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Improved production techniques of jute in drought like situation

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Jute is an important eco- friendly bastfibre crop grown in Eastern and Northeastern states of India. It is cultivated by around 40 lac small and marginal farm families (8 lac ha) of West Bengal, Bihar, Odisha, Assam, Uttar Pradesh, Tripura and Meghalaya. West Bengal is a leading state of the country in acerage and production of jute. Around 80% of total jute is produced in upland condition. Where drought like situation is very comman, and affects the production. Jute is acrop of 17-18 weeks and sown in mid March-April. There are three critical stages namely, 0-1 week, 3-4 week and 6-7 weeks. At these stages, the crop is more vulnerable to soil moisture deficit. Around 500 m.m. rainfall is required throughout the growth period of crop.

In recent years, at the sowing time of jute farmers from different jute growing areas frequently face high temperature (mid March-April), soil moisture deficit, uneven rainfall distribution (temporal deflection due to local and weather variation). Combined effect of all these factors are generally manifested in different form of water stress in jute crop. Generally, at the time of sowing water stress in the soil leads to poor germination and causes poor crop stand (against standard plant population around 6 lac/ha). As a consequence there is yield loss of 40-50%. Further, yield reduction upto 20-25% have been found due to plant with shorter height and narrow leaves. There are three types of drought like situation in jute crop depending upon the time of its occurrence namely, early, mid and late stage. At all three stages,crop growth are adversely affected. Agronomic interventions at the time of early and mid stage help in mitigating ill effects of drought like situation in jute crop. Water scarcity in late stage and at the time of fibre extraction is responsible for production of low yield with inferior quality (T.D. 6-7) of jute fibre. Use of water harvesting structure has been found beneficial at these stages. Under this circumstance, it has become very crucial to grow the crop successfully in order to meet the demand of jute industry. Besides, environmentalconsciousness around the globe has resulted in use of jute and its products. To fulfill the increasing demand of jute, it is inevitable to increase the productivity of jute fibre from such area because area of jute has remained. Further, due to scarcity of land area expansion is not possible. Also the productivity of jute in upland area is less than national average (2300 kg/ha in 2009-10). Central Research Institute for Jute and Allied Fibres, Barrackpore, Kolkata is a leading research Institute in the field of jute and allied fibres. Several agronomic technologies have been developed by the institute for cultivation of jute in drought like situation. The institute envisaged to uplift the economic condition of jute growers belonging to such areas through demonstration of developed technologies. During year 2010-2013 demonstrations were laid out at farmer's field with objectives of show the potential of technology as well as upgrade the knowledge and skill of growers in relation to drought like situation.In West Bengal, Murshidabad and Nadia are leading districts area and production of jute.Murshidabad district ranked Ist both in area under cultivation as (around 22%) well as production (23 %) of jute. One village was selected from each district. Devkundu village located in Beldanga block of Murshidabad and Gopalpur from karimpur block of Nadia district was selected. Farmers of both districts deeply plough their land after harvesting of *Rabi* crops. They raised the height of bund in order to increase the infiltration rate of rain water. Generally a farmer used higher dose of seed (6-8 kg/ha), NPK@60:30:30. Pre emergence herbicide Butachlor 100% EC @1 kg/ha is applied three to seven days before sowing of jute seed*. Farmers participating in the programme were selected on the basis of their past experience, capability, available resources and their trustworthiness.

During the demonstration, number of farmers and area gradually Increased (19 to 52 in nos. and 0.5 ha to 4 ha). Participants were marginal farmers with primary education and medium socio-economic status. Before laying out of demonstration soil samples were collected and analyzed. Soil sample of Murshidabad district contained pH 6-82-8.47, organic carbon 0.22-1.16%, available NPK 216-517 kg/ha, 8.7-151.9 kg/ha and 158-417 kg/ha respectively. Available sulphur in soil was 11.4-34.2 kg/ha. Similarly soil sample of Nadia district had pH6.8-7.5, organic carbon 0.52-1.70%, available NPK 334-633 kg/ha, 32.7-168.4 kg/ha and 171-641 kg/ha, respectively.

In early and late stage of jute crop, three techniques

Fig. 1 : Application of sulphur in jute

were demonstrated (application of sulphur @30kg/ha along with recommended dose of fertilizer, mulching@ 2 ton/ha and augmented nutrition *i.e.* NPK 80:40:40) in order to deal with drought like situation.In fisrt year 20110-11, demonstration on sulphur application along with recommended dose of fertilizer and mulching was laid out (Fig. 1and 2). Maximum jute fibre was obtained from application of sulphur over recommended dose of fertilizer (RDF). It also resulted in subsequent increase in oilseed crop grown in such sulphur applied plots. In following years, 2011-12 and 2012-13 method of mulch application was modified due to non-availability of material, its bulkiness, carriage and high cost factor etc. (Fig. 3). Also augmented nutrition was included (Fig. 4).

Fig. 2 : Application of mulch in jute@ 2 t/ha

Fig. 3 : Sowing of jute in crop residue of *moong*

Fig. 4 : Application augmented nutrition in jute

District wise fibre yield obtained through improved technologies has been depicted in Table 1. In Murshidabad yield gain was more in comparison to Nadia district. *Moong* (cv. Pant moong 5) was sown in mid January-mid February in order to deal problem of mulch application. The crop could be harvested after 60-65 days after sowing. It yielded 5-6 tonpulse/ ha as well as mulch material (around 2 ton/ha). In the field *moong* residues were left as such. Pulse provided nutritional security to the jute growers. The growers were also less affected from fluctuation of jute market price. After harvesting of pulse, jute was sown in mid March to mid April.

It is clear from Table 2 that mulch application gave highest additional return(8.40). at the same time, it had limitations like is availability, its bulkiness, carriage and high cost etc. Highest fibre yield in comparison to farmer practice was observed in application of sulphur along with recommended dose of fertilizer (3.46-5.10 q/ha) followed by mulch/pulse crop residue (3.36-4.0 q/ha) and augmented nutrition *i.e.* NPK 80:40:40 (1.9-3.35q/ha). A farmer can harness the potential of technologies depending upon availability of nutrient status of soil as well as mulch material.

Farmer's feedback regarding simplicity and complexity of demonstrated technologies were recorded over three point continuum. Around 6.52 farmers reported that there was problem in application of mulch materialat field level. Considering the fact, farmers were motivated to grow *moong* crop prior to sowing of jute crop. Most of them were agreed that demonstrated technologies were simple and cheap. They were aware that intensive cropping had depleted their soil and it could be replenished by applying particular nutrient as well as enhancing the dose of chemical fertilizer. This method helped in better utilization of local natural resources. It saved their time also.

For *in-situ* retting of whole jute plant in less volume of ground water,acircular micro-pond (6.5 m floor diameter, 7.5 m top diameter and 1 m depth) was constructedin 70-80 m² area. Retting was completed within 10-12 days against 18-21 days (conventional retting). A shilpaulin sheet (thickness 200 gsm) of 30feet x 27 feet was laid outin the pond (Fig. 5). It was filled with underground water. Early sown jute (around 20 March) of total 1 acre land could beretted thrice at 15 days interval (Fig. 6). Muddy water as a result of washing of jute fibre was channeled innear by paddy plot for irrigation. It produced higher fibre quality (2-3) of jute. It also saved transportation cost (harvested jute bundles to the retting spot) of around Rs. 7,000/ha. This micro-pond could

Fig. 5: Retting of jute in micro-pond

Fig. 6 : Extraction of fibre jute in micro-pond

Table 1 : Jute fibre yield under different drought management technologies

District	Application of sulphur with recommended dose of fertilizer (60:30:) (q/ha)			Average (q/ha)	Augmented nutrition *i.e.* NPK 80:40:40 (q/ha)			Average (q/ha)	Mulching/pulse crop residue (q/ha)			Average (q/ha)
	2010-11	2011-12	2012-13		2010-11	2011-12	2012-13		2010-11	2011-12	2012-13	
Murshidabad												
New method	32.50	32.24	23.02	29.25	-	29.85	23.20	26.52	34.41	32.24	25.50	30.71
Farmer's practice	29.18	26.75	20.87	25.60	-	26.75	20.87	23.81	29.18	26.75	20.87	25.60
Nadia												
New method	32.82	24.56	25.67	27.68	-	27.35	23.79	25.57	30.17	28.30	24.35	27.58
Farmer's practice	29.33	27.91	21.25	26.16	-	27.91	21.25	24.58	29.33	27.91	21.25	26.13

Table 2 : Economics of different drought management technologies

Method	Cost of fertilizer (Rs.)	Increase in input price	Yield (q/ha)	Increase in yield (q/ha)	Additional income (Rs.)	Additional income/ Rs
Application of sulphur with recommended dose of fertilizer (60:30:30) (q/ha)	3,915-4,606	2,325-2,735	31.60-32.60	3.46-5.10	3,948-6,920	2.97-5.09
Mulching/pulse crop residue	1,871-3,715	800	24.92-32.56	3.36-4.0	6,720-8,924	8.40
Augmented nutrition *i.e.* NPK 80:40:40 (q/ha)	3,742-4,974	1,200-1,801	23.50-29.85	1.9-3.35	3,800-6,700	3.20-3.72
Farmer's practice	1,590-3,715	-	21.06-29.20	-	-	-

*Year 2010-11 urea @ Rs.550/q, sulfa Rs.960/ha and jute fibre @Rs.2000/q
Year 2011-12 urea @ Rs.550/q, sulfa Rs.1000/ha and jute fibre @Rs.2000/q
Year 2012-13 urea @ Rs.550/q, sulfa Rs.1800/ha and jute fibre @Rs.2000/q

be used for rain water harvesting and for providing life saving irrigation in high value crops.

Besides, six one day training programmes were conducted to raise the awareness level of jute growers. The scientists of the institute explained the origin of drought like situation, its symptoms and its ill effect in jute crop, control measure etc. There was increase in the level of knowledge and skillof participating farmers (no.425) in relation to better utilization of natural resources like soil, rain water, under ground water, crop residue etc.

Serious efforts are desired from concerned organization in order to harness full potential of above technologies in wider scale in similar kind of jute growing areas.

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