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Evaluation of Frontline Demonstration of Greengram (*Vigna radiata* L.) in Sundarbans, West Bengal

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Green gram (mungbean) is one of the important pulse crop in India, plays a major role in augmenting the income of small and marginal farmers of Sundarbans. The low production of traditional varieties of greengram was a cause of concern for the farmers at large. To overcome this problem of low yield, Krishi Vigyan Kendra of CIFRI has conducted frontline demonstration field of fourteen villages in Kakdwip, Namkhana, Patharpratima and Kulpi blocks of Sundarbans, West Bengal. Cultivation of high yielding varieties of greengram viz. K-851, PDM-54, B-105, Pusa Baishakhi and Sonali has given yield increases of 38.25, 50.82, 25.0, 33.33 and 60.0 percent, respectively over local check. The technology gap were 396 kg ha^{-1} for K-851, 300 kg ha^{-1} for PDM-54, 350 kg ha^{-1} for B-105, 300 kg ha^{-1} for Pusa Baishakhi and 400 kg ha^{-1} for Sonali varieties of greengrain. The highest extension gap of 223 kg ha^{-1} was recorded in variety K-851, followed by 337 kg ha^{-1} for PDM-54, 300 kg ha^{-1} for Pusa Baishakhi, 200 kg ha^{-1} for Sonali and the lowest 150 kg ha^{-1} for B-105. This high extension gap in all these varieties requires urgent attention from planners, scientists, extension personnel and development departments. The technology index were 33 percent for K-851, 23.07 percents for PDM-54, 31.81 percents for B-105, 27.27 percents for Pusa Baishakhi and 33.33 percents for Sonali. Except PDM-54 and Pusa Baishakhi all other varieties have given technology index of more than 30 percents indicating that the performance by these varieties in Sundarbans conditions was not more than the satisfactory level and these varieties requires more tolerance to salinity. The changes will accelerate the adoption of newer varieties to increase the productivity of greengram in this area. There is a need to adopt multi pronged strategy which involves enhancing greengram production through horizontal and vertical expansion and productivity improvements through better adoption of improved technology.

(***Key words:*** *Frontline Demonstration, Technology gap, Extension gap, Technology index*)

Agriculture in India has shown a gradual transformation from subsistence farming to the commercial farming. The green revolution has provided a great boost to the food grain production especially in two crops namely rice and wheat. One of the attractions of the green revolution technologies is that they are, in principle, scale neutral, and can raise yields and incomes for both small- and large-scale farmers. But it has also generated several ecological problems (soil degradation and depletion of ground water) and steep variation in yield of better-endowed region to the less endowed region. In spite of the higher domestic prices of the two cereals farmers are not finding them remunerative because of the diminishing return. Pulse crop play an important role in Indian agriculture. Their ability to use atmospheric nitrogen through biological nitrogen fixation is economically more sound and environment friendly. With 35 percents of world area and 27 percents of production, India is the largest pulse producing nation.

Greengram crop is one of the important pulse crops and is being cultivated in Sundarbans after the harvest of aman rice. Greengram contains 25 percent of high digestible proteins and consumed both as whole grain as well as dal. It is a soil-building crop, which fixes atmospheric nitrogen through symbiotic action and can also be used as green manure crop adding 34 kg N ha^{-1}. The improved technology packages were also found to be financially attractive. Yet, adoption levels for several components of the improved technology were low, emphasizing the need for better dissemination (Kiresur *et al.*, 2001). Several biotic, abiotic, and socio-economic constraints inhibit exploitation of the yield potential and these needs to be addressed.

Agriculture is the main occupation in Sundarbans and rice is the main staple crop of the region. Crop growth and yield are limited through poor plant nutrition and uncertain water availability during the growth cycle. Inappropriate management

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may further reduce the fertility of soil (Rabbinge, 1995). The green gram crop is mainly cultivated in summer season from February to May in midlands and lowland on residual soil moisture. Frontline demonstration on greengram 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 cultivated varieties.

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 farmers' field under coastal saline soil of South 24 Parganas district of West Bengal. The present investigation was carried out at Narayanpur, Nandabhaga, Debnibas, Budhakhali, Arunberia, Shibpur, Mundapara, Gangadharpur, Bhubhannagar, Kusumpukur, Belpukur, Akshaynagar, Kumarpur and Dhurbachoti under Kakdwip, Namkhana, Patharpratima and Kulpi blocks of Sundarbans in South 24 Parganas district of West Bengal.

The materials for the present study comprised high yielding strains of greengram viz. K-851, Sonali, B-105, Pusa Baishakhi and PDM-54. Locally cultivated varieties were used as local check. The soil type was gangetic alluvium (Entisols) and medium to low in fertility status. The objective of the performance evaluation was to study the gaps between the potential yield and demonstration yield, extension gaps and the technology index. In the present study the data on output of greengram crop were collected from FLD plots, besides the data on local practices commonly adopted by the farmers of this region were also collected.

To estimate the technology gap, extension gap and the technology index the following formulae have been used. (Samui *et al.*, 2000, Sagar and Chandra Ganesh, 2004).

- Technology gap = Potential yield – Demonstration yield
- Extension gap = Demonstration yield - Farmers yield
- Technology index

  = {(Potential yield – Demonstration yield) / Potential yield} X 100

The soil type was gangetic alluvium (Entisols) and medium to low in fertility status (Table 1)

RESULTS AND DISCUSSION

The prevalent farming situation in Sundarbans areas being characterised paddy cultivation during *kharif* season under rain-fed condition and water requirement for growing rabi and summer crops are met only through residual soil moisture and/or stored rain-water. One of the greatest lacunae faced by the farmers of this area is lack of soil moisture. The green gram crop requires one irrigation during its whole life span.

Frontline demonstration was conducted on 129 hectares of land on 1430 demonstration plots. The five high yielding strains of greengram namely K-851, PDM-54, B-105, Pusa Baishakhi and Sonali were used. On an average the highest yield 1000 kg ha^{-1} was achieved by PDM-54 followed by 806 kg ha^{-1} by K-851, 800 kg ha^{-1} by B-105 and Pusa Baishakhi and 750 kg ha^{-1} by Sonali (Table 2). The result indicates that the Frontline demonstration has given a good impact over the farming community of Sundarbans as they were motivated by the new agricultural technologies applied in the FLD plots. Yield of greengram 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 high yielding varieties had performed well when compared to local check.

The percentage increase in the yield over local check was 38.25, 50.82, 25.0, 33.33 and 60.0 for K-851, PDM-54, B-105, Pusa Baishakhi and Sonali,

Table 1. *Soil characteristics of adopted blocks*

Sl. No.	Name of the Block	C%	pH	EC d Sm^{-1}
1.	Kakdwip	0.11-0.86	6.0-7.99	0.09-26.50
2.	Namkhana	0.21-0.69	6.5-7.6	0.33-4.0
3.	Kulpi	0.06-0.88	5.4-8.5	0.21-7.8
4.	Pathar Pratima	0.01-1.44	4.3-8.5	0.09-26.50

Table 2. *Productivity of greengram, yield gaps and technology index*

Variety	No. of Demons-trations	Area (ha)	Yield (Kg ha^{-1})			% increase over local check	Technology gap	Extension gap	Technology index
			Potential	Demons-tration	Local Check				
K-851	849	69.0	1200	806	583	38.25	396	223	33.00
PDM-54	70	10.0	1300	1000	663	50.82	300	337	23.07
B-105	95	10.0	1100	750	600	25.00	350	150	31.81
Pusa Baishakhi	230	20.0	1200	800	500	60.00	400	300	33.33
Sonali B-1	186	20.0	1100	800	600	33.33	300	200	27.27

respectively. The technology gap, the gap in the demonstration yield over potential yield were 396 kg ha^{-1} for K-851, 300 kg ha^{-1} for PDM-54, 350 kg ha^{-1} for B-105, 300 kg ha^{-1} for Pusa Baishakhi and 400 kg ha^{-1} for Sonali. The technology gap observed may be attributed to dissimilarity in the soil fertility status and weather conditions as well as the soil moisture availability. Hence location specific recommendation appears to be necessary to bridge the gap between the yields of different varieties.

The highest extension gap of 223 kg ha^{-1} was recorded in variety K-851, followed by 337 kg ha^{-1} for PDM-54, 300 kg ha^{-1} for Pusa Baishakhi, 200 kg ha^{-1} for Sonali and the lowest 150 kg ha-1 for B-105. This emphasized the need to educate the farmers through various means for more adoption of improved high yielding varieties and newly improved agricultural technologies to bridge the wide extension gap. More and more use of new high yielding varieties by the farmers will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinuance of old varieties with the new technology. This high extension gap in all these varieties requires urgent attention from planners, scientists, extension personnel and development departments.

The technology index shows the feasibility of the evolved technology at the farmers' field. The lower the value of technology index more is the feasibility of the technology. The technology index were 33 percent for K-851, 23.07 percents for PDM-54, 31.81 percents for B-105, 27.27 percents for Pusa Baishakhi and 33.33 percents for Sonali. Except PDM-54 and Pusa Baishakhi all other varieties have given technology index of more than 30 percents indicating that the performance by these varieties in Sundarbans conditions was not more than the satisfactory level and these varieties requires more tolerance to salinity. In Sundarbans, only a small chunk of farmers have access to irrigation or affordable chemical inputs, and where growth and yield reducing losses, farmers' actual yields are less than its genetic potential. Sustainable intensification strategies for Sundarbans require improved soil, water and nutrient management innovations. Summer greengram cultivation has also ensured sustainable natural resource management objectives. Vulnerability to natural disasters can substantially be reduced through the adoption of greengram cultivation because of the improvement in productivity, increase cash income and acquired assets that families can fall back on when disasters occurs. Direct involvement of beneficiaries in adopting green gram cultivation technology suitable to their condition has given high payoffs in terms of enthusiasms and interest and also in ensuring that the technology addresses the priority needs that have been identified by the beneficiaries.

Despite the low soil moisture availability climatic and natural aberrations faced in Sundarbans areas, the high yielding varieties of Greengram K-851, PDM-54, B-105, Pusa Baishakhi and Sonali had given a very good result in coastal agro-ecosystem of Sundarbans in comparison to local check. These varieties may be popularized in this area by the state agriculture departments and extension agencies to mitigate the large extension gap. Mainly small and marginal farmers are associated with the cultivation of sesame in Sundarban and the use of new production technologies will substantially increase the income as well as the livelihood of the farming community. There is a need to adopt multi pronged strategy which involves enhancing greengram production through horizontal and vertical expansion and productivity improvements through better adoption of improved technology. In the fragile environments and poor farm resource base, greengram is the best choice for farmers. Cultivation of greengram also helps in protecting the environment from the risk of high input agriculture.

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