the cropping season and off-type plants were removed before harvest. Farmers were able to observe the different varietal characteristics (genetic and morphological) expressed by the varieties grown in their fields. On-field meetings were conducted in all five villages at the end of the cropping season to document the traits preferred by the farmers.

The pod yields of different varieties taken up by the farmers in the postrainy season of 2009 were compared with the local variety along with other farmer-preferred parameters. This created awareness about the new varieties and gave farmers the opportunity to select their varieties based on criteria they themselves determined. Demonstrations, field visits and field days were used to provide extension advice and training in preharvest crop management to the collaborating farmers and the CBOs. They showed a lot of enthusiasm in participating in the variety selection exercises. Farmer-participatory selection of varieties were conducted during farmers' field days where men and women farmers were grouped separately and their preferences were documented (Table 6). The yield of selected varieties ICGV 00350 and ICGV 44 ranged from 26% to 121% more than local variety in different locations (Annexure 1). The criteria used by the farmers for the selection of varieties were based on a combination of the following attributes: Grain yield, haulm yield, seed size and color, plant vigor, growth habit, tolerance to pest and diseases and stay green character and capacity to withstand moisture stress.

Table 6. Varieties and traits preferred by participating farmers.

Cluster	Farmers' preference
Khassim Nagar Jayanna Thirumalapur	First preference: ICGV 44. Second preference: ICGS 00350. Farmers preferred the uniform pod size, tolerance to leaf spot and sucking pests in ICGV 44 and its stay-green character, useful for fodder purposes, when compared to ICGS 00350. They also noticed the loss of some pods in the soil during harvest in the latter variety.
Mojerla Kambalapur Malkapur	First preference: ICGS 00350. Second preference: ICGV 44. They liked the greater no. of pods per plant in ICGS 00350 compared to ICGV 44 and the stay green plant character and tolerance for moisture stress. It needs only 6 irrigations when compared to the local variety (needs 8). Women farmers said they preferred a short-

	duration variety because water in the bore wells gets depleted when there has not been sufficient rain in the rainy season. Hence, the crop suffers from season-end moisture stress.

A couple of varieties were short-listed by the VSBCs in consultation with farmers and the project scientists for further utilization and multiplication. The seed of selected varieties were procured by the committees and stored in the village seed banks (Table 7). The seed procurement price were fixed by the VSBCs on the basis of the markets prices at harvest time. It was decided to pay Rs. 100 above the market price. The seed producer benefited by getting a higher than market price and also saved on expenses like loading, transportation, market taxes and labor charges, etc for selling the produce in the market yard. This usually amounts to Rs 70-90 per 100 kg of pods.

Table 7. Quantity of seed procured by VSBCs and the amount invested by the communities.

VSB (Cluster village)	Quantity of seed procured (kg)*	Amount invested by VSBC/SHG members (Rs)
Khassim Nagar	11 360	340 800
Jayanna Thirumalapur	3000	90 000
Mojerla	1120	33 600
Kambalapur	1080	32 400
Malkapur	1480	44 400
Total	18 040	541 200

* Varieties ICGV 00350 and ICGS 44.

f) Capacity building

Imparting training to stakeholders was part of each activity to strengthen farmers' capabilities to tackle the situation technically and manage through appropriate decisions. A number of training programs were conducted on improved production techniques (ridges and furrow method of sowing, sowing by seed cum fertilizer drill, intercultural operations , optimum plant population, spacing), seed storage technology, and IPM, etc in the project villages to enhance production. On-farm training programs were organized for focus groups (groundnut farmers) in the cluster villages during field visits. A lot of emphasis was also given to educating farmers and develop awareness on improved method of cultivation. Young educated farmers were given printed technical information (bulletins, flyers and posters) on improved cultivation practices, seed production and certification, integrated pest and disease management (IPDM), grain storage methods and management.

A training program on seed treatment and a demonstration of low cost seed germination test were conducted in all nucleus villages for VSBC members and lead farmers. The test is simple, inexpensive and reliable. It can be conducted at the farmer level without any additional facilities or equipment. It requires old newspapers and a plate. Four layers of a newspaper are spread on the floor and sprinkled with water to wet the paper. Groundnut seed are placed on the

paper 2 cm apart and rolled and placed on the plate and incubated at room temperature for 3-5 days. The paper should be wet every day. The germination count was taken five days after incubation (Table 8). There was no significant difference between the newspaper method and the paper towel germination method, which is expensive and more difficult to get the materials at village level (Fig. 4).

Table 10. Seed treatment and low cost seed germination test.

Treatment	Germination percentage		
	Newspaper method*	Paper towel method	Farmers' field**
Benlate + Capton (1:1)[b]	88	89	83
Dithane M 45 (Farmers' practice)[b]	74	78	73
Control(no treatment)[a]	72	69	71
Control (no treatment)[b]	93	95	94

* Germination test conducted in farmers' houses using a newspaper.
** Seed sown in one row (5 m) in farmers' fields (seed counted prior to sowing).
[a] Seed procured from oil mill (local market).
[b] Four replications (farmers as replications) (seed from ICRISAT).

g) Institutional linkages

The preproject studies (baseline survey) conducted indicated that the overall dimension of productivity constraints related to

- Farmers' institutions
- Improved production technologies
- Access to improved-cultivar seeds
- Access to institutions

Based on interactions with farmers and the project team's previous experiences, it was felt that farmers' associations were viable platforms to bring farmers together, build their capacities and enable them to gain access to resources, inputs (seed) and markets. This would directly help them in cutting uncertainty and transaction costs, and empower them to make choices relating to the feasibility, productivity and profitability of village-level seed enterprises. It would also help to pinpoint asymmetric access rules, and allow farmers to raise their voice and have it heard.

Evidently, improvement of farmers' livelihoods depends on the strength of their coming together. Access to resources is influenced by the extent to which farmers are organized and the institutional arrangements available, and finally the contextual social and political structure that prevails. Farmers' organizations, therefore, would have a vital role to play in rural change. One of the aims of this project is to help increase farmers' access to improved varieties and availability of seed and improved production technology that can improve farm productivity. This role was in the past held by agricultural extension services and research institutions. Now

public spending on extension and research is shrinking, and institutional changes, such as privatization of farm services, have thrown it open to many new actors.

Rural communities are often heterogeneous in their technical demands – apart from the fact that many local decision-making systems are not well-organized, or are dominated by elites of the local area. Farmers' associations appear as an attractive approach for articulating such demands. This project identified a few areas for immediate collaboration in developing a common understanding of the issues of seed availability and technology development for enhancing productivity as they relate to the needs of the rural poor. For instance, sharing of experiences between scientists and farmers, higher levels of coordination with various research institutes, NGOs, KVKs, for ongoing field operations and support for initiative-linked activity, focusing on the involvement of various institutions to interact with farmers' associations and linking them to development of farmers' learning platforms. Village seed bank committee members were trained and linked with various institutions like Regional Agricultural Research Stations (RARS) and local NGOs for supply of breeder seed and technical backstopping. For procedural and legal advice on farmers' associations they were linked with the Hyderabad Cooperative Society Ltd. to ensure administrative sustainability.

h) Funding

To sustain the VSBs, regular inflow of finances are essential for procurement of seed from seed producers and storage in godowns for eight months till the next crop season and to meet interest on the capital raised. VSBCs were strengthened in managing seed banks as a micro seed enterprise through investments from seed bank members, committee office-bearers, and SHGs. A micro seed enterprise business model was developed (Fig. 4) to attract investors in the village, especially SHGs. These SHGs can get loans from scheduled banks at a low interest rate (0.25%) and they can invest in VSBs as a profitable venture. Apart from this, SHG members are also the members and office-bearers of seed bank committees, responsible for managing VSB activities by involving themselves from the beginning of the venture. This addresses the sustainability of VSBs by involving farmers in production, procurement, storage and distribution of seed. Variation in the procurement price and selling price of seed in the

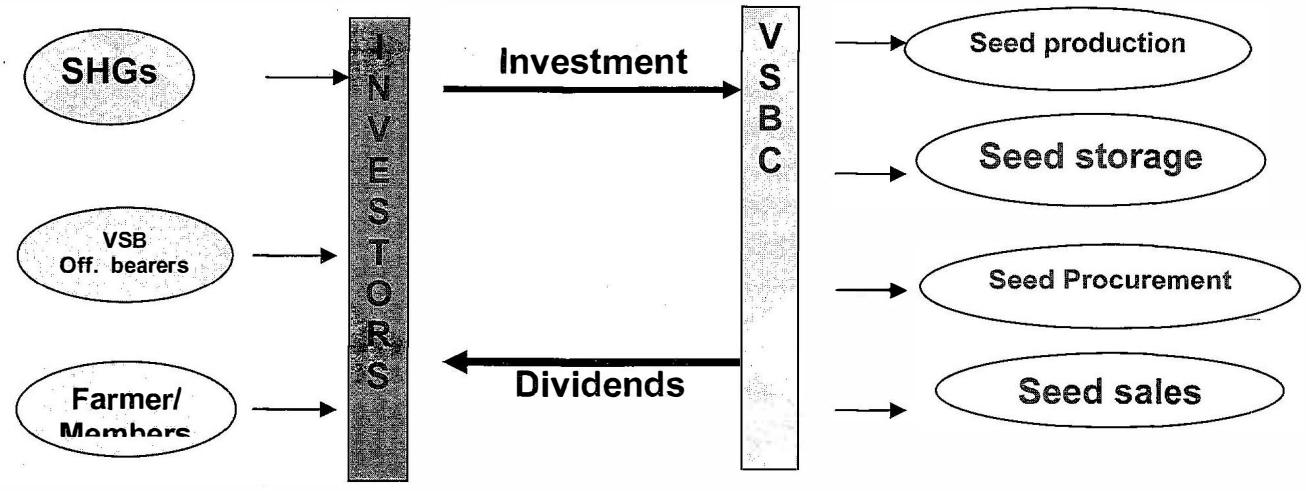


Figure 4. Fund flow diagram.

market has a wide gap because production, grading, transportation and storage take a major chunk of the selling price because of the bulkiness of groundnut seed. No private seed company has shown interest in trading in groundnut seed as profit margins are very low. Taking the advantage of this factor, seed production, grading and storing of seed within the village by farmers has a major sliding advantage in this model. Hence it may be profitable as a micro rural seed enterprise. The quantity of seed procured by the VSBCs and investment by the community is given in Table 7.

IX. Advantages of village seed banks

- Availability of seed of improved varieties in sufficient quantities within the village
- Assured and timely supply of seed material to farmers
- Decentralized seed production
- Availability of improved-variety seed at lower prices
- Improved seed delivery to resource-poor farmers
- Reduced dependence on external seed sources and effective curbs on spurious seed trade
- Good opportunity for SHGs to invest and develop a village seed enterprise
- Encourages village-level trade and improves village economy
- Social responsibility of seed production and delivery system
- A step toward sustainable crop production
- Avoid introduction of diseases carried through seed (seed-borne pathogens) produced and imported from other agroecoregions
- Scope for farmer-participatory varietal selection and feedback to the scientific community on the performance of cultivars
- Availability of true-to-type varieties and healthy seed within the reach of farmers at
- affordable prices
- The probability of sustainability is high because involving farmers from the beginning of VSB establishment, seed production, storage and marketing through their own investment and sharing the benefits
- Estimated impact of village seed banks in the project villages (annexure 3) was approximately 25% increase in yield and overall income of the farmer enhanced by 34%.

X. Constraints

- Willingness of farmers to adopt quality seed production practices
- Additional investment for inputs in seed production
- Buy-back assurance to farmers from FA/SHGs/NGOs
- Proper seed storage facilities and management at village level
- Availability of funds with FA/SHGs/NGOs for seed procurement, packing, storage and transportation
- Fixing minimum support price for seed procurement
- Technical support for seed production and its monitoring
- Responsibility of quality control aspects and monitoring of seed production
- Availability, access and procurement of breeder seed from research institutes for seed production at regular intervals

XI. Conclusions

An effective means of improved groundnut seed distribution is farmer-to-farmer seed exchange. This may be primed to a limited extent by the supplies of improved seed from public agencies, agricultural research stations and nongovernmental organizations to farmers in easily accessible villages. However, such a system is very slow. To speed up the flow of seed of adapted, acceptable, improved groundnut varieties to farmers, there is a need to form a network between research institutes, agencies involved in quality control and various nongovernmental organizations, community-based organizations (SHGs, farmer schools, farmer youth clubs, farmer associations) interested in various aspects of seed production and utilization. For crops like groundnut, the basic farmer demand is for quality seed of improved varieties. The most economical way would be to produce seed at the village level through community-based seed systems and sell it to local communities without incurring the extra costs of processing and certification. Village-based seed banks provide an alternative solution to this problem and help farmers become self-reliant. This initiative needs organized communities, institutional technical backstopping and continued interaction between various institutions, policymakers and stakeholders to strengthen local seed systems to enhance groundnut productivity in the project villages. Therefore, VSB is an efficient and sustainable model that can be out scaled to other crops and other areas.

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