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Impact of Integrated Crop Management on Production Potential of Green Gram Varieties IPM02-14 and MH-421 under Semi-arid Condition of (III-A Zone) Rajasthan

Babu Lal Yadav[1], Irfan Khan[1], Krishan Gopal Vyas[2], Malu Ram Yadav[3], Rakesh Kumar[4]

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ABSTRACT

Background: Green gram is considered India's highly valuable pulse commodity, ranking third following chickpea and pigeon pea. Rajasthan is one of the leading green gram producing state along with Maharashtra, Andhra Pradesh, Bihar, Karnataka, Gujarat. It is a leguminous crop known for fixing atmospheric nitrogen and contribute in improvement of soil fertility in term of organic matters.

Methods: Demonstrations on green gram were conducted during *Kharif* season of 2021 and 2022 at partner farmers' fields. The farmers actively participated in 125 demonstrations over a 50 hectare area (each demonstration was 0.4 hectare), with the goal of improving green gram producing technologies.

Result: Two years demonstration results indicated that the maximum average yield (8.14 q/ha) of green gram in demonstrations than farmers practices (6.31 q/ha). The yield enhancement of 29.07 per cent was observed in the demonstration as results of integrated crop management. However, 2.86 q/ha technological gap, 1.83 q/ha extension gap and 25.33 per cent technology index were recorded. The highest net return (` 44,863 /ha) and B: C ratio (3.75) was observed in demonstration against to farmers practices (` 32,773 /ha and 3.23).

Key words: Demonstration, Green gram, Productivity.

INTRODUCTION

Green gram (*Vigna radiata* L.) is most important *kharif* pulse crop of India and also known by names *viz*., 'Mung', 'Mungbean' (Ready, 2010). Rajasthan is green gram producing state along with Maharashtra, Andhra Pradesh, Bihar, Karnataka, Gujarat. Green gram was grown on 25.61 lakh hectares in Rajasthan in 2021-22 with a yield of 9.05 lakh tonnes and a productivity of 354 kg/ha (Commissionerate of Agriculture, Rajasthan-Jaipur, 2021-22). It is being cultivated during both the *kharif* and summer seasons. Green gram has ability to deposit atmospheric nitrogen and enrich soil with organic matters. It also helps in preventing soil erosion. Green gram yield potential is also relatively low due to the crop's reliance on rainfed conditions and marginal areas, inadequate management approaches and inherent crop characteristics.

Front-line demonstrations (FLDs) serve as prominent tactics as farmers are often motivated by the concepts of "learning by doing" and "seeing is believing." Frontline demonstrations presumably play an essential role in appropriate technology transmission and altering farmers' scientific temperaments. The primary goal of FLD is to exhibit innovative crop cultivation techniques and plant health measures, as well as management approaches, to farmers from various agroclimatic zones.

In this context, KVK Chomu (Jaipur-1) under the technical guidance of ATARI-Jodhpur demonstrated a CFLDs on green gram along with improved crop management techniques that aim to show yield potential of variety and feasibility of farming technologies in that particular locality of selected villages as compare to existing local races of green gram and locally adopted cultivation practices.

[1]Krishi Vigyan Kendra, Chomu, Jaipur-I, Jaipur-303 702, Rajasthan, India.
[2]Krishi Vigyan Kendra, Jaisalmer-II (Pokaran), Swami Keshwanand Rajasthan Agricultural University, Bikaner NH-11, Gomat, Pokaran, Jaisalmer-345 021, Rajasthan, India.
[3]Rajasthan Agricultural Research Institute, Durgapura, Sri Karan Narendra Agriculture University, Jobner, Jaipur-302 018, Rajasthan, India.
[4]ICAR-Krishi Anusandhan Bhawan-II, New Delhi-110 012, India.

Corresponding Author: Babu Lal Yadav, Krishi Vigyan Kendra, Chomu, Jaipur-I, Jaipur-303 702, Rajasthan, India.
Email: babuagron86@gmail.com

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MATERIALS AND METHODS

The current investigation was laid out during *Kharif* 2021 and 2022 under rainfed conditions to increase green gram productivity by KVK Jaipur-1. In this study four villages namely Sundarpura, Bhaghawas, Gadoora and Chauru (Bloks Kishangardh Renwal and Phagi) selected for conducting green gram CFLD in Jaipur district of Rajasthan.

Total number 125 demonstrations with and an area of 50 ha were conducted at farmers' field during both the years. Each demonstration was 0.4 ha. Table 1 presents the current investigation on CFLDs and farmer practices (FP). The selected villages soils ranged from sandy loam to loamy sand texture. Rajasthan's III A Zone package of practices was adopted by selected farmers for green gram production and necessary inputs were provided based on their needs. The varieties of green gram IPM02-14 were demonstrated under demonstration during *Kharif* 2021 and MH-421 in *Kharif* 2022.

Before accomplishing the CFLD, the gap and adaptability level were assessed. Farmers selection and skill development on green gram cultivation was imparted by organizing training at farmers' fields. KVK scientists made regular visits to demonstration sites and farmer fields. The farmer's feedback was also recorded for future study improvements. Extension activities like as training, group meeting and field days were held in the selected villages.

The various variables given by Yadav *et al*. (2004) were employed for gap analysis and economic calculations. The parameters and formulas used for analysis are listed below.

Extension gap = Demonstration yield - Farmers' practice yield

Technology gap = Potential yield - Demonstration yield

Technology Index =

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

RESULTS AND DISCUSSION

Seed yield

The results revealed (Table 2) that the productivity of Mungbean under CFLD ranged between 7.97 q/ha to 8.31 q/ha during *Kharif* 2021 and 2022 respectively as against a yield of 6.09 to 6.53 q/ha respectively, under farmers' practice (FP). The yield increased 30.87% to 27.26 during both the years. The average yield of two years 8.14 q/ha recorded under demonstration and 6.31 q/ha in FP. The average yield increased 29.07 per cent over FP. Variances in yield observed throughout demonstration years were attributed to variances in weather conditions, differences in soil fertility status, occurrence of pest/diseases and inappropriate use of manures and fertilizers. High yielding cultivars, seed rate, line sowing, seed treatment with bio fertilizers, Integrated nutrient management (INM), Integrated weed management (IWM), and Integrated pest management (IPM) all contributed to the increase in yield with improved technology. The Similar results were also observed by Bamboriya *et al*. (2022); Meena *et al.* (2022); Yadav *et al*. (2023); Bharti *et al*. (2024).

Extension gap

The extension gap is a measure employed to find out yield discrepancies between shown technology and FP, as shown in Table 2. The extension gap exhibited a growing tendency since the variety and potential yield are different. The extension gap ranging from 1.88 to 1.78 q/ha during *Kharif* 2021 and 2022 respectively. The highest extension gap was reported 1.88 q/ha during 2021 and lowest extension gap was recorded 1.78 q/ha during 2022. Average extension gap was 1.83 q/ha in present investigation. Adoption of better technology, particularly improved varieties with bumper yield, line sowing, INM, IWM, and adequate IPM tactics in experiments may account for this performance. Similar findings recorded by Meena and Singh (2017), Meena *et al.* (2022) and Hooda and Rani (2024).

Technology gap

The technology gap was ranged from 2.03 q/ha to 3.69 q/ha in 2021 and 2022. The maximum technology gap was 3.69 q/ha recorded in 2022. The minimum technology gap was 2.03 q/ha recorded in 2021. An average technology gap of 2.86 q/ha was recorded between the demonstration and potential yield. The reason of this divergence in technological gap may be due to weather parameters and soil fertility. These findings same with the findings of Meena and Singh (2017); Meena *et al.* (2022) and Yadav *et al*. (2023).

Technology index

The demonstrations' technology index aligned with the technological gap. The technology's viability in the farmer's

Table 1: Technological gap analysis of mungbean.

Particulars	Farmers' conventional practice	KVK Intervention
Varieties	Own available seed and SML-668	IPM 02-14, RMG-975, IPM 205-7 (Virat) and MH-421
Seed rate	20-25 kilo-gram/hectare	20 kilo-gram / hectare
Seed treatment	No followed	Thiram @ 2-3 gram per kg seed
Treatment with Biofertilizers	Not followed	PSB culture @ 5 millilitre per kilo gram seed
Nutrients management	Imbalance Application fertilizers N, P and S	Recommended N:P: S (20:40:20 kg/ha)
Weed management	Use of Pendimethalin @ 1 kg. a.i./ha as pre-emergence and one hand weeding	Use of Pendimethalin @ 1 kg. a.i./ha as pre-emergence and Imazethapyr @ 40 gm a.i./ha as a post-emergence
Plant protection	Inadequate use of plant protection measures	Use of Imidacloprid 17.8 SL @ 0.4 ml per lit. for sucking pest

Table 2: Performance of green gram under CFLD and farmer practices.

Demonstration year	Area (hectare)	No. of demonstration	Varieties	Yield (quintal/hectare)			Percent increase over FP	Technology gap (q/ ha)	Extension gap (q/ ha)	Technology index (%)
				Potential	Demonstration	FP				
2021	20.0	50	IPM 02-14	10.0	7.97	6.09	30.87	2.03	1.88	20.30
2022	30.0	75	MH-421	12.0	8.31	6.53	27.26	3.69	1.78	30.75
Total	50.0	125	-	22	16.28	12.62	58.13	5.72	3.66	51.05
Average	-	-	-	11.00	8.14	6.31	29.07	2.86	1.83	25.53

Table 3: Comparative economics of green gram under CFLD and farmer practices

Demonstration year	Cultivation cost (`/ha)		Gross return (`/ha)		Net return (`/ha)		Benefit-cost ratio	
	Demonstration	FP	Demonstration	FP	Demonstration	FP	Demonstration	FP
2021	15,500	13,700	57,982	44,305	42,482	30,605	3.74	3.23
2022	17,200	15,700	64,444	50,640	47,244	34,940	3.75	3.22
Total	32,700	29,400	122,426	94,945	89,726	65,545	7.49	6.45
Average	16,350	14,700	61,213	47,473	44,863	32,773	3.75	3.23

field is shown by the Technology Index. Inadequate transfer of established technology to growers and a lack of extension services for technology transfer were reflected in the higher technology index. Variation in the technology index was ranged from 20.30% to 30.75% during *Kharif* 2021 and 2022. The highest technology index percent was recorded (30.75%) in 2022 and the lowest technology index percent was recorded (20.30%) in 2021. On an average technology index percent was 25.53% in the two years of demonstrations. These results were in conformity with findings of Meena and Singh (2017); Bamboriya *et al*., (2022) and Garg and Singh (2023).

Economics

Economics of experiment was calculated by employing cost of each particulars used in respective demonstration year (Table 3). Green gram production's economic analysis showed that the average cultivation cost rose in demonstration practice (` 16,350/ha) compared to FP (` 14,700/ha). In comparison to farmer practices, it was shown that CFLD produced greater net returns (` 44,863/ha) and gross returns (` 61,213/ha). Additionally, the demonstration plot's average B:C ratio (3.75) was higher than the farmers' practice (3.23). The maximum gross return (` 57,982/ha and 64,444/ha), net return (` 42.482/ha and 47,244/ha) and B:C ratio (3.74 and 3.75) under CFLD during *Kharif* 2021 and 2022. The minimum gross return (` 44,305/ha and 50,640/ha), net return (` 30,605/ha and 34,940/ha) and B:C ratio (3.23 and 3.22) under farmer practices during *Kharif* 2021 and 2022. It was clearly demonstrated that the demonstration of green gram with the entire package was superior to FP. Higher profits from demonstrations could be attributed to better technology such as improved variety with high yield potential, INM, IWM, plant health techniques, non-monetary variables, crop cultivation activities that are completed on schedule, and scientific monitoring. The result confirmed the similar findings of Bamboriya *et al*. (2022); Singh *et al.* (2022); Yadav *et al*. (2023); Garg and Singh (2023) and Bharti *et al*. (2024).

CONCLUSION

In accordance to the findings of the two-year CFLD on green gram crops, the use of ICM techniques in conjunction with enhanced yield-increasing varieties IPM 02-14 and MH-421 outperformed farmer approaches in every demonstration. The successful execution of front-line demonstration and other extension operations *viz*., training, field visits and field days in farmers' fields, may help achieve the horizontal dissemination of improved technologies that is required.

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Conflict of interest

All authors declared that there is no conflict of interest.

REFERENCES

Bamboriya, S.D., Singh, G., Choudhary, M.D. and Choudhary, L. (2022). Impact assessment of cluster front line demonstration on greengram crop. Journal of Community Mobilization and Sustainable Development. 17(2): 489-492.

Bharti, O.P., Jatav, R.C., Tiwari, S.K., Baraiya, B.R., Chouhan, P. and Singh, S.R.K. (2024). Impacts of cluster frontline demonstrations on yield and economics of green gram in Madhya Pradesh, India. Legume Research. 47(11): 1944-1950. doi: 10.18805/LR-5250.

Crop-wise fourth advance estimates of area, production and yield of various principal crops during 2021-22. Commissionerate of Agriculture, Rajasthan-Jaipur, 2021-22.

Garg, R. and Singh, S. (2023). Summer mung (*Vigna radiata* L.) promotion by cluster front line demonstration in irrigated agro-ecosystem: A case study. Legume Research. 46(7): 893-897. doi: 10.18805/LR-5122.

Hooda, V. and Rani, P. (2024). Impact of cluster frontline demonstrations on green gram for productivity enhancement and dissemination of technology in Hisar district of Haryana. The Journal of Rural and Agricultural Research. 24(1): 35-38. doi:10.48165/IJEE.2022.58131.

Meena, M.L. and Singh, D. (2017). Technological and extension yield gaps in green gram in Pali district of Rajasthan, India. Legume Research. 40(1): 187-190. doi: 10.18805/lr.v0iOF.3549.

Meena, R.K., Singh, B., Shinde, K.P. Meena, R.K. and Chawla, S. (2022). Cluster frontline demonstrations in enhancement of production and productivity of green gram. Journal of Food Legumes. 5(3): 207-211.

Reddy, A.A. (2010). Regional Disparities in Food Habits and Nutritional intake in Andhra Pradesh, India, Regional and Sectoral Economic Studies. 10(2): 125-134.

Singh, P., Kumar, R., Bamel, J.S., Mehla, V., Kumar, A., Singh, J. and Singh, S. (2022). Increasing productivity and profitability of summer mungbean through cluster frontline demonstrations in Sonipat, Haryana. Legume Research. 45(9): 1167-1170. doi: 10.18805/LR-4850.

Yadav, B.L. Khan, I., Rathore, S.S. and Gupta, M. (2023). Enhanced productivity of greengram through cluster front line demonstration in Jaipur district of Rajasthan. Annals of Agricultural Research. New Series. 44(3): 402-406.

Yadav, D.B., Kamboj, B.K. and Garf, R.B. (2004). Increasing the productivity and profitability of sun-flowers through frontline demonstrations in irrigated agro-ecosysem of eastern Haryana. Haryana J. Agron. 20(1): 33-35.