

1. Title: CRIJAF Single wheel jute weeder for intercultural operation in line sown dry land crops

2. Challenge: Weeds are major threat to all crops and removal of weed at early stage of crop growth facilitates better crop yield. Due to hot and humid climate and intermittent rain, the weed growth in jute, particularly at initial growth stage is so profuse that, controlling it becomes very troublesome and costly. Weed infestation in the field increases the cost of production and reduces the quality and quantity of crop. The initial 15 to 60 days after sowing of seed is critical period for weed competition and the reduction in yield due to weed is around 16 to 42 per cent. Effective land preparation involving primary and secondary tillage destroy the weeds to some extent. In India, particularly in major jute growing area, farmers still practicing broadcast method of sowing to avail limited soil moisture with less care in land preparation. Afterwards, the intercultural operation is done by manual uprooting of weeds which is labour intensive and costly. Due to shortage of labour in peak seasons, weeding operation cannot be done within short period of 20-35 DAE of plants. Manual weeding in jute field involves 40 % of total expenditure for jute cultivation and thereby reduction in fibre yield up to 70 % under un-weeded situation. Considering the socio-economic factors of the jute farmers and nature of land holding, there was a challenge to come out with a low cost and light weight manual weeder for mechanical weeding.

3. Initiative: As mechanization is gradually spreading amongst the farmers and they have become aware of the advantages of line sowing. The popularization and adoption of mechanical weeders have a great potential. Considering the above aspects, ICAR-CRIJAF initiated the research work by keeping the socio-economic status of jute farmers in mind to develop a low cost and light weight manual weeding machine suitable for operation in between line sown jute and other dry land crops for weeding out young composite weed flora. The main components of the push and pull forward type single wheel weeder consists of body frame, ground wheel, blade or tyne attachment frame (share type, hoe type and scraper) and handle. Considering the multi-purpose use of weeder in different types of soil, the body frame has been made sturdy for its durability and to withstand the pressure exerted during its operation. The weeder operates on a small size rubber cycle wheel for its smooth operation in the field with better stability and balance. The weeder can work with three types of blade *i.e.* 3-4 tines rake, scraper and share. The elbow flex-on angle of the weeder is kept at 100° to reduce the drudgery of operator while operating in the field. The handle grip is made of 22 mm diameter for comfortable hand gripping. The overall dimensions of the weeder including

handle are 53 cm width, 162 cm length and 92 cm height from the ground and its weight is 6.0 kg. Weeding operation is push and pull type in standing posture and removes weeds completely from its operational width of 18 cm. To avoid the accumulation of weeds ahead of tynes, the operator walks behind while using the tool.

4. Key result/Insight/Interesting fact

Mechanical weed control is any physical activity that inhibits unwanted plant growth. The operation involves removal, injure, kill or make the growing condition unfavourable for weeds. The weeding operation involves push and pull type and removes weeds completely from its operational width. It is easy to operate due to small cycle wheel (compact) as its ground wheel and suitable for shallow weeding up to the depth of 5.0 cm. It is used during the 15-30 days of crop age and controls 80-85 % weeds in the inter-row space. As far as physiological aspect is concerned, it is light in weight *i.e.* 6.0 kg and its handle height and angle of operation can be adjusted as per operator requirement. After the testing of machine at laboratory condition and field evaluation at ICAR-CRIJAF farm, it has been taken directly to the farmers' field in all jute growing states of India under various schemes. The technology is very promising as it reduces labour requirement by more than 60 man-days per ha, besides reduces drudgery and cost requirement in line sown crops. The weeding capacity/field capacity of weeder is about 0.026-0.028 ha/h (35 man-hours/ha).

Economic benefits:

- Saves labour requirement for weeding by 60 man-days
- Increases fibre yield by 10-15 %
- Saves about Rs.15000-17000/- per ha over manual weeding operation and 60% of weeding time.

Other benefits:

- Reduces drudgery
- Aerates soil, stimulates crop growth.
- Breaks soil crust.
- Reduces pollution.
- Large area covered in less time.
- Doesn't harm soil health like herbicides.

References:

1. Naik, R. K., Sarkar, S. and Jha, S.K. (2015). Development of improved weeder for jute. *JafNews*, 13(1):19.

2. Naik, R.K. Jha, S.K. and Sarkar S. (2017). Performance evaluation of manual weeders for jute crop in West Bengal, India. *Research Journal of Agricultural Sciences*, 8(6): 1341-1343.
3. Naik, R.K., Jha, S.K., Sarkar, S. and Ghorai, A.K. (2018). Performance evaluation of manual operated single wheel weeder for jute crop. *International Journal of Agricultural Engineering*, 11(1): 49-53.
4. Naik, R. K.,Ghorai, A.K., Jha, S.K., Sarkar, S., Samjdar, T., Shamna, A. and Roy, M.L. (2019). CRIJAF single wheel jute weeder, ICAR-CRIJAF, Barrackpore, Kolkata. P.6.

5. Impact:

The escalated cost of cultivation of jute in terms of human labour for weeding and thinning operation have drastically reduced the profit of farmers' and compelling the farmers to reduce the acreage of jute cultivation to accommodate the other profitable crops. Due to shortage of labour in peak seasons, weeding operation cannot be done within short period of time (20-35 DAE) and ultimately affects the crop yield. This technology is very ideal due to adoption of line sowing of jute by the farmers. The technology has been commercialized and demonstrated across the jute growing states during last 3-4 years with very positive feedback and acceptability. From positive feedback of the technology, National Jute Board, Ministry of Textiles (Govt. of India) sponsored a programme called Jute-ICARE, in technical collaboration with ICAR-CRIJAF, where CRIJAF Single wheel jute weeder was distributed around 2000 pcs. free of cost among the group of farmers of West Bengal, Assam, Bihar, Odisha and Meghalaya. By using the technology the farmers can earn additional monetary benefit of Rs. 15,000- Rs. 17,000/ ha by saving in manual labour cost involved in weeding and thinning operation.

6. Lessons Learned:

Generally jute farmers follow broadcast method of sowing to utilize the limited soil moisture availability due to summer rainfall. In this method, it is difficult to maintain the recommended seed rate due to small size seeds. In practice farmers use a higher seed rate (7-8 kg/ha) than recommended seed rate. To maintain optimum plant population of 5-6 lakh/ha in the field, excess 75-80% of the emergent seedlings are removed during weeding and thinning operation employing human labour. After using the CRIJAF Multi-row seed drill of low seed rate and spacing of 25 cm in between two rows, there is no need of thinning

operation. But farmers were very much reluctant to use this machine initially, therefore, we used more extension approaches prior to convincing the farmers for using this technology. We followed awareness camps, exposure visits, field days, result demonstrations, method demonstrations, farmers' field school, training etc.

Thereafter, farmers were convinced about its utility not only in line sown jute crop but also other dry land crops and vegetables. Some farmers' used this machine in broadcasted jute field to arrange the crop line for better intercultural operation. Besides, they experienced higher plant growth due to air circulation in the soil and soil moisture conservation using mechanical weeder. CRIJAF Single wheel jute weeder can be economically operated in field crops for mechanical weed management at early stages with reduced cost and drudgery.

7. Supporting Quotes and Images:

A. Mr Musha Shaikh, a farmer from Bara Andulia village under Chapra block of Nadia district, West Bengal was at first hesitating to follow line sowing and mechanical weeding due to ignorance of this novel technology. After attending the training-cum-demonstrations organized under Jute-ICARE Programme and interaction with Master Trainers of Jute-ICARE, he requested to demonstrate this technology in his field. After realising the advantages, he adopted the line sowing method in his field. He experienced reduction of human labour for weeding operation by CRIJAF Single wheel jute weeder. He told the Scientists from our institute that *“gaachh gulo khoob sustho aar samaan bhabe baadhchhey. Songe-songe nirani ityaadi korte khoob kom kharach laagchhey.”* (meaning the seedlings were healthy, stout and uniformly grown compared to the seedlings raised from broadcast land. Labour requirement for thinning and weeding operation was very much reduced). He found that the seedlings were healthy, stout and uniformly grown compared to the seedlings raised from broadcast land. Labour requirement was 60 % less for weeding and he saved Rs. 15,000/ha due to reduction in human labour. Since then, he has been using this technology and motivated his neighbouring farmers to adopt this.

B. Mr Santu Modal, a farmer from Boyra village under Bagdah block of North 24 Parganas district, West Bengal is a registered farmer in Jute-ICARE Programme. After attending the training on improved cultivation of jute and discussion with the MTs, he carried out line sowing and mechanical weeding at 20 days crop age with this machine. He was saved about Rs. 14000/ha in weeding cost. **The Extension Scientists visited his field during the operation of the machine and confirmed that “machine operation was quite easy, breaking soil crust, aerating the land as told by the concerned scientist. It covered more**

area in less time and most importantly there was a reduction of 52 labours per ha in this field condition.”

C. Mr. Pradeep Kumar Das, a farmer from Nahakghat village under Batadraba block of Nagaon district, Assam is an enlisted farmer under Jute-ICARE Programme. He is using this technology after discussion with Block Supervisor and Master Trainer of Jute-ICARE since 2016-17 cropping season. He is saving around Rs. 15000-18000/ha in weeding operation in jute and he also using the machine for other line sown crops like potato, pea, maize, vegetable etc.

D. Mr. Kuddus Ali, a farmer from Sunseri village under Batadraba block of Nagaon district, Assam is an enlisted farmer under Jute-ICARE Programme. He is using this technology since 2016-17 cropping season and saving weeding cost around Rs. 18000/ha in line sown jute crop of 20 days old.



Photo 1. Field operation of CRIJAF SWJW



Photo 2. Operation of SWJW in line sown jute crop



Photo 3. Operation by farm women



Photo 4. Creation of line broadcasted crop

8. Additional Information:

1. The technology was generated from Institute Funded project. Besides this, Agricultural Extension Section, ICAR-CRIJAF; National Jute Board and Jute Corporation of India helped to disseminate the technology to the jute farming community Jute-ICARE programmes.
2. Contact person for this story: Dr. R.K. Naik, Senior Scientist, ICAR-CRIJAF, Barrackpore, E-mail: ranjanagrieng@gmail.com
3. Unit price: Rs. 2,000/-
4. The commercial production and marketing of technology by:
 - ❖ M/s Creative Displayers,
55(26), S.N. Banerjee Road,
Barrackpore, Kolkata-700 120, West Bengal
Mobile No. 9830543631
Email Id.: sanjib_b2@yahoo.com

**Drs. R. K. Naik, S. K. Jha, Shamna A., S. Kumar, M. L. Roy & S. Satpathy
ICAR-CRIJAF, Barrackpore, Kolkata-700120**