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RESEARCH **P**APER

Yield advantages and nutritional security of farming communities by adoption of technological interventions under pulses

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Uttar Pradesh is the second largest producer accounting for about 16 per cent of total production. The area, production and productivity of pulses in UP including district Azamgarh is quite low as compared to other states in respect of national acreage and production. Among various constraints, poor crop management and protection technologies assume primary position. Considering the facts of low yield of pulses due to technological gap and various other constraints, Krishi Vigyan Kendra, Azamgarh of Uttar Pradesh conducted front line demonstration consequently five years on improved agricultural technologies of pulses *i.e.* pigeonpea, chickpea, field pea and lentil in scientific manner at farmers' field during 2008-09 to 2012-13. A total of 241 demonstrations of pulses were conducted in an area of 90.0 hectares. The results of five years under front line demonstration on pulses revealed that the average grain yield of pigeonpea (19.1 q/ha), chickpea (19.1 q/ha) field pea (23.5 q/ha) and lentil (17.8 q/ha) with their 56.5, 43.6, 40.8 and 45.1 per cent increase in yield over farmers practice were recorded under demonstration plots. Implementations of improved technological interventions in all demonstrated crops were also found remunerative in terms of B: C ratio over existing practices. The enhanced yield achieved through adoption of improved production and protection technology in pulses maintain the soil health, incremental sustainable development in production, enhancing nutritional securities and improves the livelihood of the farmers. The outcome of the trial inspired the farming communities to replace their old non-descriptive varieties with resistant and high yielding varieties and other production and protection related technological options which are being cultivated.

Key words : FLDS on pulses, Grain yield, Food, Nutritional security

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INTRODUCTION

Historically, India is the largest producer, consumer and importer of pulses. Although it is the world's largest pulses producer, there is still a huge shortage of pulses and also, the prices are not affordable to a large section of consumers. An immediate need is the development and dissemination of low-cost technologies in pulses production, so that they can be affordable to the common man. Even though pulses production increased by 3.35 per cent per annum during the last decade, the cost of production and consequent prices are too high to be affordable to the common man; to increase production at lower cost is a bigger challenge. The earlier experience shows that technological efforts need to be supported by the right policy environment to harvest fruits of R and D in agriculture (Reddy, 2010). Still, the productivity of pulses in India is low at 694 kg/ha and to make pulses

production internationally competitive, the average yield levels need to be increased to at least 1.50 ton/ha. Food and nutritional security is an integral component of economic growth and development of the society. Economic upliftment not only implies in income, but also the well being in terms of food and nutritional security of the communities. Majority of farming community in India comes under small and marginal farming, where the size of the land holding is very small to achieve the standards of livelihood. The daily income of these farmers is not sufficient to get their daily needs. Out of the 125 crore Indian populations, 83.3 crore lives in rural areas (Chandramouli, 2011) and their main source of livelihood is agriculture and animal husbandry.

In spite of impressive growth of Indian agriculture, ensuring household food and nutritional security is still challenge due to imbalanced growth in agriculture biased towards wheat and rice. In fact, pulses in India have long been considered as the poor man's only source of protein. Pulses are important in Indian agriculture both in terms of enriching soil health and for food availability and nutritional security of ever growing population and also weaker sections of the society who could not afford other sources of protein. It has been estimated that India's population would reach 1.68 billion by 2030 from the present level of 1.25billion. Accordingly, the projected pulse requirement for the year 2030 is 32 million tones with an anticipated required growth rate of 4.2 per cent (IIPR Vision, 2003).

Pulses are good sources of proteins and commonly called the poor man's meat. The frequency of pulses consumption is much higher than any other source of protein; about 89.1 per cent consume pulses at least once a week, while only 35.4 per cent of persons consume fish or chicken/ meat at least once a week in India (IIPS and ORC Macro, 2007). Further, any reduction in prices of pulses will increase consumption by the poor more than the rich consumers (Mittal, 2006). It can be grown on range of soil and climatic conditions and play important role in crop rotation, mixed and inter-cropping, maintaining soil fertility through biological nitrogen fixation and thus contribute significantly to sustainability of the farming systems (Gowda *et al.*, 2013). The major pulse producing states are MP (24%), UP (16%), Maharashtra (14 %), AP (10 %) and Karnataka (7 %), Rajasthan (6 %), which together for about 77 per cent of the total production (Reddy *et al.*, 2013). State productivity of pulses in UP is about 823 kg/ha while, the area, production and productivity of pulses in district Azamgarh of UP are 28012 hectares, 27480 metric tons and 981 kg/ha, respectively (District Sankhyikiya Patrika-2012). Any shortfall of pulses production potential has been attributed to a number of factors, the major ones being the increasing population, rising income, inadequate transfer of appropriate technology, seed longevity, poor seed quality, geographical shift, abrupt climatic changes, complex disease, pest syndrome and socio-economic conditions (Ali and Gupta, 2012). Adoption of traditional farming system, non-adoption of recommended production technologies due to lack of knowledge and conviction about latest proven technologies are also responsible for declining of yield potential of pulse crops. There is need to increase production and productivity of pulses in the country by more intensive technological interventions. Front line demonstration (FLD) is introduction by the ICAR with inception of technology mission of pulse and oilseed crops during mid eighties. The field demonstrations conducted under the close supervision of scientist of the KVK. The basic objectives of demonstration on pulse crops are to demonstrate the superior productivity potentials at the farmers' field under different agro-climatic regions and farming situations. Looking into the importance of diet, increasing soil fertility status and stagnation of production due to biotic, abiotic and other factors, it becomes necessary to bridge the gaps between technological interventions and existing practices.

Keeping the importance of front line demonstration and shortfall of production potential of the pulse crops, the KVK, Azamgarh (UP) has conducted demonstrations on improved production and protection technologies of pulse crops in a scientific manner for establishment of production potential of pulse crops at farmers' fields during the year 2008-09 to 2012-13 with the following objectives:

- –To exhibit the performance of promising high yielding pulses varieties with advanced recommended package of practices for harvesting higher crop yields.
- –To compare the yield levels of local check (farmers' field) and demo fields.
- –To collect feedback information for further improvement in research and extension programme.

RESEARCH METHODOLOGY

FLDs on pulse crops were conducted by Krishi Vigyan Kendra, Azamgarh, Uttar Pradesh during the

period from 2008-09 to 2012-13 in ten villages *viz.*, Sikraur, Dhanehua, Lasara Kala, Newada, Jagdishpur, Gopalpur, Ekrampur, Aunti, Pandri and Majhgava covering 6 blocks out of 22 blocks of district. During these five consecutive years, the demonstrations were conducted as per their respective seasons and a total number of 109, 55, 57, 20 farmers participated with area of 43.0, 18.0, 21.0, 8.0 ha for the pigeonpea, chickpea, field pea and lentil. The soil of the operational area was generally sandy loam in texture which is low in nitrogen, phosphorus and low to medium in potash. The improved varieties used to grow like Narendra arhar-2, PG 186, KPMR 400 and Narendra Lentil- 1 of pigeonpea, chickpea, field pea and lentil, respectively. A balanced dose of fertilizer (DAP @ 125kg/ha) and use of *Trichoderma* @ 10 g/kg of seed as seed treatment including rhizobium and PSB were taken at high priority. The farmer's practices (use of non-descriptive varieties, broadcasting of seed and fertilizer, no integration of biofertilizers, occasional manual weeding and indiscriminate of plant protection measures etc.) were taken as local check at each site. All the agronomical practices other than the interventions *i.e.* tillage, seed rate, irrigation, recommended weed management and plant protections measures were applied in similar manner on demonstrated crops. A multi disciplinary scientific team of the centre inspected at regular interval right from sowing to harvesting and made to guide them. These visits also utilized to collect feedback information at location specific for further improvement in research and extension activities that must be matching with farmers needs, stable, feasible and also profitable. The yield data were collected from the demonstrations and control plots and analyzed with the suitable statistical tools to compare the yield of existing practices (local check) and FLDs plots.

Table 1: Performance of front line demonstration on pulses during 2008-09 to 2012-13 (pooled data)

Crops	Demonstrated technology	No. of demo	Area (ha)	Average yield (q/ha)		Per cent increase in yield over check	Range of increase in yield (%)	Average net returns (Rs./ha)	BCR		Nutritional security (as per WHO/FAO 80g/day/man over check (No.)
				Demo	Local check				Demo	Local check	
Pigeonpea	Raised bed planting of Narendra Arhar - 2 + *Trichoderma* @ 10 g/kg seed+*Rhizobium* and PSB each @ 20 g/kg seed+ DAP @125 kg/ha + PP	109	43	19.1	10.8	56.5	40-60	37202	4.49	3.94	104
Chickpea	PG 186 + *Trichoderma* @ 10 g/kg seed + *Rhizobium* and PSB each @ 20 g/kg seed +DAP @125 kg/ha + Pendimethalin + PP	55	18	19.1	13.02	43.6	28-58	40910	4.10	3.43	76
Field pea	KPMR 400 + *Trichoderma* @ 10 g/kg seed+ *Rhizobium* and PSB each @ 20 g/kg seed DAP @125 kg/ha + Pendimethalin + PP	57	21	23.46	16.04	40.8	21-56	34592	3.53	3.04	93
Lentil	Narendera Lentil 1 + *Trichoderma* @ 10 g/kg seed + *Rhizobium* and PSB each @ 20 g/kg seed DAP @125 kg/ha + Pendimethalin + PP	20	8	17.8	12.3	45.1	32-59	29630	3.52	3.01	69
Total		241	90								342

Demo indicates Demonstration, BCR= Benefit cost ratio and PP= Plant protection measures

RESEARCH FINDINGS AND ANALYSIS

The pooled data of five years obtained from demonstrations on pulse crops during 2008-09 to 2012 are presented in Table 1. Results clearly indicate that the yield of pulses increased

successively over the years in demonstration plots. The crop-wise average yield was 19.1, 19.1, 23.5 and 17.8 q/ha in pigeonpea, chickpea, field pea and lentil demonstrated plots while, control plot recorded 10.8, 13.0, 16.1 and 12.3 q/ha, respectively. The findings also depicted that the raised crop supplemented with proven production technologies and suggestions at regular intervals enhances grain yield 56.5, 43.6, 40.8 and 45.1, respectively. The increase in percentage of yield was ranging between 40-60 in pigeonpea, 28-58 in chickpea 21-56 in field pea and 32-59 in lentil during the five years of study. The results clearly speak of the positive effect of front line demonstration over existing practice towards enhanced the yield of pulses in demonstrated area. The similar trends of yield enhancement in front line demonstration of pulse crops has been documented by Yadav *et al.* (2007).

As per economic evaluations like net returns and B: C ratio of front line demonstration clearly revealed that all the pulse crops recovered the net returns and B: C ratio from the recommended practices was substantially higher than farmers practice during all the years of demonstration. The pulses under improved technological interventions recorded Rs. 37202, Rs. 40910, Rs. 34592 and Rs.29630 as average net returns on per hectare in pigeonpea, chickpea, field pea and lentil, respectively. The average benefit cost ratio of demonstrated and control plots were 4.49, 4.10, 3.53, 3.52 and under local check 3.94, 3.43, 3.04 and 3.01 in same sequence of pulses during demonstration period. Hence, favourable benefit cost ratio proved the economic viability of the interventions and convinced the farmers for adoption of intervention imparted. Similar findings were also reported by the Lathwal (2010) during his study in front line evaluations on urdbean at Haryana. Farmers were encouraged to adopt these scientific technologies through organizing field days, training programme and farmers conventions etc. at appropriate at the demonstration sites. The yield advantages of various pulses over traditionally grown were nutritionally nourished 342 mans through adoption of latest improved technological interventions to the respective crops.

Conclusion :

Food production provides the base for food security as it is a key determinant of food availability. Importance of pulses in maintaining food security as well as nutritional security and soil ameliorative has been felt since long. Front line demonstration on pulse crops showed a significant increase in yield of demonstration over farmers practice and higher income also. By this way, the livelihood security of the small and marginal farmers can be improved by increasing the productivity of pulse crops. The enhanced yield achieved through adoption of improved production technologies and increased the income of the farmers. Front line demonstration was also effective in changing attitude, skill and knowledge of improved/recommended practices of pulses cultivation including adoption. It was highly appreciated by farmers because of due to most effectiveness, easily compatible in existing cropping system as well as good impact over crop yield parameters. This has cumulatively been able to raise living standard of farmers and overcome the problem of poverty, malnutrition and unemployment.

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