Effects of various technological interventions on summer moong (*Vigna radiata* L.)

Abstract

The field demonstrations were laid out at 30 farmers (12.0 ha area) during 2018, 2019 and 2020 to examine the impact of various technological interventions on summer moong. In this intervention, PDM 139 variety of moong bean was sown by using seed drill during 10^{th}-20^{th} Aprilof each year with 25 kg/ha seed rate and treated with Thiram @ 3 g/kg of seed and*Rhizobium* culture10g/kg seed. Pendimethylene@ 1.5 kg/ha was applied for weed management, whereas urea 27.5kg/ha and SSP of 250 kg/ha was applied as fertilizer doses. Farmers practice kept as check for comparing the impact of intervention on moong bean yield and economic returns. Results of the study revealed that, the crop yield was increased by 50.0, 43.9 and 44.0% under intervention over farmers practice during 2018, 2019 and 2020, respectively. Mean of the technology gap was 3.13 q/ha and mean extension gap was 2.16 q/ha. Whereas, technology index was observed 0.31 during the demonstrations. Economic returns showed significantly improved under intervention during all the years as compared to the farmers practice. B:C ratio was 1.88 under intervention during 2019, which was higher compared farmers practice in all the years.

Keywords: Moong bean, Production, Intercropping, Technology gap, Extension gap, Technology index.

Introduction

"Moong bean is the mature fruit seed of (*Vigna radiata* L. Wilczek) cultivated in India, Burma, Srilanka, Pakistan, China,Fiji, Queensland,Thailand, Philippines, Vietnam, Indonesia, Malaysia, Korea and Africa. India is the biggest producer of Moong bean where about 3.83 million ha are cultivated with 1.60 million tons production"[1]. "In case of Indian states, it is widely cultivated in Orissa, Maharashtra, Andhra Pradesh, Madhya Pradesh, Gujarat,Rajasthan and Bihar. Moong beanand urdbean are the excellent sources of high quality protein and mineral"[2, 3, 4]."Summer moong is a short duration crop which produces grains within 65 days after sowing. Summer moong not only provide financial support to farmers, but also it fixates atmospheric nitrogen to the soil. The seeds have high (28%) protein content that is easily digestible, are easy to cook and lack flatulence factors in contrast to other legumes"[5,6]. "Moong bean is a rich source of protein (14.6– 33.0 g/100

g) and iron (5.9–7.6 mg/100 g)”[7]. “Moong bean contains 1- 3% fat, 50.4% carbohydrates, 3.5-4.5% fibers and 4.5-5.5% ash, while calcium and phosphorus are 132 and 367 mg per 100 grams of seed, respectively”[8,9]. Moong bean is consumed as whole grains, sprouted form as well as dhal in a variety of ways in homes. It is also used as green manuring crop. Cattle can be fed moong beans, even the seed husk, which can be soaked in water and used as feed. These crops are grown in India during the three distinct seasons of rabi, summer, and kharif. After the harvesting of wheat, cotton, mustard, potatoes, lentils, peas, and chickpeas, summer moong beans can be planted. Zaid Moong bean farming can enhance soil fertility following the rotation of paddy and wheat crops. Under this study,improved variety, seed treatment, recommended dose of fertilizers/ biofertilizers, weed management and plant protection management techniqueswere studied for increasing production of summer Moong.

Materialsand Methods

Present study was conducted during the summer season of the year 2018, 2019 and 2020 in adopted villages (Koppe, Lendijheri and Chillod) of district Balaghat under the FarmerFIRST project, College of Agriculture, Balaghat. The soil of the district is generally sandy loam in texture[10, 11, 12]. Thedistrict was bounded by 21° 19' to 22° 24' N Latitude and 73°31' to 81° 30' E Longitude with an altitude of 330m above sealevel (masl) (Sarvade*et al.*, 2020). “Climate of thedistrict is sub- tropical characterized by a hot summer andgeneral dryness except during the southwest monsoon season.The normal annual rainfall of Balaghat district is 1294.5 mm.Maximum temperature (43°C) recorded during the month ofMay and minimum (8° C) during the month of December”[13, 14, 15].

“A total 12.0 ha area was covered under the demonstrations (4.0 ha in each year). The demonstrations were conducted in the field of 30 farmers in the area of 0.4 hectare each. In demonstration fields, moong crop was grown according to the package of practices (Anonymous, 2017). In demonstration, quality seeds of improved variety, seed treatments, recommended dose of fertilizers, weed management and plant protection management techniques were demonstrated on the farmer’s field through front line demonstration” [29] (Table 1). The demonstrations were laid out in Randomized Block Design (RBD) with 3 replications. The conventional practices were maintained in case of local checks. Farmers' opinions regarding the technology being demonstrated were gathered in order to enhance research and extension efforts going forward. The data were collected from front line demonstration’s fields as well as from control field (farmers practices) and finally the technology gap, extension gap, technology index were calculated as formula given by Samui *et al.* [16]and Henderson and Tilton [17] as follows:

Technology Gap = Potential yield – Demonstration yield

Extension Gap = Demonstration yield – Farmer's yield

Additional Return= Demonstration Return- Farmer practices return

Technology index =Potential Yield- Demonstrated Yield/Potential Yield

The results were analyzed statistically using analysis of variance (P=0.05) ANOVA as described by Gomez and Gomez, [18].

Results and Discussion

Yield of summer moong

Technologies undertaken in demonstration fields and practices adopted by farmers in control are presented in Table 1, and revealed that the farmers were not adopted a single recommended practice in moong crop as considered marginal crop by the farmers. The grain yield of moong under front line demonstrations recorded as 6.75 q/ha,6.88q/ha and 6.96 q/ha, however in farmer's practice grain yield recorded as 4.50 q/ha,4.78q/ha,and4.83 q/ha in the year 2018, 2019 and 2020, respectively. Significanthighermean grain yield (6.86 q/ha) was recorded under intervention as compared to farmer practices (4.70 q/ha) (Table 2). In recommended intervention, there was increase in grain yield of moong that 50, 43.9 and 44.0 % during the respective year (2018, 2019 and 2020).The demonstrated mediumduration moong variety i.e. PDM 139 in Krishi Vigyan Kendra, JNKVV, Narsinghpur, Madhya Pradesh and reported 24% increase in the average moong bean yield [8, 19].

Mean technology gap was 3.13q/ha and extension gap was 2.16 q/ha. Mean technology index was 0.31. According to these results, farmers need to convince for adoption of the new suggested technology for increasing yield of the summer moong bean. KumarandBoparai[20] studied impact of frontline demonstrations on summer moongcrop conducted in Jalandhar district of Punjab and reported that recommended varieties, seedrate, timely sowing and plant protection technology resulted in average increase inyield of 18.73 per cent in summer moong over the check plots [21, 22].

"It is observed that in general average potential yield gap between FLD and farmer's local check yield is about 27%. The potential yield level could be obtained by adoption of improved package of practices. Front Line Demonstration conducted on Mung bean crop with improve variety PDM 139 in Madhya Pradesh the improve practice yield was 6.86 q/ha and farmers yield was 4.70 q/ha.Theresults revealed the increase the yield over check was 45.9 %. From the table 2, it is clearly seen that moong productivity is higher under intervention as compare to farmer practice" [23, 24, 25]. Based on the above criteria for Madhya Pradesh has potential for increasing production of moong beanby adoption of recent technologies. In Madhya Pradesh, moong bean production can be increased in five years by reducing 10% yield gap every year.

Economic returns

The cost of cultivation in farmers practice was increased from Rs. 20500/- in 2018 to Rs. 22600/- per ha in 2020. In case of demonstrated intervention, it was increased 8.98% in 2018, 14.51% in 2019 and 18.71% in 2020. Gross and net return in farmers practice was also increased from Rs. 25087/- and Rs. 4587/- per ha in 2018 to Rs. 34051/- and Rs. 11451/- per ha in 2020, respectively. Gross return in demonstrated intervention was increased 33.33% in 2018, 30.52% in 2019 and 30.60% in 2020. Net return also increased in demonstrated intervention as 69.64% in 2018, 48.68% in 2019 and 46.16% in 2020. B:C ratio was improved under demonstrated interventions in all years of an experimentation. Highest B:C ratio was observed in demonstrated intervention in 2019. Patel *et al.*,[8] also reported similar results such as front line demonstration recorded higher gross return and net return as compared tolocal check [26, 27, 28].

Conclusions

During the Covid 19 period, the demonstrations were laid out and findings were concluded as the grain yield of the moong bean was increased under intervention. Extension of the technology knowledge was given to the farmers, but the gap in technology adoption by the farmers is the concerning issue for the farming communities. During 2018, the percent increase in gross and net return was higher as compared to the year 2019 and 2020.

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Table 1: **Difference between technological intervention and farmers practices for moong crop**

S.no	Particular	Technology Interventions	Farmers Practice
1.	Variety	PDM 139	Local variety
2	Seed rate	25 kg/ha	20 kg/ha
3	Seed treatment	Thiram @ 3 g/kg of seed	Not applied
4	Rhizobium culture	10g/kg seed	Not treated
5	Time of sowing	10-20th April	25-30th April
6	Weed management	Pendimethylene@ 1.5 kg/ha	Not applied
7	Fertilizer dose	Urea: 27.5kg/ha and SSP: 250 kg/ha (On soil test basis)	Irrational use of nitrogenous fertilizers and nonapplication of DAP
8	Method of fertilizer application	Fertilizers drilled at the time of sowing	Broadcasting
9	Insect-pest management	Need based spray of insecticide at Economic threshold level (ETL)	Overdoses/ un recommended brands of insecticide

Table 2: Grain yield and gap analysis of demonstration intervention in summer moong

Year	Area (ha)	No. of farmers	Yield (q/ha)			Increase over farmer practices (%)	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			Farmers Practice	Intervention	Potential				
2018	4	10	4.50	6.75	10.0	50.0	3.25	2.25	0.33
2019	4	10	4.78	6.88	10.0	43.9	3.12	2.10	0.31
2020	4	10	4.83	6.96	10.0	44.0	3.04	2.13	0.30
Mean	**4**	**10**	**4.70**	**6.86**	**10.0**	**45.9**	**3.13**	**2.16**	**0.31**

Table 3. Economics of demonstrated intervention in summer moong

Particulars	Year 2018		Year 2019		Year 2020	
	Intervention	Farmers Practice	Intervention	Farmers Practice	Intervention	Farmers Practice
Cost of cultivation	22522 (8.98)	20500	25500 (14.51)	21800	27800 (18.71)	22600
Gross Returns	37631 (33.33)	25087	47988 (30.52)	33,340	49068 (30.60)	34051
Net returns	15109 (69.64)	4587	22488 (48.68)	11,540	21268 (46.16)	11451
B:C ratio	1.67	1.22	1.88	1.52	1.76	1.50

Values in parenthesis are % data increase over farmers practice;

MSP price of summer moong is in year 2018= Rs. 5575/q;year2019 = Rs. 6975/q;year2020= Rs. 7050/q