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Productivity enhancement of greengram through improved production technologies in Kalaburagi district of Karnataka

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Abstract
Greengram is one of the important pulse crop in India, which plays a major role in supplementing the income of small and marginal farmers. One of the major constraints of traditional green gram farming is low productivity of local varieties. In this point of view Krishi Vigyan Kendra, Kalaburagi conducted Front line demonstration at 150 farmer's field to demonstrate production potential and economic benefit of improved technologies at adopted farmer's field during 2010-11 to 2016-17 of seven years studyinrainfed condition. The results shows improved production technologies of green gram, (BGS-9) recorded increased mean yield of seven years 10.49 and 15.78% during study period over local check. The technology gap which shows the gap in the demonstration yield over potential yield were 14.51 q/ha over a seven years, The highest extension gap of 1.70 was recorded in during 2013-14 this high extension gap requires urgent attention by the extension and development agencies. The technology index is 58.0 percent during 2010-11 and 2016-17which shows the good performance. There is a need to adopt multipronged strategy that involves enhancing sesame production through area expansion and productivity improvements through better adoption of improved technology. The improved technologies resulted higher mean net income of Rs.32061 /ha with a benefit cost ratio of 3.17 as compared to local.

Keywords: Front line demonstrations, green gram, extension gap, yield and B: C.

Introduction
Green gram [*Vigna radiata* (L.) Wilczek] is a protein rich staple food. It contains about 25% protein, which is almost three times that of cereals. It is consumed in the form of split pulse as well as whole pulse, and is an essential supplement of cereal based diet. Green gram improves soil physical properties and fixes atmospheric nitrogen. In India, among the grain legumes, green gram is an ancient and well known leguminous crop of Asia, is a favorable one since it thrives better in *kharif* season and it can be grown as a sole or inter crop or fallow crop. It play an important role in Indian Agriculture as they restore soil fertility by fixing atmospheric nitrogen through their nodules.

Agriculture is the main occupation in Kalaburagi region. Crop growth and yield are limited through poor plant nutrition and uncertain water availability during the growth cycle. Inappropriate management may further reduce the fertility of soil (Rabbinge, 1995) [4]. The green gram crop is mainly cultivated in Khari 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 of KVK, Kalaburagi (Karnataka state). The Frontline demonstrations 130 were organized on farmer's field to demonstrate the impact of integrated crop management technology on green gram productivity over three years during Kharif season 2010-11to 2016-17. Each frontline demonstration was laid out on 0.4 ha area, adjacent 0.4 ha was considered as control (farmer's practice). The integrated crop management technology fallowed (Table 1). The yield data were collected from both the demonstration and farmers practices by random crop cutting method. Qualitative data were converted into quantitative form and expressed in terms of per cent increase in yield calculated using following formula (Samui *et al.*, 2000) [6].

Table 1: Improved production technology and Farmers practices of greengram under FLD

Sl No.	Technology	Improved practices	Farmers practice	GAP (%)
1	Variety	BGS-9	Local	100
2	Land preparation	Ploughing and harrowing	Ploughing and harrowing	Nill
3	Pre emergent herbicide	Pendimethalin (@ 2.5 l/ha)	No herbicide	Full gap
4	Seed rate	12-15 kg/ha	18-20 kg/ha	Partial gap
5	Sowing method	Line sowing	Line sowing	No gap
6	Seed treatment	Biofertilizers and Trichoderma	No seed treatment	Full gap
7	Fertilizer dose (NPK kg/ha)	25:50:0	10:20:0	Partial gap
8	Plant protection	IPM	Indiscriminate application	Full gap
9	Grading the produce	Grading the produce	Not followed	Full gap

Technology gap = Potential yield – Demonstration
Yield Extension gap = Demonstration yield – Farmers yield
Technology index = ((Potential yield - Demonstration yield) / Potential yield} X 100

Results & Discussion

During the 2010-11 to 2016-17 of seven years study period it was observed that the adoption of improved production technologies in demonstration trials has increased the yield over the farmers' practices. Full gap was observed in most of production technology was the reason of not achieving potential yield. Farmers were not aware about recommended technologies.

Frontline demonstration was conducted on 53 hectares of land on 130 demonstration plots. The growth and yield attributing parameters are increased with improved production technology. On an average the plant height, Number of pods per plant and pod length increase were observed45.7 cm, 32.1 and 11.1 cm, respectively compare to farmers practice (38.1 cm, 25.3 and 10.5 cm, respectively) during seven subsequent years (2010-11 to 2016-17). The result indicates that the growth and yield parameters are increased in demo plots compare to farmers practice due to improved production technology such as improved variety, seed treatment with biofertlizers and early weed control, low seed rate will help for the plants to grow properly. The result indicates that the frontline demonstration has given a good impact over the farming community of Kalaburagi as they were motivated by the new agricultural technologies applied in the FLD plots.

The data in table 3 revealed that, the green gram variety BGS-9 yielded 10.49 q/ha to 15.78% higher yield over farmers practice (9.14 q ha^{-1}) during the 2010-11 to 2016-17 of seven years study. The highest yield of 12.50 q/ha was observed in 2013-14 and lowest yield 6.5 q/ha in 2010-11 due to moisture availability and deficiency of rainfall. (Pooniaand Pithia, 2010). The result indicates that the frontline demonstration has given a good impact over the farming community of Kalaburagi as they were motivated by the new agricultural technologies applied in the FLD plots. Yield of green gram was, however varied in different years, which might be due to the soil moisture availability & rainfall condition, climatic aberrations, disease and pest attacks as well as the change in the location of trials every year. The percentage increase in the yield over local check was 30.0, 12.94, 13.15, 15.74, 13.73, 12.09 and 10.90 during seven subsequent years (2010-11 to 2016-17) over a farmer check. The increased grain yield with improved technologies was mainly because of line sowing, use of nutrient management and timely weed management. The reason for this could be the inter plant competition for the moisture and nutrients which could be more severe under local check demonstration (Farmers practice). Also, the higher weed infestation under the local check as evident from the higher weed cover and reduced the amount of nutrients and water available to the local check. This may be attributed to sufficient and more than average rainfall distributed fairly during the pod setting to physiological maturity stage, better utilization of applied nutrients (Pooniaand Pithia, 2010).

The economic viability of improved technologies over traditional farmer's practices was calculated depending on prevailing prices of inputs and output costs (Table 3).

Table 2: Details of green gram growing under Existing Farmer's Practices and Improved Practices adopted in Frontline demonstrations at farmer's field in Kalaburagi

Year	No of Demo.	Area (Ha)	Plant height (cm)		No. of pods/plant		Pod length (cm)	
			Demo	Check	Demo	Check	Demo	Check
2010-11	20	8	39.7	32.3	26.9	19.8	10.4	9.8
2011-12	12	5	41.8	31.7	29.7	21.3	10.9	10.2
2012-13	12	5	49.3	39.6	32.4	25.6	11.2	10.6
2013-14	12	5	48.8	41.3	35.9	27.4	11.5	10.8
2014-15	12	5	45.7	40.8	33.1	29.1	11.0	10.4
2015-16	12	5	44.1	38.6	31.9	25.3	10.9	10.1
2016-17	50	20	50.5	42.7	34.6	28.8	11.8	11.3
Average	-	-	45.7	38.1	32.1	25.3	11.1	10.5
Total	130	53	-	-	-	-	-	-

Table 3: Seed yield and economics of green gram as affected by improved and local practices in farmers' fields.

Year	No of Demo.	Area (Ha)	Yield (q/ha)			% increase in yield over farmers practice	Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		Net return (Rs/ha)		B:C	
			Potential yield	Demo yield	Farmers practice		Demo	Check	Demo	Check	Demo	Check	Demo	Check
2010-11	20	8	25	6.50	5.00	30.00	9700	8900	19825	15250	10125	6350	2.04	1.71
2011-12	12	5	25	9.95	8.81	12.94	11340	10700	37810	33478	26470	22778	3.33	3.13
2012-13	12	5	25	10.41	9.20	13.15	14380	13460	46845	41400	32465	27940	3.26	3.08
2013-14	12	5	25	12.50	10.80	15.74	17800	16200	57500	49680	39700	33480	3.23	3.07
2014-15	12	5	25	11.60	10.20	13.73	16790	15150	48140	42330	31350	27180	2.87	2.79
2015-16	12	5	25	10.20	9.10	12.09	13650	11760	49980	44590	36330	32830	3.66	3.79
2016-17	50	20	25	12.30	10.90	12.84	17200	15980	65190	57770	47990	41790	3.79	3.62
Average	-	-	15	10.49	9.14	15.78	14409	13164	46470	40643	32061	27478	3.17	3.03
Total	130	53	-	-	-	-	-	-	-	-	-	-	-	-

Table 4: Performance of Front Line Demonstrations (FLD) of green gram in Kalaburagi (Karnataka)

Year	No of Demo.	Area (Ha)	Yield (q/ha)			% increase in yield over farmers practice	Technological gap (q/ha)	Extension gap (q/ha)	Technological index (%)
			Potential yield	Demo	Farmers practice				
2010-11	20	8	25	6.50	5.00	30.00	18.50	1.50	74.0
2011-12	12	5	25	9.95	8.81	12.94	15.05	1.14	60.2
2012-13	12	5	25	10.41	9.20	13.15	14.59	1.21	58.4
2013-14	12	5	25	12.50	10.80	15.74	12.50	1.70	50.0
2014-15	12	5	25	11.60	10.20	13.73	13.40	1.40	53.6
2015-16	12	5	25	10.20	9.10	12.09	14.80	1.10	59.2
2016-17	50	20	25	12.30	10.90	12.84	12.70	1.40	50.8
Average	-	-	15	10.49	9.14	15.78	14.51	1.35	58.0
Total	130	53	-	-	-	-	-	-	-

The results revealed that the FLD plots increased higher gross return, net return and B: C ratio of Rs. 46470 /ha, Rs. 32061 /ha, 3.17, respectively as against farmers practice (local check). The highest net return observed in Rs 49770 /ha in the 2016-17. The additional cost increased in the improved technologies was mainly due to more cost involved in balanced fertilizer, improved seed and weed management practices. Similar results also have been reported by Khan et *al.* (2009). To get maximum yield of green gram recommended package of practices should be followed. By not following any one management practice yield may be reduced severely and it was also observed that delay in sowing, unbalanced does of fertilizer, untimely weed management and plant protection drastically reduced the grain yield of green gram.

The technology gap in the demonstration yield for green gram ranges from 12.50 to 18.50. The technological gap may be attributed to the dissimilarity in the soil fertility status and weather conditions (Mukharjee, 2003). The extension gap ranges from 1.21 to 1.70 during four years of FLDs for green gram. The technology index of green gram was ranges from 50.0 to 74.0. This emphasized the need to educate the farmers through various means for the adoption of improved agricultural production technologies to reverse this trend of wide extension gap. On the basis of the result obtained in present study it can be concluded that use of improved method of green gram cultivation can reduced the technology gap to a considerable extent thus leading to increase productivity of green gram in the district. Extension gap emphasis the need to educate the farmers through various means like village level training, on campus training, method demonstration, front line demonstration, etc. Technology index which shows the feasibility of the technology demonstrated has depicted good performance of the intervention.

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