The Journal of Rural and Agricultural Research Volume 24 No. 1, 62-66 (2024)
Received March 2024; Acceptance June 2024

Yield and Economic Assessment of Green gram (*Vigna radiata* L.) Crop under Rainfed Condition in Jhunjhunu District of Rajasthan

R. S. RATHORE*, DAYANAND[1], R. NAGAR[2] AND R. KHAN[3]
Associate Professor (LPM) & CFLD Incharge, COA, Mandawa
**Corresponding Author-Email:drranjeetrathore@gmail.com*

Abstract

Front line demonstrations (FLD) were conducted on green gram (Vigna radiate L.*) crop in* Kharif *season under rainfed condition. Total 100 farmers field were selected in Jhunjhunu district of Rajasthan for two consecutive years i.e. 2019 and 2020 in selected four villages at different locations. It was revealed that the production of green gram grain yield of front line demonstrations were 16.96 per cent higher than local check (farmers' traditional practice). The extension gap, technology gap and technology index were 112 Kg /ha, 374 Kg /ha and 32.37 per cent, respectively. An additional investments of Rs. 760 /ha coupled with scientific monitoring of demonstrations and non-monetary factors resulted in additional return of Rs. 7855/ ha. Fluctuation in market rate of grain during the experiment period influenced the economic returns of per unit area. On an average Incremental benefit: Cost ratio (IBCR) was found as 10.38.On the basis of two years results, it was concluded from the data that FLD programme found effective in enhancing yield, changing attitude, knowledge and skill of the demonstration farmers as well as neighboring farmers of the demonstration site.*

Key words: Green gram, Front line demonstration, Grain yield, Yield gap, Economics

Introduction

Green gram (*Vigna radiata* L.) is the major *Kharif* pulse crop of the Rajasthan state, grown mainly under rainfed conditions with limited soil moisture conditions in vast area. It is a short duration, have high capacity for nitrogen fixation in soil and tolerance for barren conditions, making them one of the most significant pulse crops in arid/ semi arid parts of the Indian subcontinent (Patil *et al.,* 2011; Hanumantha *et al*., 2016; Muthu *et al*., 2018 & Zhou et al., 2020). Pulses play a very important role in nutritional security and form a important part of human daily diet especially in developing and developed countries. Raghuvanshi *et al*., 2011 reported that green gram is preferred for human ingestion due to its great palatability, simple digestion and little gas generation. In front line demonstrations latest and proven technologies are demonstrated at farmer's field for the first time before being carried out in the main extension system of the state Agriculture department. Field demonstrations are the long term educational activities conducted in systematic manners on a farmer's field to show the worth of new ideas. Field demonstration educates the farmers through results obtained in terms of higher yield as well as income and it follows the principle of "**believing by seeing**". The world population is projected to grow from 7.3 billion in 2015 to about 8.9 billion by 2050; therefore, nutritional

[1]Senior Scientist & head
[2] S M S (Entomology)
[3] S M S (Horticulture)
Krishi Vigyan Kendra, Jhunjhunu - 333 001
(S K Rajasthan Agricultural University, Bikaner)

security is a big challenge for agriculture sector. Pulses are considered as "poor man`s meat" (Sharma, 1984). The green gram secures third place in the country after chickpea and pigeon pea in terms of cultivated area. In India, it is cultivated on 4.26 million ha (mha) area with 2.01 million tons (mt) production and 472 kg/ha productivity (AICRP on MULLaRP, 2018). According to Department of Agriculture (fourth advance estimate of 2020), the Rajasthan state comprised 2.32 mha area, 1.30 mt production with a productivity of 559 kg/ha., whereas, in Jhunjhunu district the area, production and productivity were 59379 ha, 35592 tonnes and 599 kg/ha, respectively (Department of Agriculture, 2020-21).

Reasons of its low productivity are use of local genotypes of long duration, broadcasting sowing method, poor soil fertility with no or less use of manures and fertilizers, lack of seed treatment and plant protection measures. Productivity of green gram can be enhanced by adopting the improved package of practices as recommended by the research institutes and agricultural universities. Hence, Krishi Vigyan Kendra, Abusar- Jhunjhunu conducted FLD programmes on farmers' field and because of overwhelming response and encouraging results, demonstration were conducted continuously at farmers' field. The objectives of the study were as follows:

1. To enlist the cultivation practices of green gram crop under FLD.
2. To exhibit the performance of newly released green gram improved variety IPM-02-14 & MH-421 with full recommended package of practices for higher crop yield.
3. To compare the yield levels of local check and FLDs organized by KVK.
4. To collect & consider the farmer feedback information for further improvement in research and extension programme.

Materials and Methods

Front line demonstrations on green gram crop during *Kharif season* were laid out in Jhunjhunu district of Rajasthan to assess the performance of FLDs in two consecutive years i.e. 2019 and 2020 in selected four villages at different locations. The soils of the district is generally sandy loam in texture which is low in nitrogen, low to medium in phosphorus and medium to high in potash. Each demonstration was of one acre area and using recommended package of practices (Table 1). The farmers were provided quality seed of newly released green gram variety (IPM-02-14 & MH-421). Sowing of FLDs were made during the onset of monsoon (last week of June to first week of July) under rainfed conditions. The demonstrations on farmers' field were regularly visited and monitored right from sowing to harvesting by scientists of Krishi Vigyan Kendra, Jhunjhunu. During visits demonstration performance data and farmers feedback information were regularly collected to draw a meaningful conclusion. Field days and group meetings were also organized at demonstration sites to provide the opportunities for other farmers to witness the benefits of demonstrated technologies. The grain yield of demonstration crop was recorded & analyzed for gap analysis, cost and returns as per Samui *et al*., (2000).

The detail of different parameters was as follows:

1. Extension gap = Demonstration yield – Local check yield
2. Technology gap = Potential yield – Demonstration yield
3. Technology index = Potential yield – Demonstration yield x 100/ Potential yield
4. Additional return = Demonstration return – Farmers practice return
5. Effective gain = Additional return – Additional cost
6. Incremental Benefit Cost ratio (B: C) = Additional return /Additional cost

Results and Discussion

It was revealed from the Table 1 that majority of the farmers were using old varieties/long duration local seed in place of newly released varieties of green gram. Green gram crop is more susceptible to salty irrigation water; hence the crop sowing is done after onset of monsoon which is normally occurs in last week of June to first week of July. The soil of the district is suitable for green gram crop cultivation. Althogh line sowing is prevalent in the study area, but 10-15 per cent farmers yet sown by broadcast method. Higher seed

Table 1: Details of farming situation and gap percentage

S. No. Technology	Improved technology	Farmers practice	Gap (%)
1. Variety	MH-421, IPM-02-3, IPM-02-14	RMG-344, SML-668	5-10
2. Soil Type	Sandy loam	Sandy loam	Nil
3. Land preparation	Ploughing & harrowing	Ploughing & harrowing	Nil
4. Sowing method	Line sowing	Line & Broadcast sowing method	10-15
5. Seed rate	15 kg/ ha	20 kg/ ha	Higher seed rate
6. Seed inoculations	*Trichoderma viridae*	15-20%	80-85
7. Fertilizer dose (kg /ha)			
N	20	-	100
P	40	20-25 %	75-80
S	25	15-20 %	80-85
$ZnSo_4$	25	30-40 %	60-70
Biofertilizer	NPK Consortia	5 %	95
8. Application of Gypsum	250 kg/ha	15-20 %	80-85
9. Weed Management	One hoeing	One hoeing – 30%	70
10. Disease management (Damping off/ Root Rot, YMV)	Application of *Trichoderma* as seed treatment/ with FYM,use of resistant varieties & IPM	5 % application	95
11. Pest management			
A. Sucking pests	Imidacloprid 17.8 SL 4 ml/ lit, Thiamethoxam 25 WG @0.4 gm/lit of water	25-30 %	70-75
B. pod borer	Emamectin benzoate 5 SG @0.5 gm/lit of water	35- 40 %	65-60

rate more than recommendation was noticed in the field survey before site selection. Only 15-20 per cent farmers adopted seed inoculation by *Trichoderma viridae*. It was observed that none of the farmers used nitrogenous fertilizer and only 15 to 30 per cent farmers applied phosphatic fertilizer, sulphur and zinc element in the crop. Application of low dose fertilizers may be due to uncertainty of rain and long dry spell. Majority (95%) of the farmers did not treat seed before sowing. About one-fifth (15-20%) of the farmers applied gypsum before crop sowing. These two activities (seed treatment and gypsum application) are very important with a little cost to increase the production and productivity of pulses crops. Less than one-third (30%) of the farmers control weed by manual one hand hoeing before emergence of flowering. Similarly one-third of the farmers protect their crop from sucking pest and pod borer.

Grain yield

The increase in grain yield under demonstration was 16.48 to 17.44 per cent more than farmers' practices in two consecutive years at the same plot and farmer. On an average, 16.96 per cent yield advantage was recorded under demonstrations carried out with improved cultivation technology as compared to farmers' traditional way of green gram cultivation.

Gap analysis

An extension gap of 110-114 kg per ha was found between demonstrated technology and farmers practices during different two years and on an average basis the extension gap was 112 kg per ha (Table 2). The extension gap was low (110 kg/ ha) during 2019 and was high (114 kg/ha) during 2020. Such gap might be attributed to adoption of improved technology in demonstrations which resulted in higher grain yield than the traditional farmers' practices. Wide technology gaps were

Table 2: Grain yield and gap analysis of front line demonstrations of green gram at farmers' field

Year	Variety	No. of demon-stration	Area (ha)	Potential Yield (Kg/ha)	Yield (Kg/ha) demon-stration	Farmer's practices	% increase over control	Extension gap (Kg/ha)	Technology Gap (Kg/ha)	Technology Index (%)
2019	IPM-02-14	50	20	1100	781	671	16.48	110	319	29.00
2020	MH-421	50	20	1200	771	657	17.44	114	429	35.75
Av.	**-**	**50**	**20**	**1150**	**776**	**664**	**16.96**	**112**	**374**	**32.37**

observed during different years and this was lowest (319 kg/ha) during 2019 and was highest (429 kg/ha) during 2020. The average technology gap was recorded 374 kg/ha. The difference in technology gap between two years may be due to climatic factors. Similarly, the technology index for all the demonstrations during different years were in accordance with technology gap. Higher technology index (32.37%) reflected the inadequate proven technology for transferring to farmers and insufficient extension services for transfer of technology.

Economic analysis

Different variables like seed, fertilizers, herbicide and pesticides were considered as cash critical inputs for the demonstrations as well as farmers practice and on an average an additional investment of Rs. 760 per ha was made under demonstrations. Economic returns as a fluctuation of grain yield and market sale price varied during different years. Maximum returns (Rs. 34225 per ha) during the year 2019 was obtained due to higher grain yield and higher market sale rates. The higher additional returns and effective gain obtained under demonstrations could be due to improved technology, non-monetary factors, timely agricultural operations of crop cultivation and scientific monitoring. The lowest and highest incremental benefit: cost ratio (IBCR) was 10.96 & 9.80 in 2019 and 2020, respectively (Table 3). IBCR depends on produced grain yield and market sale price. Overall average IBCR was found as 10.38 The results confirm the findings of front line demonstrations on oilseed and pulse crops by Singh *et al.* (2000), Singh *et al.* (2002), Yadav *et al.* (2004), Lathwal (2010) and Dayanand *et al*. (2019).

Conclusion

Front line demonstration program was effective in changing attitude, skill and knowledge of improved / recommended practices of green gram cultivation including adoption. This also improved the relationship between farmers and scientists and built good rapo between them. The demonstration farmers also acted as primary source of information on the improved practices of green gram cultivation as well as source of good quality pure seeds in their locality, relatives and surrounding area for the next season. The concept of front line demonstration may be applied to all farmer categories including progressive farmers for speedy and wider dissemination of the recommended practices to other members of the farming community. This will help in the removal of the cross-sectional barrier of the farming population.

Acknowledgement

Authors are highly thankful to supporting staff of Krishi Vigyan Kendra, Jhunjhunu for necessary help during the study and are also thankful to Indian Council of Agricultural Research for providing budget to conduct front line demonstrations of green gram on farmers' field.

References

AICRP on MULLarp (2018). Project Coordinator Report- (2018-19) All India Coordinated Research Project on MULLaRP, ICAR- Indian Institute of Pulses Research, Kanpur-208 204, Uttar Pradesh, India, Pp 35-39.

Annonymous (2015). Area, production and yield of major crops in Rajasthan during 2014-15. Krishijagran.com

Annonymous (2016). Area, production and yield of food grains in India. E-pulses data book, ICAR-IIPR, Kanpur.

Table 3: Economic analysis of green gram front line demonstrations on farmer's field

Year	Cost of cultivation (Rs./ha.)		Additional Cost)	Gross return(Rs./ha.)		Additional Return	Sale price of	Net Return ((Rs/ha.)		Effective	Incremental
	Demon.	Local check	in demon.(Rs./ha)	Demon.	Local check	in demon. (Rs./ha.)	grain(Rs./qtl.)	Demon.	Local check	grain (Rs./ha.)	B:C Ratio (IBCR)
2019	20250	19550	700	54475	46802	7673	6975	34225	27252	6973	10.96
2020	21050	20230	820	54356	46319	8037	7050	33306	26089	7217	9.80
Av.	**20650**	**19890**	**760**	**54416**	**46561**	**7855**	**7013**	**33766**	**26671**	**7095**	**10.38**

Dayanand; Rathore, R. S. and Verma, R. K. (2019). Performance of green gram variety IPM-02-3 in front line demonstrations under rainfed conditions. *Int. J. Agricult. Stat. Sci*., 15(1):131-134.

Department of Agriculture (2020-21). Government of Rajasthan, Agriculture statistic http://www.agriculture.rajasthan.gov. in/content/agriculture/en/Agriculture-Department-dep/agriculture-statistics.html.

Hanumantha, R.B.; Nair, R.M. and Nayyar, H. (2016). Salinity and high temperature tolerance in mungbean [*Vigna radiate* (L.) Wilczek] from a physiological Perspective. *Front. Plant Sci*. 7: 957. doi: 10.3389/fpls.2016.00957.

Lathwal, O. P. (2010). Evaluation of front line demonstrations on black gram in irrigated agro ecosystem. *Annals of Agricultural Research*, 31(1&2): 24-27.

Muthu, M.C.; Sushree, A. and Srivastava, R. (2018). Influence of production factors on seed quality parameters of green gram (*Vigna radiata*) CV. KKM-3. *Legume Research*. 41: 891-894.

Patil, A.B.; Desai, N.C.; Mule, P.N. and Khandelwal, V. (2011). Combining ability for yield and component characters in mungbean [*Vigna radiata* (L.) Wilczek.]. *Legume Research*. 34:190-195.

Raghuvanshi, R.S.; Singh, S.; Bisht, K. and Singh, D.P. (2011). Processing of Mungbean products and its nutritional and organoleptic evaluation. *International journal of food science and technology*. 46(7): 1378-1387.

Samui, S.K.; Maitra, S.; Roy, D.K.; Mondal, A.K. and Saha, D. (2000). Evaluation of front line demonstration on groundnut (*Arachis hypogea* L.) in Sundarbans. *J Indian Soci of Coastal Agri Res*, 18 (2): 180-183.

Singh, R. K.; Gaur, R. B.; Verma, R. S. and Yadav, D. K. (2000). Evaluation of front line demonstrations to identify adoption gaps in Chickpea production in irrigated conditions of Sri Ganganagar district. *Indian Journal of Pulses Research*, 13(1): 28-30.

Singh, R. K.; Gaur, R. B.; Verma, R. S.; Yadav, D. K.; Singh, V. and Prakash V. (2002). Evaluating gaps in transfer of technology in Chickpea front line demonstrations in semi-arid region of Rajasthan. *Haryana Journal of Agronomy*, 18(1&2): 110-114.

State released varieties of Mung bean in India Project Coordinator's Report, AICRP on MULLaRP, ICAR, IIPR, Kanpur, 2017- 18. http://dpd.gov.in/Varieties/Mungbean %20 varieties. pdf Accessed on 02.10.2020 at 5.19 PM (IST).

Yadav, D. B.; Kamboj, B. K. and Garg, R. B. (2004). Increasing the productivity and profitability of unflower through front line demonstrations in irrigated agro ecosystem of eastern Haryana. *Haryana Journal of Agronomy*, 20 (1&2):33-35.

Zhou, H.; Zheng, D.; Feng, N.; Xiang, H.; Liu, Y. and Liang, X. (2020). Grain Yield in Mung bean (*Vigna radiata*) is associated with spatial distribution of root dry weight and volume. *Legume Research*. 43 (3): 408-414.