

Participatory Approaches for Productivity Enhancement in Pigeonpea Through Improved Production Technologies

V. KANTHARAJU, BASAVARAJA, RAJU G. TEGGELLI AND G. GIRISH

*Krishi Vigyan Kendra, University of Agricultural Sciences
 Gulbarga 585101, Karnataka, India*

Abstract

Pigeonpea *Cajanus cajan* (L.) Millsp. is a major *kharif* pulse crop of Karnataka. The major constraint of its low productivity is non-adoption of improved technologies. Front line demonstrations on improved technologies were conducted at 195 farmers fields in five adopted villages of Gulbarga district during *kharif* seasons of 2005-06 to 2009-10. The demonstrated technologies includes *Fusarium* wilt resistant varieties (WRP-1 and TS3-R), sterility mosaic disease (SMD) resistant variety (BSMR-736), seed treatment with *Trichoderma viride* (4 g/kg seeds), integrated nutrient management (25:50:0 NPK kg/ha + zinc sulfate at 15 kg/ha and *Rhizobium* at 375 g/ha) and integrated pest management (IPM). The improved technologies recorded a mean yield of 13.54 q/ha which was 18.69% higher than that obtained with farmers practice yield (11.10 q/ha) besides the higher mean net income of Rs 22,876/ha with a B : C ratio of 2.68 when compared to farmers practice (Rs 16,177/ha and 2.12). The demonstrated technology also recorded less incidence of sterility mosaic disease and *Fusarium* wilt (< 5%), *Heliothis* pod borer (5—10%) and pod fly (<8%) when compared to farmers practice.

Key words : Pigeonpea, Front line demonstrations, INM, IPM, Net return.

Pigeonpea *Cajanus cajan* (L.) Millsp. is one of the major grain legume crops of the tropical and sub-tropical regions. It is grown predominantly under rainfed conditions. Pigeonpea occupies 1.76% of the gross cropped area and 22% of the total pulse production in India, which accounts for 90% of the world's production. In India, pigeonpea ranks second in both area and production next only to chickpea. It is grown over an area of 3.3 m ha. producing nearly 2.88 m tonnes with an productivity of 640 kg per ha. In Karnataka, around 90% of the pigeonpea area comes under northern Karnataka. Gulbarga district, "pulse bowl of Karnataka" alone covers 65% of the states share. Gulbarga district ranks first in both area (0.28 m ha) and production (0.18 m tonnes). It occupies 55% area and 45% production of the state. The productivity of pigeonpea in Karnataka (543 kg/ha) and India (640 kg/ha) are far below the average productivity of the world i.e. 848 kg/ha (1). The major constraints for lower yield are inappropriate production technologies viz., use of local varieties, use of disease susceptible varieties, lack of seed treatment, INM and IPM. Keeping this in view, frontline demonstrations on pigeonpea were conducted to demonstrate the production potential and economic benefits of latest improved technologies on farmer's fields.

Methods

Front line demonstrations were conducted on 195 farmers fields of five adopted villages viz., Garur (B), Ladmugali, Srichand, Kodli and Gudur of Gulbarga district during *kharif* seasons of 2005-06 to 2009-10 in rainfed condition on medium to dark black soils with low to medium fertility status under pulse based production system. Each demonstration was conducted on an area of 0.4 ha and the same area adjacent to the demonstration plot was kept as farmer's practice. The package of improved technologies included *Fusarium* wilt and sterility mosaic disease (SMD) resistant varieties, seed treatment, INM, IDM and IPM. The varieties of pigeonpea WRP-1 (wilt resistant) in 2005-06 and 2006-07, BSMR-736 (SMD resistant) in 2007-08 and 2008-09 and TS3-R (wilt resistant) in 2009-10 were included in demonstration. Sowing was taken up from July first to second week in all the years with the seed rate of 10 kg/ha. Entire dose of N and P through diammonium phosphate at 25:50:0 kg/ha was applied as basal dose. Zinc sulfate at 15 kg/ha was applied 30 days after sowing. The seeds were treated with *Trichoderma viride* at 4 g/kg seeds and *Rhizobium* at 375 g/ha. SMD infected plants were uprooted and burnt, IPM practices were taken up as

Table 1. Effect of improved technologies on seed yield of pigeonpea in farmer's field.

Year	Area	Demonstration (no.)	Yield (q/ha)			Local check	Additional yield (q/ha) over local check	Percent increase in yield over local check
			Maximum	Minimum	Average			
2005-06	05	12	14.3	11.7	12.8	11.10	1.7	15.31
2006-07	05	12	13.1	11.0	12.3	10.8	1.5	13.8
2007-08	15	37	20.0	15.0	17.5	13.75	3.75	27.27
2008-09	25	62	13.78	13.22	13.50	11.04	2.46	22.20
2009-10	30	72	12.50	10.07	11.60	9.3	2.30	14.9
Total/Average	80	195	14.73	12.32	13.54	11.10	2.34	18.69
CV	-	-	-	-	17.11	14.32	-	-

and when pests appears. IPM schedule includes ovi-
cidal spray—i.e. profenophos 50 EC at 2 liter/ha ;
pheromone traps at 5/ha ; bird perches at 10/ha ; neem
based insecticide at 2 liter/ha ; Ha NPV at 500 LE/ha ;
contact insecticide at 2 liter/ha. The per cent pest and
disease incidence and yield was recorded.

To popularize the demonstrated technology,
KVK in collaboration with developmental depart-
ments, NGO's and mass media organized the technol-
ogy dissemination means like campus training at
KVK, off campus training at village level. Extension
functionaries training, group discussions, farmers-
scientist interaction, publication and distribution of
literatures. Rapid rowing survey for pests and dis-
eases, pest and disease forecast through All India
Radio, Doordarshan and Print Media was also done.

Results and Discussion

The results of seed yield of pigeonpea (both farm-
ers practice and technology demonstrated) was re-
corded (Table 1). The productivity of pigeonpea in

Gulbarga district of Karnataka under improved tech-
nologies ranged between 10.7 and 13.78 q/ha with
mean yield of 13.54 q/ha. The productivity under im-
proved technologies varies from 11.7 to 14.3, 11.0 to
13.1, 15.0 to 20.0, 13.22 to 13.78, 10.7 to 12.50 q/ha with
a mean yield of 12.8, 12.3, 17.5, 13.5 and 11.6 q/ha
during 2005-06, 2006-07, 2007-08, 2008-09 and 2009-10
respectively as against a yield ranged between 10.8
and 13.75 q/ha with a mean of 11.1 q/ha under local
check (farmers practice). The additional yield under
improved technologies over local practice ranged from
1.5 to 3.75 q/ha with a mean of 2.34 q/ha. In compari-
son to local practice, there was an increase of 15.31,
13.8, 27.27, 22.20 and 14.9% in productivity of
pigeonpea with a mean of 18.69 q/ha under improved
technologies in respective years.

The data on the economics of improved tech-
nologies and farmer's practice are presented in Table
2. The economic viability of improved technologies
and farmers practice was calculated depending on
prevailing prices of input and output costs. The cost
of production of pigeonpea under improved tech-

Table 2. Economics of improved technologies and farmers practice in pigeonpea.

Year	Total cost of cultivation (Rs/ha)		Gross return		Net return (Rs/ha)		B : C ratio		Additional cost of cultivation (Rs/ha)	Additional net return (Rs/ha)
	Improved technology	Local check	Improved technology	Local check	Improved technology	Local check	Improved technology	Local check		
2005-06	13500	14400	28160	24420	14660	10020	1:2.08	1:1.69	900	4640
2006-07	13850	14331	27060	23760	13834	9429	1:1.9	1:1.65	481	4405
2007-08	13225	14330	38500	30250	24500	15919	1:2.91	1: 2.11	1105	8581
2008-09	13500	14500	43200	35328	29700	20528	1:3.2	1:2.43	1000	9172
2009-10	13550	14400	45240	39390	31690	24990	1:3.33	1:2.73	867	6700
Average	13525	14392	36432	30629	22876	16177.2	2.68	2.12	870	6699
CV	-	-	-	-	7.2	41.49	-	-	-	-

Table 3. Effect of IPM practices on pest and disease incidence in pigeonpea (average of five years).

Parameter	Demonstration plot (%)	Farmers practice plot (%)
1 Sterility mosaic disease	< 5	5—15
2 <i>Fusarium</i> wilt	< 5	5—20
3 <i>Heliothis</i> pod borer	5—10	15—20
4 Pod fly	< 8	12—15

nologies varied from Rs 13,225 to 13,850/ha with an average of Rs 13,525/ha as against Rs 14,330 to 14,500/ha with an average of Rs 14,392/ha in farmers practice. The farmers practice recorded on additional cost of production ranging from Rs 481 to 1,105/ha with a mean of Rs 870/ha over improved technologies. The additional cost incurred in farmer's practice was mainly due to more cost involved in indiscriminate use of pesticides for controlling *Heliothis* pod borer. The cultivation of pigeonpea under improved technologies gave higher net return which ranged from Rs 13,834 to 31,690/ha with a mean value of Rs 22,876/ha as compared to farmer's practice which recorded Rs 10,020 to 24,990/ha with a mean of Rs 16,177/ha. There was an additional net return of Rs 4,640 in 2005-06, 4,405 in 2006-07, 8,581 in 2007-08, 9,172 in 2008-09 and 6,700 in 2009-10 under demonstration plots. The improved technologies also gave higher B:C ratio of 2.08, 1.9, 2.91, 3.2 and 3.33 as compared to 1.69, 1.65, 2.11, 2.43 and 2.73 under farmer's practice in the corresponding years.

Seed treatment with PGPR and *Rhizobium* (2), application of RDF + zinc and boron (3) and use of *Fusarium* wilt resistant variety, TS3-R (4) and seed treatment with *Trichoderma* (5) helped in increasing the growth and yield parameters in pigeonpea. Tomar et al. (6) reported that improved technologies like resistant variety, seed treatment, weeding increased the yield and economics in black gram.

The per cent sterility mosaic disease and *Fusarium* wilt (< 5%), *Heliothis* pod borer (5—10%) and pod fly (< 8%) incidence was less in demonstration plots when compared to farmer's practice where in per cent sterility mosaic disease, *Fusarium* wilt, *Heliothis* pod borer and pod fly incidence was 5—15, 5—20, 15—20 and 12—15% respectively (Table 3).

Penchala Raju et al. (7) reported that adoption of IPM in pigeonpea recorded highest yield, less pod

Table 4. Extension programmes/activities organized on improved technologies in pigeonpea.

Extension program activity	No. of programs organized	No. of participants
1 On campus training	10	459
2 Off campus training	12	692
3 Training to extension personnel	06	238
4 Field days	05	557
5 Group discussion/farmers – scientist interaction	09	258
6 Rapid rowing survey of pest and diseases	Once in a every week (October to January)	-
7 Doordarshan program	06	-
8 AIR program	05	-

damage by *Heliothis* pod borer and higher benefit cost ratio when compared to non IPM plots under farmers fields.

To improve the knowledge of farmers regarding understanding of improved technologies, Krishi Vigyan Kendra conducted several extension activities which includes training programs i.e. on campus (10 nos. involving 459 participants) and off campus (12 nos. involving 692 participants) and training to extension functionaries (6 no. involving 238 participants) belonging in to line departments and NGO's for horizontal spread to the technology and to develop effective linkages so as to create awareness about the technology (Table 4).

Periodic visit of KVK scientists to demonstration fields, farmers visit to KVK, phone calls, distribution of literature through leaf let, pamphlets. Rapid rowing survey for pest and disease incidence and forecast through AIR, doordarshan and local print media was done for horizontal spread of the technology and also create awareness about the technology.

For mass interaction of farmers with scientists and farmers with farmers, field days were organized in the demonstration fields where in major emphasis was given to spread the technology.

The technology on improved production technologies in pigeonpea was stepwise and effective. Rajanna et al. (8) reported that farmers scientist participatory approach is the best one as compared to other methodologies in which knowledge about the farming practice, mass media use, participation in

training programme, extension agency contact and extension participation had significant relation with attitudes of farmers.

The work is a part of growing experience in participatory research, farmers training and demonstration. Collaboration among farmer groups, Krishi Vigyan Kendra and scientists on improved production technologies has provided opportunities to strengthen our bonds for emerging conviction that participatory approaches can facilitate changes in farmers knowledge, attitudes and practices with improved access to latest information and technology.

The results from the present study brought out the potential of improved production technologies in enhancing pigeonpea production and economic gains in rainfed condition.

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