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Evaluation of Cluster Frontline Demonstration of Summer Green Gram (*Vigna radiata* L.) in Haveri District of Northern Karnataka

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ABSTRACT

Pulses are the integral part of many diets across the globe and they have great potential to improve the human health, conserve soil fertility, protect the environment and contribute to global food security. India is the largest producer, consumer and importer of the pulses in the world. Green gram (*Vigna radiata* L.) is an important pulse crop in India, plays a major role in augmenting the income of small and marginal farmers of Northern Karnataka. The low production of traditional varieties of green gram was a cause of concern for the farmers at large. To overcome this problem of low yield, ICAR-Krishi Vigyan Kendra in Haveri district has conducted cluster frontline demonstration in field of adopted villages. The present study was conducted by KVK, Haveri during 2020-21and 2021-22 during summer season with twenty five frontline demonstrations in Sigehalli and Kalasuru villages of Haveri district. The results of demonstrations showed that cultivation of high yielding variety IPM 02-14 (Shreya) of green gram has given yield increase of 34.95 and 28.31% during 2020-21 and 2021-22, respectively over local check.

The technology gap ranges from 4.55 and 4.25 during 2020-21and 2021-22, respectively. The highest extension gap of 1.70 was recorded during 2021-22. This high extension gap requires urgent attention from planners, scientists, extension personnel and development departments. The technology index varies from 39.56 and 36.95 during 2020-21 and 2021-22, respectively. The changes will accelerate the adoption of newer technologies to increase the productivity of green gram in this area. There is a need to further disseminate the improved technologies among the farmers with effective extension methods like training and demonstrations. The farmers' should be encouraged to adopt the recommended package of practices for realizing higher benefit through better adoption of improved technology.

Keywords Extension gap, Farmers practice, Frontline demonstration, Green gram, Technology gap.

INTRODUCTION

Pulses have great importance in Indian agriculture as they are rich source of protein (17 to 25%) as com-

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pared to that of cereals (6 to 10 %), their ability to fix atmospheric nitrogen and improve the soil fertility. Among pulses, green gram is one of the most important crops. Protein malnutrition is prevalent among men, women and children in India. Pulses contribute 11 % of the total intake of proteins in India (Reddy 2011). In India, frequency of pulses consumption is much higher than any other source of protein, which indicates the importance of pulses in their daily food habits. Keeping the cheapest source of protein, it is important to increase pulses production to increase balanced diet among the socially and economically backward classes. The cultivation of green gram in summer season is the special feature of Haveri district, in which paddy is the major *kharif* crop covering an area of 27507 ha and green gram is grown mainly in paddy fallows during *rabi* season immediately after the harvest of the paddy crop (Anon 2020). These soils are usually highly fertile, instead of leaving the fields fallow during the *rabi* season, farmers utilize the residual moisture in the soil to grow green gram. Among the *rabi* crops green gram, reigning poor man's crop over the centuries and has potential to sustain food and nutritional security of the small and marginal farmers because of its short duration, faster growth and high nutritive values. But the yield levels are much lower than the normal season. Through this practice, the newly improved innovative technology having higher production potential under the specific cropping system can be popularized and simultaneously feedback from the farmers may be generated on the demonstrated technology (Singh *et al*. 2012). The participatory rural appraisal study in the taluk reveals that the non availability of released variety suited to *rabi* season, farmers were cultivating the local variety of green gram i.e., Kari hesaru (in which seeds are black in color) which is low yielding, susceptible to mungbean Yellow Mosaic Virus (YMV), leaf crinkling and powdery mildew diseases and grown purely on rainfed situation. For control of these pests and diseases farmers were using pesticides indiscriminately which has led to increased cost of cultivation. The local variety has lesser plant height, canopy spread and lower biomass production leads to lower yield. The local variety being long duration of 85-90 days made impossible to cultivate the third crop during summer season. These factors cause the poor yield thus reducing income of farmers.

Keeping this in view, to identify the suitable variety for summer season, green gram crop is one of the important pulse crops in Northern Karnataka. Green gram contains 25 % of high digestible proteins and consumed both as whole grain as well as dal. It is a soil building crop which fixes atmospheric nitrogen through symbiotic action and can also be used as green manure crop adding 34 kg N ha^{-1}. The improved technology packages were also found to be financially attractive. Yet, adoption levels for several components of the improved technology were low, emphasizing the need for better dissemination . Several biotic, abiotic and socio-economic constraints inhibit exploitation of the yield potential and these needs to be addressed. Crop growth and yield are limited through poor plant nutrition and uncertain water availability during the growth cycle. The green gram crop is mainly cultivated in summer season. Frontline demonstration on green gram using new crop production technology was initiated with the objectives of showing the productive potentials of the new production technologies under real farm situation over the locally adopted production technologies.

MATERIALS AND METHODS

Frontline demonstration is the new concept of field demonstration evolved by ICAR with the inception of technology mission on oilseeds and pulses. The main objective of frontline demonstrations is to demonstrate newly released crop production technologies and its management practices in the farmer's field. The present investigation was carried out at adopted villages (Sigehalli and Kalasuru) of ICAR-KVK, Haveri district, Karnataka state. The materials for the present study comprised high yielding genotype of summer green gram (IPM 02-14) (Shreya). Table 1 shows that under the demonstrated plot only recommended varieties and bio-agents were given to farmer by the KVK and all the other package and practices were timely performed by the farmer itself under the supervision of KVK scientist. Locally cultivated variety was used as local check. The soil type was medium to low in fertility status. During demonstration, the scientists study the factors contributing to higher crop production, field constraints, generate production data and feed-back information (Meena and Dudi

Table 1. Details of green gram growing under existing farmer's practices and improved practices adopted in frontline demonstrations at farmer's field in Haveri district of North Karnataka.

Sl. No.	Operations	Existing farmer practices	Improved/recommended practices adopted in demonstrated plot (FLDs)
1	Variety	Local	IPM 02-14 (Shreya)
2	Time of sowing	December	Januvaey
3	Seed treatment	Not done	*Rhizobium* @ 500 g ha^{-1} of seed material
4	Nutrition	Lower dose of nutrition	RDF (25:50:20 kg ha^{-1})
5	Method of sowing	Broadcasting	Line sowing
6	Plant protection measures	Non-adoption of recommended package of practices	Spraying of imidacloprid @ 250 ml ha^{-1}
7	Weed management	Not done	Spraying of pendimethalin 30 EC @ 3.25 l ha^{-1}

2018).The objective of evaluation was to study the gaps between the potential yield and demonstration yield, extension gaps and the technology index. In the present study the data on output of green gram crop were collected from CFLD plots, besides the data on local practices commonly adopted by the farmers of this region to estimate the technology gap, extension gap and the technology index. The following formulae have been used for calculating the different indices (Verma Samui *et al*. 2017).

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmers yield

Technology index= ((Potential yield - Demonstration yield) / Potential yield) X 100

RESULTS AND DISCUSSION

Frontline demonstration was conducted on 10 hectares of land on 25 demonstration plots. The high yielding genotype of green gram IPM 02-14 (Shreya) was used for study. On an average the yield increase was 31.63 q ha^{-1} during the study period. The result indicates that the frontline demonstration has given a good impact over the farming community of Haveri as they were motivated by the new agricultural technologies applied in the CFLD plots. Yield of green gram was, however varied in different years, which might be due to the soil moisture availability and rainfall condition, climatic aberrations, disease and pest attacks as well as the change in the location of trials every year. The IPM 02-14 (Shreya) had performed well when compared to local check. The percentage increase in the yield over local check was 34.95 and 28.31 (Table 2) during two subsequent years (2020-21 and 2021-22). The technology gap, gap in the demonstration yield over potential yield ranges from 4.55 and 4.25 % during 2020-21 and 2021-22, respectively. The technology gap observed may be attributed to dissimilarity in the soil fertility status and weather conditions as well as the soil moisture availability. Hence, location specific recommendation appears to be necessary to bridge the gap between the yields of different technologies. The highest extension gap of 1.60 was recorded during 2021-22 (Table 2). This emphasized the need to educate the farmers through various means for more adoption of newly improved agricultural technologies to bridge the wide extension gap. More and more use of new high yielding varieties by the farmers will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinuance of old varieties with the new tech-

Table 2. Performance of frontline demonstrations (CFLD) of summer green gram in Haveri district of Northern Karnataka.

Sl. No.	Year	Area (ha)	No. of farmers	Seed yield (q/ha)		Control	% increase over control	Technology gap	Extension gap	Technology index (%)
				Potential	Demonstration					
1	2020-21	10	25	11.50	6.95	5.15	34.95	4.55	1.80	39.56
2	2021-22	10	25	11.50	7.25	5.65	28.31	4.25	1.60	36.95
Average		7.10	5.40	31.63	4.44	1.70	38.25			

Table 3. Economics of improved technologies and farmers practice in green gram.

Year	Total cost of cultivation (Rs ha^{-1})		Gross returns (Rs ha^{-1})		Net returns (Rs ha^{-1})		B:C ratio	
	Demo	Farmers practice	Demo	Farmers practice	Demo	Farmers practice	Demo	Farmers practice
2020-21	7250	6875	26410	19570	19160	12695	3.64	2.84
2021-22	7750	7050	27550	21470	19800	14420	3.55	2.99
Average	7500	6963	26980	20520	19480	13558	3.60	2.92

nology. This high extension gap in all these varieties requires urgent attention from planners, scientists, extension personnel and development departments. The technology index shows the feasibility of the evolved technology at the farmers' field. The lower the value of technology index more is the feasibility of the technology. Farmers also did not practice seed treatment with *Rhizobium* culture, which is important component in increasing the yield and yield attributes of pulses (Khedkar *et al*. 2017).

The highest technology index were 39.56 % for the year 2020-21 and lowest in 2021-22 with 34.95 % in Haveri district, only a small chunk of farmers has access to irrigation or affordable chemical inputs and where growth and yield reducing losses, farmers' actual yields are less than its genetic potential (Table 2). Sustainable intensification strategies for Haveri district requires improved soil, water and nutrient management innovations. Green gram cultivation has also ensured sustainable natural resource management objectives. Vulnerability to natural disasters can substantially be reduced through the adoption of green gram cultivation because of the improvement in productivity, increase in cash income and acquired assets that families can fall back on when disasters occurs. These findings were similar to the findings of Gaur and Jadav (2020) and Kumar *et al*. (2020).

Direct involvement of beneficiaries in adopting green gram cultivation technology suitable to their condition has given high payoffs in terms of enthusiasms and interest and also in ensuring that the technology addresses the priority needs that have been identified by the beneficiaries.

Despite the low soil moisture availability, climatic and natural aberrations faced in the region, IPM 02-14 (Shreya) had given a very good result in comparison to local check. These technologies may be popularized in this area by the state agriculture departments and extension agencies to mitigate the large extension gap. Mainly small and marginal farmers are associated with the cultivation of arhar in the region and the use of new production technologies will substantially increase the income as well as the livelihood of the farming community. There is a need to adopt multi-pronged strategy which involves enhancing green gram production through horizontal and vertical expansion and productivity improvements through better adoption of improved technology. The findings of the present study were in close conformity with the findings Rai *et al*. (2016) and Verma *et al*. (2017). In the fragile environments and poor farm resource base, green gram is the best choice for farmers. Cultivation of green gram also helps in protecting the environment from the risk of high input agriculture.

Economic return: The input and output prices of commodities prevailed during the demonstrations were taken for calculating cost of cultivation, gross return, net return and benefit/cost ratio. Data in Table 3 reveals that the cost involved in the adoption of improved technology in green gram ICM varied and was more profitable. The cultivation of green gram under improved technologies gave higher net return of Rs 19160 and 19800 ha^{-1} respectively, as compared to farmers practices (Rs 12695 and 14420 ha^{-1}during 2020-21 and 2021-22, respectively). An average net return and B:C ratio of demonstration field is Rs 19480 ha^{-1} and 3.60, respectively as compared to farmers practice (Rs 13558 ha^{-1} and 2.92) shown in Table 3. The benefit cost ratio of ICM of summer green gram under improved cultivation practices was higher than farmer's practices in both the years and this may be due to higher yield obtained under improved technologies compared to local check (farmer's practice). The higher additional returns obtained under demonstrations could be due to improved technology. The results were in line with the findings of frontline demonstrations on pulses Kumar *et al*. (2020) and Patel *et al*. (2013).

Reasons for low yield of summer green gram at farmers' fields

Optimum sowing time was not followed due to non-availability of quality seed. More than 90 % of the farmers had been sowing seed as improper method due to which the plant population was sometimes 2-3 times more than the recommended one. Farmers were cultivating the local variety of green gram, which is low yielding, susceptible to green bean Yellow Mosaic Virus (YMV), leaf crinkling and powdery mildew diseases. For control of these pests and diseases farmers were using pesticides indiscriminately which has led to increased cost of cultivation.

CONCLUSION

In the frontline demonstrations there was an average increase of 31.63% in grain yield over the local check. Such increase was recorded with average net returns of Rs 19480 ha^{-1}. As found in the results the BCR (3.60) was sufficiently high to motivate the farmers for adoption of the technologies. These demonstration trials also enhance the relationship and confidence between farmers and KVK scientists. The recipient farmers of CFLDs also play an important role as source of information and quality seeds for wider dissemination of the improved varieties of green gram for other nearby farmers. It is concluded that the CFLD program was a successful tool in enhancing the production and productivity of green gram crop through changing the knowledge, attitude and skill of farmers.

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