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Increasing productivity and profitability of summer moong through frontline demonstration (FLD) in Kaithal district of Haryana

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Abstract
The objective of the front line demonstration (FLD) that was conducted at the farmer's field by the Krishi Vigyan Kendra in Kaithal, Haryana, was to determine the difference in yield of summer moong that existed between the demonstrated field and the farmers' practices (FP) under irrigated conditions. It was determined that conventional farming techniques resulted in a yield of 4.0 q/ha for summer moong, while the demonstrated farming procedures resulted in a yield of 5.75 q/ha for summer moong. These findings were based on an average of the two years, 2017-18 and 2018-19. The average of the technology gap, extension gap, and technology index was recorded as 6.25, 1.75, and 52.08 respectively, and the average cost benefit ratio was recorded as 3:95 and 4:28 respectively in demonstrated field and farmer's practices during 2017-18 and 2018-19 respectively. These figures were recorded during the years 2017-18 and 2018-19. The discrepancy between the two practices, namely the front line demonstration and the farmers' practices, may be because the farmers have not followed the Package and Practices and the most recent technology from the time of sowing to the time of the final harvest of summer moong.

Keywords: Productivity, profitability, frontline demonstration, moong

Introduction

India produces about 25 per cent of the world's pulses, but it eats 30 per cent of the world's pulses and buys 14 per cent of its pulses needs from other countries. India's pulse yield of 806 kg/ha is low compared to other countries. This may be because of bad policy and other things. Some other possible reasons are: Lack of high-quality pulses seeds, lack of technical expertise, lack of plant protection and integrated nutrition strategies, and lack of widespread acceptance of these methods all make it harder for pulses to produce enough food.

This is a direct result of the green revolution, which led to a steady and huge rise in the country's food grain production, which was only 264 million tonnes in 2013-14. Pulses are grown in marginally dry areas, while rice and wheat are grown in the fertile belts. So, over the last few decades, pulse output has gone down. The main places where pulses are grown in India have moved from the northern states to the country's centre and south over the last 30–35 years. But when irrigation systems improved, pulses were replaced by wheat, paddy, and sugarcane.

As a result, land was given to central and southern India to grow pulses, usually on dry, rain-fed land. The weather in North India is good for growing pulses, but as irrigation systems improved, pulses were replaced by wheat, paddy, and sugarcane. To feed the country's growing population, however, it doesn't look like it will be possible shortly to move away from the rice-wheat agricultural system or grow pulses on a large enough area of land. The future looks really bad. The problem was made worse because pulses were not as profitable as other goods. One of the most important pulse crops grown in Haryana is mung, which can be planted in the summer or during the kharif season. It's ready to eat in about sixty days during the summer, but it was not recommended to grow until 2005. Summer mung gives farmers an extra way to make money while also making the land more fertile. This makes it one of the most critical rice-growing areas in the state.

The summer mung crop is easy to add to the rice-wheat cropping cycle because it only lasts a short time and can be changed. Summer mung bean growing in irrigated agricultural ecosystems has helped improve the health of the soil, could bring in more money, and adds value to rice-wheat cropping systems. If more land is used to grow pulse crops, the nutrition of farmers with few resources might get better if the rate of national pulse production goes up.

Farm Science Centers, also called Krishi Vigyan Kendras (KVKs), were set up to test new technologies, show how they can be used, and build farmers' skills through On-Farm Testing (OFT), Front Line Demonstrations (FLDs), and trainings. They also offer farm advisory services through several different ways of communicating. The goal of field level demonstrations (FLDs) is to determine how well different technologies can help produce crops in agricultural areas. So, KVK Kaithal is doing FLDs on various crops and businesses, focusing on pulse crops. This is very important to the mission of the organization. As a result, a study was designed and carried out to find out how summer mung FLDs affect the crop's production, productivity, and profitability.

Material and Methods

Krishi Vigyan Kendra, Kaithal carried out the research in the adopted villages where FLDs had been held throughout the course of the summers of 2017 and 2018. The enhanced variety MH-421 was used in a total of 103 front line demonstrations that were held on summer mung throughout 50 hectares of land. The purpose of these demonstrations was to showcase better production technology. The FLDs were conducted in agricultural settings that made use of irrigation. The soils ranged from sandy to clay loam, with a pH ranging from 5.9 to 7.1, had low levels of accessible nitrogen and phosphorus (40% low and 30% high), and contained high levels of potassium (60% high), but lacked some micronutrients, including zinc and copper.

In the course of having focused group discussions with local farmers, it was discovered that the lack of availability of acceptable varieties of summer mung and the timing of its planting are the two primary factors contributing to the district's low levels of summer mung production and acreage. With the previous approval of farmers who were willing to participate, fields belonging to local farmers were chosen from each of the district's seven different developmental blocks in order to carry out FLDs. Before the FLDs were organised, some farmers received "on campus instruction" on enhanced growing procedures for summer mung. This was done in advance of the FLDs. During the training, each and every agronomic practise, including but not limited to seed rate and treatment, fertilizer management, weed control, and plant protection measures, were taken into consideration.

According to Dharmalingam and Basu (1993) [2], the best time to sow summer mung is between the 3rd week of March (20th March) and the middle of April. However, farmers typically sow it after the 20th of April, which results in less productivity due to the humid conditions that exist during the maturity time. As a result, the planting of FLDs on all plots was finished before the 20th of April in each of those years. The majority of farmers depended on artificial fertilizers to fulfil the plant's nutritional requirements, which was problematic. However, applying bio fertilizers to the seed prior to planting the crop helps to enhance the health of the soil while also increasing the availability of nutrients in the soil. Therefore, it has been established that dual inoculation with Rhizobium and phosphate solubilizing bacteria (PSB) would generate a greater yield. The farmers in the region often plant their summer mung crop using the broadcast technique, despite the fact that planting the crop in lines results in a far better yield. The cultivation process was shown to work best using the line sowing approach. The farmers (local check) in the district paid little attention at all to the weed control element. However, it was proved that raising the crop with one hand weeding and an application of pendimethalin 30 EC at 3.3 l/ha (pre-emergence) was successful.

In order for the farmers to successfully complete the FLDs, they were given 25 kg of mung seed per hectare in addition to other inputs. All of the various agricultural activities were controlled completely by the participating farmers. They were provided with regular direction for the application of the whole package and methods, and their fields were observed while they were cultivating the crop.

In addition to offering training to the participating farmers, both years saw the organization of special educational events such as mung gyan divas, farmer field days, crop harvest days, and group meetings on FLD plots. This contains a series of lectures on various production processes as well as demonstrations of certain management strategies. Mung gyan diwas, Farmers' field days, crop harvest days, and other group gatherings brought fresh and exciting innovations in summer mung farming to the attention of farmers.

After the harvesting and selling of the mung crop, a well-structured questionnaire was used to gather the data from the participating farmers. Data on yields were collected from each of the participating farms individually, and the weighted mean of those yields was computed. The percentage improvement in production over traditional farming methods is equal to the difference between the average yield of FLD plots and traditional farming methods.

The cost of cultivation was calculated for both FLD and the farmers' practise, and it included the cost of inputs such as seed, fertilisers (both chemical and bio-fertilizer), pesticides and herbicides, hired labour (with the exception of family members), the cost of field preparation and sowing, the cost of harvesting, and the cost of transportation. The gross and net returns on average were determined based on the price at which grain was sold at the neighbourhood market. The Benefit-Cost-Ratio was also computed as a ratio of the net return to the associated costs of cultivation (Kumari *et al*. 2007) [10]. On summer mung grown in exhibited plots with comparable farmer practices, a comparison was done regarding productivity and economic returns (local check).

Extension gap, technology gap and technology index were calculated (Samui *et al*., 2000) [11] as given below:

a) Extension gap= Demonstration yield - Farmers’ practice yield
b) Technology gap= Potential yield - Demonstration yield
c) Additional return= Demonstration return - Farmers’ practice return
d) Technology index= (Potential yield - Demonstration yield Potential yield / Potential yield) × 100

Results and Discussion

Yield-difference evaluation

Table 1. shows the yield obtained by FLDs and farmers in 2017 and 2018. The average yield of demonstration plots was 5.5 q/ha in 2017 and 6.0 q/ha in 2018. Farmers' practices yielded 4.0 q/ha in 2017 and 4.0 q/ha in 2018.

In 2017 and 2018, average plot output increased by 37.5 per cent and 50.0 per cent, respectively. In the micro farming context tested, the short duration yellow vein mosaic resistant variety (MH-421) performed better than the local check. FLD results motivated farmers to employ the technology in the future. The higher yield of summer mung may be due to the use of an improved variety, suitable sowing time and method, prescribed seed rate with seed treatment, needed fertilizer dose, and pre-emergence herbicide. Kumar *et al*. (2017) [9] found similarly.

Kumar *et al*. (2019) [7] noticed a 30.90 per cent increase in yield using the SML-818 variety in Poonch, Jammu and Kashmir. Kumar and Boparai (2020) [5] demonstrated SML 668 and SML 832 at Jalandhar. After potato harvest and March sowing, they discovered a 10.48 q/ha yield.

Extension gap

The extension gap was 1.5 q/ha in 2017 and 2.0 q/ha in 2018. (Table 1). The July mung FLDs measured the extension gap. A wider extension gap indicates farmers lacked expertise of summer mung cultivation practices. Choudhary *et al.* (2009) [1] recommend making farmers aware of the need for improved agriculture methods and inspiring them to choose upgraded agricultural practices over conventional ways. Field extension workers in Jammu and Kashmir's Poonch area distributed improved mung production technologies to boost crop yields.

Kumar and Boparai (2020) [5] reported that the average extension gap was 1.80 q/ha and stressed the necessity to educate farmers about improved mung cultivation practices.

Technological gap and index

The technology gap was 6.5 q/ha in 2017 and 6.0 q/ha in 2018. This gap may be due to changes in soil fertility, weather circumstances when the mung crop grows, crop management practices, etc. Prescribe location-specific crop management strategies to exceed the feasible demonstration yield.

The technology index showed the viability of agricultural technology in micro-farming circumstances (Kumari *et al*. 2007) [10]. Lower indexes imply more practicability, and vice versa. Table 2 shows that the technology index fluctuated between 54.16 and 50.00 percent in 2017 and 2018. It shows a mismatch between the research facility's mung-growing technique and farmer use. Kumar *et al*. (2019) [7] discovered the technology index may reach 70.85 per cent.

Economics

Table 2 compares the demonstration's economics to farmers' practices. Land preparation, seed cost, herbicide, fertilizer, and other ancillary costs were somewhat higher in the demonstration. 2017's average gross return was Rs. 22000/ha, while 2018's was Rs. 30000/ha. The average net return per acre throughout the study was 15000 to 19000 rupees.

Demonstration farmers got an additional Rs. 5500 to Rs. 10000 per acre. In both years, summer mung cultivation strategies enhanced net return. Benefit-cost ratio (BCR) was different in both years. Farmers who participated in the FLD initiative saw their earnings improve by roughly Rs. 3,000 per acre. Singh *et al.* (2017b) [12] found a similar benefit-cost ratio in mungbean. Kumar and Boparai (2020) [5] observed the ratio ranged from 1.92 to 2.44. Kumar *et al.* (2019) [7] determined the B:C ratio in SML818 and SML 668 to be 3.20 to 6.56.

Table 1: Performance and gap analysis of cluster frontline demonstrations on summer moonbean at farmer's field

Year	No. of demo*	Yield(q/ha)			Percentage increase	Extension gap (q/ha)	Techno gap (q/ha)	Techno* index (%)
		Potential	Demo*	Farmer' practice				
2017-18	37	12.0	5.5	4.0	37.5	1.5	6.5	54.16
2018-19	66	12.0	6.0	4.0	50.0	2.0	6.0	50.00
Average		12.0	5.75	4.0	43.75	1.75	6.25	52.08

*Demonstration and Technological

Table 2: Performance and gap analysis of cluster frontline demonstrations on summer moongbean at farmer's field

Year	Cost of cultivation (Rs./ha)		Gross returns (Rs./ha)		Net returns (Rs./ha)		Additional net returns (Rs./ha)	BC ratio	
	Demo*	Farmers practice	Demo*	Farmers practice	Demo*	Farmers practice		Demo*	Farmers practice
2017-18	7000	6500	22000	16000	15000	9500	5500	3.14	2.46
2018-19	7000	7000	30000	20000	23000	13000	10000	4.28	2.85
Average	7000	6750	26000	18000	19000	11250	7750	3.71	2.65

Conclusions

The current study demonstrated that there is a gap between potential yield, demonstration yield, and farmers' practise due to an existing gap in technological extension, and that FLDs had a positive effect toward increasing the yield of summer mung. This was demonstrated in a comprehensive manner. This method has shown to be an environmentally benign option to growing summer rice, in addition to helping to save subterranean water supplies. The fast growth of this technique may be attributed to the fact that it offers two distinct benefits: first, an increase in farmers' revenue, and second, an improvement in the quality of the soil. It is clear from the findings of the study that there is a gap between the improved cultivation practices that are recommended for summer mung and the adoption of those practices by the local farmers in the district. As a result, the Front Line Demonstration (FLD), which was an educational exercise, was successful in altering the knowledge, skills, and attitude of farmers, and it also increased the output and productivity of summer mung in the region. Additionally, it assisted in reducing the yield gap and contributed to an increase in the amount of land in the district that was planted with summer mung. In addition, FLD has been shown to be an effective technique for raising public awareness and may inspire farmers to adopt better growing methods for summer mung. The use of enhanced summer mung growing procedures results in a higher yield, greater economic returns, and increased resource usage and conservation on the farm level.

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