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Impact of FLD on vegetable pigeonpea (*Cajanus cajan*) variety 'Vaishali' under rainfed condition of central Gujarat

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Abstract

Traditionally, pigeonpea [*Cajanus cajan* (L.) Millsp.] cultivated for grain seed but for vegetable purpose, pods are harvested when it is immature. In Gujarat, it is used as substitute of green pea [*Pisum sativum* (L.)]. Pigeonpea is as one of the most important pulse crops of the Panchmahals district of Gujarat. However, productivity of pigeonpea in this district is very low. Attempts were made to improve productivity and to increase area under pigeonpea by adopting high yielding variety (Vaishali). In order to compare conventional pigeonpea with HYVs, 75 front line demonstrations were carried out in systematic manner on farmers' field to show the worth of a new varieties in comparison to local check and thereby convincing farmers about potentialities of improved variety and advance production management practices for adoption. The yield (green pod) in HYVs was recorded 80q/ha whereas it was 45q/ha in local check. Similarly, the benefit cost ratio for HYVs was estimated to 3.9 as compared to local check (2.5). The impact of FLDs was standardized which showed improvement in knowledge of pigeonpea cultivation and higher level of satisfaction in terms of its culinary uses and economic gain resulted into mass scale adoption of HYVs in Panchmahal district (Gujarat).

Key words: Frontline demonstration, pigeonpea, production technology

Introduction

Among sub-tropical legumes, pigeonpea or red gram [*Cajanus cajan* (L.) Millsp.] occupies an important place in rainfed agriculture. Globally, it is cultivated over 4.67 million ha, out of which; 3.30 million ha is confined to India alone. Though, it is mainly consumed as pulse, and also has a wide range of uses including as fresh or canned green pigeonpea vegetable purpose which is quite common in many parts of India including Gujarat. Vegetable pigeonpea is characterized by large pods and seeds are easy to shell. Vegetable pigeonpea can also be grown in slightly degraded soil, backyards, field bunds land with undulating topography *etc.* The fresh seeds (green seeds) can be frozen and canned for commercialization and export. It is more easily digested when cooked. It is a good source of protein, vitamins (A, C, B complex), minerals (Ca, Fe, Zn, Cu), carbohydrates and dietary fibers, *etc.* Compared to pulse, it has five times more ß- carotene content, three times more thiamine, riboflavin and niacin content and has double amount vitamin C content. Besides it has higher shelling per cent (edible grains) (70%) than that of green peas (52%). These all factors indicate that pigeonpea is nutritionally rich vegetable and it can be used in daily cuisine. Even after this, the farmers' adoption rate for vegetable pigeonpea is poor, owing to inferior pod and seed characteristics of traditional strain of pulses. A survey was conducted to find out the liking of farmers about the qualities of pigeonpea, it was found that the farmers prefer pigeonpea which is having more number of pod, bold seed, and good taste, these physical characteristics indicate that green pods are also liked for harvesting pigeonpea for vegetable purpose. The consumers preferred long (5-7 cm), wide (1.5-2.0 cm), pods with high numbers of seeds per pod (4-7). In view of this preference, the varieties which were bred or are cultivated mainly for vegetables (pod) purpose should be recommended for sowing in the area where pigeonpea is used as culinary purpose. Consequently, varieties Shavani, Vaishali, Mahima, Ganesh, *etc.* has been recommended for commercial cultivation in Central Gujarat.

Materials and Methods

An extensive survey was conducted to collect information pertaining to various usage of vegetable pigeonpea in the Panchmahals District of Gujarat. Seventy five farm families each from seven pigeonpea growing villages were selected from three Talukas *viz.*, Goghamba, Kalol, and Godhra for gathering the information. A questionnaire containing (10) questions were put to the respondents and data were analyzed. To popularize the improved vegetable pigeonpea production practices, constraints in vegetable pigeonpea production were identified through participatory approach. Preferential ranking technique was utilized to identify the constraints faced by the respondent farmers in vegetable pigeonpea production. Farmers were also asked to rank the constraints they perceive as limiting factors for vegetable pigeonpea protection in order of preference. The quantification of data was done by first ranking the constraints and then calculating the Rank Based

Quotient (RBQ) as given by Sabarathnam (1988), which is as follows:

$$R.B.Q. = \sum fi\,(n=1\text{-}ith) \times 100/Nxn$$

Wherein,

fi = Number of farmers reporting a particular problem under i^{th} rank

N = number of farmers

n = number of problems identified

Based on top rank farmers problems identified, front line demonstrations were planned and conducted at the farmers' field under technology demonstration for harnessing pulses production programme. In all, 150 full package frontline demonstrations were conducted to convince them about potentialities of improved variety of pigeonpea 'Vaishali' during the years 2015, 2016 and 2017. All the participating farmers were trained on all aspects of pigeonpea production management. Recommended agronomic practices and genuine seeds were used for FLDs in 0.5 ha area in each demonstration. A one fifth area was also devoted to grow local standard check. To study the impact of front line demonstrations, out of 75 participating farmers, a total of 50 farmers were selected as respondent through proportionate sampling. Production and economic data for FLDs and local practices were collected and analyzed. The technology gap and technology index were calculated using the following formulas as given by Samui *et al.* (2000):

Potential gap= Potential yield-Demostration yield

Technology index= (Potential yield-Demostration yield)x100/Potential yield

Results and Discussion

Constraints in pigeonpea production

Farmers' pigeonpea production problems were documented in this study. Preferential ranking technique was utilized to identify the constraints faced by the respondent farmers in pigeonpea production. The ranking given by the different farmers are presented in Table 1. A perusal of Table indicates that lack of suitable HYVs was given the top most rank by 29 respondent farmers. The FLD participants were provided HYVs seeds as critical inputs. Based on the ranks given by the respondent farmers for the different constraints listed out in Table 1, the rank based quotients were calculated and presented in Table 2.

The analysis of data presented in the Table 2 revealed that lack of suitable HYVs, low soil fertility, weed infestation and followed by leaf hopper infestation were the major constraints to pigeonpea production. Other constraints such low technical knowledge, wilt, pod fly infestation, pod borer infestation, intercropping, wild animals and erratic rainfall were also found to reduce pigeonpea production. Earlier workers Saxena *et al.*, (2010); Ouma *et al.*, (2002); Joshi *et al.*, (2005) have reported similar problems in maize production.

Performance of FLD

A comparison of productivity levels between demonstrated variety and local check is shown in Table 3. During the period under study it was observed that in front line demonstrations, the improved pigeonpea variety Vaishali recorded the higher green pod yield (80 qha^{-1}) compared to local check (45 qha^{-1}). The percentage increase in the yield over local check was 77.7. Similar yield enhancement in different crops in front line demonstration has amply been documented by Haque Mishra *et al.* (2009), Kumar *et al.* (2010) and Dhaka (2010). From these results, it is evident that the performance of only improved variety was found better than the local check under local conditions. Farmers were motivated by results of agro technologies applied in the FLDs trials in also to adopt improved variety. Yield of the front line demonstration trials and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology index. The technology gap showed that the gap in the demonstration yield over potential yield 35.00 qha^{-1}. The best potential yield comes from the demonstration field where all inputs are given at optimum level. The observed technology gap may be attributed to dissimilarities in soil fertility, salinity and erratic rainfall and other vagaries of weather conditions in the area. Hence, to narrow down the gap between the yields of different varieties, location specific recommendation appears to be necessary. Technology index showed the feasibility of the variety at the farmer's field. The lower the value of technology index more is the feasibility. Table 3 revealed that the technology index values were 36%. The finding of the present study is in consonance with the findings of Hiremath and Nagaraju (2009) in case of onion crop.

The economics of pigeonpea production under front line demonstrations were estimated and the results have been presented in Table 4. Economic analysis of the yield performance revealed that front line demonstrations recorded higher gross returns (Rs. 120000 ha^{-1}) and net return (Rs. 87400 ha^{-1}) with higher benefit cost ratio (3.7) compared to local checks. These results are in line with the findings of Gurumukhi and Mishra (2003) and Hiremath *et al.* (2007)

Conclusion

The study undertaken with the help of 75 FLD participants at KVK, Panchmahals to know the economics of pigeonpea production using HYV and adoption level and constraint influencing the adoption of HYV. The results revealed that lack of knowledge of suitable HYV, soil fertility; weed infestation, wilt and low technological knowledge were the five most important factors which limits the adoption of HYVs of pigeonpea in Panchmahals. The yield of pigeonpea in demonstration was 80 q/ha as compared local check (45q/ha) has change the mindset of farmers at present, they are adopting the improved production technologies as demonstrated through FLDs.

Table 1. Ranks given by farmers for different constraints (n=75)

S. No.	Constraints	Ranks									
		I	II	III	IV	V	VI	VII	VIII	IX	X
1.	Lack of suitable HYVs	29	16	12	08	05	05	00	00	00	00
2.	Low technical knowledge	14	08	16	10	08	05	02	06	04	02
3.	Low soil fertility	13	12	16	17	05	06	03	03	00	00
4.	Weed infestation	18	15	11	07	03	06	07	08	00	00
5.	Intercropping	00	00	05	08	05	10	20	35	00	00
6.	Wild animals	05	05	04	07	07	02	10	13	10	12
7.	Wilt	06	04	15	11	13	26	00	00	00	00
8.	Pod borer infestation	10	10	09	06	07	05	08	10	05	05
9.	Pod fly infestation	09	14	10	11	09	07	04	06	05	00
10.	Leaf hopper infestation	08	14	17	15	13	00	05	00	00	03

Table 2. Frequency distribution of RBQ values given by farmers (n=75)

S. No.	Problems	R.B.Q	Overall rank
1.	Lack of suitable HYVs	85.46	I
2.	Low technical knowledge	69.2	V
3.	Low soil fertility	74.26	II
4.	Weed infestation	73.6	III
5.	Intercropping	48.13	IX
6.	Wild animals	45.2	X
7.	Wilt	66.8	VI
8.	Pod borer infestation	59.73	VIII
9.	Pod fly infestation	67.46	VII
10.	Leaf hopper infestation	73.06	IV

Table 3. Yield, technology gap and technology index of demonstration

Variables	Yield ($q\ ha^{-1}$)	Increase (%) over Local check	Technology gap (qha^{-1})	Technology index (%)
Local check	45 .00	-	-	-
Demonstration (Vaishali)	80.00	77.7	35 .00	36

Table 4. Economics of frontline demonstrations

Variables	Cost of cultivation ($Rs\ ha^{-1}$)	Gross return ($Rs\ ha^{-1}$)	Net return ($Rs\ ha^{-1}$)	Benefit cost ratio
Local check	26500	67500	41000	2.5
Demonstration	32600	120000	87400	3. 7

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