Indian Journal of Extension Education
Vol. 53, No. 2, 2017 (41-46)

Consumer Acceptance for Vegetable Pigeonpea through front line Demonstrations in Central Gujarat

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ABSTRACT

Conventional pigeonpea *(Cajanus cajan* (L.) Millsp.) is harvested as seed but for the purpose of vegetable, it is harvested as pods when it is immature. At two stages it is a nutritious and delicious vegetable and forms a substitute for green pea *(Pisum sativum* (L.). Pigeonpea is one of the most important pulse crops of the Panchmahals district of Gujarat. However, productivity of pigeonpea in the district is very low. Attempts are made to improve productivity and to increase area under pigeonpea by adopting HYVs (High Yielding Variety). In order to compare and contrast conventional pigeonpea with HYVs varieties, 75 frontline demonstrations were carried out in a systematic manner on farmers' field to show the worth of new varieties in comparison to local check and thereby convincing farmers about potentialities of improved production management practices of pigeonpea for further adoption, involving feasible and effective scientific package of practices. The demonstrations clearly showed enhancement of productivity, at the same time area under pigeonpea cultivation was also noticed to be enhanced. The yield (green pod) was found to increase from 4300 kg/ha in local check to 7300 kg/ha in demonstrations. Similarly, the benefit cost ratio for HYVs varieties was found to increase to 3.22 as compared to local check (2.27). The economics and benefit cost ratio can be further improved to 3.23 by giving slightly higher inputs for cultivation and marketing. The impact of FLDs was analyzed which showed improvement of knowledge and satisfaction of farmers as the main reason for mass scale adoption.

Key words: Pigeonpea, production technology, frontline demonstration

INTRODUCTION

Among sub-tropical legumes, pigeonpea or red gram *[Cajanus cajan (L.)* Millspaugh] occupies an important place in rain-fed agriculture. Globally, it is cultivated over 4.67 million ha, out of which 3.30 million ha is confined to India alone. Though mainly consumed as a pulse, this crop has a wide range of uses including as fresh or canned green pigeonpea which is quite common in many parts of India including Gujarat. Vegetable pigeonpea is characterized by large pods and its seeds are easy to shell. It has some anti-nutritional factors like phytolectins, but since these phytochemicals are sensitive to heat, they can be easily destroyed during cooking. 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 and 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 pulses, it has five times more beta carotene content, three times more thiamine, riboflavin and niacin content and has double vitamin C content. Besides these, it has higher shelling percent (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 has been poor, mainly due to inferior pod and seed characteristics of commercial cultivars. A survey conducted at this KVK revealed 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). The preference of cultivars varied amongst farmers depending on whether the green pods or shelled seeds were to be presented to the consumer. With respect to seeds, hundred seed weight (HSW) was the only single criterion affecting consumer acceptance. In view of this preference, the varieties which were bred or are cultivated mainly for vegetables (pod) purpose should be recommended for planting in the area where pigeonpea is an important crop. Consequently vars. GT-1, Vaishali, Mahima, Ganesh, *etc.* may be

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recommended for cultivation in Central Gujarat region. The vegetable pigeonpea can successfully be taken for cultivation as intercrop with maize and sesamum, where it was found to help reduce incidence of 'phyllody' disease of sesamum.

METHODOLOGY

An extensive survey was conducted to collect information pertaining to various uses of vegetable pigeonpea in the Panchmahals district. Seventy five farm families (who grew pigeonpea) each from seven 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 vegetable pigeonpea protection in order of preference. The quantification of data was done by ranking the constraints first and then calculating the Rank Based Quotient (RBQ) as given by Sabarathnam (1988), which is as follows:

$$\text{R. B.Q.} = \frac{\sum fi\ (n + 1 - ith)}{N \times n} \times 100$$

Wherein,

fi = Number of farmers reporting a particular problem under ith 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' fields 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 2009, 2010 and 2011. 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. A one fifth area was also devoted to grow local standard check. To study the impact of frontline demonstrations, out of 75 participating farmers, a total of 50 farmers were selected as respondents 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):

$$\text{Technology gap} = \text{Potential yield} - \text{Demonstration yield}$$

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

Knowledge level of the farmers about improved production practices of pigeonpea before frontline demonstration implementation and after implementation was measured and compared by applying dependent't' test. Further, the satisfaction level of respondent farmers about extension services provided was also measured based on various dimensions like training of participating farmers, timeliness of services, supply of inputs, solving field problems and advisory services, fairness of scientists, performance of the variety being demonstrated and overall impact of FLDs. KVK farm demonstrated the performance of various varieties of pigeonpea *viz.* K.Sel. GT-1, Virgin, Vaishali, Mahima, Ganesh, and BDN-2 in demonstration block.

The selected respondents were interviewed personally with the help of a pre-tested and well structured interview schedule. Client Satisfaction Index was calculated as developed by Kumaran and Vijayaragavan (2005).

The individual obtained score

$$\text{Client Satisfaction index} = \frac{\text{The individual obtained score}}{\text{Maximum score possible}}$$

The data thus collected were tabulated and statistically analyzed to interpret the results.

RESULT AND DISCUSSION

The results of study on the utilization of pigeon pea when compared to green pea was found to be 45 per cent more among the farm families of Panchmahals Gujarat. The vegetable pigeonpea is used for various culinary purposes viz. Kachodi (40.55%), Green sabji (20.23%), Paratha (10.25%), Undhiya (5.9), Khichari and pulav (8.15%) Masala curry (10.00%) and Green dahl (5.5%) etc. by the farm families.

The survey conducted in Godhra, Ghoghmba and Kalol taluk of Panchmahals, where vegetable pigeonpea is consumed on a large scale, it was found that the rural consumers preferred pods with green base color with minor or dense streaks on its surface. In contrast, the

urban consumers preferred green color pods. For vegetable purposes, generally large pods are preferred since they are attractive and relatively shelled easily. Although seed number/pod in the various commercial varieties ranged between 3 and 7, on an average, the optimum seed number/ pod that is easily marketed is 4-7. The most popular vegetable pigeonpea cultivars have long pods and large seeds (weighing at least 25 to 35 g/100 seeds when green) (Table 1). These cultivars are grown as a normal field crop grown for seed purpose, but immature pods are also harvested at an appropriate stage for use as vegetable.

This practice is more prevalent around cities where green pods can readily be marketed at attractive prices. After harvesting some green pods, the rest crop is left for producing dry seeds. The per cent varietal performance of the Panchmahals farmers were in following descending order : K.Sel. (40), Abhaya vaishali (30), Mahima (28), Vargin (25), GT-1(20). Most of the respondents were unaware about the overall performance of different varieties, they have grown only local available strain of pigeonpea. The local Ganesh and Mahima cultivars matured the earliest (120 days) for vegetable purpose whereas K.Sel. & Vaishali were late varieties (150days).

Table 1: Varietal performance of pigeonpea.

Germplasm	Days		Seeds/ pod	Pods/ plant	Pod length (cm)	100 green seed weight (g)
	Flowering	Maturity				
Local	85	120	2.3	076.2	3.2	18
BDN-2	90	135	3.4	178.6	5.2	21
AGT-2	90	135	3.1	189.4	4.7	20
GT-1	90	135	3.3	150.2	4.5	22
Vaishali	110	140	3.1	205.8	4.5	20
Abhaya Vaishali	95	120	4.4	194.6	5.9	25
Mahima	90	120	4.3	183.9	6.4	30
Ganesh	100	130	4.9	218.4	6.7	30
Vergin	105	125	4.2	225.3	6.8	28
K.Sel.	120	150	5.4	205.8	7.5	35

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 given in Table 2. 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 2, the rank based quotients were calculated and presented in Table 3.

Table 2: Ranks given by farmers for different constraints n=75

Constraints	Ranks									
	I	II	III	IV	V	VI	VII	VIII	IX	X
Lack of suitable HYVs	29	16	12	08	05	05	00	00	00	00
Low technical knowledge	14	08	16	10	08	05	02	06	04	02
Low soil fertility	13	12	16	17	05	06	03	03	00	00
Weed infestation	18	15	11	07	03	06	07	08	00	00
Intercropping	00	00	05	08	05	10	20	35	00	00
Wild animals	05	05	04	07	07	02	10	13	10	12
Wilt	06	04	15	11	13	26	00	00	00	00
Pod borer infestation	10	10	09	06	07	05	08	10	05	05
Pod fly infestation	09	14	10	11	09	07	04	06	05	00
Leaf hopper infestation	08	14	17	15	13	00	05	00	00	03

The analysis of data presented in the Table 3 revealed that lack of suitable HYVs, low soil fertility, weed infestation 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, inter-cropping, wild animals and erratic rainfall were also found to reduce pigeonpea production. Other authors (Ouma *et al.,* 2002; Joshi *et al.,* 2005) have reported similar problems in maize production.

Table 3: Frequency distribution of RBQ values given by farmers n=75

Problems	R.B.Q	Overall rank
Lack of suitable HYVs	85.46	I
Low technical knowledge	69.2	V
Low soil fertility	74.26	II
Weed infestation	73.6	III
Intercropping	48.13	IX
Wild animals	45.2	X
Wilt	66.8	VI
Pod borer infestation	59.73	VIII
Pod fly infestation	67.46	VII
Leaf hopper infestation	73.06	IV

Performance of FLD

A comparison of productivity levels between demonstrated variety and local checks is shown in table 4. During the period under study, it was observed that in front line demonstrations, the improved pigeonpea variety Vaishali recorded the higher grain yield (75.00qha-1) compared to local check (43.00q ha-1). The percentage increase in the yield over local check was 74.40. Similar yield enhancement in different crops in front line demonstration has amply been documented by Haque (2000), Tiwari and Saxena (2001), Tiwari *et al.* (2003), Hiremath *et. al.* (2007), 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 FLD trials and it is expected that they would adopt these technologies in the coming years. 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 shows the gap in the demonstration yield over potential yield and it was 5.00q ha-1. The best potential yield comes from the scientist's 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 recommendations appear to be necessary. Technology index shows the feasibility of the variety at the farmer's field. The lower the value of technology index, the more is the feasibility. Table 4 revealed that the technology index values were 6.25 per cent. The finding of the present study is in consonance with the findings of Hiremath and Nagaraju (2009) in case of Onion crop.

Table 4: Yield, technology gap and technology index of demonstration

n=75

Variables	Yield (q ha-1)	Increase(%) over Local check	Technology gap (qha^{-1})	Technology index (%)
Local check	43.00	-	-	-
Demonstration (Vaishali)	75.00	74.4	5.00	6.25

The economics of pigeonpea production under front line demonstrations were estimated and the results have been presented in Table 5. Economic analysis of the yield performance revealed that front line demonstrations recorded higher gross returns (₹. 105000 ha-1) and net return (₹ 60200 ha-1) with higher benefit cost ratio (3.22) compared to local checks.

These results are in line with the findings of Gurumukhi and Mishra (2003), Hiremath *et. al.* (2007), Hiremath and Nagaraju (2009) in the cases of potato and onion. Further, additional cost of ₹ 2000 per hectare in demonstration has yielded additional net returns of ₹ 7000 per hectare with incremental benefit cost ratio 3.23 suggesting a higher profitability and economic viability of the demonstration. Similar results were also reported by Hiremath and Nagaraju (2009).

Table 5: Economics of frontline demonstrations

Variables	Cost of cultivation (₹ ha^{-1})	Gross return (₹ ha^{-1})	Net return (₹ ha^{-1})	Benefit cast ratio
Local check	26500	60200	33700	2.27
Demonstration	32600	105000	72400	3.22
Additional in demonstration	2000	7000	3420	3.23*

* Incremental benefit cost ratio

Increase in Knowledge:

Knowledge level of respondent farmers on various aspects of improved pigeonpea production technologies before conducting the frontline demonstration and after implementation was measured and compared by applying dependent't' test. It could be seen from Table 6 that farmers mean knowledge score had increased by 34.28 after implementation of frontline demonstrations. The increase in mean knowledge score of farmers was observed significantly higher. As the computed value of 't' (5.46) was statistically significant at 5 per cent probability level. The results are at par with Narayanaswamy and Eshwarappa (1998), Singh and Sharma (2004), Singh *et. al.* (2007). It means that there was a significant increase in the knowledge level of the farmers due to frontline demonstration. This shows the positive impact of frontline demonstration on the knowledge of farmers that have resulted in higher adoption of improved farm practices. The results so arrived might be due to the concentrated educational efforts made by the scientists.

Table 6: Comparison between knowledge levels of the respondent farmers about Improved Farming Practices of maize

n=75

Mean score			Calculated 't' value
Before FLD implementation	After FLD implementation	Mean difference	
31.57	65.85	34.28	5.46*

* Significant at 5% probability level.

Farmers' Satisfaction:

The extent of satisfaction level of respondent farmers over extension services and performance of demonstrated variety was measured by Client Satisfaction Index (CSI) and results presented in Table 7.

Table 7: Extent of farmers satisfaction of extension services rendered

n=75

Satisfaction	Level Number	Per cent
Low	09	12.00
Medium	30	40.00
High	34	45.33

It is observed from table 6 that majority of the respondent farmers expressed high (45.33 %) to the medium (40%) level of satisfaction for extension services and performance of technology under demonstrations. Whereas, very few (12%) per cent of respondents expressed lower level of satisfaction. The results are in conformity with the results of Narayanaswamy and Eshwarappa (1998), Kumaran and Vijayaragavan (2005) in case of Bajra crop. The medium to higher level of satisfaction with respect to services rendered, linkage

with farmers, and technologies demonstrated etc. indicate stronger conviction, physical and mental involvement in the frontline demonstration which in turn would lead to higher adoption. This shows the relevance of frontline demonstration.

CONCLUSION

The study has been 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 inhibited the adoption of HYVs of pigeonpea in Panchmahals. The yield of pigeonpea in demonstration was 75q/ha as compared local check (43q/ha). The benefit cost ratio for HYV was 3.22 as compared to 2.27 in case of local check. The impact of FLD was also analyzed which showed that there was significant improvement in the knowledge level and satisfaction on the part of farmers.

Paper received on : January 09, 2017
Accepted on : January 16, 2017

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