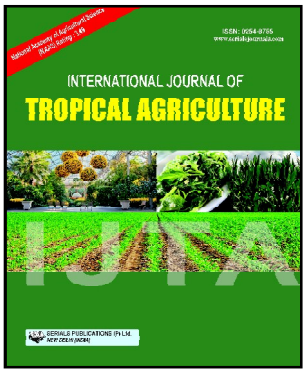

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Performance of the Demonstration under Cluster Front Line Demonstration on Blackgram and Redgram

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Abstract: Blackgram (*Vigna mungo*) and pigeon pea (*Cajanus cajan*) are the two potential pulse of South 24 Parganas district of West Bengal during kharif season. Cluster front line demonstrations were conducted during 2016-17 with selected technologies in the farmer's field to evaluate the technology, socio economic impacts and farmer's perception about the demonstrated technology. It was found that maximum yield of blackgram (9.1 q/ha) was noticed in application of Panchagavya and Dasaparni at vegetative and pod formation stage, followed by IPM (Seed treatment with Mancozeb 50% + Carbendazim 25% WS @ 2.5g/kg seed, Yellow sticky trap @ 16/ha & Need Based Spot application of Insecticides & spraying of wettable sulphur @ 2g/lt as prophylactic measure). IPM demonstrated field showed lowest pod borer infestation and powdery mildew infestation (5.4% and 5.24% respectively); whereas the infestation was 42.30% and 48.61%, respectively in case of farmers practices. B:C was recorded highest (3.27) in case of organic treatments. Five different demonstration have been conducted in pigeon pea of which Ali Cultivation along with seed treatment chemical fungicide (Carbenzim 25%+Mancozeb 50%) and seed enrichment with rhizobium and PSB followed by application trichoderma with cowdung recorded maximum yield (12.69 q/ha). Chemical pest management recorded lowest infestation of pod borer, podfly and wilt (6.95%, 5.75% and 8.45% respectively). 10.5 q/ha yield was obtained from farmers own practices. In both the crop the farmers showed their interest to the demonstrated technology. Ignorance to pulse cultivation was noticed as the constraints during the demonstration as most of the produce is utilized for family consumption.

Keywords: Blackgram, organic amendments, redgram, rhizobium, Trichoderma

I. INTRODUCTION

Pulse are the rich source of vegetable protein; thus called as poor man's meat for the underprivileged people who cannot afford animal proteins or particularly in regions where meat and dairy are not physically or economically accessible. Pulses are low in fat and rich in soluble fibre, which can lower cholesterol and help in the control of blood sugar. Apart from nutritional sources pulses are an important crop for family consumption which helps to maintain the food security as well as for selling purpose and creates economic stability. In addition, the nitrogen-fixing properties of pulses via rhizobium can improve soil fertility, which increases and extends the productivity of the farmland. Crop rotation with pulse and can also promote farm biodiversity and soil biodiversity. Pulses can contribute significant role in reducing the use of synthetic fertilizer as nitrogen fixer and in some cases free soil-bound phosphorous. Among the different pulse crop grown during kharif season in West Bengal black gram [*Vigna mungo* (L.) Hepper] commonly known as urdbean, mash, mashkalai, black mapte etc. and red gram or pigeon pea (*Cajanus cajan*) are the most important one. India is the largest producer (25% of global production), consumer (27% of world consumption) and importer (14%) of pulses in the world. Pulses account for around 20 per cent of the area under food grains and contribute around 7-10 per cent of the total food grains production in the country. Though pulses are grown in both kharif and rabi seasons, rabi pulses contribute more than 60 per cent of the total production [1]. During 2017 the total pulse production was estimated 22140 thousand tonnes [2]. Gram is the most dominant pulse having a share of around 40 per cent in the total production followed by Tur/Arhar at 15 to 20 per cent and Urad/Black Matpe and Moong at around 8-10 per cent each. Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and Karnataka are the top five pulses producing States. Productivity of pulses is 764 kg/ha [1]. During XII plan (2010-2015) the total area under pulse in West bengal was estimated 2.45 lakh ha with productivity (829 kg/ha) [3]. In this regard, to sustain this production rather increase the pulse production and consumption system, the Department of Agriculture, Cooperation and Farmers Welfare had sanctioned the project "Cluster Frontline Demonstrations on Rabi Pulses 2015-16" through National Food Security Mission. Sasya Shyamala Krishi Vigyan Kendra implemented the project in South 24 Parganas district of West Bengal with main objective to boost the production and productivity of pulses through CFLDs with latest and specific technologies.

II. MATERIALS AND METHODS

The present investigation of CFLDs was conducted during kharif season of 2016-17 by the Sasya Shyamala Krishi Vigyan Kendra in different villages of 4 distinguished blocks *viz.* Baruipur, Basanti, Gosaba, Falta and Budge Budge II of South 24 Parganas. Selection of blocks was done using PRA tools. Potential technologies for sustainable pulse production were selected from the result reported by DAC, SAU and Research Institutes. Demonstration on seed treatment with rhizobium and PSB (@ 250 g per 4 kg seed) along with increased dose of phosphorus and 2% spray of DAP and boron; spraying of panchagavya (3%) and dasaparni (1%) at flowering and pod formation stage and IPM (seed treatment with mancozeb 50% + carbendazim 25% WS @ 2.5g/kg seed, yellow sticky trap @ 16/ha & need based spot application of NSKE (3%) & spraying of wettable sulphur @ 2g/lt as prophylactic measure) was carried out in blackgram. Total area under demonstration of black gram (var. WBU 108) was 12 ha. Ali Cultivation along with seed treatment chemical fungicide (Carbenzim 25%+Mancozeb 50%) and seed enrichment with rhizobium (@ 250 g per 4 kg seed) and PSB (@ 250 g per 4 kg seed) followed by application trichoderma (@ 6 g per kg) with cowdung; application of 2% DAP at 20-25 and

40-45 DAS, and 2% boron during pre flowering and post flowering period, respectively; application of panchagavya (3%), dasgavya (5%), Jeevamrit (5%); IPM (hellilure pheromone trap @ 12 per ha, yellow sticky trap @ 20 per ha and need based spot application of novaluron+ indoxacarb @ 2 ml/lt) and chemical management of pod fly and pod borer using (two round spinosad @0.3 ml per lt and emamectin benzoate @ 0.5 g per lt) and two round spray of copper oxy chloride at the base of the plant to check wilting was demonstrated in pigeon pea (var. Laxmi) at about 20 ha of land. The demonstration was conducted in pre-selected 106 nos. and 189 nos. farmers field for black gram and red gram respectively. Farmers were trained to follow the package and practices. In case of local check, the traditional practices were followed by the farmers. Observation of agronomic parameters and pest diseases and respective yield was recorded afrom both CFLD and farmers practice plot (local check). Socio-economic parameters, their perceptions about the technology and feedback and suggestion (if any) were noted from the farmers via personal interview.

III. RESULT AND DISCUSSION

It is apparent from the tabulated result that field under CFLD showed potential effect over the farmers practices in both the crop duly presented in the table 1-6. In blackgram maximum plant height (52.3 cm), seed per pod (11.4 nos.) and yield (11.4 q/ha) of black gram seed was obtained from the field demonstrated with Spraying of panchagavya (3%) and dasaparni (1%) at flowering and pod formation stage followed by IPM demonstrated field and Seed treatment with rhizobium and PSB (@ 250 g per 4 kg seed) along with increased dose of phosphorus and 2% spray of DAP and boron. Only 5.2 q per ha yield was obtained by farmers practices (Table 1). Infested pod by pod borer and powdery mildew incidence was significantly lower (5.40% and 5.24% respectively) in the demonstrated field with IPM (seed treatment with mancozeb 50% + carbendazim 25% WS @ 2.5g/kg seed, yellow sticky trap @ 16/ha & need based spot application of NSKE (3%) & spraying of wettable sulphur @ 2g/lt as prophylactic measure). On the contrary 42.30% and 48.61% infestation of pod by pod borer and powdery mildew incidence was noted in local practices followed respectively. The benefit cost ratio was recorded highest in organic treatment (T_2) i.e. 3.27 followed by T_2 and T_1 (Table 2).

The comparative effect of the technology demonstrated in pigeon pea shows that Ali Cultivation along with seed treatment chemical fungicide (Carbenzim 25%+Mancozeb 50%) and seed enrichment with rhizobium (@ 250 g per 4 kg seed) and PSB (@ 250 g per 4 kg seed) followed by application trichoderma (@ 6 g per kg) with cowdung recorded as best option in respect of agronomic parameters which was reflected in yield also (12.69 q/ha). Only application of 2% DAP at 20-25 and 40-45 DAS, and 2% boron during pre flowering and post flowering period, respectively yielded 12.47 q per ha which was at par with T_4 (IPM). 10.5 q/ha yield was recorded from farmers own practices. Infested pod by pod borer (*Helicoverpa armigera* and *Etiella zinckenella*) and pod fly (*Melanogromyza obtusa*) and wilt incidence was lowest in chemical management (T_5: two round spinosad @0.3 ml per lt and emamectin benzoate @ 0.5 g per lt) and two round spray of copper oxychloride), which was 6.95%, 5.75% and 8.45%; whereas the infestation was recorded 27.25%, 19.55% and 32.40% respectively in local practices. Highest benefit cost ratio was obtained in the field demonstrated with IPM (T_4). The benefit cost ratio was estimated for the local check was 2.12.

Rhizobium is a biological nitrogen fixer found in association with the legume crop; seed enrichment with rhizobium can influence the crop growth via enhanced nodulation [4]. Legumes are phosphorus responsive crop, increased use of phosphatic fertilizer along with PSB yielded better crop growth

Table 1
Comparative analysis of different technology adopted in Black gram

Technology	*Plant Height(cm)*		*Seed/pod*		*Yield (q/ha)*		*% yield increase over untreated*	*Infested pod by pod borer (%)*		*Disease (% infestation)*	
	Treated	*Untreated*	*Treated*	*Untreated*	*Treated*	*Untreated*		*Treated*	*Untreated*	*Treated*	*Untreated*
T_1	44.7	39.6	9.6	7.86	7.2	5.2	38.46	16.46	42.30	19.25	48.61
T_2	52.3		11.4		9.1		75.0	9.63		7.89	
T_3	43.8		11.3		7.8		50	5.40		5.24	

[T_1: Seed treatment with rhizobium and PSB (@ 250 g per 4 kg seed) along with increased dose of phosphorus and 2% spray of DAP and boron; T_2: Spraying of panchagavya (3%) and dasaparni (1%) at flowering and pod formation stage; T_3: IPM (seed treatment with mancozeb 50% + carbendazim 25% WS @ 2.5g/kg seed, yellow sticky trap @ 16/ha & need based spot application of NSKE (3%) & spraying of wettable sulphur @ 2g/lt as prophylactic measure). % disease infestation was counted over no of plant infested Powdery Mildew; pod infestation by borer was counted over pod borer complex infestation]

Table 2
Economic parameters of the demonstrated technology in blackgram

Sl.No.	*Technology demonstrated*	*Farmer's Existing plot*				*Demonstration plot*			
		Gross Cost (Rs/ha)	*Gross return (Rs/ha)*	*Net Return (Rs/ha)*	*B:C ratio*	*Gross Cost (Rs/ha)*	*Gross return (Rs/ha)*	*Net Return (Rs/ha)*	*B:C ratio*
1.	T_1	18,375.00	36,400.00	17,650.00	1.98	20,075.00	50,400.00	30,325.00	2.51
2.	T_2					19,445.00	63,700.00	44,255.00	3.27
3.	T_3					19,765.00	54,600.00	34,835.00	2.77

Table 3
Comparative analysis of different technology adopted in pigeon pea

Technology	*Plant Height(cm)*		*Seed/pod*		*Yield (q/ha)*		*% yield increase over untreated*	*Infested pod by pod borer (%)*		*Infested pod by pod fly (%)*		*Disease (% infestation)*	
	Treated	*Untreated*	*Treated*	*Untreated*	*Treated*	*Untreated*		*Treated*	*Untreated*	*Treated*	*Untreated*	*Treated*	*Untreated*
T_1	119.3	108.9	3.9	3.2	12.69	10.5	20.86	18.50	27.25	12.5	19.55	25.30	32.40
T_2	110.4		3.7		12.47		18.76	15.25		14.25		11.25	
T_3	110.2		3.4		12.42		18.29	9.75		6.45		11.25	
T_4	112.3		3.6		12.47		18.76	8.50		6.25		9.45	
T_5	116.1		3.3		12.42		18.29	6.95		5.75		8.45	

[T_1: Ali Cultivation along with seed treatment chemical fungicide (Carbenzim 25%+Mancozeb 50%) and seed enrichment with rhizobium (@ 250 g per 4 kg seed) and PSB (@ 250 g per 4 kg seed) followed by application trichoderma (@ 6 g per kg) with cowdung; T_2: application of 2% DAP at 20-25 and 40-45 DAS, and 2% boron during pre flowering and post flowering period, respectively; T_3: application of Panchagavya (3%), Dasgavya (5%), Jeevamrit (5%); T_4: IPM (hellilure pheromone trap @ 12 per ha, yellow sticky trap @ 20 per ha and need based spot application of novaluron+ indoxacarb @ 2 ml/lt) and T_5: Chemical management of pod fly and pod borer using (two round spinosad @0.3 ml per lt and emamectin benzoate @ 0.5 g per lt) and two round spray of copper oxy chloride. % disease is counted over no of plant showed wilting; pod infestation by borer was counted over pod borer and pod fly infestation]

Table 4
Economic parameters of the demonstrated technology in pigeon pea

Technology demonstrated	*Farmer's Existing plot*				*Demonstration plot*			
	Gross Cost (Rs/ha)	*Gross return (Rs/ha)*	*Net Return (Rs/ha)*	*B:C ratio*	*Gross Cost (Rs/ha)*	*Gross return (Rs/ha)*	*Net Return (Rs/ha)*	*B:C ratio*
T_1	23500.00	49875.00	26375.00	2.12	23875.00	60277.50	36402.50	2.52
T_2					23145.00	59232.50	36087.50	2.56
T_3					22965.00	58975.00	36010.00	2.56
T_4					23010.00	59247.50	36237.50	2.58
T_5					24021.00	58995.00	34974.00	2.46

Table 5
Socio-economic impact parameters of the demonstrated technology

Sl.No.	*Crop and variety Demonstrated*	*Total Produce Obtained (kg)*	*Selling Rate (Rs/Kg)*	*Purpose for which income gained was utilized*	*Employment Generated (Mandays/ house hold)*	*Farmers Feedback*
1.	Black gram var. WBU-108	9,804.00	60.00	Family expenses and procurement of agro-inputs for next season	15	Satisfactory. Bold seeded variety, suitable for *kharif* season
2.	Red gram var. Laxmi (ICPL 85063)	27840	47.50		19	The variety (Laxmi) is suitable for kharif season. Bold seeded variety. Technology demonstrated are economic and feasible. But availability of bio fertilizer and IPM kits availability must be ensure

Table 6
Farmers' perception of the intervention demonstrated

Crop	*Farmers' Perception parameters*					
	Suitability to their farming system	*Likings (Preference)*	*Affordability*	*Any negative effect*	*Acceptability*	*Suggestions, for change/ improvement, if any*
Black gram	Yes	Convinced	Affordable	No	Yes	• Availability of spurious biofertilizer and IPM kits, • More Extension work to be entrusted for outreach programme to create mass awareness, • Availability of IPM tools • Quality seed availability • Market availability of quality inputs
Red gram						

as the phosphorus present in soil made available to the plant by the PSB. Cow dung enrichment with *Trichoderma viride* can check the soil borne diseases [5]. Organic amendments like panchagavya, dasagavya, jeevamrit, dasaparni influences the crop growth, imparts resistance to crop against pest via antifeedant or repellent effect [6]. They are the rich source of beneficial microbes those can influence plant growth characters. Dasaparni can be a good alternative of chemical pesticide in pest management. IPM is now the potential tool for pest management in eco-friendly way. Uses of different trap like pheromone trap, yellow sticky trap are now very much useful to manage the pest and gaining popularity among the farmers [7]. It is very useful to spray pesticides either chemical or biorational on need based; and application must be done in spot after effective scouting to reduce the pesticide load. Pre mix of novaluron and indoxacarb is very effective combination product of chitin synthesis regulator and voltage dependent Na^+ channel blocker which can control the lepidopteran pest as reported by [8]. Chemical management was found most potent technology in managing the pest of pulses. Spinosad and emamectin benzoate are both very specific towards lepidopteran caterpillar [9].

The socio-economic impact of the demonstrated technologies and farmers perception was recorded from the individual farmers under the programme. All the farmers were satisfied with the technology and as per their perception the technologies are affordable to them. Their suggestions and feedback recorded is duly presented in the table-5&6.

IV. CONCLUSION

It is unambiguous to conclude that the adoption of improved package of practices of pulses production technology may result in higher productivity per unit area. Small intervention like application of DAP at vegetative stage followed by boron spray or effective pest management using IPM technologies or organic amendments produced from locally available resources can give better impact on the production system. It is a divulged truth that the production of pulses crop gets influenced due to intensive intervention via CFLD programme with advancement in technology. It is a present demand to popularize the improved production technology of pulses. Role of extension institute will be the key factor in the value chain system to ensure food security, economic stability among the farming community of our nation.

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