

Effect of Technological Interventions on Yield and Economics of Pigeon pea in Eastern U.P.

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ABSTRACT

Pigeon pea is an important pulse crop widely consumed in India. It is also play an important role in sustainable agriculture enriching the soil through biological nitrogen fixation The area, production and productivity of the pulses in the country are 23.63 million hectare, 14.56 million tones and 6.25 q/ha, respectively. Looking of fact its yield productivity is far below the potential yield. Krishi Vigyan Kendra, Post Graduate College, Ghazipur conducted front line demonstration on the improved package of practices of pigeon pea in the district during 2005-06 to 2009-10 for five consecutive years. The highest grain yield (20.0 q/ha) was recorded in the year 2007-08. In front line demonstration, it was 42 per cent more over the farmers practice (14.0 q/ha), however the lowest yield (7.0 q/ha) was recorded in the year 2006-07 under FLD and 6.0 q/ha in farmers practice. The variation in the percent increase in the yield was found due to variation in agro climatic parameters under rain fed condition. The productivity and income gain under FLDs over traditional practices of pigeon pea cultivation created greater awareness and motivated the other farmers to adopt appropriate production technology of pigeon pea in the district. The selection of critical input and participatory approach in planning and conducting the demonstration definitely help in transfer of technology to the farmers.

Pigeon pea (*Cajanus cajan* L. Millsp.) is the second most important pulse crop in India and consumed in most parts of the country. However, its productivity is far below the potential yield. The area, production and productivity of the pulses in the country are 23.63 million hectare, 14.56 million tones and 6.25 q/ha, respectively (Masood Ali *et al.* 2007-08). The area, production and productivity of pigeonpea in the states of Uttar Pradesh are 31.58 lakh ha, 25.5 lakh tonnes and 7.60 q/ha, respectively. The area production and productivity of pigeon pea in district Ghazipur of Uttar Pradesh are 6045 ha, 6270 metric tonnes and 10.37 q/ha, respectively.

Front line demonstration (FLD) is introduction by the Indian Council of Agricultural Research, New Delhi with inception of technology mission of pulse and oil seed crops during mid eighties. The field demonstrations conducted under the close supervision of scientist of the KVK. The basic objectives of FLD are to speedy spread of the newly introduced high yielding varieties of pigeon

pea and acquaint extension functionaries and local farmers with front line varietals and management technologies.

METHODOLOGY

Front line demonstration on pigeon pea was conducted by Krishi Vigyan Kendra, Post Graduate College, Ghazipur, U.P. during the period from 2005-06 to 2009-10 in six villages *viz.* Sabua, Laxmanpur, Chochakpur, Alipur Bangawan, Mahepur and Permeth of Karanda block of district Ghazipur. The Total 91 number of farmers were associated under this programme. The component demonstration of front line technology in pigeon pea i.e. improved variety Narendra Arhar 1 and 2, balanced dose of fertilizer(18 kg Nitrogen+46 kg P₂O₅/ha) and use of *Trichoderma* @ 5 gm/kg of seed as seed treatment were taken in an area of 0.12 to 0.30 ha of each farmers. The total area covered in 5 years was 25 hectares for demonstration of recommended improved practices of pigeon pea. In the demonstration, one control

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plot was also kept where farmers practices was carried out (Table 1). All the production and protection technologies other than interventions were applied in similar manner in demonstrated as well as in farmer's practices. These production and protection technologies are given in the table-2. The yield data was collected from the selected FLD farmers by random crop cutting method.

RESULTS AND DISCUSSION

The result obtained during five years are presented in Table 3. The result revealed that the yield was recorded in demonstrated plots i.e. 16.74, 7.00, 20.,17, 13.65 q/ha during 2005-06, 2006-07, 2007-08,2009-10, respectively. This results clearly indicate that due to knowledge and adoption of appropriate varieties i.e. Narendra Arhar -1 and Narendra Arhar-2, use of balanced dose of fertilizer (10 kg N and 46 kg P₂O₅/ha) and seed treatment with *Trichoderma* @ 5 g/kg. of seed, the yield of pigeon pea increased by 28.77, 16.66, 42.00, 36.00, 39.29 percent over the yield obtained under farmers practices (i.e. use of the non-descriptive local variety, no use of the balanced dose of fertilizer and no any control measure adopted for wilt management). As we know that HYV proved the vital role in production and productivity of crops, till variety is one of the important intervention for disease management also.

NA-1 and NA-2 varieties of pigeon pea released by N. D. U.A&T, Faizabad specially for their enhancing production potential, wilt resistant and pod fly tolerant. Wilt is one of the disease causing, drastic yield loss in Pigeon pea. In this disease *Fusarium oxysporum fungus* causes the damage of mid ribs of plant roots and finally check the water and nutrient supply to the plants. These varieties are resistant against wilt up to the some extent. In all the pulse crops, wilt is one of the major causes for lower plant population resulting poor production and productivity. This disease occurs several infestation due to moisture accumulation in root zone. Bio-fungicides i.e. *Trichoderma* recommended as a seed treatment @ 5 gm/kg of seed to control/management of wilt disease. *Trichoderma* is one of fungus which kill the another fungus *Fusarium oxysporum* which is the major cause of the wilt under biological management . In case we could not use this bio-fungicides (*Trichoderma* spp.) as a seed treatment, we can able to apply this bio-fungicide by using mixture of well decomposed F.Y.M., compost in standing crop as

broad casting. But the dose of *Trichoderma* (bio-fungicides) is to be 5.00 kg per ha with 80-100 kg F.Y.M./compost. It is generalized that farmers are treating the pulse crop as secondary. They are selecting the neglected/marginal fields for pulse cultivation. Nutrient requirements for each pulse crop are established under NARS on the basis of the soil testing results. In Pigeon pea crop, 18 kg N and 46 kg P₂O₅/ha has been recommended as based dressing (entire dose of the fertilizer should be applied at the time of sowing/last ploughing). Pulses are protein rich, it requires more nitrogen for the protein synthesis. Naturally, biological nitrogen fixation occurs in the pulse crop. Root nodules of pigeon pea having symbiotic bacteria *Rhizofium leguminesoum*. Like this, six other species of *Rhizobium* have been found in the root nodules of other group of the pulses. These bacteria are able to convert the atmospheric nitrogen into the soil through fixation processes. About 78.8 percent gaseous nitrogen found in the atmosphere. About 18 kg N/ha is to be required as a stater dose for the growth and development of the crop during early stages of crop establishment. Phosphorus is one of major nutrient requires for the root establishment, nodulation and root development of pulse crop for the better nodulation and root development, 46 kg/ha has been advised as a basal application.

The above findings are in similarity with the findings of Singh (2002).

Economic Analysis

The economic analysis presented in table 4 reveals that effective gain under demonstration plot was highest in the year 2007-08 (Rs. 17000/ha) and lowest effective gain (Rs.2700/ha) was noted in the year 2006-07.

It is revealed from the data presented in the table that highest net profit i.e. Rs. 40,000/ha gain in 2007-08 over the formers practices i.e. Rs. 26,000/ha. It means 14,000/ha net profitability was gain more than farmers practices by using Rs. 3,000/ha. additional cost. Similar trend was also found in each year of investigations. B:C ratio was also noticed in similar trend in every year of demonstrated results.

The FLD produces significant positive results and provided the researcher an opportunity to demonstrate the productivity potential and profitability of the latest

technology (Intervention) under real farming situation, which they have been advocating for long time. This could be circumventing some of the constraints in the existing transfer of technology system in the district Ghazipur of Uttar Pradesh.

Constraints Identified in Pigeon pea Cultivation

1. Non availability of quality seeds in time.
2. High cost of quality seeds.
3. High cost and non availability of phosphoric fertilizers.
4. Untimely sowing.
5. Unstable plant population due to broadcasting system.
6. No use of fertilizer.

7. Heavy weed infestation.
8. Severe infestation of insect and diseases.
9. No control measure adopted in long standing crop; especially management of pod borer and pod fly in long standing crop due to lack of suitable sprayer. So, Agriculture engineers is yet to be required a develop suitable equipments for spraying the pesticides. Many suitable pesticides, bio pesticides, botanicals are available in the market.
10. High rate of labour wages.
11. Lack of proper communication of pigeon pea technology to farmers.
12. Weak extension support.

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

Sl. No.	Particulars (component)	Technological intervention	Farmers Practices
1	Variety	NA-1 and NA-2	Local
2	Seed treatment	Trichoderma powder @ 5 g/kg of seed	No seed treatment
3	Fertilizer dose	18 kg N and 46 kg P ₂ O ₅ per hectare	No use of fertilizer

Table 2 : General production and protection technologies applied in the demonstrated and control plots (Farmers practice) at the farmer field.

Sl. No.	Particulars	General technologies
1	Seed rate	15 kg /ha
2	Sowing method	Line sowing (R x R 60 cm) (P x P 20 cm)
3	Situation	Upland rain fed
4	Soil type	Sandy loam
5	Weed management	Two mechanical weeding, one at 30 days after sowing and another at 60 days after sowing
6	Plant protection	Need based chemical insecticide spray for pod borer and pod fly.

Table 3: Productivity of pigeon pea crop under front line Demonstration and farmers practices

Year	Under FLD programme		Average yield (q/ha)		Per cent increase in the yield over farmers practices
	Total farmers	Total area (ha)	Demonstrated plot (FLD)	Farmers practice	
2005-06	13	05	16.74	13.00	28.77
2006-07	07	05	07.00 *	06.00	16.66
2007-08	16	05	20.00	14.00	42.00
2008-09	38	05	17.00	12.50	36.00
2009-10	17	05	13.65	09.80	39.29
Total/Average	91	25	14.88	11.06	25.34

*Crop affected due to erratic rain fall and pest infestation.

Table 4: Economic analysis of demonstration plot and farmers practice

Year	Demonstration plot (Rs./ha)			B.C. Ratio	Farmers plot (Rs./ha)			B.C. Ratio	Additional cost (Rs./ha)	Additional gain (Rs./ha)
	Cost of cultivation	Gross returns	Net returns		Cost of cultivation	gross returns	Net returns			
2005-06	10000.00	30000.00	20000.00	3.00	8000.00	23000.00	15000.00	2.87	2000.00	5000.00
2006-07	10050.00	18900.00	8850.00	1.88	9000.00	16200.00	7200.00	1.80	1050.00	1650.00
2007-08	15000.00	55000.00	40000.00	3.66	12000.00	38000.00	26000.00	3.17	3000.00	14000.00
2008-09	14200.00	40800.00	26000.00	2.87	12400.00	30000.00	17600.00	2.41	1800.00	8400.00
2009-10	13500.00	38220.00	21720.00	2.83	10700.00	27440.00	16740.00	2.56	2800.00	4980.00

Note: Cost of grain yield has estimated at prevailing market rate.

CONCLUSION

The result revealed that scientific technological intervention i.e. use of high yielding variety of pigeon pea Narendra Arhar-1&2, Seed treatment by using trichoderma @ 5gm./Kg of seed and use of balanced dose of fertilizer @ 10kg N and 46kg P₂O₅ /ha on the basis of the soil testing gave higher grain yield and net profitability to the farmers in every year of investigations.

Implication of FLD on Pigeon Pea

The FLD programme was effective in changing attitude skill and knowledge of recent technology for high yielding varieties, balanced dose of the fertilizer and biological disease management of pigeon pea including their adoption. This also improved the relationship between farmers and scientist and built confidence between them. The selected farmers of the demonstration acted also as a source of information and pure seeds of wider dissemination of HYV of pigeon pea for the other farmers. The productivity gain under FLD over conventional practices of pigeon pea cultivation created greater awareness and motivated the other farmers to adopt appropriate recent production and protection technologies of pigeon pea in the district. The selection of critical input and participatory approach in planning and conducting the demonstration definitely help in the transfer of technology to the farmers.

Policy Recommendations

Policy makers advised to prepare a plan ensuring availability of pigeon pea variety Narendra Arhar-1&2, facilitate soil testing campaign at farmers field level for pigeon pea growers by using balanced dose of fertilizer in pulses crops. Also ensuring the availability, transportation and storage of biofungicide (Trichoderma) at the field level. Develop a suitable plant protection equipment for spraying of agrochemicals in long standing pigeon pea crop yet to be researched or developed by the agricultural engineers by researchers. Also ensuring the availability of other alternate plant protection equipment at field level.

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