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Performance Evaluation of CRIJAF Nail Weeder in Jute Growing Areas of North 24 Parganas District of West Bengal

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ABSTRACT

The study is based on the result of 153 front line demonstrations carried out by ICAR-Central Research Institute for Jute and Allied Fibres, Barrackpore in North 24-Parganas district during 2017-18 and 2018-19 on mechanical weed management through CRIJAF Nail weeder. The FLD on weed management through CRIJAF nail weeder was carried out to show reduction in cost of cultivation due to less labour requirement as compared to conventional practices as well as enhancement in yield. The demonstration yield was increased by 12.11 per cent over the local check. The average extension gap, technology gap and technology index were 360.50 kg/ha, 559.50 kg/ha and 14.38 during the period under study. On an average, the demonstrated field gave higher net returns (Rs. 87337 / ha) and benefit: cost ratio (2.37) compared to the local checks. It clearly showed that adoption of improved agro-technology can boost the economics of jute growers.

Key words : *Frontline demonstration; Technology gap; Extension gap; Technology index; Yield gap.*

Jute which is also known as a "Golden Fibre" is a commercial fibre crop which plays a significant role in the economy of farmers, especially for India and Bangladesh. In India majority of jute farmers belong to marginal and small farmers' category. The cultivation of jute is being done in 87 districts of India, out of which, 33 districts are identified as prominent jute growing districts. Most of the prominent jute growing districts are situated in West Bengal like, Murshidabad, Nadia, Hooghly, North 24 Parganas, Malda, Howrah etc. The economy of the jute farmers of the West Bengal, to some extent is very much dependent on jute crop. Around 30 percent of annual agricultural income of farmers of the state comes from cultivation of jute (*Das et al., 2006*). Since this crop is mainly grown by small and marginal farmers, increasing high cost of cultivation are not conducive to the farming systems.

Weeds are of special significance in jute cultivation because yields are adversely affected if weeding is not done timely or efficiently. Normally, in jute field grassy weeds dominate over sedge and broadleaf weeds and reach upto 90 per cent infestation. During the initial critical growth phase, jute being a C_3 plant cannot compete with C_4 weeds, which ultimately reduces the fibre yield of jute crop. It is revealed that human labour (77.15%) which includes family labourers also, is the major contributing factor in comparison to others towards high cost of cultivation of jute (*Chapke et al, 2006*). It has been reported that if weeds are not managed properly, loss of yield can be up to 70 per cent (*Ghorai et al., 2004*). Generally, jute growers follow two manual weeding (20-25 DAS and 35-40 DAS) preferably by khurpi, blade hoe or wheel hoe. It costs around 40 per cent of the total cost of cultivation and affects profitability. ICAR-CRIJAF, Barrackpore has developed CRIJAF Nail Weeder that can economize the cost of cultivation. It is able to reduce the labour requirement for weeding by 65 -80 per cent (*Ghorai et al., 2010* and *Annual Report of DARE, 2010-11).*

A cluster of technologies has been developed by

ICAR-Central Research Institute for Jute and Allied Fibres, Barrackpore for improving the jute production and fibre quality. In order to improve the profitability from jute, and the economic status of jute farmers, the improved technologies were taken to farmers' field of North 24 Parganas district of West Bengal through Frontline demonstration (FLD) programme under National Food Security Mission (NFSM).

Demonstration is one of the most powerful extension tools in communication of new ideas, methods and techniques in agricultural development. It helps to convince the farmers faster than any other method through the process of observing, hearing, learning by doing and experiencing things (*Pathak, 1999*). Productivity of jute per unit area can be increased by adopting feasible, scientific and sustainable management practices. With this in view, front line demonstrations were held at farmer's field, in a systematic manner, to showcase the potential of improved production technologies to enhance yield of jute. It was suggested strongly by *Chapke et al.,2006,* to introduce mechanized farming whenever possible to reduce cost of cultivation substantially.

One of the promising jute production technologies selected for demonstrations was CRIJAF Nail weeder. Conventional manual weeding in jute, involves around 40 per cent of the total cost of cultivation (*Saraswat, 1974*) and fibre yield reduction is up to 70 per cent under un-weeded situation and generates poor net return from jute cultivation (*Ghorai et al., 2004*).

METHODOLOGY

The frontline demonstrations were conducted by Agricultural Extension Section of ICAR-CRIJAF, Barrackpore in North 24 Parganas district of West Bengal during 2017-18 and 2018-19. The demonstrations were conducted in the farmers' fields under the direct supervision of scientists & extension personnel. Care was taken to organize interpersonal discussion, group interactions, field visits, farmers' day and scientist-farmer interactions for effective sharing / dissemination of information and solving their problems related with the jute cultivation. A total 153 front line demonstrations on mechanical weed management in jute through CRIJAF nail weeder was conducted at farmer's field.

The data on yield and economic performance were collected from FLD plots as well as control plots to work out the fibre yield, cost of cultivation, net returns with the benefit-cost ratio. More than 10 per cent difference between beneficiary and non-beneficiary farmers was considered as significant difference. The extension gap, technology gap and technology index were calculated using the formula as suggested by *Samui et al. (2000).*

Technology gap (q / ha) = Potential yield – Demonstration yield

Extension gap (q / ha) = Demonstration yield– Farmer's conventional practice yield

Technology index (per cent) = [Potential yield – Demonstration yield / Potential yield] x 100

RESULTS AND DISCUSSION

A comparison of the productivity level between front line demonstrations and local practices is shown in Table 1. It is evident from results that under the demonstrated plot, yield performance of jute was sustainably higher than that in the control plot following local traditional practices in all the years of the study (2017-18 and 2018-19). Fibre yield under demonstration plots ranged from (3215 – 3446 kg/ha) during the period under study. Technological intervention (CRIJAF nail weeder), thus, enhanced yield to a tune of 10.98 per cent during 2017-18 and 13.24 per cent during 2018-19 respectively, over the local practice. The results are in close conformity with the research results of *Chapke (2012).* The difference between realizable potential and current productivity is about 440-675 kg/ha. This yield gap can be narrowed down through faster adoption of improved agricultural technologies (*Ghorai et al., 2013*). Studies have indicated that the adoption of

Table 1. Yield differences of jute fibre for FLD on mechanical weed control

Year	No. of FLDs	Yield (Kg/ha)		Additional yield over local check (kg/ha)	(%) increase in yield over local check
		FLD	Local check		
2017-18	82	3215	2897	318	10.98
2018-19	71	3446	3043	403	13.24
Mean		3330.50	2970	360.50	12.11

recommended jute production technologies has the potential to give higher yield and income to the farmers (*Jha et al., 2008* and *Chapke, 2012*).

Similar enhancement in yield due to operation of CRIJAF nail weeder in jute under front line demonstrations was documented by *Kumar et al., 2015.* Yield in front line demonstration and potential yield of the crop was compared for estimating yield gaps. These gaps were further categorized as technology and extension gaps. Technology gap indicates a gap in demonstration yield over the potential yield, and this was 675 kg/ha and 444 kg/ha in 2017-18 and 2018-19, respectively (Table 2). The technology gap observed may be attributed to soil moisture availability, soil nutrient availability, competition between jute and weed for water and nutrient uptake etc.

Extension gap ranged from 318 kg/ha – 403 kg/ha during the period under study (Table 2). Higher extension gap identified in jute growing areas indicated that solution lies in adoption of jute production technologies (*Chapke et al., 2009*). A wide extension gap emphasizes the need to educate farmers for using mechanical means of weed control through CRIJAF nail weeder as part of improved production technologies, to reverse this trend.

Hence, to narrow down the gap between the two types of yield, not only location specific recommendation but improved agro-technologies are very much necessary. Greater use of the latest, improved production technologies can subsequently bridge this extension gap between demonstration yield and farmer's yield. New technologies, may, eventually lead farmers into discontinuing conventional weed management practices. Technology index refers to the feasibility of the technological intervention at farmers' field. Lower the value of technology index (14.38 per cent) means more is the feasibility (Table 2).

The economics of growing jute under front line demonstrations were estimated and results are presented in Table 3. Economic analysis of the intervention (CRIJAF Nail Weeder) revealed that besides higher production, participating farmers in FLDs realized a lower cost of cultivation due to less labour requirement as compared to conventional practices during the period under study. CRIJAF Nail weeder saved labour requirement for weeding by about 60 man-days which saved about Rs.15000-17000/- per ha over manual weeding operation which is less than the conventional method of weeding followed by the farmers. It also reduced drudgery and cost for thinning operation. This has proved that ICAR-CRIJAF technologies can play an important role in profitable and sustainable jute production by small and marginal jute farmers of West Bengal and thus, contribute to the doubling of their income.

Front line demonstrations recorded higher mean gross return (Rs.1,50,703 / ha) and mean net returns (Rs. 87,337 /ha) with average benefit: cost ratio (2.37) compared to the local checks (1.65) in our study. The findings of present study is in conformity with the findings of *Chapke (2012, 2013)* and *Mitra and Samajdar (2013)* who reported higher net return and B: C ratio in the FLDs on improved technologies in jute compared to the farmer's practices.

Table 2. Yield gap and technology index in FLD

Year	No. of FLDs	Technology Gap (Kg/ha)	Extension Gap (Kg/ha)	Technology Index (%)
2017-18	82	675	318	17.35
2018-19	71	444	403	11.41
Mean		559.50	360.50	14.38

Table 3. Economic evaluation of the FLDs

Year	Cost of Cultivation (Rs. /ha)		Gross Return (Rs. /ha)		Net Return (Rs. /ha)		B : C	
	FLD	Local check	FLD	Local check	FLD	Local check	FLD	Local check
2017-18	60142	75597	133103	114143	72961	38546	2.21	1.51
2018-19	66589	83642	168302	148620	101713	64978	2.53	1.78
Mean	63365.50	79619.50	150702.50	131381.50	87337	51762	2.37	1.65

CONCLUSION

On the basis of above findings in the present study, it is concluded that front line demonstrations of improved technology reduces technology gap to a considerable extent, thus leading to increased productivity of jute in North 24 Parganas district of West Bengal. This also improved linkages between farmers and scientists and built confidence for adoption of the improved technology. Productivity enhancement under FLDs over farmer practices of jute cultivation created a greater awareness, and motivated other non-adopters to adopt improved technologies in this fibre crop. It helps them to spend more (by 50%) on food, health, cloths and children's education and to invest for next crop cultivation including non-price advantages such as, generates family employment, source of domestic fuel, facilitate to keep clean field for cultivation of next crop, improve soil fertility (*Chapke,2013*). In a similar study it was observed that impact of the trainings and demonstration had 17.87 per cent more effect over the existing knowledge and management on the farmers to adopt the technology (*Sadat et al.,2017*). The results obtained from this intervention were encouraging in terms of yield, net returns and benefit-cost ratio as compared to farmers' practice. The impact of technological intervention has been summarized mostly on the basis of yield and its related parameters. This will help in motivating the farmers for larger adoption of the technological intervention.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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