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Frontline demonstration: a productivity enhancement and technology dissemination tool for pigeon pea in eastern UP

RK SINGH, VB SINGH*, AK SINGH and RR SINGH****

Krishi Vigyan Kendra, Kotwa, Azamgarh 276001 UP
***Zonal Agricultural Research Station, Baribag, Ghazipur 233001 UP**
****Directorate of Extension**
Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad,UP
Email for correspondence: rratansingh@yahoo.co.in

ABSTRACT

The frontline demonstration (FLD) was conducted by the Krishi Vigyan Kendra, Azamgarh (ND University of Agriculture and Technology, Faizabad) UP on pigeon pea by using raised bed production technique with improved package of practices at 62 farmer fields in the district for four consecutive years viz 2007-08, 2008-09, 2009-10 and 2010-11. The results reveal that increasing trends were obtained with yield of demonstrated plots along with per cent increase in yield over traditional practices in each progressive year of the study. The highest grain yield (16.3 q ha^{-1}) was found in the last year 2009-10 which was very close to yield obtained in 2010-11. In the frontline demonstration it was substantially higher (69%) over the farmers practice (9.64 q ha^{-1}) however the lowest yield (12.6 q ha^{-1}) was recorded in the year 2007-08 under demonstration when compared to traditional production system (9.40 q ha^{-1}) which resulted more than succeeding year 2008-09 in farmers practice. The ascending variation in the per cent increase in the yield was found due to variation in agro-climatic parameters under rainfed condition. In same sequence the other parameters like technology gap, extension gap and technology index were also analyzed for assessment of technology adoption rate with extension activities and feasibility of demonstrated technologies at ground reality levels. The average of technology gap and technological index were found to be 10.6 and 42.3 per cent respectively. Moreover the results clearly indicate the positive effects of FLDs over the existing practices towards enhancing the productivity of pigeon pea in the rainfed region of eastern UP. Demonstrated technologies proved most remunerative and economically feasible against traditional production system.

Keywords: Pigeon pea; raised bed planting technique; FLD programme

INTRODUCTION

Pigeon pea, *Cajanus cajan* (L) Millsp is the second most important pulse crop in India after chickpea. It has multiple uses and occupies an important place in the prevailing farming systems in the country and vegetarian diet. It also plays an important role in sustainable agriculture by enriching the soil through biological nitrogen

fixation along with deep root system of this crop which makes it more suitable for its cultivation under rainfed conditions. Raised bed planting of pigeon pea provides congenial environment during sowing. Seeds were placed nearly 6 inches above from soil surface which facilitated smooth germination without seed decay during severe rainy period. District Azamgarh of eastern Uttar Pradesh occupies 10,018 hectares of land and 6,648 metric tons production with average productivity of 664 kg ha^{-1} of pigeon pea. In order to make the nation self sufficient in pulses productivity levels of pulses need to be increased substantially from 598 kg ha^{-1} to 1,200 kg ha^{-1} by 2020 (Ali and Kumar 2005). Faulty sowing practices, improper crop geometry, avoid use of biofertilizers, *Trichoderma*, other intercultural operations and climatic variabilities are predominant reasons for limiting the potential yield of pigeonpea.

METHODOLOGY

Frontline demonstration on pigeon pea was conducted by Krishi Vigyan Kendra, Azamgarh (ND University of Agriculture and Technology, Faizabad), UP during the period 2007-08, 2008-09, 2009-10 and 2010-11in seven villages viz Sikraur, Gopalpur, Ekrampur, Kariyagopalpur, Surhan, Pandri and Gopalpur covering five blocks of district Azamgarh. A total 52 farmers were associated under this programme. Variety Narendra Arhar-2 was taken into the demonstration. Raised bed planting technique considering 60 x 30 cm plant geometry with the help of planter was adopted and thinning was done manually to maintain intra spacing between plants. The balanced dose of fertilizer (22 kg Nitrogen + 60 kg P_2O_5 ha^{-1}) was applied at the time of last planking in the form of diammoniam phosphate. PSB, *Rhizobium* and *Trichoderma* @ 25, 25 and 10 gm kg^{-1} of seed respectively were used as seed treatment. An area of 0.25 to 0.40 ha of each farmer was taken under demonstration thus covering total of 23 hectares. At every location control plots were kept for comparison where farmers practices were carried out (Table 1). All the essential production and protection technologies other than interventions were applied in similar manner in treatments as well as control plots (Table 2).

The yield data were collected from the selected FLD farmers by random crop cutting method. Qualitative data were converted into quantitative form and expressed in terms of per cent increase in yield calculated using following formula:

$$\text{Per cent increase in yield} = \frac{\text{Grain yield under FLD} - \text{Grain yield under farmers practice}}{\text{Grain yield under farmers practice}} \times 100$$

The extension gap, technology gap, technology index, BCR etc were worked out as per Samui et al (2000) as given below:

Technology gap = Potential yield - Demonstrated yield

Extension gap = Demonstrated yield - Yield under existing practice

$$\text{Technology index} = \frac{\text{Potential yield - Demonstrated yield}}{\text{Potential yield}} \times 100$$

RESULTS and DISCUSSION

The results obtained during four consecutive years are presented in Table 3. It is evident from the findings that the increase in yield over respective farmers practices was observed in all the years. The cropping year 2009-10 was observed to be more conducive and in this year 69 per cent higher pigeon pea yield was observed (16.3 q ha^{-1}) over farmers practices (9.64 q ha^{-1}). The lowest yield (12.6 q ha^{-1}) was observed in the first year of experimentation (2007-08) as compared to farmers practices. It was found due to knowledge and adoption of appropriate variety like Narendra Arhar-2, raised bed planting, balanced doses of fertilizers (22 kg N & 60 kg P_2O_5 ha^{-1}) and seed treatment with *Rhizobium* 25 g, Phosphorus Solublizing Bacteria (PSB) 25 g and *Trichoderma* 10 g kg^{-1} of seed and adoption of proper plant protection measures effectively enhanced the yield of pigeon pea by 34.4, 56.5 and 69.0 per cent over the yield obtained under farmers practices (use of the non-descriptive local variety, broadcasting of seed, no use of the balanced doses of fertilizers and lack of protection measures for wilt and pod borer management). The above results are in conformity with the findings of Singh (2002) and Mahetele and Kushwaha (2011).

The extension gap that ranged from 3.20 to 6.66 q ha^{-1} emphasizes that there is need to educate the farmers through various ways for adoption of improved production technologies (means increasing mode of extension gap values). A descending trend of technology gap (ranging from 12.4 to 8.70 q ha^{-1}) reflects the farmers cooperation in carrying out such demonstrations with encouraging results in subsequent years. The technology gap may also be attributed to the dissimilarity in soil fertility status and weather conditions etc. Technology index showed the feasibility of the evolved technology at the farmers fields. However the lower value of technology index indicates that more is the feasibility of technology at farmers fields. As such fluctuation in technology index (ranging from 49.6 to 34.8) during the study period in certain regions may be attributed to the dissimilarity

Table 1. Differences between technological intervention and farmers practices under FLD on pigeon pea

Component	Technological intervention	Farmers practice
Variety	Narendra Arhar -2	Local (non-descriptive)
Seed treatment	*Rhizobium* @ 25 g kg^{-1} of seed, PSB @ 25 g kg^{-1} of seed *Trichoderma* powder @ 10 g kg^{-1} of seed	No seed treatment
Fertilizer dose	22 kg N and 60 kg P_2O_5 ha^{-1}	No use of phosphatic fertilizer
Weed management	Pendimethalin (pre-emergence) 3.5 liter ha^{-1}	Occasional manual weeding for fodder
Plant protection measures	Chloropyriphos @ 1.5 liter ha^{-1} at 50% poding stage	No control measure

Table 2. General production and protection technologies applied in the demonstrated at the farmer field

Particulars	Proven technologies
Seed rate	15 kg ha^{-1}
Sowing method	Raised bed planting following 60 x 30 cm crop geometry
Situation	Upland rainfed
Soil type	Sandy clay loam
Thinning and weed management	Pre-emergence application of Pendimethalin 3.5 liter ha^{-1} followed by manual weeding once at 30 days after sowing & thinning at the same time
Plant protection	Chloropyriphos @ 1.5 liter ha^{-1} at 50% poding for control of pod borer and pod fly

Table 3: Acreage, beneficiaries, yields and other test parameters of raised bed sown pigeon pea in eastern UP

Year	Coverage		Potential yield (q/ha)	Average yield		Increase in yield over farmers practice	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)	B:C ratio
	Total farmers	Total area		Demonstrated plot (FLD) (ha)	Farmers practice					
2007-08	13	5.0	25.0	12.6	9.40	34.4	3.20	12.4	49.6	4.40
2008-09	13	5.0	25.0	13.1	8.40	56.5	4.70	11.9	47.6	4.81
2009-10	26	10.0	25.0	16.3	9.64	69.0	6.66	8.70	34.8	4.16
2010-11	10	3.0	25.0	15.7	10.1	55.4	5.60	9.30	37.2	4.48
Total/ average	62	23	25.0	14.43	9.39	53.8	5.04	10.6	42.3	4.46

in soil fertility status, weather conditions, improper intercultural operations and pest management etc. The growing of pigeon pea in raised bed planting system provides multiple option for agronomic management aspects like each furrow can be used as drain channel during intense rainfall while the same furrow is used for rainwater conservation during drought. The raised bed planting was also helpful for getting higher B:C ratio.

The frontline demonstration on the technologies adopted under the experiment was helpful for the farmers to adopt new technologies to boost pigeon pea production and provided the researchers an opportunity to demonstrate the productivity potential and profitability of the latest interventions under micro farming situations which they had been advocating for long time. Similar reporting has also been made by Kirar et al (2006).

CONCLUSION

Through the FLD programme the new technologies like use of high yielding varieties, new methods of planting, balanced doses of the fertilizers, biofertilizers and integrated pest management practices were demonstrated to the farmers. The productivity gain under demonstrations over conventional practices created awareness and motivated the other farmers to adopt appropriate recent production and protection technologies of pigeon pea in the district.

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