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Impact Assessment of Adoption of Innovative Jute Production Technologies Developed by ICAR-CRIJAF

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ABSTRACT

ICAR- Central Research Institute of jute and allied fibres (CRIJAF) has developed a technology cluster of four different technologies- CRIJAF SONA, CRIJAF Nail Weeder, Multirow seed drill and improved seed variety JRO 204 (Suren). It has promised to increase the productivity of the jute fibres at the same time reduce the cost of cultivation by cutting off the labour requirements. In this context the villages of 24 Parganas (N) and Nadia districts of West Bengal were selected where the institute has already disseminated its innovative technologies. Two categories of 40 farmers, consisting of adopter and non-adopters, each from the two villages were selected in order to carry out the study in the year 2021. Total 160 respondents were selected as sample. The objective was to determine the impact of the interventions on the fibre yield, cost of cultivation, income and labour requirement in the jute farming using z-test as well as paired t test. The results revealed that adoption of the innovative jute production technologies have indeed brought positive impact by increasing the fibre yield and income as well as reduced the labour requirement and cultivation costs.

***Key words** : Adoption; Innovative jute production technologies; Impact assessment; Innovative technologies.*

In India, jute is the cash crop for a large segment of the poor and the marginal farmers in the states like West Bengal, Bihar, Assam, Meghalaya and Odisha and it continues to be an important commodity for employment and source of income. Although, India is the largest producer of raw jute and jute goods, the quality of the fibres produced in the country was deemed not up to the mark as per demand in the international market. To meet the demands of the jute industry, production of jute and allied fibres have to be increased. In order to increase the production, it is important to increase the jute productivity and to increase the area covered under jute cultivation. To address such issues the scientists of different disciplines of ICAR- Central Research Institute for Jute and Allied Fibres (ICAR- CRIJAF) has developed a cluster of technologies that could address the problems faced by the jute growers already identified by previous research studies. The following innovative Jute production technologies have been developed from the ICAR-CRIJAF and disseminated to their adopted villages. These technologies are presented below:

CRIJAF SONA- The talc based microbial formulation consisting of three different stains of *Bacillus pumilus* which reduces the retting of fibres duration by 6-7 days and increase fibre recovery by 9.7-12 per cent with improvement in the fibre quality in terms of colour, lusture, fibre strength etc. (*Majumdar et al., 2011*).

CRIJAF Nail Weeder- The nail weeder is a new weeding tool invented by CRIJAF which contains 2-15 nails fixed at 3 cm apart in a series each nail is 0.9-0.8 cm in thick, one scrapper and one tyne. CRIJAF nail is used for weeding and thinning in jute field at very early plant growth stage (5-7 days after sowing) (*Banerjee et al., 2020*)

Multirow Seed Drill - The manual jute seed drill mainly consists of seed dispenser-cum-seed box, main shaft, drive wheels-cum-transportation wheels, furrow openers and seed covering device etc. The spacing

between furrow openers is as per recommended spacing for the olitorius/tossa jute. When seed dispenser rotates, the seeds are fallen through these orifices in the furrow made by the furrow openers thus leads to line sowing of jute seeds (*Shambhu and Thakur, 2018*).

JRO 204 (Suren) - Typical characteristics of the improved variety of jute seeds are: non-shattering pod, resistant to premature flowering, non-lodging tall cylindrical stem, flowering 120 days, fibre yield 36-38 q/ha (*Kar et al., 2010*)

Assessment of the impact in an area of study plays a great role in the determination of the overall effectiveness of any intervention among the farming community. In this scenario the study has been conducted with the specific objectives i.e,

i. To study the impact of jute production technologies between adopter and non-adopter farmers with reference to some selected indicators
ii. To study the impact of jute production technologies among the adopter farmers before and after adoption of the technologies with reference to some selected indicators.

METHODOLOGY

In order to carry out the study, villages namely Brahmapur and Kumra were selected from the districts Nadia and North 24 Parganas respectively where ICAR-CRIJAF has disseminated its innovative jute production technologies. A random sample of 80 adopter farmers and 80 non adopter farmers were selected. Jute growers who have already adopted the technology package containing four innovative technologies i.e. CRIJAF Nail weeder, CRIJAF Multirow seed-drill, CRIJAF SONA and improved variety JRO-204 developed by CRIJAF since last 5 years, were considered as adopter famers for the study. Total 160 jute growers were selected for the study.

In order to detect the impact of the technologies, data were collected from both the adopter farmers and the non-adopter farmers as well as before and after adoption of adopters based on the indicators viz. fibre yield (quintals), cost of cultivation (₹), income (₹) and labour required (man days) per bigha (1ha=7.5 bigha) of land. Ex-post facto research design was followed for the study as adoption has already been occurred. Data were collected by personnel interview method through a structured interview schedule designed for the study. The suitable statistical tool i.e., independent samples 'z' test (sample size >30) was executed using software SPSS v26 to find out the significant differences between the selected indicators of two categories. Again, paired t test was employed to identify the significant differences before and after adoption of the jute production technologies among the adopter jute growers.

In order to access the impact of specific jute production technologies four major indicators were selected which acts as very important factors which determine the overall improvement of the farm condition. The data were collected during March-April 2021 using structured interview schedule. The respondents were interviewed personally, and their responses were recorded carefully. The findings were appropriately interpreted and the conclusions and inferences were drawn.

RESULTS AND DISCUSSION

The impact of jute production technologies between adopter and non-adopter farmers with reference to some selected indicators :

Yield : It is clear from the Z-test (Table 1) that the average yield per bigha of land was found to be 4.65 quintal per bigha for the adopter category farmers. While for the non-adopter category it was found to be only 3.53 quintal per bigha. This study found that the mean yield of the jute produced by the adopter farmers (4.65 ± 0.42) were significantly higher as compared with those of the fibre yield got by the non-adopter farmers (3.53 ± 0.59), t (158) =13.94, p=0.015. It was found significant at 5 per cent level of significance.

Therefore, it can be concluded that the farmers who have adopted the innovative jute production technologies developed by CRIJAF are getting higher fibre yield as compared to that of non-adopter farmers.

Cost of cultivation : The Z-test in Table 1 presented that the average cost of cultivation of jute was found to be ₹ 10043.75 per bigha for the adopter category farmers, while for the non-adopter category it was found to be ₹ 13364.00 per bigha. This study found that the mean cost of cultivation of the adopter farmers ₹ (10043.75 ± 1040.61) were significantly lower as compared with those of the mean cultivation cost as required by the non-adopter farmers ₹ (13364.00 ± 1567.44), t (158) = -15.78, p=0.001. It was found significant at 1 per cent level of significance.

Therefore, it can be concluded that the cost

Table 1. Comparison using independent samples z-test between adopter and non-adopter jute growers (N=160)

Indicators (Per bigha) (1ha=7.5 bigha)	Adopters (80)		Non-adopters (80)		t value	Sig.
	Mean	SD	Mean	SD		
Yield (quintal)	4.65	0.42	3.53	0.59	13.94*	0.015
Cost of cultivation (₹)	10043.75	1040.61	13364.00	1567.44	-15.78**	0.001
Income (₹)	17674.13	1805.96	15613.38	3278.76	4.92**	0.001
Labour requirement (mandays)	17.55	2.22	26.24	3.44	-18.98**	0.001

**Significant at 0.01 probability level; *Significant at 0.05 probability level

Table 2. Mean and Standard Deviation of the jute growers before and after the adoption of innovative jute production technologies and their paired t test values (N=80)

Indicators (per unit bigha)	Before		After		t value	P value
	Mean	SD	Mean	SD		
Yield (quintal)	3.84	0.44	4.66	0.42	-13.45**	.001
Cost of cultivation (₹)	12338.13	1690.84	10043.75	1040.61	16.16**	.001
Income (₹)	14606.25	1681.95	17674.13	1805.96	-16.27**	.001
Labour requirement (mandays)	23.98	3.53	17.55	2.23	17.46**	.001

** = Significant at 0.01 probability level

of cultivation per unit land of adopter farmers is significantly lower than that of non-adopter farmers.

Income : The Z-test table presented that the average income earned per bigha of land of jute was found to be ₹ 17674.13 for the adopter category farmers, while for the non-adopter category it was found to be ₹15613.38 per bigha. This study found that the mean income per bigha of land earned by the adopter farmers ₹ (17674.1 ± 1805.96) was significantly higher as compared with those of the mean income level of the non-adopter farmers ₹ (15613.38 ± 3278.76), t (158) = 4.92, p=0.000. It was found significant at 1 per cent level of significance.

Therefore, it can be concluded that the farmers who are adopting the innovative jute production technologies developed by CRIJAF are achieving higher income levels as compared to that of the non-adopter farmers.

Labour requirement : Table 1 indicate that the mean labour requirement per bigha of land of jute was found to be 17.55 mandays per bigha for the adopter category farmers, while for the non-adopter category it was found to be 26.24 mandays per bigha. This study found that the mean labour requirement in the jute cultivation as required by the adopter farmers (17.55 ± 2.22) was significantly lower as compared with those of the labour requirement of the non-adopter farmers (26.24 ± 3.44), t (158) = - 18.98, p=0.001. It was found significant at 1 per cent level of significance.

Therefore, it could be concluded that the farmers who have adopted the innovative jute production technologies developed by CRIJAF have employed a smaller number of labour as compared to that of the non-adopter farmers.

The impact of jute production technologies among the adopter farmers before and after adoption of the technologies with reference to some selected indicators.

Yield : Table presented that the average yield required per bigha of land of jute was found to be 4.66 quintals after the adoption of the jute production technologies. Before the adoption of the innovative jute production technologies, it was found to be 3.84 quintals per bigha. This study found that the average yield of the farmers after adoption (4.66 ± 0.42) which is significantly higher as compared with the average yield obtained before the technological adoption (3.84 ± 0.44), t (79) = -13.45, p=0.001. It was found significant at 1 per cent level of significance.

Therefore, it can be concluded that the farmers who have adopted the innovative jute production technologies developed by CRIJAF have subsequently enhanced their yield as compared with the yield obtained before its adoption.

Cost of cultivation : Table indicate that the average cost of cultivation required per bigha of land of jute was found to be ₹ 10043.75 after the adoption of the jute production technologies. Before the adoption of the innovative jute production technologies, it was found to be ₹ 12338.13 per bigha. This study found that the average cost of cultivation of the farmers after adoption (10043.75 ± 1040.61) which is significantly lower as compared with the average cost of cultivation before the technological adoption (12338.13 ± 1690.84), t (79) = 16.16, p=0.001. It was found significant at 1 per cent level of significance.

Therefore, it can be concluded that the farmers who have adopted the innovative jute production technologies developed by CRIJAF have subsequently reduced their cost of cultivation as compared to the cultivation cost utilised before its adoption.

Income : Table indicate that the average income earned per bigha of land of jute was found to be ₹17674.13 after the adoption of the jute production technologies. Before the adoption of the innovative jute production technologies, it was found to be ₹ 14606.25 per bigha. This study found that the mean income level of the farmers after adoption (17674.13 ± 1805.96) was which is significantly higher as compared with the mean income level before the technological adoption (14606.25 ± 1681.95), t (79) = -16.27, p=0.001. It was found significant at 1 per cent level of significance.

Therefore, it can be concluded that the farmers who have adopted the innovative jute production technologies developed by CRIJAF have experienced enhancement in their income level as compared to the income level before the adoption of the innovative jute production technologies.

Labour requirement : Table 2 indicate that the mean labour requirement per bigha of land of jute was found to be 17.55 mandays per bigha after the adoption of the jute production technologies. Before the adoption of the innovative jute production technologies, it was found to be 23.98 mandays per bigha. This study found that the mean labour requirement in the jute cultivation as required after adoption was (17.55 ± 2.23) which is significantly lower as compared with the labour requirement before the technological adoption (23.98 ± 3.53), t (79) = 17.46, p=0.001. It was found significant at 1 per cent level of significance.

Therefore, it can be concluded that the farmers who have adopted the innovative jute production technologies developed by CRIJAF have experienced reduction in the labour requirement as compared to the labourers required before the adoption of the innovative jute production technologies.

Similar results were found by *Naik et al. (2017)* implied that evenly distributed jute plant population by using Multirow seed drill has increased the fibre yield by about 10-15 per cent as compared to the broadcast method. The mechanical intercultural operations in line sown crop have reduced the cost as well as labour requirement for weeding and thinning by more than 50 per cent. *Das et al. (2017)* reported the reduction in man power requirement in fibre extraction process up to an extent of 3 mandays/ha as well as additional return of ₹13490/- per hectare by following improved method of retting using CRIJAF SONA. High prices for better quality fibre and increase in net return was also reported by *Majumdar and Satpathy (2014)*. Because of improved varieties of jute seeds released by All India Network Project on Jute and Allied Fibres (AINPJAF) that were resistant to premature flowering, 80 per cent of the jute area came under tossa jute owing to its higher fibre yield (*Mahapatra et al, 2012*). The study conducted by *Jha et al. (2022)* found that the results obtained by using CRIJAF Nail Weeder were encouraging in terms of yield, net returns and benefit-cost ratio as compared to the conventional practices. Also, it was able to reduce the labour requirement for weeding and thinning by 65-80 per cent (*Ghorai et al., 2010*).

Therefore, there is a wide scope of enhancing the current scenario of jute cultivation by adopting these promising technologies as developed by ICAR-CRIJAF through different extension methods. *Kumar et al. (2007)* found the significant role of training and demonstrations in the promotion of improved production practices of jute ensuring its adoption. Again, *Sadat et al. (2017)* found that farm training and demonstrations has a significant role in improving the knowledge and adoption of improved jute technology. Similar results were found by *Singh et al. (2009)* that the agricultural extension reforms have brought improvements in the extension systems along with considerable improvement in the adoption of new technologies and farm practices which would substantially increase the income of all sections of farmers in the study area.

CONCLUSION

ICAR-CRIJAF has developed a cluster of technologies for improving the jute production and

quality of fibres and have been disseminated among its adopted villages. Adequate extension efforts were aimed at proper adoption of these technologies among the practicing jute growers. The present study concluded that there were a significant and positive differences between the jute growers who have adopted these technologies with that of non-adopter farmers with respect to the indicators: yield, cost of cultivation, income and labour requirement. In addition to this, significant difference was found among the selected indicators after adoption of such innovative technologies as compared prior to adoption. This implied that the adoption of the jute production technologies has really brought positive impact among the jute growers' community by increasing their fibre yield and income and reducing their cost of cultivation and labour requirement in many farming operations during cultivation of jute, thus improving the livelihood of jute growers and bringing economic prosperity.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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