International J. Seed Spices 8(2), July 2018:48-53

Seed village programme : Ensuring livelihood security of small and seed spices farmers

Dheeraj Singh*, M. K. Choudhary, M. L. Meena, L. P. Balai and C. Kumar

ICAR- Central Arid Zone Research Institute,

KVK, Pali-Marwar (Rajasthan) - 306 401 India

Abstract

Quality seed is the key input for realizing potential productivity. The main criteria for describing seed quality are purity, germination percentage and vigour of seeds. In most of the crops, the small and marginal farmers depend on their own farm saved seeds for crop production. Moreover, the crops are raised for market and a small portion of the grains are separated, stored and used as seeds in the next season which may not meet the quality aspects as expected for a seed which results in poor field stand and ultimately low yield. Despite implementation of the organized seed programme, there exists an alarming gap between the demand and supply of quality seeds. The immediate increase in the productivity and production of these crops can be achieved by a higher distribution of quality seeds of new and high yielding varieties. In this context, the concept of seed village which advocates village self-sufficiency in multiplication and distribution of quality seeds is getting momentum. Keeping the above facts in mind, Krishi Vigyan Kendra (KVK), CAZRI, Pali (Rajasthan) India started the seed village programme in selected villages during 2009-10. Under this, quality seeds of improved varieties of prominent crops of the area namely, Ajwain (AA-1), Fenugreek (RMt 305), Fennel (RF-125) and Cumin (GC-4) were distributed by the KVK to the identified farmers. A number of trainings on seed production technology to the identified farmers in the seed villages were also arranged for technology empowerment of farmers regarding isolation distance, sowing practices, seed treatment, off type plant and other agronomic practices. The farmers used these quality seeds and took their own seed multiplication in operational area which showed a considerable spread of improved variety in nearby villages. Thus there is vast scope to produce and distribute quality seed in most crops for which seed village concept is a novel and highly practical approach and needs to be promoted.

Keywords: Adoption, horizontal spread, livelihood security, seed village, seed spices.

Introduction

After soil and water, seed is one of the most important components of agricultural production and has the potential to increase crop yield by 20-30% within a very short time, which not only eradicates problems of food security but also enhances livelihoods of poor people. Most of the growing cultivars are old, low yielding and also vulnerable to pests and diseases. In places where the national economy is mainly based on smallholder agriculture, the innovation systems approach occupying greater space. In countries like Ethiopia, adoption of the innovation system approach by the major actors in research and development is an opportunity, provided that the main players in the system are the smallholder farmers that make 85% of the total population in the country (Assefa, 2010). It is, however, equally important to determine the critical innovation value, to explain a logical linkage and fair balance between technical/institutional innovations, poverty reduction and environmental safety. Existing mechanisms to meet the quality seed requirements of small-scale farmers are not adequate and have serious limitations. In spite of many efforts, seed supply particularly of food grain crops is a serious concern (Hedge, 2004). Lack of timely availability of good quality seeds of high-yielding varieties is one of the major constraints contributing to stagnant yields of major crops. More than 80% of crops in developing countries are sown from seed stocks selected and saved by farmers (Hodgkin *et al.*, 2007). Hence, large area under food grain crops is still sown with seeds saved by farmers. Experimental evidences are there that cereal crops give 10-20 percent less yield per ha when farmers use their own saved seed (Reddy *et al.*, 2010). Village based seed banks provide an alternative seed system to these problems and help farmers become self-reliant (Reddy *et al.*, 2006). There is need to ensure availability of quality seed of improved varieties at village level and integration of informal seed enterprises and farmers in the seed production and supply systems to enable timely availability of quality seed at the door-step of farmers. This has called for the intensification of agriculture through development of

*Corresponding author email: dheerajthakurala@yahoo.com

improved varieties and production technologies.

Keeping the importance of seed village programme, the KVK, CAZRI, Pali conducted these innovative approaches on major spice crops of Pali region *.viz.,* ajwain, fennel, fenugreek and cumin at identified farmers' field with following objectives:

1. Improve the quality of farm saved seeds,
2. Increase the Seed Replacement Rate (SRR),
3. Enhance the horizontal spread of high yielding varieties among farmers and improving the productivity of crops.

Materials and methods

ICAR-CAZRI, Krishi Vigyan Kendra, Pali located at 24.75^0 to 26.48^0 North latitude and 72.78^0 to 74.30^0 East longitudes in state of Rajasthan, India started the seed village program (SVP) in its selected villages in 2009. Under this program, quality seeds of improved varieties of prominent crops of the area namely ajwain (AA-1),fenugreek (RMt 305), fennel (RF-125) and cumin (GC-4) procured from NRCSS, Tabiji and ARS, Sumerpur were distributed to the identified farmers in the area, who were selected as per stand and procedure. A number of trainings on seed production technology for the identified farmers in the seed villages were also arranged, as were programs on isolation distance, sowing practices, seed treatment, off-type plant and other agronomic practices. Accordingly, ajwain (AA-1), fenugreek (RMt 305), fennel (RF-125) and cumin (GC-4) were laid out in the KVK-adopted villages of Hemawas, Kharda, Bhagawas, Sardar Samand, Rupawas and Sindhiyao Ki Dhani of Pali district. The area was selected based on irrigation facilities, suitability of climatic conditions to raise the crop for more than one season, labour availability and knowledge of local farmers on that particular crop, occurrence or out break of pests and diseases. Past history of the area for suitability to raise seed crop, average rainfall and distribution and closeness to a urban area for easy movement of seed and other inputs.

Regular visits by the KVK scientists to demonstration fields were ensured, with the scientists demonstrating and popularizing technology for the farmers (Table 1). These visits were also utilized to collect feedback for further improvement in research and extension programmes. Field days and group meetings were also organized at the demonstration sites to provide the opportunities for other farmers to witness the benefits of demonstrated technologies as per package and practices for Zone IIb. Data were collected from the seed village program farmers and analysed with the suitable statistical tools to compare the yields of farmers' fields and seed village programme farmers (SVP) fields.

In demonstration plots, a few critical inputs such as quality seed, balanced fertilizers and agro-chemicals were provided and non-monetary inputs like timely sowing in lines and timely weeding were also performed, while traditional practices were maintained as a type of local check or control. These SVP farmers were facilitated by KVK scientists in performing field operations like sowing, spraying, weeding, harvesting etc. during the course of training and visits. These raw data was further utilized to generate additional information regarding horizontal spread and the adoption of a particular variety as per standard procedure (Reddy *et al.*, 2010 and Haverkort, 1991).

Training

Training on seed production and seed technology were provided to farmers for the seed crops grown in the seed villages. During this training seed production technique, isolation distance, sowing practices, other agronomic practices to be followed for the given crop were taught to the farmers. Trainings were also organized during flower initiations stage of the seed crop. The seed growing farmers were trained to identify off types, rogues and removal of these plants from the seed plots and to maintain the quality of seed production and other agronomic practices, plant protection measures and harvesting methods to be followed by the farmers. similarly training were organized/provided after harvest and at the time of seed processing to impart knowledge on seed cleaning, seed grading, seed treating, seed storage, seed packaging aspects, how to draw the representative seed sample, send the seed sample for seed testing/local seed testing method to assess the

Table 1. Technology demonstrated and popularized.

Crops	Thematic area	Technology demonstrated	Popularization methods
Ajwain Fenugreek Fennel and Cumin	Improved production technology	Improved variety seed treatment, line sowing Irrigation scheduling, weed management, Integrated nutrient management, integrated pest management post harvest management	Result demonstration Method demonstration Method demonstration Extension activities *viz*. Field day, Farmers Meet, Field visit, Farmers' Scientists Interaction, crop exhibition, farmers' fair etc.

Results and discussion

Impact of Improved Variety

There was a substantial increase in the yield of selected varieties in all four crops as compared to the local varieties used by the farmers (Table 2). In ajwain, variety AA-1 yielded 13.7q ha^{-1} as compared to 9.8q ha^{-1} from local variety, showing 40% increased yield advantage. In fennel there was a 60% yield advantage by using improved variety RF-125 over the local variety. In fenugreek the variety RMt-305 yielded 15.4q ha^{-1} over the local variety which yielded 10.5q ha-1 thus gaining a yield advantage of 47%. Similarly in cumin the SVP farmers got an average yield of 10.8q ha^{-1} from variety GC 4 as compared to local variety yielding 5.9q ha^{-1}, thus depicting an yield advantage of 70% over the local variety. The results of the study corroborate the findings of front line demonstrations carried out by Lal *et al.* (2013) and Singh *et al.* (2011). Earlier research suggests that there is a good potential for improving performance and productivity in the agricultural sector which can only be attained through positive transformation of the sector, including increased availability and use of improved seed varieties (Ampofo, 1990 and Imoloame *et al.*, 2007). These agricultural sectors has benefited from myriad interventions that seek to improve yield, reduce poverty and increase income. Farmers have benefited much from the dissemination of high-yielding crop varieties in addition to other complementary technologies (Langyintuo and Dogbe, 2005; Faltermeier, 2007).

Economic analysis

An attempt was also made to determine the economics of improved variety and to compare it with the local variety (Table 3). These findings revealed that in all the four spice crops the cost of cultivation of the local variety was on par with the improved variety but in the case of the gross returns and benefit cost ratio, a significant difference was observed. In ajwain the gross return was 56,600 INR which was significantly higher as compared to the return from local variety (₹ 41,800) with a B:C ratio of 3.7 respectively. In fennel the B:C ratio of improved (3.1) over the local variety (2.5) was significantly higher showing the superiority of the improved variety over the local variety. In fennel the gross return from the improved variety was ₹ 66,500 as compared to the return of ₹ 51,900 from the local variety. In fenugreek also the improved variety recorded a higher gross return and B:C ratio (₹ 69,900 and 3.9) as compared to the local variety (₹ 44,400 and 2.3). In cumin which is the most priced commodity of western Rajasthan the results showed a return of ₹ 71,500 as compared to local variety giving gross returns of ₹ 59,800. Amongst all the four spice crops compared the improved variety of fenugreek yielded a B:C ration of 3.9 as compared to other crops. These results are also in close proximity with the result of Lal *et al.*, (2014) and Singh *et al.*, (2014) who reported similar results while experimenting with spice crops and Dakha *et al.*, (2010) with similar results in maize. This increase in productivity, rather than enhanced area, has contributed more towards increased production. This has been achieved mainly due to the adoption of new varieties and improved production technology (Singh *et al.*, 2012).

Table 2. Comparative yield of improved vs local variety of different crops under SVP

S. No.	Name of crop	Variety	Yield of improved variety (q ha^{-1})	Farmer practice yield (q ha^{-1})	Per cent increase
1.	Ajwain	AA-1	13.7	9.80	39.8
2.	Fennel	RF-125	16.6	10.4	59.6
3.	Fenugreek	RMt -305	15.4	10.5	46.7
4.	Cumin	GC- 4	10.8	5.90	70.2

Table 3. Comparative economics of improved vs local variety of different crops under Seed Village Programme (SVP)

S. No.	Name of crop	Cost of cultivation (INR ha^{-1})		Gross return (INR ha^{-1})		B: C ratio	
		Improved variety	Local variety	Improved variety	Local variety	Improved variety	Local variety
1.	Ajwain	14900	14200	56600	41800	3.7	2.1
2.	Fennel	21500	20300	66500	51900	3.1	2.5
3.	Fenugreek	17800	17000	69900	44400	3.9	2.3
4.	Cumin	23500	22200	71500	59800	3.0	2.6

Horizontal spread of improved variety from seed villages

Data presented in Table 4 reveals the horizontal spread of the improved varieties in all the four spice crops. Ajwain AA-1 has more effective tillers and a higher number of seeds per umbel. It performs well even under slightly saline/ sodic irrigation water and soil conditions. Secondly it has potential for growing in conserved soil moisture and very much resistant to insects and pest hence from an initial group of twenty three farmers it spread to sixty-five farmers covering thirteen cluster villages. At the same time, the area increased from twenty one hectares to sixty nine hectares. Farmers appreciated the early vigorous growth and branching of the RF 125 variety of fennel, which were due to its bold size and the quality of grain and umbel containing higher volatile oil content giving typical aroma to seeds. It spread to eleven villages covering eighty-two hectares of land. Fenugreek variety RMt -305 is a high yielding variety which performs well even under slightly saline water conditions. From an initial number of 44 farmers it spread to 96 farmers covering 67 hectares of land. Cumin var. GC-4 is resistant to wilt and blight and produce good quality seed with better aroma due to higher percentage of volatile oils as compared to the local one. This variety spread to one hundred twenty three farmers from an initial group of sixty five farmers and covered an area of 175 hectares. The results are in accordance with the findings of Pandit *et al.* (2011) and Joshi and Witcombe (1996) who concluded that farmers emphasized simultaneous selection more than an empirical selection based on yield only. Farmers' selected varieties are extending very rapidly and farmer-to-farmer seed transfers were found to be very effective in scaling-up the seed transfer and increase varietal diversity. Joshi *et al.* (1995) also reported that in addition to grain yield, farmers also consider other parameters like growing period, plant height, thresh ability, milling recovery, taste and other characters (Osborn and Faye ,1991). Farmers contribute to goal setting by identifying traits and providing a testing system that are suitable for multiple farmers and multiple locations and allow for the trade-off between many traits (Joshi *et al.*, 2002). It is a key reference point that farmers use to make decisions and to communicate among themselves. Scientists need to understand farmers' knowledge if they want to contribute to farmers' welfare by providing new information to them, by developing and communicating appropriate technologies effectively with them (Bellon, 2001).

Adoption of improved seeds

Data presented in Table 5 reveals that for all the selected four crops ajwain, fennel, fenugreek and cumin, the beneficiary farmers have a high level of adoption ranging from 55–72% whereas, in the case of the local variety the adoption rate was very low ranging from 13–26%; showing the importance of the improved variety over the traditional variety. The main criteria for such high adoption rates are high yield with superior plant and seed characteristics. The results are also in conformity with Rashid *et al.* (2004) who indicated that farmers consider characters like bold grains, large spike, strong stem, earliness, etc. along with yield; therefore, breeders have to emphasize farmers' attitudes during selection. The above findings are also in line with the findings of Baksh *et al.*, 2003, Singh *et al.*, 2007, Singh *et al.*, 2012 and Kudi *et al.*, 2011 who pointed out that high yield got the highest score and ranked first in adoption followed by other post harvest characters.

Table 4. Horizontal spread of improved variety from seed villages

S. No.	Name of crop	Variety	Number of farmers		Number of villages		Area (ha)	
			Initial	Final	Initial	Final	Initial	Final
1.	Ajwain	AA-1	23	65	5	13	21	69
2.	Fennel	RF-125	37	89	7	11	25	82
3.	Fenugreek	RMt 305	44	96	5	8	33	67
4.	Cumin	GC-4	65	123	8	13	37	175

Table 5. Adoption of improved seeds by the farmers in seed villages

S. No.i	Name of crop	Variety	Per cent adoption
1.	Ajwain	AA-1	55.3
2.	Fennel	RF-125	52.7
3.	Fenugreek	RMt 305	60.2
4.	Cumin	GC-4	72.4

Conclusion

Under the seed village program (SVP), a substantial increase in the yield of selected crop varieties was obtained as compared to local varieties with a high rate of horizontal spread of seeds to more farmers. The results also show that for all the selected crops, the beneficiary farmers recorded high levels of adoption for improved varieties as compared to local varieties. Thus in SPV there is ample scope for farmer-participatory varietal selection and feedback to the scientific community on the performance of cultivars. This is an efficient and sustainable model that can be out scaled to other crops and areas. However, there is need to form a network between research institutes, agencies involved in quality control and various NGOs, community-based organizations (SHGs, farmer schools, farmer youth clubs, farmer associations) interested in various aspects of seed production and utilization. This initiative enhances the crop productivity leading to overall positive impact on the livelihoods of farming communities.

Acknowledgements

I proffer my sincere thanks to Director, Central Arid Research Institute (CAZRI), Jodhpur, Rajasthan, India for all the essential facilities, Director, ATARI for providing financial assistance and State Agriculture Department, Pali, Rajasthan for providing facilitator & during course of investigation.

References

Ampofo, ST. 1990. Farmers' adoption of recommended practices. Paper presented at Farmer–Extension: The First Farming Systems Workshop, Accra.

Assefa, A. 2010. Farmer-led innovation: experiences and challenges in Ethiopia. Progress report. Online available from: http://www.future agricultures.org/farmerfirst/files/T2b_Assefa.pdf

Bellon, M.R. 2001. Participatory Research Methods for Technology Evaluation. A Manual for Scientist Working with Farmers. Mexico, D. F. CIMMYT, pp. 93.

Baksh, E., M.H. Rashid and M.G. Rabbani. 2003. Participatory rural appraisal of PVS site Daulatpur, Thakurgaon, Dinajpur, Bangladesh. A PRA report of Wheat Research Centre, Bangladesh Agricultural Research Institute, Nashipur, Dinajpur, pp.31.

Dhaka, B.L., Meena, B.S. and Suwalka, R.L. 2010, Popularization of Improved Maize Production Technology through Frontline Demonstrations in South-eastern Rajasthan. *J. Agri. Sci.*, 1(1): 39-42.

Faltermeier, L. 2007. Adoption of water conservation and intensification technologies in the lowland rice production system of northern Ghana. Paper presented at the MEIDE Conference, Maastricht, Netherlands.

Haverkort, B. 1991. Farmers experiments and participatory technology development. In Joining Farmers Experiments: Experience in Technology Development. Eds. B. Haverkort, J.Vander Kamp & A.Waters-Bayer). London, UK: Intermediate Technology Publications.

Hedge, D.M. 2004. Becoming self-reliant. Hindu survey of India Agriculture 2004, pp 45-47.

Hegde, D.M. 1998. Effect of integrated nutrient management on productivity and soil fertility in pearl millet–wheat cropping system. *Ind. J. Agro.* 43(2): 580-87.

Hodgkin, T., Rana J. and Tuxill J. 2007. Seed systems and crop genetic diversity in agroecosystems. In: Jarvis D, Padoch C, Cooper HD (eds) Managing biodiversity in agricultural ecosystems. CABI Publishing, Rome, pp 77–116.

Imoloame, E.O., Gworgwor, N.A. and Joshua, S.D. 2007. Sesame (*Sesamum indicum* L.) weed infestation, yield and yield components as influenced by sowing method and seed trait in Sudan Savanna agro-ecology of Nigeria. *African J. of Agric.* 2(10): 528-533.

Joshi, A. and Witcombe, J.R. 1996. Farmer participatory crop improvement. II. Participatory Varietal Selection: a case study in India. *Expl. Agric.* 32: 461-477.

Joshi, K.D., Rana, R.B., Subedi, M., Kadayat, K.B. and Sthapit, B.R. 1995. Effectiveness of participatory testing and dissemination programme: a case study of Chaite Rice in the western hills of Nepal. LARC working paper No. 95/49. Pokhara, Nepal: Lumble Agricultural Research Centre.

Joshi, K.D., B.R. Sthapit., M. Subedi & J.R. Witcombe. 2002. Enhancing on-farm varietal diversity through participatory varietal selection: a case study of Chaite Rice in Nepal. *Expl Agric.* 33:335-344.

Kudi, T.M., Bolaji, M., Akinola, M.O. and Nasai, D.H. 2011. Analysis of adoption of improved maize varieties among farmers in Kwara State, Nigeria, *International Journal of Peace and Development Studies* 1(3): 8-12.

Lal, G., Mehta, R.S., Singh, D. and Choudhary, M.K. 2013. Effect of technological interventions on cumin yield at farmers' field. *International Journal of Seed Spices*, Vol 3 (2): 65-69.

Lal, G., Maheria S. P. and Chaturvedi J. 2014. Boosting of cumin yield and growers' returns with adoption of improved varieties and technologies: An impact study carried out in Nagaur district of Rajasthan state, India Scholarly *J of Ag Sci*, Vol. 4(5) 290-294

Langyintuo, A.S. and Dogbe, W. 2005. Characterizing the constraints for the adoption of a Callopogoniummucunoides improved fallow in rice production systems in northern Ghana. *Agriculture, Ecosystems & Environment*, 110: 78–90.

Osborn, T. and Faye, A. 1991. Using farmers participatory research to improve seed and food grain production in Senegal. Winrock International Institute for Agricultureal Development. Development Studies Paper Series. Winrock, Arlington, USA.

Pandit, D. B., M. S. N. Mondal, M. A. Hakim, N. C. D. Barma, T. P. Tiwari, and A. K. Joshi. 2011. Farmers Preferences and informal seed dissemination of first UG99 tolerant wheat variety in Bangladesh. Czech *Journal Genetics and Plant Breeding* 47:160–64.

Rashid, M.H., D.B. Pandit, M.M. Islam & M.M. Rahman. 2004. Research Report on Participatory research to increase the Productivity and sustainability of wheat based cropping at Dinajpur, Bangladesh. Report presented at the 2nd Regional Review and Planning Workshop of PVS project, held at Hotel View-Bhirikuti, Olitpur, Nepal during 14-18 June 2004.

Reddy, Ravinder Ch., Nigam, S.N., Parthasarthy, Rao P., Shaik Ahmed, Ratnakar, R., Ashok, Alur., Kumar, A., Reddy, B.V.S. and Gowda, C.L.L. 2010. Village Seed Banks: An integrated seed system for improved seed production and supply – A case study. Information Bulletin No. 87. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. pp 40.

Reddy, Ravinder Ch., Reddy, K. Gurava, Reddy, G. Thirupati, Wani, S.P. and Bezkorowajnyi, Peter. 2006. Enhanced fodder production with innovative sustainable informal seed system for food feed crops: A case study of village seed banks, Paper Presented at the International Conference on Livestock Services for Enhancing Rural Development, Beijing, China 16-22 April, 2006.

Singh, D., Chaudhary, M.K., Meena, M.L. and Roy, M.M. 2014. Seed Village Programme: An Innovative Approach for Small Farmers, Agricultural Information Worldwide – vol. 6:143-146.

Singh, D., Choudhary, M. and Meena, M.L. 2012. Indian rural technology of front line demonstrations enhancing agricultural productivity under rainfed conditions of Rajasthan, *Indian Journal of Social research*. 53(2): 141-151.

Singh, D., Meena, M.L. and Choudhary, M.K. 2011. Boosting seed spices production technology through front line demonstrations. *Int. J. Seed Spices*. 1(1): 81-85.

Singh, S.N., V.K. Singh, R.K. Singh and R.K. Singh. 2007. “Evaluation of On-farm Front Line Demonstrations on the Yield of Mustard in Central Plains Zone of Uttar Pradesh.” Indian Research *Journal of Extension Education*, 7(2/3):79–81.

Received : November 2017; Revised : December 2017; Accepted : December 2017.