JUTE IN INDIA

A STATUS NOTE

(JUTE AND MESTA)

DIRECTORATE OF JUTE DEVELOPMENT
GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE & FARMERS WELFARE
DAC&FW
NIZAM PALACE
KOLKATA-700020

STATUS OF JUTE AND MESTA IN INDIA-2018

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1. Introduction:

1.1 Jute is an important natural fibre crop in India next to cotton. In trade and industry, jute and mesta crop together known as raw jute as their uses are almost same. Raw jute plays an important role in the country's economy. Raw jute was originally considered as a source of raw material for packaging industries only. But it has now emerged as a versatile raw material for diverse applications, such as, textile industries, paper industries, building and automotive industries, use as soil saver, use as decorative and furnishing materials, etc. Raw jute being bio-degradable and annually renewable source, it is considered as an environment-friendly crop and it helps in the maintenance of the environment and ecological balance. Now-a-days, the people of the world are very much worried about the growing environmental pollution and ecological degradation and they are trying to find out a solution of this problem. In the process, they find out the virtue of the use of natural fibre like raw jute and as such there is a prospect of the crop in future. Jute as a natural fibre has some definite inherent advantages. Its silky lusture, high tensile strength, low exhaustibility, considerable heat resistance and long staple length are the qualities that can not be matched by synthetic fibre. Further attraction of Jute lies in its easy availability, inexhaustible quantity at a comparatively cheaper rate. Moreover, it can easily be blended with other natural and man made fibres.

1.2 As per latest estimate, Jute and Mesta shares to the tune of only 0.4 and 0.03 per cent respectively to the total cropped area (200.86 million ha) in the country (2013-14). With its insignificant coverage, it plays a predominant role in the country's economy by generating employment, earning foreign exchange, solving many of the socio-economic problems, etc. In earlier years, Jute was considered as a Golden Fibre but there after it had to pass through different critical situation. The main problem came in the way with the introduction of synthetic fibre by the end of sixties/early seventies. After the development of diversified product of jute fibre and due to growing concern about the environment pollution, the importance of jute has again revived. Jute being a natural annual renewal source of raw material, bio-degradable, safe, non-toxic and environment friendly, offer excellent fibre as raw material for different textiles and other utility products, apart from as raw material in the packaging industry in this environmentally vulnerable world. Considering the various problems in the crop, various development programmes like IJDP, SJDP, JTM, NFSM-Commercial Crop (Jute) etc. were taken up by the Government for improving the production and productivity of the crop from time to time.

1.3 Considering the agro-climatic requirements of the crop, the cultivation of jute is mainly concentrated in the eastern and north eastern India and that of Mesta, almost through out the country. Jute and Mesta is mainly rainfed crop baring about 20 per cent of jute which is raised under irrigated condition. As a result, the crop has to face various problems, particularly, for increasing the productivity of the crop. Besides, the crop is commonly known as small and marginal farmers' crop. At the time of partition of the country in 1947, the area under jute in India was only about 2.6 lakh ha with a production of about 16.7 lakh bales. But the country's requirement at that time was about 60 lakh bales. Thereafter, through various development efforts, the area and production has increased and at present, it is about 104 lakh bale of raw jute (2016-17). The productivity of jute has crossed 25 q/ha and that of Mesta 13q/ha during 12^{th} Plan period.

1.4 Even though jute agriculture is suffering from various problems, but it is meeting the requirements of raw materials to our industries. Virtually, there is no scope to increase the area under the crop to meet the additional requirement of fibre because there is a pressure on land for food crops and also the comparative return. Therefore, the additional requirement has to be made through increasing the productivity mainly. Considering the present day requirement and future projection, jute is not only to be considered in its quantitative perspective but also its qualitative aspects.

2. Crop Description:

2.1. Scientific Name:

Jute (*Corchorus sp.)*
Family: Sparrmanniaceae
Cultivated Species: *Corchorus capsularis*
Corchorus olitorius
Chromosome number: 2n=14
White jute (*Corchorus capsularis) is* a predominately self pollinated and tossa jute *(Corchorus olitorius)* is a partially cross pollinated species.

Mesta (*Hibiscus sp*.)
Family: Malvaceae

Cultivated Species: *Hibiscus cannabinus (2n= 36)*
Hibiscus sabdariffa var. altissima (2n= 72)
Both Hibiscus cannabinus and H. sabdariffa are predominately self pollinated crops.

2.2. Origin:

2.2.1 Raw Jute comprises of Jute and Mesta. Two species of jute viz., *Corchorus capsularis* known as white jute and *Corchorus olitorius* known as tossa/daisee jute belonging to the family Sparrmanniaceae and are cultivated for fibre purpose. *C. olitorius* is widely cultivated, and has originated from Africa (primary center of origin) with India or Indo-Myanmar region as its secondary centre of origin. This species has been reported from Africa, Asia and Northern Australia. The other cultivated species *C. capsularis* is found in Indo-Myanmar and South China region, but not in Africa and Australia. It has originated from Indo-Myanmar region including South China. In India, nine species of *Corchorus* (7 wild and 2 cultivated) have been reported so far.

2.2.2 Two species of mesta viz., *Hibiscus sabdariffa* var. altissima and *Hibiscus cannabinus* belonging to the family Malvaceae are cultivated for fibre purpose. *Hibiscus cannabinus* is in the genus Hibiscus and is probably native to southern Asia, though its exact natural origin is unknown. The *sabdariffa* (HS) mesta is commonly known as Roselle. However, in different places it is also known as Java jute, Thailand jute, Pusa hemp, Hemp, Chansi, Tengra pat, Lalambadi, Chukair, Yarra-gogu, Palechi, Puboibija etc. The *cannabinus* (HS) mesta is commonly known as Mesta or it is also called Kenaf. However, in general both the species are generally termed as Mesta in India. It is also known as Bimli, Decan hemp, Gogu, Channa, Ambari, Gongkusa, Sunkura, Sheria, etc.

2.3. Morphology:

2.3.1 Jute is an herbaceous annual plant, stems glabrous. Leaves 6-10 cm long, 3.5-5 cm broad, elliptic-lanceolate, apically acute or acuminate, glabrous, serrate, the lower serratures on each side prolonged into a filiform appendage over 6 mm long, rounded at the base, 3-5 nerved; petioles 2-2.5 cm long, slightly pubescent, especially towards the apex; stipules subulate, 6-10 mm long. Flowers pale yellow; bracts lanceolate; peduncle shorter than the petiole; pedicles 1-3, very short, sepals 3 mm long, oblong, apiculate. Petals 5 mm long, oblong spathulate. Style short; stigma microscopically papillose. Capsules 3-6.5 cm long, linear, cylindric erect, beaked, glabrous, 10-ribbed, 5-valved; valves with transverse partitions between the seeds. Seeds trigonous, black. The plant has tap root system with numerous lateral branches. It is hardy in nature and can grow well both on high and low lands and is able to tolerate waterlog conditions to some extent. Although both the species of jute (*C. capsularis* and *olitorius*) are alike in general appearance, there are considerable differences between them.

2.3.2 Mesta is an annual or biennial herbaceous plant (rarely a short-lived perennial) growing to 1.5-3.5 m tall with a woody base. The stems are 1–2 cm diameter, often but not always branched. The leaves are 10–15 cm long, variable in shape, with leaves near the base of the stems being deeply lobed with 3-7 lobes, while leaves near the top of the stem are shallowly lobed or unlobed lanceolate. The flowers are 8–15 cm diameter, white, yellow, or purple; when white or yellow, the centre is still dark purple. The fruit is a capsule, 2 cm diameter, containing several seeds. The fibres in kenaf are found in the bast (bark) and core (wood). The bast constitutes 40% of the plant. These fibres are long (2 - 6 mm) and slender. The cell wall is thick (6.3 µm). The core is about 60 % of the plant and has thick (ø 38 µm) but short (0.5 mm) and thin walled (3µm) fibres. Since the paper pulp is produced from the whole stem, the fibre distribution is bimodal. The pulp quality is similar to hardwood.

2.4. Nutritional Value:

2.4.1 Jute leaves are being used as vegetables in Africa, Middle East, South east Asia for a long time. Besides, it is also used as herbal medicine to control or prevent dysentery, worm and constipation etc. Jute leaves are being used as health-food in Japan. Jute leave is rich in vitamins, carotinoids, calcium, potassium and dietary fibers.

2.4.2 Mesta leaves are used for preparing pickles and curries. The mesta seed contain about 16 to 20 % oil which can be used for culinary purposes and for manufacturing soaps Kenaf seeds yield a vegetable oil that is edible with no toxins. Kenaf oil is high in omega polyunsaturated fatty acids (PUFAs) which are now known to help in keeping humans healthy. Kenaf seed oil contains a high percentage of linoleic acid (Omega-6) a polyunsaturated fatty acid (PUFA). Linoleic acid (C18:2) is the dominant PUFA, followed by oleic acid (C18:1). Alpha-linolenic acid (C18:3) is present in 2 to 4 percent. The PUFAs are essential fatty acids for normal growth and health. Furthermore, they are important for reducing cholesterol and heart diseases.

2.5. Important zones for cultivation in India:

Jute cultivation is confined to the eastern and north eastern States coming under humid and sub humid regions. These areas represent diverse soil climatic conditions.

Considering agro- climatic conditions of the region, the jute growing belt of India has been grouped into nine zones by Central Research Institute for Jute & Allied Fibres (CRIJAF) to facilitate the farmers and research workers as well of these diverse agro-climatic zones as under. These nine zones are given as follows:

i). Zone-I: Murshidabad, Malda (part), Nadia, Noth 24 Parganas, Howrah, Hoogly, Burdwan (part), Birbhum (part) of West Bengal. This region is marked by moderate to late rainfall. The soils are loamy and sandy loam, medium to low in N content and medium to high in P and K.

ii). Zone-II: Jalpaiguri, Coochbehar, Siligury sub-division, Malda (northern part). This area receives early and very heavy rainfall. Soil is acidic and contain medium to high N and generally deficient in P, K and Mg.

iii). Zone-III: Goalpara, Kamrup, Darrang and expanding areas of north bank of Brahmaputra of Assam. This area receives early and very heavy rainfall. Soil is acidic and contain medium to high N and generally deficient in P, K and Mg.

iv). Zone-IV: Garo Hills of Meghalaya, South Kamrup, Nagaon and expanding areas in Sibsagar south of Brahmaputra of Assam. This area receives early and heavy to moderate rains. This is red soils region with different degrees of laterization and new alluvial clay-loam soils, especially in eastern plains. Soils are mostly acidic, generally high in N and medium to poor in P, K and Mg.

v). Zone-V: Cachar of Assam and Tripura. The region is marked by high and early rains, Soils are mostly acidic, generally high in N and medium to poor in P, K and Mg.

vi). Zone-VI: It comprises of West Dinajpur of West Bengal and Purnea and Saharsa of Bihar with medium to heavy rainfall. Soil fertility status is medium to low.

vii). Zone-VII: Balasore and Cuttack of Odisha. Transported yellow and red soils of deltaic region are marked with late and medium rainfall and medium to low soil nutrient content.

viii). Zone-VIII: Low lying basin of Midnapur of West Bengal with annual inundation. Soil is buried laterite with transported alluvial soil. The soil is acidic and low in N, P and K content.

ix). Zone-IX: It covers Lakhimpur, Kheri, Sitapur and Bahraich districts of Uttar Pradesh in Tarai region with very late and poor rains. Generally, the soil is acidic, and poor in P and K and medium in N content.

Jute cultivation is mainly concentrated in the eastern and north eastern India while that of mesta cultivation is spread almost throughout the country. The crop can be grown in low, medium and high land situation, both moisture stress and water stagnating condition. White Jute can be grown comparatively in low land situation while that of Tossa Jute prefers medium and high land situation. Mesta is grown in almost all over the country. It being a hardy crop and can tolerate moisture stress; its cultivation is spread in different agro-climatic situations unlike jute which is concentrated only in eastern and north eastern States. In a major part of Jute area, particularly in North Bengal, Bihar and North-Eastern States, the soil is acidic in nature. However, the Jute crop is growing in these areas in existing situation adjusting the crop sequence.

3. Estimates of Area, Production and Yield:

3.1. State-wise position of area and production of Jute and Mesta:

3.1.1 In India jute is grown mainly in nine states, viz., West Bengal, Bihar, Assam, Orissa, Meghalaya, Nagaland, Tripura, Jharkhand and also Uttar Pradesh. State-wise normal (five years average of 2012-13 to 2016-17) area, production and yield of Jute have been depicted at **Annexure-I.** Presently, the normal area under jute in the country is around 7.43 lakh ha with a production of about 104.83 lakh bales. West Bengal contributes the maximum area to the tune of about 74.7 % and 78.6 % of total national area and production, respectively. In the case of Jute area, Bihar shared about 13.7 % followed by Assam 9.5 %. As regards Jute production, the share of Bihar was 13.5 % and that of Assam was 7.1 %. The other states contributed less in area and production of jute.

3.1.2 Mesta is grown in 13 States namely Andhra Pradesh, Assam, Bihar, Chattisgarh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Tamil Nadu, Tripura and West Bengal. The State-wise normal (five years average of 2012-13 to 2016-17) area, production and yield of Mesta have been presented at **Annexure-I.** Presently, the normal area under Mesta in the country is about 0.68 lakh ha with a production of about 5.64 lakh bale. Bihar being the major Mesta growing state shared 24.5 % and 43.6% of total area and production, respectively. The acreage under Mesta in the states i.e. Odisha, West Bengal, Andhra Pradesh, Meghalaya and Assam was 15.8%, 13.9 %, 12.7 %, 6.5% and 6.3%, respectively while the share of the states in Mesta production are 9.3%, 20.5 %, 13.0 %, 4.4 % and 4.6%, respectively. Mesta is grown in considerable area in Maharashtra (12.4%) and Nagaland (2.7%) but their production is less to the tune of 2.3 % and 0.4%, respectively.

3.1.3 The State-wise average Area, production and yield of Jute, Mesta and Raw Jute during 2012-13 to 2016-17 has been shown at **Annexure-II, Annexure-III**, and **Annexure-IV,** respectively.

It has been observed that there is gradual decrease in area coverage of jute and a large decrease of coverage of mesta from 2012-13 to 2016-17. The productivity of jute is showing a fluctuating trend but there was an increase of mesta Yield. The decrease of jute area is due to diversion of area to other competitive and remunerative short duration crops like maize, sesamum etc. mainly in West Bengal and Bihar, the major jute growing states. The decrease of mesta area is due to diversion of area to other remunerative short duration crops including horticultural crops mainly in Andhra Pradesh and Odisha.

3.2. Trend in Area, Production and Yield of Jute/Mesta in India:

3.2.1 It has been observed that from a level of about 2.6 lakh ha in 1947-48, the area under jute during the 9^{th} Plan period rose to about 8.6 lakh ha. Simultaneously, the production of jute from a level of 16.7 lakh bales in 1947-48 rose to nearly 96 lakh bales during the 9^{th} Plan period. Year to year, however, there was some fluctuation in area and production under the crop. It is, however, observed that the area under jute is gradually decreasing from 9^{th} plan period (8.6 lakh ha) to 12^{th} plan period (7.4 lakh ha) whereas the production is showing gradual increasing trend and accordingly, yield of jute reached about 25 qtls/ha in 12^{th} Plan from about 20 qtls/ha in 9^{th} plan indicating increasing trend.

3.2.2 From a level of about 2 lakh ha area under mesta during the First Plan (1951-1956), it has now come down to 1.1 lakh ha during the 11th Plan (2007-12) and even lower during 12th Plan period (0.7 lakh ha). However, with introduction of development programmes like Area Expansion Programme, IJDP etc., the coverage under mesta even rose to a level of about 3.8 lakh ha during the period of 1978-80. The production under mesta, from a level of about 8.5 lakh bales during the 1st Plan has come down to about 7.2 lakh bales during the 11th Plan and even lower during 12th Plan period (5.6 lakh bales). However, in the intermediate period, the production even reached to a level of about 18.8 lakh bales during the period 1978-80.The yield of mesta, however, did not showed increase much up to 7th Plan. The main increase in yield of mesta was noticed after the 7th Plan and it reached up to 11.6 q/ha. However, there was wide fluctuation in area and production of jute and mesta in different states and declined in most of the states. The trend in area, production and yield of jute and mesta has been shown at **Annexure – V.**

3.3. Area, Production and Yield of major crop growing countries:

3.3.1 Jute and Mesta (Kenaf) are grown in the world mainly concentrated in South-East Asian Countries and some African Countries. The major Jute/Mesta growing Countries are India, Bangladesh, China, Myanmar and Thailand. However, in China and Thailand, mainly Mesta (Kenaf) in grown. In the International scenario, Mesta is mainly known as Kenaf and it is *Hibiscus cannabinus.*

3.3.2 The Country-wise normal and yearly area, production and yield of Jute (five years average of 2012-13 to 2016-17) have been presented at Annexures-VI and VII. India is the major Jute/Mesta growing country sharing 51.76% and 56.51% of World Jute area and production, respectively. Bangladesh ranked 2nd position growing mainly Jute with 46.20% of area and 41.20 % of production in the world. The share of China in area and production of jute in world declined and at present it shared 0.76% of area and 1.07% of production. The average yield of Jute in the world was about 22.46 q/ha while it was 31 q/ha. in China followed by India(24.5 q/ha)and Bangladesh(20 q/ha).

3.3.3 **Gap of yield with other countries:** The gap of yield in other countries as compared to India with regard to jute (five years average of 2012-13 to 2016-17) is given at **Annexure-VIII**. The yield of jute was higher in China (3158 Kg./ha) than India (2452 Kg/ha.) and slightly lower in Bangladesh (2003 Kg./ha.). The countries having higher yield of jute than the world's average productivity (2246 Kg.ha) countries was in China, India and Egypt.

4. Crop Products, Demand/Supply and Export/Import:

4.1. Industrial use of Raw Jute: Raw jute as a natural fibre has some definite inherent advantages. Its silky lusture, high tensile strength, low extensibility, considerable heat and fire resistance and long staple length are the qualities that make it suitable for industrial use. Raw jute is mainly used in the industry in the manufacture of packaging materials. The major jute products are twine, yarn, hessian, sacking, carpet backing clothes, etc. These items cater to the packaging requirements of the sectors like food-grains, sugar, cement, fertilizer, cotton packaging, salt, postal canvass, vegetables, etc. This apart the jute is used as a source of fuel in the rural areas. Besides, the jute stick is also used as fencing, as wall of the kutcha houses, used in betel vine, etc.

4. 2. Diversified Use: In view of the competition of the Jute Sector in manufacturing traditional products and also the suitability of raw jute fibre for the manufacture of various

other utility products, initiatives have been taken to use raw jute for manufacture of various diversified products. These are : i) Jute-geo-Textiles; ii) all jute pile carpets, iii) paper and paper pulp; iv) decorative fabrics including wall cover, window curtains, etc; v) garments or apparel cloth either from pure jute or in blend with other textile fibres; vi) blanket, bed linen made of jute yarns blended with wool or synthetic fibres; vii) coloured/printed shopping bags; viii) rigid packaging for tea and apples; ix) soft luggage; x) handicrafts; xi) shoe and shoe upper; xii) non-oven products including automobile panels; xiii) jute composites; xiv) particle board from jute sticks for partition wall, table tops, false ceiling, etc. The demand and use of these diversified products are gradually increasing.

4. 3. State-wise processing units: At present, there are about 77 composite Jute Mills in the Country. The State-wise position is West Bengal – 60, Andhra Pradesh – 7, Bihar – 3, Uttar Pradesh – 3, Assam – 1, Orissa – 1, Chattisgarh – 1 and Tripura – 1. Besides, numbers of small scale units have also been established through out the Country mainly for the production of diversified products and other utility item from raw jute.

4.4. Demand and supply scenario of raw jute:

The Supply and distribution position of Raw Jute (2011-12 to 2016-17) are indicated hereunder:

(QTY : In lakh bales of 180 Kg each)

	2011 - 12	**2012 - 13**	**2013 - 14**	**2014 - 15**	**2015 - 16**	**2016 - 17**
Carryover	22.50	31.00	29.00	24.00	14.00	6.00
Production	102.50	93.00	95.00	72.00	65.00	90.00
Import	9.00	8.00	9.00	1.00	6.00	6.00
Total supply	134.00	132.00	133.00	97.00	85.00	102.00
Domestic consumption	10.00	10.00	10.00	12.00	9.00	10.00
Mill consumption	92.00	95.00	95.00	70.00	70.00	80.00
Total demand	103.00	105.00	105.00	82.00	79.00	90.00
Carry over	31.00	27.00	28.00	15.00	6.00	12.00

Source: Office of the Jute Commissioner, Govt. of India

4.5. Production of Jute Goods:

Item-wise production of jute goods (2011-12 to 2017-18) is indicated hereunder:

(QTY : IN 000' M.T)

(APRIL / MARCH)	**HESSIAN**	**SACKING**	**CBC**	**OTHERS**	**TOTAL**
2011 - 12	239.6	1164.6	3.6	174.1	1581.8
2012 - 13	210.0	1218.2	2.9	160.2	1591.3
2013 - 14	202.5	1150.4	3.3	171.5	1527.7
2014 - 15	211.3	901.8	3.0	151.2	1267.3
2015 - 16	196.5	891.9	0.0	128.9	1217.3
2016 - 17	178.6	871.6	0.0	92.3	1142.5
2017 - 18	173.3	902.7	0.0	102.1	1178.1

Source: Office of the Jute Commissioner, Govt. of India

4.6. Domestic Consumption of Jute Goods

Item-wise domestic consumption of jute goods for the last ten years is indicated hereunder:

(QTY : IN 000' M.T)

(APRIL / MARCH)	HESSIAN	SACKING	CBC	OTHERS	TOTAL
2008-09	249.8	1043.0	0.3	142.5	1435.6
2009-10	182.6	879.8	1.2	141.9	1205.5
2010-11	182.3	1034.4	0.9	133.4	1351.5
2011-12	184.2	1079.7	0.9	117.1	1381.9
2012-13	165.8	1118.7	0.8	113.9	1399.0
2013-14	157.6	1043.1	0.4	126.4	1327.5
2014-15	171.7	873.2	0	111.4	1156.3
2015-16	164.2	890.2	0	90.2	1144.6
2016-17	140.9	855.9	0	78.9	1075.7
2017-18	141.9	894.2	0	76.5	1112.6

Source: Office of the Jute Commissioner, Govt. of India

4.7. Export of Jute Goods

The item-wise export of jute products (2012-13 to 2017-18) are indicated hereunder**:**

(QTY : IN 000' M.T VALUE : Rs / Crores)

(APRIL / MARCH)		HESSIAN	SACKING	YARN	JDP	OTHERS	TOTAL
2012-13	Qty	66.2	67.7	43.8	0	7.7	185.4
	Value	903.28	416.47	221.16	363.59	87.30	1991.80
2013-14	Qty	50.1	84.6	25	0	6	165.7
	Value	861.03	527	143.58	483.88	106.46	2121.95
2014-15	Qty	80.2	46.9	23.6	0	7.7	161.7
	Value	769.5	296.6	138.7	508.6	100.4	1813.8
2015-16	Qty	77.7	38.7	16.9	0	5.1	155.2
	Value	827.3	307.5	118.5	562.3	73.7	1889.4
2016-17	Qty	78.6	46.6	9.3	0	4.1	155.1
	Value	930.2	411.9	72.8	590.9	68.5	2074.2
2017-18 (Apr-Nov)	Qty	58.9	31.7	10.9	0	2.4	114.7
	Value	632.9	290.9	82.4	399.3	43.4	1449.1

Source: Office of the Jute Commissioner, Govt. of India

It has been observed that the quantity of jute products exported varies from 114.7 to 185.4 thousand ton and the value of export varies from Rs. 1449.1 Crore to 2121.95 Crore. The maximum exporting item in last few years is hessian.

4.8. Import of Jute:

The import of raw jute and jute products (2005-06 to 2011-12) are indicated hereunder

QTY : IN 000' M.T; VALUE IN Rs. in Crore

(APRIL / MARCH)	Raw Jute		Jute Products						Total Import
	000'MT	Value	000'MT	Value	000'SQM	Value	Nos.	Value	Value
2013-14	52.803	146.56	128.061	583.37	46284.734	145.53	21161	0.21	875.66
2014-15	46.163	142.24	202.426	670.85	116874.131	222.25	45904	1.01	1036.35
2015-16	91.360	367.98	168.578	1012.68	95642.606	243.55	68576	0.32	1624.52
2016-17	138.871	704.22	129.049	788.43	37100.943	141.72	745664	1.45	1635.83

Source: NJB, Kolkata website

5. General Issues and constraints in raw jute production:

5.1 Raw jute comprises jute and mesta. Two species of jute viz., *Corchorus capsularis* known as white jute and *Corchorus olitorius* known as tossa/daisee jute belonging to the family tiliaceae and two species of mesta viz., *Hibiscus sabdariffa* var. altissima and *Hibiscus cannabinus* belonging to the family malvaceae are cultivated for fibre purpose. The fibre is obtained from the bark of the aforesaid plants of jute/mesta and known as bast fibre or stem fibre. After the harvest of the crop, the fibre is obtained by retting of the plants and as such it requires huge volume of water for retting. The cultivation of these crops has been spread to a particular set of edapho-climatic condition utilizing the natural resources. Jute cultivation is mainly concentrated in the eastern and north eastern India while that of mesta cultivation is spread almost throughout the country. Various problems are coming in the way of the production of raw jute, some of them are highlighted hereunder:

5.1.1 **Environmental Factor**: Climate, particularly, rainfall is one of the important factors in raw jute production. Raw jute (jute and mesta) is mainly grown under rainfed condition baring about 21 per cent of jute area which is raised under irrigated condition. The sowing of jute is taken up during March to May. As such, the sowing as well as the initial growth of the crop is highly dependable on rainfall. Even the crop is sown with the onset of a nor-wester shower, it may have to witness a drought situation after the sowing of the crop. On the other hand, at the later stage of the crop growth, it may have to witness water stagnation particularly in the northern and north-eastern belt i.e. in North Bengal, Bihar and Assam where early and heavy rainfall occurs even from the month of May. Under the situation even if proper technology is adopted, desired production may not be obtained due to this aberrant weather situation. It is, therefore, necessary to develop some varieties, which have got drought tolerance as well as pre-mature flowering resistance character. On the other hand, if the sowing is delayed, varieties required for such situation should have resistance capacity to water logging or water stagnation condition. The sowing of mesta is taken up during the months of April to June. As the crop is grown under rainfed condition, sowing is entirely dependent upon the receipt of rainfall during this period. The rainfall during the sowing period is uncertain and erratic and as such, the sowing of the crop is very often delayed. On the other hand, the early sown crop also suffers moisture stress due to lack of rains in the subsequent period.

5.1.2 **Crop Competition:** Raw jute being cash crop, the coverage as well as the use of various inputs is highly dependent upon the prevailing price of the fibre. Accordingly, it has been observed that whenever the price is high, the farmers take more care and invest more on the crop, thereby getting higher productivity. Besides, the farmer also intends to cover more area under jute to some extent. On the other hand, in the low price situation, the farmers are reluctant to invest more on the crop and also intend to reduce the area.

5.1.3 **Social Factor**: Raw jute is mainly grown by small and marginal farmer. As such, their investment capacity is poor. Even though proper technology is available but, very often it is observed that with the poor status of the farmers, they are not in a position to invest more on adopting proper technology, particularly, for the use of proper doses of fertilizer and proper plant protection measures.

5.1.4 **Seed**: Jute seed is mainly produced in far of places of the jute growing areas, i.e. in Maharashtra and Andhra Pradesh. It is very often observed that good quality particularly the certified seed does not reach to the far end, i.e. in Assam, North Bengal, Meghalaya and Tripura well in time. Accordingly, whenever, there is a shower, to avail optimum soil moisture condition, farmer use whatever seed is available in the market, may not be of good quality or may be of non-descriptive type. It is thus necessary that the jute growing states should take proper initiative for production and timely availability of jute seed in their state. In the case of mesta, though number of varieties has been developed, but availability of good quality seed is very less. Organized seed production of good quality seeds in mesta crop is very less. Accordingly, it is necessary to take up organized seed production of good quality seeds.

5.1.5 **Variety and Technology Adoption** : Presently, the most popular variety of jute is JRO-524 which has been developed more than 30 years back, However, some new varieties like JRO-8432, JRO-66, JRO-128, S-19, JBO-2003H, JRO-204, AAUOJ-1, CO-58, JBO-1, JRO-2407, JRC-698, JRC-80, JRC-532, JRC-517, JBC-5, etc. have been released. The potential yield of the jute varieties is 35 to 40 q/ha. But the actual achievement is little more than 50 % of the potential yield. Number of mesta varieties have been developed with a yield potentiality of 25 to 30 q/ha. But in actual practice, the yield achieved is much lower. In all India perspective, the yield achieved in mesta crops is nearly 11 q/ha. The main varieties of mesta are HS-4288, HS-7910, AMV-1, AMV-2, AMV-3, AMV-4, AMV-5, GR-27, AMV-7, HC-583, AMC-108, MT-150, JMB-2004-D, JRM-3, JRM-5. Due to various problems like weather, lack of good quality seeds, lack of proper technology adoption, the productivity is still low. However, in the Frontline Demonstration (FLD), the yield of jute is achieved to the tune of 30 q/ha or even more. Suitable implements for line sowing are still lacking. Virtually, the crop is mainly sown by broadcasting method. However, a multi-row seed drill has been developed which is gradually being popularized but being its high cost it is difficult for the farmers to have such implements. Hence, a cost effective implements is required for adoption of line sowing.

5.1.6 **Post Harvest Operation including Retting**: Retting is one of the important operations governing the quality of fibre as prevailed at present. Adequate retting facilities are not available everywhere. It is, therefore, necessary to develop a technology through which retting could be possible in a small volume of water and also in a short span of time. Some of the technologies like ribbon retting has already been developed and demonstrated for jute crop but being a labour intensive technology, it has not yet been popularized. Similar technology with cost effective in nature needs to be developed for mesta crops also.

5.1.7 **Marketing**: Raw jute is mainly a market oriented crop. Normally, the jute growers do not have the holding capacity of the fibre and the temporal disposal pattern shows that the growers usually dispose of their produce immediately after the harvest of the crop. The marketing of raw jute is mainly governed by the private traders as the institutional marketing covers not more than 10 per cent of the total produce. As such, the buyers show monopolistic attitude in respect of price of the fibre and the farmers are to depend on the mercy of the traders. To safeguard the interest of the farmers and to make an effective development programme, it is necessary to develop a proper marketing infrastructure for raw jute.

6. Varietal Development:

6.1. The various varieties of jute released for cultivation in India is presented below:

Sl. No.	Name of the Variety	Year of release	Potential yield (q/ha)	Significant attributes	Area recommended
1	**2**	**3**	**4**	**5**	**6**
***Corchorus olitorius* (Tossa jute)**					
1.	JRO 632 (Baisakhi tossa)	1974	30-32	Suitable for late sowing, induces premature flowering if sown before mid-April, pods shattering type.	Medium and upland
2.	JRO 878 (Chaitali tossa)	1974	30-32	Suitable for mid-March to end-April sowing, pods non-shattering , better fibre fineness and strength.	Medium and upland
3.	JRO 7835 (Basudev)	1974	32-34	Pods are non-shattering type, suitable for early sowing (mid-March to end-April), withstand waterlogging to some extent at later stage of growth.	Medium and upland; not suitable for low lying and high rainfall areas
4.	JRO 524 (Navin)	1977	32-40	Pods are non-shattering, suitable for early sowing , optimum sowing time mid-March to mid- April ; less susceptible to yellow mite and is resistant to root rot diseases, better retting quality, most widely cultivated jute variety (cover 80% of jute area)	Medium and upland
5.	TJ-40 (Mahadev)	1983	30-35	Pods are shattering type, better fibre quality, optimum sowing time is mid- April to end- April	Suitable for Orissa
6.	JRO 3690 (Savitri)	1985	30-33	Pods are shattering type, better fibre quality, suitable for late sowing optimum sowing time is April.	Medium and uplands of jute growing states

7.	KOM-62 (Revati)	1992	30-35	Pods are non- shattering type, optimum sowing time mid-March to late- April.	Suitable for Orissa
8.	JRO 66 (Golden Jubilee tossa)	1997	35-40	Pods are non-shattering type, fibre quality TD_2 grade, ideal for mid- April to early May sowing.	Entire tossa jute belt
9.	JRO 8432 (Shakti tossa)	1999	35-40	Suitable for mid-March sowing, premature flowering resistant, non-shattering pod.	Medium and upland of entire jute belt
10	JRO 128(Surya)	2002	32-38	Pods are non-shattering type, optimum sowing time is mid-March to end of April. Very good fibre quality which may be suitable for making value added products	Entire *olitorius* jute growing belt
11	S-19 (Subala)	2005	30-35	Suitable for early sowing in mid-March, resistant to premature flowering, tolerant to major pests, fibre quality is TD2	Medium and upland of West Bengal, Bihar, Assam and Orissa
12	JRO-204 (Suren)	2007	36-38	Suitable for early sowing , optimum sowing time is 1st week of March, resistance to premature flowering	Medium and upland of West Bengal, Bihar, Assam and Orissa
13	AAU-OJ-1 (Tarun)	2007	36	Suitable time of sowing mid-March, non-shattering type pod, resistance to premature flowering, better biotic resistance against stem rot, root rot, anthracnose and yellow mite.	Suitable for Assam
14	JBO-2003-H(Ira)	2008	38	Suitable time of sowing is mid-March, resistant to premature flowering, better fibre quality, better biotic resistance to stem rot, root rot, anthracnose and yellow mite	Assam, West Bengal, Bihar and Orissa
15	CO-58 (Sourav)	2010	34	Suitable time of sowing is mid-March, pods are non- shattering type, resistance to premature flowering, better fibre quality, resistance to major pest and diseases	Tossa jute growing belt of the country
16	JBO-1 (Sudhangshu)	2010	30-35	Suitable time of sowing is mid-March to end- April, pods are non-shattering type, low lignin content, resistance to premature flowering, better fibre quality, resistance to major pest and	Tossa jute growing belt of country

				diseases	
17	JROM 1 (Pradip)	2013	37-40	Suitable time of sowing is mid-March to end- April, Stem: Cylindrical , non-branching; Leaf colour: Green, laceolate shape; Flower:Petal colour; Yellow; Fruit: Pods green cylindrical, non-shattering	Tossa jute growing belt of the country
18	JROG 1 (Rithika)	2015	37-39	Suitable time of sowing is mid-March to end- April, non-shattering pod, resistance to premature flowering, resistance to root rot and stem rot disease , fibre quality is good, tolerance of abiotic stresses	Tossa jute growing belt of the country
19	JRO-2407 (Sampati)	2016	35-40	Suitable for early March sowing, 100-120 days fibre crop, good fibre strength, resistance to major diseases and pests.	Tossa jute growing belt of country
20	KRO 4 (Gouranga)	2017	29-31	Suitable for mid-March to mid-May sowing. Tolerant to stem rot disease and insects like semilooper, apion, BHC and yellow mite.	West Bengal, Assam, Bihar and Odisha
21	BCCO 6 (Kisan Pat)	2017	28-35	Coppery red stem variety with better fibre tenacity (21.18 g/tex) and fineness (2.81 tex), sowing in 2nd fortnight of April to May.	Tossa jute growing belt of country

***C. capsularis* (White jute)**					
1	JRC 7447 (Shyamali)	1971	28-30	Pods are non-shattering type, capable of utilizing higher dose of N_2 fertilizer, suitable for mid-March to mid-April sowing	Suitable for medium and upland of entire *capsularis* jute belt
2	JRC 4444 (Baldev)	1980	30-32	Pods are non-shattering type, optimum sowing time early-March to mid-April	Suitable for Orissa
3	UPC 94 (Reshma)	1983.	25-27	Pods are non-shattering type, suitable for late February to late March sowing.	Suitable for medium and upland of entire *capsularis* jute belt
4.	Hybrid C (Padma)	1983	25-28	Pods non-shattering type , suitable for late February to late March sowing.	*Capsularis* jute belt, for low-lying flood

					prone areas of N. Bengal, Assam and Bihar
5.	KC-1 (Joydev)	1992	26-33	Pods non-shattering type, suitable for early-March to mid-April sowing.	Suitable for Orissa
6.	KTC-1 (Rajendra Sada Pat-I)	1994	25-27	Pods non-shattering type, suitable for mid-April sowing in Bihar region	Suitable for Bihar
7.	JRC 698 (Shrabanti White)	1999	30-35	Pods non-shattering type, suitable for mid-March to mid-April sowing, fibre quality W_2 grade having fineness with fairly good fibre tenacity.	Suitable for low-lying flood prone areas of North Bengal, Assam and Bihar
8.	Bidhan Pat-3	2000	25-27	Pods non-shattering type, photo-period insensitive optimum sowing time between early March to early July and harvested by 110 days after sowing suitable for paper pulp industry.	Low lying flood prone areas of jute growing belt
9.	Bidhan Pat-1	2001	13-14	Pods non-shattering type, photo-period insensitive optimum sowing time between early March to early August , can be harvested in 60-65 days	Flood prone areas jute growing belt
10.	Bidhan Pat-2	2001	20-23	Pods non-shattering type, photo-period insensitive optimum sowing time between early March to early July , can be harvesting in 90-110 days	Flood prone areas of jute growing belt
11	JRC-80 (Mitali)	2005	30-35	Suitable for mid-March to early April sowing in both high and low land, can withstand drought at early stage of growth and water logging at later stage of growth.	North Bengal, Assam and U.P.
12	JRC-532(Sashi)	2009	30-35	Pod non-shattering type, drought resistant at early stage of growth and tolerate water logging and mature in 110 days after sowing	North Bengal, Assam, Bihar, Orissa, U.P.
13	JRC-517(Sidhartha)	2009	32-35	Pod non-shattering type, drought resistant at early stage of growth and tolerate water logging and mature in 120 days after sowing	North Bengal, Assam, Bihar, Orissa, U.P.

14	RRPS-27-C-3 (Monalisa)	2009	34	Suitable for mid-March sowing, pod non-shattering type, resistant to premature flowering, better fibre quality, resistance to major pest and diseases	West Bengal, Assam, Bihar and Orissa
15	NDC 2008 (Ankit)	2009	27	Suitable for mid-February to mid-March , better fibre quality, tolerant to drought and water logging, tolerant to major pest and diseases.	Bihar, Orissa, Assam, W.B. , U.P.
16	JBC-5 (Arpita)	2010	28-30	Suitable for mid-March, pod non- shattering type, resistance to premature flowering, better fibre quality, resistance to major pest and diseases	White jute growing belt of the country
17	JRCM 2 (Partha)	2013	27-28	Suitable for mid-March to last week of April sowing, Stem: Cylindrical , green with light red pigmentation; Fruit: Pods green ,capsule type in shame, non-dehiscence	White jute growing belt of the country
18	KJC-7 (Shresthaa)	2016	28-30	Ideal time for sowing im early March to early April, 110-120 days fibre crop	White jute growing belt of the country
19	JRC 9057 (Ishani)	2016	30-35	Green stem with light red pigmented variety suitable for March to April sowing. Very fine (1.31 tex) fibre quality and tolerant to stem rot and semilooper	West Bengal, Assam, Bihar and Odisha
20	AAUCJ 2 (Kkhyati)	2017	27-30	Green stem high yielding variety with better tolerance to semi looper and yellow mites and stem rot of jute.	Assam and white jute growing belt of the country

6.2. The various varieties of mesta released for cultivation in India is presented below:

Sl no.	**Name of the variety**	**Year of release**	**Yield (q/ ha)**	**Significant attributes**	**Area recommended**
1	2	3	4	5	6
Kenaf (*Hibiscus canabinus*)					
1	HC-583	1963	25	Most popular variety, tolerant to root rot disease	Mesta growing area of W.B.
2	AMC-108	1982	20-25	Resistant to foot and stem rot diseases, tolerant to jassids and spiral borer	Southern India, Bihar, Orissa

3	MT 150 (Nirmal)	2005	30	Superior paper pulp quality for newsprint.	Entire mesta growing belt
4	JBM-2004-D (Sumit)	2009	27	Resistant to foot and stem rot and tolerant to Spiral borer, mealy bug and good fibre quality and strength	North Bengal, Assam, Bihar, Orissa
5	JRM-3 (Sneha)	2010	25-38	Suitable for mid-April to mid-May, better fibre quality, resistant to major pests and diseases	Mesta growing belt of the country
6	JRM-5 (Shrestha)	2010	27.5	Suitable for mid-April to mid-May, better fibre quality, resistant to major pests and diseases	Mesta growing belt of the country
7	JBM 81 (Shakti)	2013	25.50	Suitable time of sowing mid April to mid May, Pod slightly cylindrical and non-shattering; seed colour: black	
8	JBM 71 (Shanti)	2013	27.49	Suitable time of sowing mid April to mid May, Petal colour yellow and stigma colour: red, Pod cylindrical and non-shattering; seed colour: black	
9	JRKM 9 1 (Satyen)	2016	24.26	Suitable for mid-April to last week of May sowing, , tolerant to major diseases (foot and stem rot) and major pests (spiral borer and mealy bug), better fibre tenacity.	Suitable for mid and highland rainfed situation.
10	JBMP 2 (Central Kenaf)	2016	28.42	Suitable sowing time is mid-April to last week of May, tolerant to foot and stem rot and major pests (spiral borer and mealy bug.	Suitable for mid and highland rainfed situation.
Roselle(*Hibiscus sabdariffa*)					
1	HS-4288	1967	20-30	Stem has bristles, tolerant to major pests and diseases.	W.Bengal, Bihar, Orissa, Assam, Tripura
2	HS-7910 (Ujjal)	1977	20-30	Stem has less bristles, resistant to major pests and tolerant to *Phytopthera pasrasitica*	W.Bengal., Bihar, Orissa, Assam, Tripura
3	AMV-1	1966	20	Stem has less bristles, highly susceptible to pests and diseases	A.Pradesh., Orissa, Tamilnadu., W.Bengal

4	AMV-2	1982	20	Stem has less bristles, highly susceptible to pests and diseases	A.Pradesh., Orissa, Tamilnadu., W.Bengal
5	AMV-3 (Surya)	1989	20	Stem has less bristles, resistant to foot and stem rot disease	A.Pradesh., Orissa, Tamilnadu., W.Bengal
6	AMV-4 (Kalinga)	1991	20	Stem has less bristles, moderately resistant to jassids and foot and stem rot diseases	A.Pradesh., Orissa, Tamilnadu., W.Bengal
7	AMV-5 (Durga)	2006	25	Good fibre quality, higher fibre yield, tolerant to pests and diseases under field conditions	A.Pradesh., Orissa, Tamilnadu., W.Bengal
8	GR-27 (Madhuri)	2007	27-30	Green stem with red patches only in nodes, tolerant to pests and diseases.	A.Pradesh., Orissa, Tamilnadu., W.Bengal
7	AMV-7	2011	25-30	Suitable for mid-May to mid-June sowing, maturity 130-135 days, tolerant to moisture stress, resistant to major pests and diseases	Mesta growing belt of the country
8	CRIJAF R 5 (Roselle Ratna)	2016	25-30	Suitable for mid-April to mid-May sowing, resistant to foot and stem rot diseases and major pests (jassids, aphids, semi-looper and white flies), has a better fibre fineness (2.69 tex) and fibre tenacity (18.88 g/tex)	Mesta growing belt of the country

6.3. State-wise Recommended New Varieties of Jute and Mesta:

State	Variety	
	Jute	Mesta
1. Andhra Pradesh		AMV-5 (Durga), GR-27 (Madhuri) and MT-150 (Nirmal), JRM-5 (Shrestha)
2. Assam	AAUOJ-1 (Tarun), JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), CO-58 (Sourav), JBO-1 (Sudhangshu) JRC-698, JRC-80, JBC-5 (Arpita), RRPS-27-C-3 (Monalisa)	

3. Bihar	JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), JRO-128 (Surya), JRO-66 (Golden Jubilee Tossa), CO-58 (Sourav), JBO-1 (Sudhangshu), JRC-698, JBC-5 (Arpita), RRPS-27-C-3 (Monalisa)	GR-27 (Madhuri) and MT-150 (Nirmal), JRM-5 (Shrestha)
4. Meghalaya	AAUOJ-1 (Tarun), JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), CO-58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita)	GR-27 (Madhuri) and MT-150 (Nirmal), JRM-5 (Shrestha)
5. Nagaland	AAUOJ-1 (Tarun), JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), CO-58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita)	
6. Orissa	JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), JRO-128 (Surya), JRO-66 (Golden Jubilee Tossa), CO-58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita), RRPS-27-C-3 (Monalisa)	AMV-5 (Durga), GR-27 (Madhuri) and MT-150 (Nirmal), JRM-5 (Shrestha)
7.Tripura	AAUOJ-1 (Tarun), JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), CO-58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita)	GR-27 (Madhuri) and MT-150 (Nirmal), JRM-5 (Shrestha)
8. Uttar Pradesh	JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), JRO-128 (Surya), JRO-66 (Golden Jubilee Tossa), JRC-80, CO-58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita), NDC 2008 (Ankit)	
9. West Bengal	JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), JRO-128 (Surya), JRO-66 (Golden Jubilee Tossa), JRC-80, JRC-698, CO-58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita), RRPS-27-C-3 (Monalisa)	

6.4. State-wise yield potential recorded under FLDs (AICRP project) vis-à-vis National/State average yield and yield gap analysis.

The gap in yield recorded in the Frontline Demonstrations (FLDs) as compared to the average yield of the states is shown at **Annexure-IX**. It could be observed that among major jute growing States, the highest yield gap was recorded as 954 Kg/ha in Bihar followed by Assam(693 kg/ha), Odisha (608 kg/ha), West Bengal (559 Kg/ha) and U.P(453 Kg/ha). Under mesta crop, the yield gap of 834 Kg/ha was recorded in Andhra Pradesh.

7. Climatic Requirement:

7.1. **Climatic requirement for cultivation of Jute/Mesta:**

Jute is a crop of humid tropical climates. It thrives well in areas with well distributed rainfall of 2,500 mm spread over vegetative growth period of the crop with no cloudiness. Locations with a mean rainfall of <1,000 mm, incessant rainfall and water logging are not suitable for its cultivation. For better growth, a mean maximum and minimum temperature of 34^{o}C and 15^{o}C and a mean relative humidity of 65% are required. Temperatures below 15^{o}C and above 43^{o}C during growth are not suitable for jute crop. *C. olitorius* can not withstand water logging, however, *C. capsularis* can withstand water logging, but its fibre quality is impaired with prolonged water stagnation. At a temperature below 10^{o}C, no germination occurs in both the species. *C. capsularis* can withstand higher temperature at germination (up to 32^{o}C), while *C. olitorius* is sensitive to such high temperatures.

7.2 Warm and humid climate are best suited to both the species of mesta i.e. *canabinus* and *sabdariffa. Canabinus* mesta is of short duration and suitable for higher rainfall areas and has got less drought tolerance capacity. S*abdariffa* mesta is of longer duration and got better drought tolerance capacity. The crop can grow in temperature range of 20 degree centigrade to 40 degree centigrade but optimum temperature for its growth is 30 degree centigrade to 34 degree centigrade. The crop can grow in high rainfall areas provided good drainage is there. On the other hand it can grow in low rainfall ares to the tune of even 500 mm rainfall per annum. However, a rainfall of about 125 to 150 mm per month distributed well is required during the growth period. Alternate rain and sunshine is good for better growth.

7.3 **Soils:** Jute can be raised on all kinds of soils from clay to sandy loam, but loamy alluvial are best suited. Laterite and gravel soils are not suitable for this crop. The new grey alluvial soils of good depth, receiving silt from the annual floods are the best for jute cultivation. A soil pH of 5.0-7.4 is within the tolerable limit of soil reaction. Soils with acidic pH (<4.5), effective soil depth <50 cm, electrical conductivity >2 dS/m and exchangeable sodium percentage >15 are not suitable for the crop. The crop is raised successfully on old alluvial soils of Bihar, mild acidic soils of Assam, Orissa, and light alkaline soils of *tarai* districts of Uttarakhand. It has been observed that clay loam for *C. capsularis* and sandy loam for *C. olitorius* are most suitable soil types.

7.4. **Jute cultivation in changing climatic scenario:**

7.4.1 Jute is predominantly grown as a rainfed crop (>85%) by marginal and small farmers of India. Nowadays jute farming suffers from deficit rainfall. The deviation of rain from the normal was -18.6 % during 2009-10 and it was -22.7% during the monsoon season (June-September, 2010). Thus draught is emerging as most important issue, which deserves adequate attention to sustain the jute farming under the changing climatic scenario. Hence, concerted research efforts are required to mitigate the drought stress through strengthening of breeding programmes for developing draught tolerant varieties, identification of QTLs for drought resistance and manipulation of agronomical practices etc. it is well known fact that jute is a short day plant and the critical day length has been worked out to be 12.5 hours. The reproductive phase would be induced if the day length went below 12.5 hours. This is the most unwanted phenomenon as far as best fibre crops are concerned. Although, at present the day length in the jute growing belts of the country and West Bengal in particular, is well above the critical limit during the cropping season, there may be every chance that the

duration of the sunshine hours may be getting reduced gradually over the next two decades. Therefore, development of photo-insensitive varieties of tossa jute should be given utmost priority in the research fields otherwise jute farming will be in oblivion due to vagaries of climatic condition.

7.4.2 Water logging due to flood is yet another important phenomenon that cannot be ignored to sustain the jute farming in the years to come. Tossa jute is more sensitive to water logging during early phase of its vegetative growth. Therefore, necessary efforts need to be taken to collect germplasm that are resistant / tolerant to water logging. This may ensure higher productivity in the flood prone areas of jute growing belts and Assam in particular.

7.4.3 The scientific community across the world is striving hard to combat the ill effects of climate change due to green house gases like CO_2. Jute and kenaf have tremendous potential to sequester atmospheric CO_2. The carbon sequestering capacity of jute and kenaf is several times higher than that of tree crops. Jute can sequester as high as 15 tonnes of CO_2 in 100 days. Therefore, jute and kenaf farming deserves appreciation and support from the scientific community and policy makers across the globe. In this context, carbon trading needs to be promoted and this will ensure additional income to the resource-poor farmers. In the era of environmental concern, in the near future the farm income through carbon trading may exceed the profit obtained from the sale of fibres.

8. Genetic potentiality advancement:

8.1. Genetic break through for yield improvement from ICAR/SAU/International organizations:

- Concerted efforts in genetic improvement of jute and mesta crops by Central Research Institute for Jute & Allied Fibres (CRIJAF) under ICAR have resulted in development of nearly 16 varieties in capsularis (white) jute, 15 varieties in olitorious (tosha) jute and 12 varieties in mesta.
- The selection and hybridization have been used as major methods of crop improvement in jute/mesta.
- Mutation breeding has lead to development of photo-insensitive genotypes of jute.
- Through intensive breeding efforts, crop duration has been reduced from 180-200 days to 120-130 days in jute, with concomitant increase in fibre yield and fibre quality.
- The jute varieties JRO-524 and JRC-321 and mesta variety HC-583 gained maximum popularity among the jute farmers due to their high yield and quality.
- New breeding initiatives have resulted in development of better quality genotypes like JRC-80, JRO-8432, and JRO-204.
- Assam Agricultural University, RRS, Nagaon has developed the new olitorius jute variety ‘Tarun’ (AAU OJ 1), which has high fibre yield, better quality and also resistant to root rot and stem rot diseases and becoming very popular in the state of Assam.

8.2. Advance tools to be applied if any like transgenic, genomics etc.

In the field of biotechnology, some developments have been made on jute, kenaf and mesta. Isolation of protoplasts, somatic hybridization and genetic transformation have been attempted in Bangladesh and India. Protocols for plant regeneration from jute (*C. capsularis* and *C. olitorius*), kenaf and mesta have been developed as it is a pre-requisite of transformation. Somaclonal variation should be utilized for creating wider genetic base for quality fibre production.

- The seed production is a problem in roselle and kenaf due to photo-sensitiveness; this can be overcome by development of Tissue Culture Techniques for effective utilization of somatic embryogenesis for production of synthetic seed.
- DNA fingerprinting should be done to improved genotypes of roselle & kenaf and other species of genus Hibiscus. This can effectively be utilized for overcoming photo-sensitiveness through transgenics.
- Development of varieties with some specific genes for example, Bt genes are not yet introduced in jute, kenaf or mesta. Biotechnological approaches are therefore needed for developing varieties with the insertion of specific genes beside the traditional approaches.
- *Functional genomics*: Molecular characterization of genes governing economically important traits like tolerance/ resistance to biotic and abiotic stress, fibre quality (strength, fineness, cellulose and lignin content), fibre development, and efficiency of retting microbes would ultimately lead to precision molecular breeding. As of now, identification of conserved domains, targeted disruption, complementation, cloning followed by constitutive, tissue specific enhanced expression, etc. are all reality in certain important crops, and should be applied for roselle and kenaf.
- *Bioinformatics*: Being a strong adjunct to molecular techniques, bioinformatics would be helpful to construct database for germplasm accessions of jute and allied fibre crops, based on morphological and molecular characterization done by different DNA markers and EST sequences. With concerted efforts to pyramid genes for productivity, fibre quality and resistance to stress along with location specific crop husbandry, the targeted national or even international level of jute and allied fibre crops may be achieved, for which bioinformatics should be of significant help.
- There is a strong need to develop jute genome for precise development of the crop to meet the quality attributes, for which an international collaboration with adequate funding is urgently called for.

9. Seed scenario:

9.1 Seed is one of the most key components governing the productivity of the crop. Jute being a bast fibre crop, both seed and fibre of good quality cannot be obtained from the same plant and the quality of fibre greatly deteriorates if the crop is left standing until seed maturity. Hence, the crop is to be grown separately for fibre purpose as well as for seed purpose. Considering the agro-climatic requirements of jute crop, the cultivation is mainly concentrated in the eastern and north-eastern states, viz., West Bengal, Bihar, Assam, Orissa, Meghalaya, Tripura, etc. but the production of jute seeds is mainly taken up in the states of Maharashtra, Andhra Pradesh, Karnataka, etc. Since the seed is produced in far off places of Jute growing State, it has been observed that very often good quality particularly the certified

seeds do not reach to the Jute growing areas timely particularly in North Bengal, Assam, Bihar etc. well in time. Since the seed is produced in other State, it has also been observed that there is lot of escalation in price of seed and also availability problem appears. Accordingly, consolidated efforts are necessary for production of seed and making availability of good quality seed to the growers of the state well in time and also with reasonable price.

9.2 On the basis of the coverage under the crop, the present level of requirement of jute seed in the country is near about 50 thousand quintals and that of mesta is about 16 thousand quintals. Both public and private sector organizations engaged in handling of production and marketing of jute seed in India The major public sector organization like National Seed Corporation (NSC), State Farm Corporation of India (SGCI), Maharashtra State Seed Corporation (MSSC), Andhra Pradesh State Seed Development (APSSDC) and Karnataka State Seed Corporation (KSSC), etc. are engaged in production and marketing of jute seed. Major seed production areas are Guntur and Prakasham in Andhra Pradesh, Akola and Amravati in Maharashtra and Bellary and Raichur of Karnataka. Presently nearly 25-30% of the seed requirement is supplied by the public sector and rest of the seed is supplied by the private sector. Previously, the coverage under certified seed used to vary between 30 to 35 per cent. But for the last three years, it has been observed that that the country's production of certified seed gone up to the total requirement of the country or even more. As per information received from the State Seed Certifying Agencies of the Jute Seed producing states, the production of certified jute seed is more than the requirement of the country and the maximum contribution is made by the Private Sector Organizations. However, the production of the seed is mainly confined to the old variety like JRO-524. Though numbers of new varieties have been released but most of the organizations are not taking up the seed production of these new varieties. Considering the price escalation factor, timely availability and new varieties, the jute growing states should come forward to take up seed production programme in the jute growing states. The organization-wise and year-wise production of certified jute seed for the last five years has been shown at **Annexure- X.**

9. 3. **State-wise seed replacement rate of crop:** The farmers virtually do not produce their own jute seed and entire seed is purchased by them from organized seed producing agencies/companies. As such almost 100 % jute seed is replaced every year. However, the seed replacement rate of jute reported by some of the jute growing States is indicated hereunder:

1. West Bengal- 100%
2. Bihar- 81.00%
3. Assam- 63.00 %
4. Odisha- 28.07%
5. Nagaland- 6.76%
6. Uttar Pradesh-100%

10. Crop Production Practices:

10.1. Time of sowing:

Sowing time of jute may differ from area to area on the basis of the receipt of pre-monsoon showers, availability of residual moisture and variety. Generally, sowing in middle of March is optimum for all Capsularis varieties and the Olitorius varieties like JRO-524, JRO-878 and JRO-7835 while JRO-632 should be sown only after middle of April. Olitorius

sowing may be staggered up to May. In Bihar and Uttar Pradesh, sowing is done up to mid July as per the onset of monsoon.

The recommended sowing for mesta crop is May-June for main season crop. However, in some areas particularly in some areas of Andhra Pradesh, rabi mesta is also raised. Sowing time for rabi mesta is February-March and usually sown with the sub-soil moisture. HC mesta being more susceptible to drought, it is usually sown under irrigated condition and also at early period. In India mesta is mainly a rainfed crop, coverage under HS mesta is maximum. However, HC mesta is also grown under rainfed condition in some areas, particularly is eastern and north-eastern states. Sowing should be done when there is sufficient moisture in the soil. A minimum of 21 per cent soil moisture content is required for germination. The seeds of *H. cannabinus* germinate within four days and seedling emergence is observed from fourth day onwards whereas *H. sabdariffa* seeds take five to six days to germinate.

10.2. Different Methods of sowing:

Sowing of jute can be done either by broadcast method or by line sowing method. Presently, 5 to 10 % of the area is hardly covered under line sowing in India. It has been established by the scientists that by adopting line sowing yield can be increased by 15 to 20 % over broadcast method. To ensure even distribution of seed, they are mixed with 3-4 times well powdered soil and broadcast cross-wise and after germination the excess plants are thinned out to maintain spacing of 10 cm (plant to plant). For line sowing, the land is prepared well and sowing is done with row to row spacing of: Capsularis – 30 cm, Olitorius – 25 cm and plant to plant spacing is maintained at 5 to 7 cm and this is done by mechanical means i.e. seed drill. A single row seed drill can cover about 0.1 to 0.15 ha per day. However, recently a multi row (4 row) seed drill has been developed and it can cover 0.8 to 1 ha per day. The depth of sowing is maintained at 2.5 to 3 cm. line sowing not only increases the yield but also reduces the cost of cultivation particularly by reducing the cost of intercultural operations which is main item of expenditure in jute cultivation.

Mesta is usually sown by broadcasting method. But as criteria of improved production technology, it is advocated to sow the crop in line. Line sowing can be undertaken with the help of seed drill. Line sowing has got certain advantages over broadcasting method such as i) Plant growth is uniform since uniform spacing is maintained, ii) Intercultural operation like weeding, hoeing, etc. become easier and cheaper. Iii) Application of pesticides and top dressing of fertilizer is easier, iv) Yield is higher by about 15-20%, v) Requirement of seed is less etc.

10.3. Land preparation:

Jute seeds being small require very fine tilth. The land can be prepared by ploughing and cross-harrowing 3-5 times followed by planking. In acidic soils (pH <6.0), incorporation of 1-1.5 t/ha of lime, 30-40 days before sowing is necessary for better crop performance. Soil moisture between 21-45% is considered ideal for proper germination.

Mesta being a rainfed crop, land preparation is usually done with the receipt of pre-monsoon showers. However, in Andhra Pradesh, for raising rabi mesta, the land preparation is done early in February for sowing the crop with the help of sub-soil, moisture.

10.4. Seeding technologies:

Depending upon the species of jute and method of sowing, the seed rate of the two species recommended is under:

Species	Seed rate in kg/ha	
	Broadcasting	**Line sowing**
C. capsularis	10	7
C. olitorius	7	5

The seeds are sown in row 20 cm (*olitorius*) and 30 cm (*capsularis*) apart. The plants within the row should be thinned manually at two stages. First thinning is done 20 days after sowing (DAS), when the plants are of 5-10 cm height . At this stage, plants are thinned to a distance of 5 cm. In second and final thinning 35 DAS, when plants are of 12-15 cm height, and are thinned to a distance of 10 cm. Thus the optimum population varies from 3.33 (*capsularis*) to 5.0 lakh/ha (*olitorius*).

The optimum plant population for mesta is about 4 to 5 lakh per hectare. The recommended row to row spacing is 25 to 30 cm and plant to plant spacing is 7 to 10 cm. if the crop is sown by broadcasting method then the plant to plant spacing is maintained at about 12-15 cm by thinning. For maintaining optimum plant population the seed rate for the two species varies. However, the recommended seed rate is higher than the actual requirement for maintaining the desired plant population. This is done because of getting uniform plant population. After emergence, the excess plants are thinned out to get desired spacing. The seed rate of the two species in two method of sowings are as under:

Species	Seed rate in kg/ha	
	Broadcasting	**Line sowing**
H. cannabinus	15-17	13-15
H. sabdariffa	13-15	11-13

Before sowing of seeds, it is always preferable to treat the seeds particularly to avoid the infection of the diseases to the crop. Seed treatment can be done with organo marcural fungicide like Agrosan GN of Ceresan at the rate of 5 gm per kg of seed or Dithane M45 at the rate of 4 gm per kg of seed or Bavistin at the rate of 2 gm per kg of seed.

10.5. Fertilizer management:

In general, the nutrient requirement of *capsularis* is more than that of *olitorius*. In soils with low organic carbon content, FYM application @ 5-10 t/ha, a month prior to crop sowing is recommended. The leaf fall from the standing crop and also root stubbles left in the soil after harvest results in recycling of handsome amount of nutrients besides organic matter in intensive cropping systems. Depending on soil fertility status, recommendations for use of fertilizers are:

Fertilizer	*C. olitorius*	*C. capsularis*
N	40 - 80 kg/ha	60 - 80 kg/ha
P	20 - 40 kg/ha	30 - 40 kg/ha
K	20 - 40 kg/ha	30 - 40 kg/ha

In heavy soils with low to moderate rainfall, all nutrients are applied as basal. In light soils and high rainfall situations, N is applied in 2 equal splits, ½ basal and ½ top dressing, i.e. preferably after weeding and thinning operations. Seed inoculation with *Azotobacter chroococum* and *Azospirillum brasilense* has been found promising to supplement part of N fertilizer. In acidic soils, P gets fixed; hence, their placement is better. K is usually applied as basal, but in leaching prone soils, split application is ideal.

In acid soils and regions with high rainfall, calcium and magnesium deficiency is common. Liming of soil @ 2-5 t/ha, once in 4 years or Dolomite application (40 kg/ha) is found promising as it supplies both calcium and magnesium.

In a medium fertile soil, the recommended dose of fertilizer for mesta is N-40 kg/ha, P2O5 – 20 kg/ha and K2O -20 kg/ha. Since, mesta is raised mainly under rainfed condition, the recommended dose of N in such cases is 25 kg/ha and it is mainly recommended for Andhra Pradesh.

10.6. Water management:

Jute requires about 50 cm water for its growth and development. In India about 15 % jute area is irrigated and the remaining area is rainfed. If the rainfall is not sufficient, the water requirement has to be supplemented through irrigation. For germination of jute seed, about 18-20 % soil moisture is required. At sowing time, if the soil moisture is not sufficient, then one pre-sowing irrigation is to be given. After sowing, usually one or two irrigations at an interval of about 20 days is required at the initial stages of growth. Thereafter monsoon rains supplement the irrigation. Jute is sensitive to both drought and water logging. At germination and knee-high stages, adequate soil moisture must be ensured by irrigation. During rainy season, the crop experiences water logging that adversely affects fibre quality. Provision of quick drainage in uplands will be beneficial to the crop. However, in lowlands, it may not be feasible.

In India, mesta is mainly raised as a rainfed crop. Since the pattern of rainfall during the sowing and growth period is highly erratic, desired yield is not obtained in mesta crop. For obtaining good yield, along with other inputs, the water requirement of the crop is to be fulfilled. The water requirement of mesta is about 50 cm. if the rainfall is uniformly is highly uncertain, in that case it is desirable to give one or two irrigation to mesta crop at an interval of 15 to 20 days.

10.7. Weed management:

Jute crop suffers from heavy weed infestation in the initial 6-8 weeks after sowing. Two-three hand weedings or mechanical hoeings are required to arrest weed menace. The first 2 manual weedings are combined with thinning operations at 20 and 35 DAS. The third weeding should be done 55-60 DAS. Due to continuous rains, sometimes manual weeding may not be possible. In such a situation, herbicide integrated with manual weeding is promising. Butachlor 50% EC or Pretilachlor 50% EC (pre-emergence, applied during sowing) @ 0.9-1.0 kg ai/ha combined with one hand weeding at 35DAS may effectively control the weeds. Recommended post-emergence herbicides for weed control include Quizalofop ethyl 5% @ 40-60 g ai/ha and should be applied 20 days after sowing.

Mesta is very susceptible to weed competition at early stage of growth. The growth rate of mesta is slower at this stage and over powered by weeds. The crop requires about two to three weeding/thinning operations depending upon the weed infestations. While two

weedings are practiced the first one is done about three weeks after sowing and the second one is done at about five weeks after sowing. In row-cropping wheel hoe is used for weeding operations and thinning is done manually. Weeding may also be done with the application of herbicides. Amongst the various herbicides, Basalin gave better result for mesta crop. Application of Basalin (Fluchloralin) @ 2 litres per hectare as pre-sowing (3 days before sowing) will kill almost all the weeds except sedges. However, application of Basalin as above followed by one manual weeding will give good result.

10.8. Plant protection:

10.8.1. **Insect pests of Jute and their control measures:**

A. Indigo caterpillar (*Spodoptera exigua* Hlon) – This is a pest of seedlings of jute. The young caterpillars are gregarious and feed on the epidermal tissues by webbing up the leaves or by joining two or more adjacent leaves. After they grow, they disappear and feed on leaves by making small holes in lamina or by margin and defoliate the plants. The crop sown early in the month of March or early April suffers much while late sown one generally escapes damage. Both the species of jute are affected. Weeding out the affected seedlings during thinning and spraying the infested crop with Fenitrothion 0.10 per cent, control the pest.

B. Thrips (*Ayyaria chactophera* Carni) – The pest are minute in size, black in colour and swift in movement. *Olitorius* jute get infested with this pest at seedling stage. The pest generally avoid light, remain in the fold of apical buds and draw nourishment from them. During feeding they macerate the leaf tissues in between veins, and when infested buds unfold the pest moves upto the next bud and thus macerate all buds in regular succession. The macerated tissues soon die and become prominent as white streaks in unfolded leaves. The pest is more common when the whether is warm and humid and dry spell intermittently prevails. Spraying with Fenazaquin 10 per cent EC @ 1.5-2.0 ml/lit, control the pest.

C. Burrowing or Field cricket (*Brachytrypes achatinus* Stoll) –They are seldom detected during day. The cricket causes extensive damage to seedlings. The pest lives generally in burrows and becomes active during night. The insects with their strong pair of mandibles cut the jute seedlings at grounf level and drag away the cut-ends in burrows built in the field. The pest is more prevalent in loam and sandy loam tracts of Assam and sub-Himalayan West Bengal. The fields of annul recurrence is to be given pre-sowing soil treatment with 3 per cent Heptachlor dust or 5 per cent Aldrin dust @ 30 kg/ha and 20 kh/ha, respectively. In the standing crop the damage may be checked by poison baiting with 10 g of wheat of paddy bran with 500 g of ‘gur’ or molasses and 30 g of Aldrin 50 WP.

D. Jute stem-weevil (*Apion corchori* Marshall) – Their presence is detected by their feeding habit. The adult weevil feeds on top leaves by making minute holes on the leaf lamina. Later on the female weevil bores a hole on the shoot apex of the seedling to lay eggs. The developing grub tunnels to some distance into the stem and damage the tissues. As the plant grows, the site of injury shift to the nodal point where a knot persists even after retting. Such knotty fibre constitutes a defect in fibre quality. Jute stem-weevil causes substantial damage to *capsularis* jute. Uprooting of the damaged plants and spraying Fenitrothion 0.01 per cent of Sevimol 0.08 per cent concentration three times at 15 days interval control the pest.

E. Red mite(*Oligonychus coffea* Noitner) – Both nymph and adult suck the sap of the older leaves from the ventral surface and gradually the infestation spreads to all the leaves. The leaves soon become leathery, turn yellow and drop-off prematurely. The red mite affects *capsularis* jute. Intermittent whowers followed by dry spell with high humidity and poor

interculture favours its infestation. Drenching ventral side of leaves with Dicofol (Kalthane 18 EC @ 850 ml/ha) 0.04 per cent or Binapacryl 0.04 per cent (Morocide 40 EC @ 375 ml/ha) twice at 15 days interval control the pest.

F. Semilooper (*Anomis sabulifera* Guen) – Both *capsularis* and *Olitorius* jute are prone to its attack. The semilooper mostly feeds on tender crown leaves (apical leaves) of both *capsularis* and *Olitorius* jute. The growth of the damaged plants is checked and plants induce to branching. They feed on leaves by making holes of irregular size and also by bitting of margin. In entire jute season, normally three waves of caterpillar attack are encountered with from end June to mid august, the second attack causes severe damage to the crop. It is common and most notorious of all the jute pests and widely distributed all over the jute growing tract. Providing perches for the predatory birds in the infested jute fields and spraying Fenvalerate 20 per cent EC @1 ml/lit or Cypermethrin 25 per cent EC @ 1-1.2 ml/lit on apical portion of the plants control the pest.

G. Hairy caterpillar (*Diacrisia oblique* Walker) – The caterpillars feed on the leaves of the plants. The ypung ones eat away the leaf tissues leaving only the outer membrane and skeleton thereof. The older caterpillars devour the entirer leaf. The pest is very destructive and in severe attacks the plants are entire defoliate leaving only bare stem standing in the field. It is serious pest in heavy rainfall areas of Assam, Bihar, Tripura and sub-Himalayan West Bengal while in other States it is sporadic in nature. Both *capsularis* and *Olitorius* jute are susceptible to this pest. Destroying the young gregarious larvae by plucking the leaves and putting them in bucket of kerosinised water and spraying *Lambda* Cyhalothrin 5 per cent EC @ 2 ml/lit, control the pest.

H. Yellow mite (*Hemitarsonemus latus* Banks) – It is highly destructive pest of both the species. Both adults and nymphs suck the juice of the lamina from dorsal side. The affected leaves present oily look but later turn to deep dull green with coppery brown shades. The laminae fold on the ventral face along the mid-rib and also along the secondary veins to give a crumpled appreance and finally the leaf curves along the mid-rib and downwards. The leaves infested heavily drop off prematurely. Growth of the plants gets checked with shortening of internodes. Warm and humid climate is conducive for development and spread of the pest. Dusting with lime-sulphur (3:1) @ 20 kg/ha and drenching thoroughly the ventral surface of the top leaves with Fenazaquin 10 per cent EC @ 1.5-2 ml/lit or Fenitrothion 0.10 per cent twice at interval of 15 days will control the pest.

I. Nematodes (*Meloidogyne incognita*) – The infestation is more in sandy loam and loamy soil where repeated jute cultivation is practiced. Nematodes affected the root and as a result gall or nodules are formed. In association with soil fungi, they affect the plants. As a result leaves first get yellow and gradually the plants wither away. Heavy gall formation is early stages of growth leads to arrest of growth of the crop. During crop season the infestation starts. Applying Carbofuran 3 kg a.i./ha or Aldicarb 3kg a.i./ha may control the pest.

10.8.2. **Diseases of Jute and their control measures:**

A. Seedling blight: It is caused by *Macrophomona phaseoli* (Tassi) Goid Fungi. The sowing of infected seed or presence of pathogen in the soil may cause this disease to both *capsulari* and *olitorious* jute at the seedling stage. The seedlings initially develop black lesions cotyledons which rot and wither; the tender stem then dries and turns brown. In humid condition it may turn black and rot. The incidences are in Hoogly, 24-Parganas, Malda, West Dinajpur in West Bengal; Purnea in Bihar; Cuttack in Orrisa and Tripura. Treatment of seeds

wither copper fungicides before sowing, applying farm yard manure or compost in sufficient quantity and lime to soil where pH is low would control the incidence.

B. Stem rot: The disease is caused by the same pathogen as in seedling blight, M. *phaseoli.* Both types of jute are susceptible. Lesions appear mainly along the apex and, argine of the leaves and ultimately the whole leaf is infected. The pathogen travels through the petiole and reaches the node, where it starts stem rot. High humidity and temperature above 33^{o} C favour infection and its spread. The disease is prevalent in Assam Valley; Purnea in Bihar; Cuttack in Orrisa, Hoogly and sub-Himalayan West Bengal in particular, besides all jute tracts in general. Applying soil ameliorant like lime in acidic soil; potash between 25 to 50 kg K_2O/ha.; Providing good drainage and improving the porosity of soil through application of organic matter, and spraying Copper oxychloride (50 per cent) concentration or 0.10 per cent of Bavistin at first infection and seed treatment with *Trichoderma viride* @ 10 g/kg seed are recommended as control measures.

C. Root-rot: This is also caused by the same pathogen *M. phaseoli* and both spices of jute are susceptible. The fungus infects the tap root directly. The infected plant show wilting as the first recognizable symptoms without any symptoms on the shoot. Finally, the infected plants turns brown to deep brown and become rusty brown, and these plants look dry and withers completely. The disease is notice all over the growing areas. Lime application to soil having lower pH; potash to soil in high dose; following crop rotation; providing proper drainage and spraying 0.1 per cent Bavistin at an interval of 20-25 days 3 times, may be adopted as control measures.

D. Collar rot: The collar rot is also caused by *M. phaseoli* in both the spice of jute. The collarregion i.e., 10-15 cm of the stem at the bottom is affected. Cankerous would on stem lead to breakage and ultimately death of the plant. The disease is prevalent all over the jute growing tract where soil is slightly clayey. Applying soil ameliorant like lime in acidic soil; potash between 25 to 50 kg K_2O/ha; and ensuring proper drainage and application of organic matter to improve the porosity of soil would check its incidence. Spraying Copper oxycholoride (50 per cent Cu) at 0.75 per cent concentration or 0.10 per cent of Bavistin 2-3 times at 20-25 days of interval is also recommended.

E. Hooghly wilt in *olitorious*: This disease is of annual occurrence on a wide scale in *olitorius* jute in the districts of Howrah, Hoogly, and Bardhaman in West Bengal where jute is followed by potato in the same field. The disease is known as 'Hooghly wilt'. The primary pathogen is *M. phaseoli,* while the secondary pathogens include *Fusarium solani* (Mart) and *Pseudomonas solanaceaum.* Soft brown or amber patches develop all over the stem which rapidly turn black and green colour of the stem fades quickly wilting occurs suddenly and rapidly. The stem withers and rots leads to death. Jute should note be followed by potao in the same field every year. Replacement of potato by 'aman' paddy or jute by 'aus' paddy or *Phaseolus mungo* replacing potato every third year should be practiced. Application of potash at the rate of 30 kg K_2O/ha reduce the incidence. Good drainage should be ensured. *Capsularis* jute is resistant to this disease and may be grown instead of *olitorius.*

F. Anthracnose of *capsularis* : The causal organism is *Colletotricum corchorum* Ikata and Tanaka. High humidity (above 84 per cent) and temperature above 33^{O}C favour infection. In beginning tiny, moist brownish black spores appear all over the stem. Latter on they coalesce together forming cankerous tissues. The stem may break from the infected point due to wind and die. The pods are also attacked by the fungus and shrivel. The disease is prevalent in Assam Valley, Surma Valley and Sub-Himalayan West Bengal. Treating the seeds with fungicides before sowing; growing resistant variety like JRC-212 and spraying Copper

oxychloride (50 per cent Cu) at 0.75 per cent 2-3 times after 7 days interval are recommended as control measures.

G. Anthracnose of *olitorius*: The disease caused by the fungus *C. gleosporiods* Penz. The disease is serious when nitrogen is applied beyond 60 kg/ha. When plants are more than 80 days old numerous lenticular small spots appear all over the stem. In mild form these sports remain superficial and do not affect the crop substantially. In severe case the necrosis goes deeper and spots coalesce to from cankers and the crop is damage heavily. The disease is most prevalent in Assam. Application of nitrogen should be restricted between 20-40 kg/ha. Treating the field with lime where soil pH is below 6.2, addition of potash at the rate of 20 kg K2O/ha and spraying Copper oxychloride (50 per cent Cu) at 0.75 per cent initial phase of infection on the stem are some of the control measures.

H. Soft rot: This disease is found on both the species of jute. The disease is caused by *Selerotium rolfsii* west. The fungus is soil borne. The disease initiates infection in late Jully onwards when the plants become older. Soft, brown, wet patches appear on the basal region of the plant above the ground level. Epidermal layer peels off exposing the fibres Turing rusty brown. Eventually plant breaks off from the point of infection. Concentric ring of light and dark brown bands on the stem indicate the presence of soft rot. The fungus thrives on fallen jute leaves or plant of previous harvest. The disease is prevalent in Assam and sub-Himalayan West Bengal. Deep ploughing and clean cultivation along with spraying Copper oxychloride (50 per cent Cu) at 0.75 per cent at basal region of the plant and the ground control the disease.

I. Die-back or black-band: Mature plants of both the spices are susceptible to the disease to the disease, caused by *Diplodia corchori* Syd. The apex of the main stem or branches begins to wither and dry up progressively from tip downwards turning brown to black. Ultimately, the plant withers, leaves drop off. Lack of requisite moisture in soil and low fertility favour the disease. It is most prevalent in the terai and red soil areas. Spraying Copper oxychloride (50 per cent Cu) at 0.5 per cent after fresh flush of flowers and seed treatment with Carbendazim 50 WP @ 2 g/kg of seed is recommended for control.

10.8.3. **Insect pests of Mesta and their control measures:**

A. Jassids (*Amrasca biguttula biguttula* **Ishida):** Jassid is one of the important sucking insects of mesta. It attacks both the species of mesta but the intensity of attack is more severe in *sabdariffa* mesta. August/September but decline from October. Both adults and nymphs injure the plant by sucking plant sap and injecting toxin saliva into the leaf tissue. The edges of the affected leaves first turn pale green, leter becomes yellowish green and finally red. In case of severe attack, the leaves curves downward and become crinkled. The plant growth becomes stunted and yield declines. Early sowing prevents the attack of Jassid. Jassid tolerant varieties like AMV-3 and AMV-4 is to be grown. Light trap may be used to control this pest. Seed treatment with carbofuran 3G @ 30 g/kg of seed prevent the attack upto 30 days age. On the standing crop if there is attack of this pest, Methyl Demiton (Metasystox 25 EC) 0.05% @ one litre (in 500 litre of water) per hectare or Dimethoate 0.05% @ 800 ml (in 500 litre of water) per hectare may be applied. The pest may also be controlled by biological method. The spider predator viz., *Chiracanthium mealnostoma* or *Thornisus katrajghatus* or *Oxyopes javanus* may be conserved in the field and this will suppress the attack of Jassids.

B. Mealy bug (*Maconellicoccous hirsutus* **Green**): Mealy bug is a predominant pest of *sabdariffa* mesta. Its attack is mostly confined to junctions of the plant. Both nymphs and adult female cause injury to the plant by thrusting their long filamentous styletes. The

attacked region sweels and internodes become shorter and deep green colour is developed. The vertical growth of internode is arrested. Due to severe attack the growing tip is damaged and secondary branches develop. These secondary branches again got infested and resulted in "bunchy tops", the characteristic symptom of this pest. At the time of extraction, the fibre snaps at the affected region resulted loss of fibre and ultimately reduction in yield. Crop rotation may be adopted to prevent attack in future. The bunchy top portion may be cut to prevent the spread of the pest. Chemically, the pest may be controlled by spray of Dimethoate (Rogor) 30 EC @ 0.05% (750 ml in 500 litre of water per hectare) or Metasystox 25 EC @ 0.05% (1 litre in 500 litre of water per hectare). Biological control measure may also be adapted. Four natural; predators *viz*., Hyperaspis maindroni, Spalgis epius, Chrysopa seclestes and Eublema silieula were identified to feed both eggs and nymphs of mealybug.

C. Semilooper (*Cosmofera erosa* **Green**)**:** Both the species of mesta are equally susceptible to semilooper. The pest usually appears in the months of September/October. The pest starts attacking the plant from apical leaves and gradually extends downwards. They start feeding from leaf margin and finally the whole leaf will be eaten away leaving only the midribs. In severe attack the growing points are also eaten away and thus pants become stunted and aften branching is induced resulted adverse effect on yield. The pest is nocturnal in habit and rmain hidden during day time. Mechanically, the pest may be controlled by the collection and destruction of the caterpillars. Spraying Fenvalerate 20 per cent EC @1 ml/lit or Cypermethrin 25 per cent EC @ 1-1.2 ml/lit, control the pest.

D. Spiral borer (*Agrilus Acutus* **Thumb)):** Spiral bores is found to attack mainly *cannabinus* mesta. It is most prevalent in high rainfall areas. The larva after hatching burrows its way beneath the cambium layer and starts feeding upon the woody tissues, making spiral around the stem beneath the bark and inner fibre layers are damaged. Infected regions swells up to form an elongated gall. Gall becomes week and breaks due to impact of strong wind. Seeds should be treated with Malathion 5% or Sevin 5% @ 10 gm/kg of seed. Spraying Fenvalerate 20 per cent EC @1 ml/lit or Cypermethrin 25 per cent EC @ 1-1.2 ml/lit, control the pest.

10.8.4. **Diseases of Mesta and their control measures:**

A. Foot and stem rot (*Phytohthora parasitica* **Muk**): This is primarily a soil born disease and mainly occurs under cloudy, high humid and low temperature condition. Usually, it is observed after heavy rains. Water logging conditions favours the spread of the disease. It is most prevalent in *sabdariffa* mesta: Plants of all ages is affected and affected both yield and quality of fibre. It is mostly found in September/October. Initially, withering of the terminal portion of the plant and pale colour of leaf is observed. After about 10 to 15 days of attack blackening of tissues at the base of the plant (foot region) is observed which gradually spread upto 60 cm height. The whole plant gradually wilted. During fibre extraction, the fibre breaks at the point of infection and fibre is discoloured. Water should not be allowed to stand in the field. Crop rotation should be followed. Roughing of the affected plants may be done. Resistant variety like AMV-3 may be grown. Seed treatment should be done with Dithane M-45 @ 3gm/kg of seed. Soil drenching may be done around the diseased plant with Dithane M-45 @ 2 gm/litre of water.

B. Leaf rot (*Phyllostica* sp**.):** The disease is occurred mainly in the month of August / September. Small concentrated ring like structures appear on the leaves and gradually increases in size and and gradually damaged the leaf. Dithane M-45 @ 0.2 per cent (2 gm/litre of water) may be applied in severe attack.

C. Tip rot (*Phoma sabdariffa*): It is usually found in *sabdariffa* mesta. The sisease appears in young plants aged about 30 to 40 days. The young plants droop and gradually die. The stem turns white. Application of Blitox 0.3% (3 gm/litre of water) or Dithane M-45 @ 0.2 per cent (2 gm/litre of water) will reduce the incidence of the disease.

D. Collar rot (*Sclerotium rolfsii* Sacc): Both the species of mesta is attacked by this disease. When the plant is attacked by this disease, deep seated lesions are observed on the stem at the grounf level. Virtually, no control measure of this disease has so far been developed. However, water logging in the field should be avoided to prevent the attack of this disease.

E. Root rot (*Pythium perniciosum* Serbino): *Sabdariffa* mesta is usually attacked by this disease. Seedings and young plants are attacked by this disease. The root are decayed, the plants wilted and subsequently die. Water logging should be avoided. Before sowing, soil should be treated with Blitox of Copper oxycloride @ 205 kg/ha. On standing crop, Copper oxycloride at 0.05 to 0.75 per cent may be sprayed on soil to control the attack.

F. Anthacnose (*Colletotricum polacci*): Mainly *cannabinus* mesta is susceptible to this disease. Initially terminal bud is attacked. Stipules and young leaves develop necrotic spots and withers. Stem infection appears as black lesions which later form cavities. Gradually defoliation occurs. Resistant variety like AMV-3 is to be grown. Seed treatment should be done with thiram @ 1.25 mg/kg of seed. Prophylactic spray with Copper oxycloride at 0.075 per cent may also be done.

G. Seedling rot (*Macrophomina phaseoli* Maubl): *Cannabinus* mesta is mainly susceptible to this disease. This disease is observed mainly under warm and high humid condition. The seedling initially develops black lesions on the cotyledons which rot and wither. Lesions appear along the apex and margin of the leaves and the whole leaf is infected on the growing plants. The pathogen travels through petiole and reaches the node and stem rot starts. Soil acidity should be corrected. Proper drainage should be maintained and potassium fertilizer should be applied, Copper oxycloride at 0.075 to 0.10 per cent may be sprayed.

10.9. Harvesting and post harvest operations:

10.9.1. Harvesting:

Jute is a bast fibre crop and can be harvested at any stage after a certain period of vegetative growth, usually between 100 to 150 days. Harvesting of jute crop at pre-bud or bud stage gives best quality fibre; however, the yields are low and older crop yields more quantity of fibre but the fibre becomes coarse and the stem does not ret properly. Hence, as a compromise between quality and quantity, early pod formation stage has been found best for harvesting. A 100-110 days crop may also be harvested to facilitate transplanting of paddy in time. Harvesting is done by cutting the plants at or close to the ground level with sharp sickles. In flooded lands, the plants are uprooted. The harvested plants are left in the field for 2-3 days for the leaves to shed. Next, the plants are tied into bundles 20-25 cm of diameter and the branching tops are lipped off to rot in the field.

The best time of harvesting is small pod stage for *cannabinus* mesta which usually occurs in October while for *sabdariffa* mesta it is at 50 per cent flowering which occurs in November. If the plants are harvested earlier to this, fibre yield will be low and many of the fibre are immature and soft and may loss at the time of extraction. If the harvesting is delayed or it is done at the maturity of the cop, the yield may be more but produces poor quality fibre

which is brittle and less flexible as the cellulose reserves decline due to its utilization by developing fruits and seeds.

10.9.2. **Retting:**

Retting is one of the important operations governing the quality of fibre as prevailed at present. The bundles are kept in 30 cm deep water, and later placed side by side in retting water, usually in 2-3 layers and tied together. They are covered with water-hyacinth or any other weed that does not release tannin and iron. The float is then weighed down with seasoned logs or with concrete blocks or are kept emerged (at least 10 cm below the surface of water) with bamboo-crating. Clods of earth used as a covering material or as weighing agent produce dark fibre of low value. Retting is best done in slow moving large volume of clean water. The optimum temperature is around 34^{o}C. If fibre comes out easily from the wood on pressure from the thumb and fingers, retting is considered complete. Adequate retting facilities are not available everywhere. It is, therefore, necessary to develop a technology through which retting could be possible in a small volume of water and also in a short span of time. Some of the technologies like ribbon retting has already been developed and demonstrated for jute crop but being a labour intensive technology, it has not yet been popularized. Similar technology with cost effective in nature needs to be developed for mesta crops also.

10.9.3. **Extraction of fibre:**

Two methods of fibre extraction are practiced – single reed method and beat-break-jerk method.

In single reed method, four or five reeds are taken out and stripping started from the bottom; the fibre of each of the reeds is slipped out free from the stick up to 8-10 cm, then gripped and pulled out slowly from the rest of the stick. Extracted strips of the bundles are washed in clean water.

In beat-break-jerk method, a handful retted stems in left hand are gently beaten at the base with a mallet, then the woody core is broken and the extractor twist the bundles at the middle, grips the fibre where the bundle is broken and shakes the bundles vigorously to and fro in water. The broken sticks slip out and water wrung out of the fibre. The fibre is then washed in clean water, rung and eventually spread to dry, preferably in shade or mild sun. The beat-break-jerk method often leaves the broken sticks and make fibre somewhat entangled resulting in sticky fibre.

10.9.4. **Grading:**

Grading of fibre is done based on six parameters namely, strength, defect, root content, colour, fineness and density. As per BIS specification there are eight grade classification of jute, i.e., W1/TD1 to W8/TD8 (W indicates white jute and TD indicates Tossa jute). Presently jute has been categorized into five grades TDN1 to TDN 5.

10.10. Use and recommendation of farm implements and machines used for different operations:

The farm implements used for different operations in the cultivation of jute and mesta are mentioned hereunder.

A. Multi row Seed Drill:

This implement is developed by CRIJAF. Manually operated multi-row (4 and 5 rows) seeder has been developed to sow jute seed in line. Seeder is operated by a man/women and sowing capacity is about 5-6 hrs/hectare. Seed requirement is 3-4 kg/hectare while sown with this multi row seed drill. Line sown crop favours better inter cultural operations especially weeding. The yield of fibre is comparatively higher.

B. Jute Weeder:

This implement is developed by CRIJAF. Manually operated (Push and Pull type) weeder suitable to operate in between rows of jute crop was developed and it is easier to operate by a man/woman. It is light in weight (about 6 kg) and the angle of wooden handle can be adjusted to hold firmly as per the need (height) of the operator. Weeding capacity of the weeder is about 0.045 hectare/hour, which is about 5 to 10 times more than the weeding done with the help of khurpi manually. This weeder is also useful in other line sown crops.

C. Manual Ribboner:

Manual ribboner has been developed by the research institutes/organizations for removing the ribbons from the plant. But the ribboning operation is yet to be made cost effective.

D. Jute Extractor/Bast Fibre Extractor:

Jute Extractor/Bast Fibre extractor has been developed by CRIJAF for extraction of ribbon/fibre. Some trials have been conducted but the machine has not been found cost effective and accordingly needs further improvement.

11. Cropping system:

Jute is one of the most suitable crop to fit in crop rotation. Since the harvesting duration of the crop is variable and accordingly it can be fitted in different crop rotations. Besides, shading of jute leaves improves the soil fertility. After the harvest of the jute crop the field remains clean, almost free of weeds. These are added advantage of jute to fit in a crop rotation. The recommended/common practices of crop rotations with jute are indicated hereunder;

Irrigated condition:

Jute-paddy-potato
Jute-paddy-gram
Jute-paddy-mustard
Jute-paddy-wheat

Rainfed condition:

Jute-paddy-pulses
Jute-gram
Jute-mustard
Jute-paddy

This apart some intercropping with jute can also be done like, Jute with Greengram, Blackgram etc.

Some of the recommended/generally followed crop rotations with mesta are indicated hereunder;

Mesta - Groundnut
Mesta – Sesame
Mesta – Sunflower
Mesta – Maize

12. Crop Development Programme:

The Government of India has approved Crop Development Programme on Jute for enhancing the production and productivity under National Food Security Mission-Commercial Crops (Jute) w.e.f. 2014-15. Under this Scheme thrust has been given on transfer of technology through frontline demonstrations and training in order to extend benefits to the farmers. From, 2015-16, in view of increased devolution to the States on account of implementation of recommendations of 14th Finance Commission, NFSM is being implemented on sharing basis between Government of India and States on 60:40 basis for general category states & 90:10 basis for North East & hilly states. However, the Central Agencies are funded 100% by GOI.

12. 1. **Aim and Objectives:**

The main objective of NFSM-CC (Jute) is to increase the productivity and to improve the quality of fiber.

12.2. **Area of operation:**

For jute, the NFSM-CC (Jute) is being implemented in Nine States viz. Assam, Andhra Pradesh, Bihar, Meghalaya, Nagaland, Odisha, Tripura, Uttar Pradesh and West Bengal. The mesta programme is being implemented in the States of Andhra Pradesh, Meghalaya, Orissa and Tripura. The programme is being implemented in the identified districts of the aforesaid States.

12. 3. **Implementing Agencies:**

A. State Programme:

The State programme is being implemented by the State Department of Agriculture of nine States, namely Assam, Andhra Pradesh, Bihar, Meghalaya, Nagaland, Odisha, Tripura, Uttar Pradesh and West Bengal.

B. Direct Funded Components (DFC):

The DFC is being implemented through two ICAR institutions (CRIJAFT & NIRJAFT), NSC, Directorate of Jute Development, etc.

12. 4. **Funding Pattern**

NFSM is being implemented on sharing basis between Government of India and States on 60:40 basis for general category states & 90:10 basis for North East & hilly states. However, the Central Agencies are funded 100% by GOI.

12. 5. **Components of the Programme:**

The programme components of NFSM-CC (Jute) will be implemented by the State/UT, Government agencies, ICAR Institutes, SAU, DAC (Directorate of Jute Development), etc. as specially focused scheme. The main components of the scheme are: 1. Production of Foundation Seed, Production of certified Seeds, 2. FLDs on alternate Retting technologies, 3. FLDs on Production technologies / Intercropping, 4. National level training (25 Participants for 3 days), 5. State level training (20 participants for 2 days), 6. Distribution of Certified seeds, 7. Distribution of nail weeder, 8. Distribution of microbial consortium such as CRIJAF SONA, 8. Local Initiatives (as per state specific needs) and 9. Contingencies & Electronic Print Media, Component wise pattern of financial assistance has been shown at **Annexure-XI.**

12.6. **Allocation, Released and Expenditure under NFSM-CC (Jute) during 2014-15 to 2017-18 (central share)**

The NFSM-CC (Jute) is being implemented from 2014-15. The allocation, released and expenditure (central share) from 2014-15 to 2017-is at **Annexure-XII.**

13. Special initiatives taken for encouraging the cultivation of the crop:

13.1. **Minimum Support Price (MSP)**:

The price policy of the govt. of India is to provide proper price support to the farmers for their produce. Keeping this objective in view, the Govt. of India every year announces the minimum support price for raw jute. It is an established fact that the support price recommendation will not become effective unless they are backed by the efficient market structure. In order to remove the structural weakness of jute marketing, the Govt. of India created the jute corporation of India (JCI) in 1971 which is committed to provide at least the minimum price to the growers. The state-wise procurement of jute by JCI for the last five years has been given at **Annexure-XIII**. The minimum support prices as announced by the Government of India for the last five years have been shown in **Annexure-XIV**.

13.2. **Marketing:**

Raw jute is mainly a market oriented crop and as such nearly 90 per cent of the raw jute produce by the farmers are sold out and only about 10 per cent is retained by them for domestic and other purpose. The jute growers are mostly marginal and small category of farmers and are general, poor in economic status. As such, their holding capacity is low and also has poor bargaining capacity in marketing raw jute. The institutional procurement is very limited and as such the marketing of raw jute is mainly governed by the private trading where the control of price is not maintained properly inmost of the years. Thereby very often the farmers are deprived of the remunerative prices. Since the price of the produce is uncertain the farmer are deprived of the remunerative prices. Since the price of the produce is uncertain the farmers are hesitant to invest more on the crop for undertaking improved production technology. As a result, even though the development programmes are in operation but the desired result is not always achieved. In view of this fact, it is necessary that the development of raw jute should be linked up with the marketing of the crop. As such, the concept of Technology Mission wherein all the aspects of jute sector could be coordinated for proper development of the crop is necessity. The price of the produce also depends on the demand and supply position of the crop and as such wide fluctuations in the price of raw jute is

noticed from year to year. Numbers of channels are involved in jute marketing from the growers to the ultimate consumers, i.e. mill. These channels are middleman, village hut, primary market, secondary market, terminal market, etc. accordingly, market scenario of raw jute in India may be viewed giving proper cognizance to the fact that the economy of about 40 lakh farm families cultivating jute and mesta is intractably linked with the marketing efficiency of the produce.

13.3. **Important markets in India:**

The important markets in different states of the country are indicated hereunder:

West Bengal	:	Beldanga, Bethuadahari, Toofanganj, Pundibari, Coochbehar Gangarampur, Balurghat Islampur, Jiaganj, Jangipur Katwa, Mathabhanga, Mekhliganj, Sheoraphuly, Champadanga Ghatal Haldibari, Kalna, Samsi, Baxirhat, Barasat
Bihar	:	Gulabbag, Punia, Salmari, Murliganj, Tribeniganj, Katihar, Supaul, Forbesganj, Araria, Kishanganj, Saharsa
Assam	:	Gauripur, Bohorihat, Dhing, Kharupetia
Andhra Pradesh	:	Vijayanagaram, Bobbili
Orissa	:	Kendrapara, Anandapur
Tripura	:	Agartala, Udaipur

13.4. **Crop insurance:**

Jute crop is covered under National Agriculture Insurance scheme (NAIS) in the major growing States of West Bengal, Assam and Odisha. Farmers growing jute under notified blocks are eligible for coverage under crop insurance scheme. This scheme is available for both loanee and non-loanee farmers. The Government is implementing Pradhan Manntri Fasal Biman Yojana (PMFBY) and jute crop is also covered under the yojna in notified blocks of Assam and West Bengal respectively.

14. Economics of Jute Cultivation:

14.1 Jute being a commercial crop, its cultivation is very often related to the return or prevailing market price of the crop. That market price is variable and some time it is even not ruminative, but farmers continue to grow jute with some variation as the crop has got some other socio-agro-economic advantages. The harvesting duration of the crop is variable. It can be harvested at 100 days age crop; it can be harvested even at 130 days. Accordingly, it can be fitted well in crop rotation. Jute being a labour intense crop, farmer gets employment opportunity in jute cultivation. In rural area, jute stick serves as on of the main sours of fuel. After harvest of the crop, the jute leaves sheded in the field improves the soil fertility.

14.2 As per information gathered from CRIFAF and the State of West Bengal, the profit margin for cultivation of jute is nominal and if the entire items of cost of cultivation (including rental value of land) is considered then the profit may be negative. It has been observed from the information that the cost of cultivation comes to about Rs. 47000 to Rs. 50000 per ha excluding the cost of rental value of land and interest on working capital. Based on the production of fibre and sticks and considering MSP as sale price of fibre, the total return comes to about Rs. 52000 to Rs. 55000 which gives and indication that the profit margin is not more than 10 per cent of investment. If the rental value of land and the interest

on working capital is added with the cost of cultivation, the profits becomes negative. However, for the last few years, most of the times and in most of the areas, the market price remain higher than the MSP and as a result the farmers could earn some profit. In some of the areas however the market price was around MSP or below the MSP an in this case the farmers could not earn any profit by cultivating jute. Thus the economics of jute cultivation depends on various factors as cited above.

14.3 **Employment Generation**: Raw jute being a labour intensive crop, cultivation of raw jute creates huge employment opportunities in the rural areas. It has been estimated that jute and mesta cultivation can generate about 25 crore working man-days annually. About 40 lakh farm families derived their sustenance by cultivating jute and mesta in the country. This apart, about 2.5 lakh people are employed in the jute industry and 25 lakh people are engaged in jute based ancillary sector.

14.4 **Source of Fuel**: In the jute/mesta growing rural areas, jute and mesta stick are the main source of fuel. In view of shortage of wood and coal, jute/mesta cultivation occupies an important position as a source of fuel in rural areas.

14.5 **Soil Fertility Improvement and Crop Rotation**: After harvesting the jute/mesta crop, the leaves are allowed to shed in the fields which is decomposed in the soil and serves as a source of manure resulting in the increase of soil fertility. In the jute field, jute is followed by rice in many of the areas. At the time of harvesting, the jute field remains almost free of weeds and result in less weed competition for the following crops.

15. Workshop, Conference and Seminars:

15.1. Outcomes/ recommendations of annual workshop conducted by ICAR/SAUs

Salient recommendations of All India Network Project on Jute & Allied Fibres coordinated by CRIJAF, Barrackpore during 2016-17

- **Release and notification of JAF varieties**

Six varieties of jute and allied fibre crops: JRO 2407 (Samapti) of *tossa* jute, KJC 7 (Shresthaa) and JRC 9057 (Ishani) of white jute, JRKM 9 1 (Satyen) and Central Kenaf JBMP 2 of kenaf, and CRIJAFR 5 (Roselle Ratna) of roselle were recommended for release and notification by the Central Sub-Committee on Crop Standard, Notification and Release of Varieties vide Gazette notification no. S.O. 2238 (E), dated, 29.06.2016. Beside, two varieties; KRO 4 and BCCO 6 (Kisan Pat) of tossa jute and one variety of white jute i.e. AAUCJ 2 (Kkhyati) have also been released and notified vide Gazette notification no. S.O. 1007 (E), dated, 30.03.2017.

- **Identification of JAF varieties for release**

One variety each in tossa jute (NJ-7010), kenaf (JBMP- 3) and roselle (JRR-17) have been identified for central release during the 29th Annual Workshop of AINPJAF held at ICARNIRJAFT, Kolkata on 10-11th March, 2017.

- **Evaluation of JAF germplasm**

Seventy-five accessions each of tossa jute, white jute and roselle and 51 germplasm of kenaf were evaluated with respective check varieties at different locations of JAF growing states.

White jute: An overall mean of 10.4±1.5 g/plant was recorded for fibre yield with a range of 7.1 g/plant (CIN-39) to 13.4 g/plant (CIN-26). Seven genotypes outperformed best check JRC 698 (12.3 g/plant) for fibre yield. Among the six locations, Coochbehar centre recorded highest mean performance for fibre yield (23.52±5.89 g/plant).

Tossa jute: Average fibre yield over the locations was recorded to be 10.0±1.4 g/plant with a range of 7.07 -13.44 g/plant. Accession OIJ-28 (13.44 g/plant) outperformed best check JRO 524 (13.36 g/plant) for fibre yield. Coochbehar centre recorded highest mean fibre yield of 16.77±4.32 g/ plant.

Roselle: An overall mean of 11.45±2.75 g/plant was recorded for fibre yield over five locations with a range of 6.38 - 17.41 g/plant. Seven accessions outperformed best check HS 4288 (14.41 g/plant) for fibre yield. Barrackpore centre recorded highest mean performance for fibre yield (16.72±8.50 g/ plant).

Kenaf: Average fibre yield over two locations was recorded to be 14.17±3.11 g/plant. Twenty-one accessions exhibited higher fibre yield than the best check HC 583 (15.85 g/plant). Accession KIN-039 (23.78 g/plant) showed highest fibre yield.

15.2. Recommendations of important conference /seminar/brainstorming sessions related to crop:

A. Research

- Due to limited scope of area expansion and competition from other crops, strategic research to increase the productivity of Jute and Allied Fibre crops should get priority.
- New research and technologies in crop improvement, production, crop protection and post harvest processing including retting should be promoted.
- For attaining self-sufficiency, the jute growing belts, especially West Bengal, more initiatives for seed production at state level in Bankura, Purulia, West Midnapore and Birbhum should be taken using new research findings of CRIJAF.
- Varieties suitable to diversified use of jute goods should be given more emphasis.
- Research on effect of biotic and abiotic stresses due to climate change and counteracting strategies for long term sustainable production of fibre crops should be encouraged.
- Jute hybrids/Bt. Jute on the pattern of Bt. Cotton research may be initiated.

B. Extension

- Extensive field level demonstrations of new technologies for seed production and crop management should be initiated with focussed approach in specific locations.
- For large scale HRD development at grass root level, both farmers training and trainers training should be organized.

C. Seed Production

- Promotion of Community based participatory seed production at village level are required for attaining self-sufficiency in seed production in drier tract of West Bengal having suitable climate. Inputs like quality seed, life saving irrigation facilities, package of practices, processing of seeds should be provided.
- Seed production of new varieties should be encouraged to increase yield and quality of fibres of Jute and Mesta.

16. Organization Associated in Jute Sector:

Number of organizations are associated in jute sector and these organizations have their respective activities for jute sector. Some of the important organization and its functions are highlighted herunder.

16.1 **Directorate of Jute Development**: The Directorate of Jute Development (DJD) is a Sub-Ordinate Office of the Department of Agriculture, Co-operation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India. The Directorate of Jute Development (DJD) had its origin in April, 1966 from the erstwhile Indian Central Jute Committee. Since then it had been working as a constituent unit of the Crops Division of the Ministry of Agriculture & Farmers Welfare (Department of Agriculture, Co-operation & Farmers Welfare) as a Subordinate Office with its Headquarters in Kolkata. The main objective of the DJD was to bring about a quantitative and qualitative improvement in the production of both jute and mesta in the Country. To achieve the objectives, the Directorate had to plan, coordinate and supervise the development and marketing programme of jute and allied fibre crops at the national level. Subsequently, in the year 1995, the Government of India decided to reorganize the Crops Development Directorates having uniform staffing pattern with a total staff strength of 31. The reorganization was implemented in June, 1996. There are altogether eight Crops Development Directorates. In the wake of reorganization of the Directorates, they have been assigned bi-focal responsibilities, (a) for the respective specified nodal crops of the country as a whole and (b) for all major crops in the states assigned to each of them. The Directorate of Jute Development has been assigned nine states and one U.T., namely, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, West Bengal and Andaman & Nicobar Islands. The Directorate of Jute Development, therefore, has to perform activities for the overall development of the nodal crops in the country, i.e., jute/mesta and allied fibre crops and also to perform the monitoring and related activities of other crops in the assigned states.

16.2 **Central Research Institute for Jute & Allied Fibres (CRIJAF):** The Central Research Institute for Jute & Allied Fibres (CRIJAF) formerly known as Jute Agricultural Research Institute (JARI) started functioning after the partition of India in 1947. The institute is located at Nilganj, Barrackpur, near Kolkata. The CRIJAF deals with jute, mesta and other allied fibre crops like sunhemp, sisal, ramie, flax, etc. and conduct research on varietal and technology development including other allied aspects. In the mine time number of variety has been developed and production technology has also been developed.

16.3 **National Institute of Research on Jute & Allied Fibre Technology (NIRJAFT):** The Indian Central Jute Committee constituted by the Government of India on the recommendation of the Royal Commission on agriculture in 1936 took necessary steps to set up Jute Technological Research Laboratories in Calcutta with a view to improve the quality of jute fibre and technology for manufacturing jute products. The institute started functioning in 1939. The administrative control of the institute later on went under Indian Council of Agricultural Research. Few years back, the institute was renamed as National Institute of Research on Jute & Allied Fibre Technology (NIRJAFT). The institute carried out research on Physics, Chemistry, Biology, Technology and Engineering aspects of jute and allied fibre crops. Number of jute products, equipments, diversified product have been developed and standardized by the institute.

16.4 **Office of the Jute Commissioner:** The Office of the Jute Commissioner is an organization under the Ministry of Textiles, Government of India and is located in Kolkata. Its main function is to advice the Government and the jute industry and trade on all matters

relating to the development of the jute industries and to implement the Government policies. It is the nodal agency for all jute control orders and licensing policies under the Ministry of Textile.

16.5 **National Jute Board(NJB) :** The National Jute Board (NJB) has been constituted as per National Jute Board Act,2008 (12 of 2009), effective on and from 1st April, 2010 and erstwhile Jute Manufacture Development Council (JMDC) and National Centre for Jute Diversification (NCJD) have been merged into National Jute Board (NJB). It is a corporate body with its office in Kolkata under the Ministry of Textiles. The NJB has been established for the development of cultivation, manufacture and marketing of jute and jute products and for matters connected therewith.

16.6 **Jute Corporation of India Ltd (JCI):** The Jute Corporation of India Ltd (JCI) was set up in 1971 as an official agency of the Government of India with the aim to provide minimum support price (MSP) to the jute cultivators and also work as a helping hand in raw jute sector. The Head Office of JCI is located in Kolkata and having regional offices in different jute growing states. It is having departmental purchase centre spread over major jute growing areas. The organization undertakes the procurement of raw jute operation with MSP particularly when the market price goes below the MSP.

16.7 **Indian Jute Industries Research Association (IJIRA)**: Indian Jute Industries Research Association (IJIRA) was established in 1937, the first cooperative R & D organization rendering Indian jute industries and Government agencies who are promoting Indian jute in export and domestic market. The institute is engaged in fundamental and applies research on jute and its products.

16.8 **National Jute Manufactures Corporation Ltd. (MJMC)** : The National Jute Manufactures Corporation Ltd.(MJMC) is an apex body for management of all nationalized jute mills and is located in Kolkata.

16.9 **Indian Jute Mills Association (IJMA)** : The Indian Jute Mills Association (IJMA) was formed in 1887 and is the representative body of the Indian jute industries and located in Kolkata.

16.10 **Jute Balers Association (JBA) :** The Jute Balers Association (JBA) is the recognized body for trading of raw jute and is located in Kolkata.

16.11 **International Jute Study Group (IJSG):** The International Jute Study Group (IJSG) is an intergovernmental body set up under the aegis of UNCTAD to function as the International Commodity Body (ICB) for Jute, Kenaf and other Allied Fibre. The International Jute Study Group (IJSG), the legal successor to the erstwhile International Jute Organisation (IJO), was established on 27 April 2002, to administer the provisions and supervise the operations of the Agreement establishing the Terms of Reference of the International Jute Study Group, 2001. The organization is the outcome of the series of meeting and UNCTAD conferences, which commenced in March, 2000 in Geneva and concluded in April, 2001 also in Geneva. The IJSG formally entered into force on and from 27 April, 2002 with the completion of the process of Definitive Acceptance/Acceptance by Governments of Bangladesh, India, Switzerland and the European Community representing its 27 member countries and representing over 60% jute trade (import and export). The office of the organization is located in Dhaka, Bangladesh. The main objective of the organization is to look after the overall jute sector in international perspective.

17. Important Websites:

17. 1. Name of important national and international organizations:

The notable institutions in India and abroad promoting, providing every assistance, R&D in the field of jute and web address of some of them is indicated hereunder:

National Organizations:

- Directorate of Jute Development- www.djd.dacnet.nic.in
- Centre Research Institute for Jute & Allied Fabrics (CRIJAF)- www.crijaf.org.in
- National Institute of Research on Jute & Allied Fibre Technology (NIRJAFT)- www.nirjaft.res.in
- Office of the Jute Commissioner- www.jutecomm.gov.in
- National Jute Board- www.jute.com
- The Jute Corporation of India (JCI)- www.jci.gov.in
- Indian Jute Industries' Research Association (IJIRA)- www.ijira.org
- Jute Manufactures Development Council (JMDC)- www.jmdcindia.com
- Indian Jute Mills Association (IJMA)- www.ijma.org
- Institute of Jute Technology- www.ijtindia.org
- Bureau of Indian Standards- www.bis.org.in

International Organizations:

- Bangladesh Jute Research Institute- www.bjri.gov.bd
- The International Jute Study Group (IJSG)- www.jute.org

17.2 Name and website of advisory service to farmers

- CRIJAF- www.crijaf.org.in
- BCKV- www.bckv.edu.in
- UBKV- www.ubkv.org.
- OUAT- www.ouat.ac.in
- AUU-www.aau.ac.in
- BAU-www.bausabour.ac.in

18. Researchable issues:

- Development of improved high yielding varieties with improved fibre quality and suitability for diversified uses, higher productivity potentials, resistance to biotic and abiotic stress.
- Enhancing system efficiency through development of cost effective location specific sustainable production technology (especially in the field of weed management) to enhance production and productivity along with providing sustainability to the production system and also to meet the emerging needs for maintaining and enhancing the competitiveness in the post WTO era.
- Genetic resources management including characterization both at morphological and molecular level and documentation leading to germplasm registration for protection; prebreeding and enhanced utilization of PGR leading to broadening of genetic base at farm level.
- Improved (user friendly as well as ecofriendly) retting technology.
- Integrated pest management.
- Integrated nutrient management.
- Promoting diversified uses.
- Strengthened efforts to facilitate transfer of technology and establishment of linkages with industry and related R&D agencies.

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Annexure-I

STATE WISE NORMAL (AVERAGE OF 2013-14 to 2017-18) AREA, PRODUCTION AND YIELD OF JUTE AND MESTA

STATE	JUTE					MESTA					RAW JUTE				
	AREA ('000 ha)		PRODUCTION ('000 bale)		YIELD (kg/ha)	AREA ('000 ha)		PRODUCTION ('000 bale)		YIELD (kg/ha)	AREA ('000 ha)		PRODUCTION ('000 bale)		YIELD (kg/ha)
	Actual	% share to all India	Actual	% share to all India		Actual	% share to all India	Actual	% share to all India		Actual	% share to all India	Actual	% share to all India	
1. An. Pradesh	0.00		0.00		0	6.6	10.5	57.45	10.7	1567	6.6	0.8	57.45	0.5	1567
2. Arunachal Pradesh															
3. Assam	71.49	9.9	798.93	7.7	2012	4.06	6.5	24.95	4.7	1106	75.55	9.7	823.88	7.6	1963
4. Bihar	93.69	12.9	1338.10	12.9	2567	17.22	27.4	234.54	43.8	2452	110.91	14.2	1572.64	14.6	2552
5.Chhattisgarh						1.14	1.8	2.12	0.4	335	1.14	0.1	2.12	0.0	336
6. Jharkhand															
7. Karnataka						0.28	0.4	0.28	0.1	180		0.0		0.0	180
8. Madhya Pradesh	5.38	0.7	4.66	0.0	148	1.70	2.7	2.35	0.4	249	7.08	0.9	7.01	0.1	178
9. Maharashtra						5.50	8.8	8.75	1.6	286		0.0		0.0	286
10. Meghalaya	6.60	0.9	67.06	0.6	1830	4.47	7.1	26.23	4.9	1056	11.07	1.5	93.29	0.9	1518
11. Nagaland	3.06	0.4	11.17	0.1	656	1.86	3.0	3.97	0.7	384	4.92	0.6	15.14	0.2	555
12. Odisha	1.19	0.2	11.77	0.1	1700	9.17	14.6	45.12	8.4	886	10.36	1.4	56.89	0.5	989
13. Tamil Nadu															
14. Telangana															
15. Tripura	0.62	0.1	5.40	0.1	1580	0.65	1.0	5.51	1.0	1534	1.27	0.3	10.91	0.1	1555
16 West Bengal	543.17	74.9	8095.87	78.3	2683	10.15	16.2	124.20	23.2	2202	553.32	70.4	8220.07	75.5	2674
All India	**725.20**	**100.0**	**10332.96**	**100.0**	**2564**	**62.80**	**100.0**	**535.47**	**100.0**	**1556**	**788.00**	**100.0**	**10868.43**	**100.0**	**2486**

Source: DES

Annexure-II

Estimates of Area, Production and Yield of Jute

STATES	Area ('000 Hectares)						Production ('000 Bales of 180 Kgs. each)						Yield (Kgs./Hect.)					
	2013-14	2014-15	2015-16	2016-17	2017-18	Average	2013-14	2014-15	2015-16	2016-17	2017-18	Average	2013-14	2014-15	2015-16	2016-17	2017-18	Average
Assam	69.82	70.40	72.13	75.14	69.95	71.49	717.26	767.55	865.81	802.75	841.29	798.93	1849	1962	2161	1923	2165	2012
Bihar	104.88	94.80	93.91	91.38	83.47	93.69	1498.08	1418.71	1308.00	1356.00	1109.71	1338.10	2571	2694	2507	2671	2393	2567
Madhya Pradesh	2.90	6.00	6.00	6.00	6.00	5.38	1.30	3.00	5.00	5.00	9.00	4.66	81	90	150	150	270	148
Meghalaya	6.39	6.59	6.66	6.67	6.67	6.60	63.92	66.26	68.28	68.37	68.47	67.06	1801	1810	1846	1845	1847	1830
Nagaland	3.03	3.04	3.06	3.07	3.08	3.06	5.77	5.79	5.83	5.85	32.61	11.17	343	343	343	343	1906	656
Odisha	1.97	1.06	1.20	0.75	0.95	1.19	19.81	10.10	14.54	1.26	13.15	11.77	1810	1715	2181	302	2492	1700
Tripura	0.64	0.65	0.65	0.59	0.55	0.62	5.37	5.56	5.70	5.37	5.00	5.40	1510	1540	1579	1638	1633	1580
West Bengal	566.40	567.22	544.70	522.47	515.08	543.17	8771.76	8341.21	7667.07	8187.66	7511.65	8095.87	2788	2647	2534	2821	2625	2683
All India	756.03	749.76	728.31	706.07	685.75	725.18	11083.27	10618.18	9940.22	10432.25	9590.90	10332.97	2639	2549	2457	2660	2517	2564

Source: DES

Annexure-III

Estimates of Area, Production and Yield of Mesta

STATES	Area (' 000 Hectares)						Production ('000 Bales of 180 Kgs. each)						Yield (Kgs./Hect.)					
	2013-14	2014-15	2015-16	2016-17	2017-18	Average	2013-14	2014-15	2015-16	2016-17	2017-18	Average	2013-14	2014-15	2015-16	2016-17	2017-18	Average
Andhra Pradesh	9.00	7.00	5.00	7.00	5.00	6.60	83.01	50.00	44.00	63.00	47.22	57.45	1660	1286	1584	1620	1700	**1567**
Assam	4.44	4.60	4.30	3.54	3.42	4.06	29.29	25.69	28.26	21.34	20.17	24.95	1187	1005	1182	1084	1062	**1106**
Bihar	16.19	16.37	16.48	16.32	20.73	17.22	247.00	218.41	322.00	215.00	170.31	234.54	2746	2402	3518	2371	1479	**2452**
Chhattisgarh	1.20	1.10	1.20	1.10	1.08	1.14	2.20	2.10	2.30	1.90	2.08	2.12	330	344	345	311	347	**335**
Karnataka	0.00	1.00	0.00	0.10		0.28	0.00	1.00	0.00	0.10		0.28	#DIV/0!	180		180		**180**
Madhya Pradesh	0.50	2.00	2.00	2.00	2.00	1.70	1.20	5.56	1.00	2.00	2.00	2.35	432	500	90	180	180	**249**
Maharashtra	22.00	0.00	0.00	0.00		5.50	35.00	0.00	0.00	0.00		8.75	286					**286**
Meghalaya	4.45	4.48	4.47	4.46	4.47	4.47	25.98	26.24	26.26	26.30	26.35	26.23	1051	1054	1058	1061	1061	**1057**
Nagaland	1.83	1.84	1.85	1.88	1.90	1.86	2.03	2.04	2.05	2.09	11.66	3.97	200	200	199	200	1105	**385**
Odisha	12.73	11.78	8.69	6.39	6.26	9.17	62.52	58.25	42.24	31.52	31.09	45.12	884	890	875	888	894	**886**
Tripura	0.85	0.63	0.63	0.58	0.54	0.65	7.00	5.08	5.53	4.96	4.96	5.51	1482	1451	1588	1532	1651	**1534**
West Bengal	8.44	8.88	9.38	13.70	10.36	10.15	110.67	112.50	109.72	161.93	126.20	124.20	2359	2280	2106	2128	2193	**2202**
All India	**81.63**	**59.95**	**54.00**	**57.34**	**56.02**	**61.79**	**606.89**	**507.87**	**583.36**	**530.15**	**442.04**	**534.06**	**1338**	**1525**	**1945**	**1664**	**1420**	**1556**

Source: DES

Annexure-IV

Estimates of Area, Production and Yield of Raw Jute

STATES	Area (' 000 Hectares)						('000 Bales of 180 Kgs. each)						Yield (Kgs./Hect.)					
	2013-14	2014-15	2015-16	2016-17	2017-18	Average	2013-14	2014-15	2015-16	2016-17	2017-18	Average	2013-14	2014-15	2015-16	2016-17	2017-18	Average
Andhra Pradesh	9.00	7.00	5.00	7.00	5.00	6.60	83.01	50.00	44.00	63.00	47.22	**57.45**	1660	1286	1584	1620	1700	**1567**
Assam	74.26	75.00	76.43	78.68	73.36	75.55	746.55	793.24	894.06	824.09	861.46	**823.88**	1810	1904	2106	1885	2114	**1963**
Bihar	121.07	111.17	110.39	107.70	104.20	**110.91**	1745.08	1637.12	1630.00	1571.00	1280.02	**1572.64**	2594	2651	2658	2626	2211	**2552**
Chhattisgarh	1.20	1.10	1.20	1.10	1.08	**1.14**	2.20	2.10	2.30	1.90	2.08	**2.12**	330	344	345	311	347	**335**
Karnataka	0.00	1.00	0.00	0.10	0.00	**0.22**	0.00	1.00	0.00	0.10	0.00	**0.22**	#DIV/0!	180	!	180		**180**
Madhya Pradesh	3.40	8.00	8.00	8.00	8.00	**7.08**	2.50	8.56	6.00	7.00	11.00	**7.01**	132	193	135	158	248	**178**
Maharashtra	22.00	0.00	0.00	0.00	0.00	**4.40**	35.00	0.00	0.00	0.00	0.00	**7.00**	286	NA				**286**
Meghalaya	10.84	11.07	11.13	11.13	11.14	**11.06**	89.90	92.50	94.54	94.67	94.82	**93.29**	1493	1504	1529	1531	1532	**1518**
Nagaland	4.86	4.88	4.91	4.95	4.98	**4.92**	7.80	7.83	7.88	7.94	44.28	**15.15**	289	289	289	289	1600	**555**
Odisha	14.70	12.84	9.89	7.14	7.21	**10.36**	82.33	68.35	56.78	32.78	44.24	**56.90**	1008	958	1033	826	1105	**989**
Tripura	1.49	1.28	1.28	1.17	1.09	**1.26**	12.37	10.64	11.23	10.33	9.96	**10.91**	1494	1496	1583	1585	1642	**1555**
West Bengal	574.85	576.10	554.08	536.17	525.44	**553.33**	8882.43	8453.71	7776.78	8349.59	7637.85	**8220.07**	2781	2641	2526	2803	2616	**2674**
All India	**837.67**	**809.71**	**782.30**	**763.41**	**741.77**	**786.97**	**11690.16**	**11126.05**	**10523.58**	**10962.40**	**10032.94**	**10867.03**	**2512**	**2473**	**2421**	**2585**	**2435**	**2486**

Source: DES

Annexure-V

Trend in Area, Production and Yield of Jute and Mesta in India (Plan wise)

Plan	Area ('000 ha)			Production ('000 bale)			Yield (Kg/ha)		
	Jute	Mesta	Raw Jute	Jute	Mesta	Raw Jute	Jute	Mesta	Raw Jute
1947-48	263.9		263.9	1671.3		1671.3	1140		1140
Pre Plan (1947-51)	411.3		411.3	2545.0		2545.0	1114		1114
1st Plan (1951-56)	645.4	197.9	843.3	3928.8	853.3	4782.1	1096	776	1021
2nd Plan (1956-61)	704.2	308.2	1012.4	4441.0	1409.4	5850.4	1135	823	1040
3rd Plan (1961-66)	847.2	380.9	1228.1	5683.6	1648.9	7332.5	1208	779	1075
Plan Holiday (1966-69)	734.5	307.4	1041.9	4869.8	1133.0	6002.8	1193	663	1037
4th Plan (1969-74)	765.0	322.1	1087.1	5495.1	1220.7	6715.8	1293	682	1112
5th Plan (1974-78)	695.9	341.4	1037.3	4906.2	1593.7	6499.9	1269	840	1128
Annual Plan (1978-80)	859.4	381.5	1240.9	6270.9	1876.4	8147.3	1313	885	1182
6th Plan (1980-85)	818.7	311.7	1130.4	6419.5	1422.9	7842.4	1411	822	1249
7th Plan (1985-90)	802.8	266.1	1068.9	7562.7	1277.1	8839.8	1696	864	1489
Annual Plan (1990-92)	826.5	238.6	1065.1	8426.5	1330.1	9756.6	1835	1003	1649
8th Plan (1992-97)	766.6	196.9	963.5	8169.4	1116.7	9286.1	1918	1021	1735
9th Plan (1997-2002)	860.4	186.0	1046.4	9625.1	1099.0	10724.1	2014	1064	1845
10th Plan (2002-07)	808.2	149.0	957.2	10042.1	924.5	10966.6	2237	1117	2062
11th Plan (2007-12)	798.8	111.4	910.2	10397.0	719.5	11116.5	2343	1163	2198
12th Plan (2012-17)	743.4	67.7	811.1	10482.9	563.6	11046.5	2538	1498	2451

Annexure-VI

Country wise Normal (Average of 20012-13 to 2016-17) Area, Production and Yield of Jute and Jute like Fibres (Mesta) in the World

Country	Area ('000 ha)		Production ('000 bale)		Yield (kg/ha)
	Actual	% to World	Actual	% to World	
1. Bangladesh	692.5	46.20	7705.6	41.20	2003
2. Brazil	0.6	0.04	4.1	0.02	1352
3. China	11.4	0.76	199.7	1.07	3158
4. Egypt	1.0	0.06	13.1	0.07	2447
5. India	**775.8**	**51.76**	**10570.0**	**56.51**	**2452**
6. Myanmar	0.6	0.04	2.2	0.01	627
7. Nepal	10.0	0.67	76.7	0.41	1384
8. Thailand	0.1	0.01	1.5	0.01	1967
9. Zimbabwe	4.2	0.28	14.1	0.08	611
World	1498.8	100.00	18703.1	100.00	2246

Source: FAO Statistics

Annexure-VII

Country-wise Area, Production and Yield of Jute and Jute Like Fibres in the major producing countries of World during 2012-13 to 2016-17

A- Area in '000 ha; P- Production in '000 bale; Y- Yield in Kg/ha

Sl. no.	Country		2012-13	2013-14	2014-15	2015-16	2016-17	Average
1	Bangladesh	A	760.4	681.0	665.7	677.6	677.7	692.5
		P	8066.9	7727.8	7494.4	7772.2	7466.7	7705.6
		Y	1910	2043	2026	2065	1983	2003
2	Brazil	A	0.8	0.4	0.8	0.7	0.1	0.6
		P	5.5	2.7	6.5	5.3	0.6	4.1
		Y	1186	1237	1524	1435	1128	1346
3	China	A	12.3	12.0	10.0	10.6	12.0	11.4
		P	218.9	197.2	172.8	188.8	220.6	199.7
		Y	3206	2966	3099	3205	3308	3158
4	Egypt	A	1.0	1.0	1.0	0.9	0.9	1.0
		P	13.3	13.9	13.9	12.0	12.1	13.0
		Y	2400	2500	2456	2438	2450	2449
5	India	A	800.0	800.0	741.0	773.0	765.1	775.8
		P	10622.2	10800.0	10933.3	9940.0	10558.0	10570.7
		Y	2390	2430	2656	2315	2484	2453
6	Myanmar	A	2.5	0.4	0.0	0.1	0.0	0.6
		P	9.8	0.6	0.1	0.2	0.1	2.2
		Y	698	249	783	588	386	630
7	Nepal	A	10.5	11.3	11.4	8.6	8.0	10.0
		P	80.1	86.1	82.7	69.7	64.6	76.7
		Y	1369	1372	1312	1452	1452	1384
8	Thailand	A	0.4	0.2	0.1	0.0	0.0	0.1
		P	4.5	1.7	1.2	0.0	0.1	1.5
		Y	2139	2027	1538	4000	3250	2007
9	Zimbabwe	A	4.2	4.2	4.1	4.1	4.1	4.2
		P	13.9	13.9	14.0	14.4	14.4	14.1
		Y	595	595	611	625	632	612
	World Total	**A**	**1596.2**	**1513.5**	**1437.1**	**1477.7**	**1469.4**	**1498.8**
		P	**19186.6**	**18990.7**	**18859.9**	**18089.1**	**18389.3**	**18703.1**
		Y	**2164**	**2259**	**2362**	**2204**	**2253**	**2246**

Source: FAO Statistics

ANNEXURE-VIII

Country wise Yield status in Jute and Allied Fibre Crops (Average yield from 2012-13 to 2016-17)

Yield in kg/ha

Country	Average Yield of Country (average of 2012-13 to 2016-17)	Average Yield of India (average of 2012-13 to 2016-17)	Increase(+)/ Decrease (-)
Bangladesh	2003	2452	-449
Brazil	1352	2452	-1100
China	3158	2452	706
Egypt	2447	2452	-5
India	2452	2452	0
Myanmar	627	2452	-1825
Nepal	1384	2452	-1068
Thailand	1967	2452	-485
Zimbabwe	611	2452	-1841
World	2246	2452	-206

Annexure - IX

Yield Gap recorded in Frontline Demonstrations (FLDs) as compared to Existing Yield of States in Jute and Mesta Crops

State	Crop	Yield in FLD Plot	Existing Yield	Yield Gap
1. Andhra Pradesh	Mesta	2447	1613	834
2. Assam	Jute	2500	1807	693
3. Bihar	Jute	2596	1642	954
4. Odisha	Jute	2650	2042	608
5. Uttar Pradesh	Jute	2209	1756	453
6. West Bengal	Jute	3136	2577	559

Annexure-X

Year wise and Agency wise Production of Certified Jute Seed (from 2012-13 to 2016-17)

Quantity in Quintal

Source	Year				
	2012-13	**2013-14**	**2014-15**	**2015-16**	**2016-17**
NSC	4693.1	5540.0	4059.0	3677.5	5860.0
MSSC	6369.0	888.2	4764.0	2715.0	3231.0
APSSDC					
SFCI	4.3				33.0
Others*	75548.1	44841.0	32790.0	30248.3	52167.0
Total	**86614.5**	**51269.2**	**41613.0**	**36640.8**	**61291.0**

Annexure-XI

Pattern of Financial Assistance on Various Components under National Food Security Mission CC-Jute (NFSM-CC-Jute)

Sl. No.	Component/Interventions	Unit	Pattern of assistance	Share of Central: State Govt.
1.	**Production of Foundation Jute Seeds**	**qtl**	Rs.12000/qtl.	90:10 for NE region 60:40 for other regions
2.	**Production of Certified Jute Seed/Quality Seed of Mesta**	**qtl**	Rs.5500/qtl.	90:10 for NE region 60:40 for other regions
3.	**FLD on alternate Retting Technology (0.25 ha each)**	**ha**	Rs.20000/ ha(Rs.17000 for inputs & Rs.3000 for contingency)	90:10 for NE region 60:40 for other regions
4.	**FLDs on Production Technology/ Intercropping**	ha	Rs.9000/ ha(Rs.8000 for inputs & Rs.1000 for contingency)	90:10 for NE region 60:40 for other regions
5.	**National Level Training (25 farmers for three days)**	**No**	Rs.80000/training	90:10 for NE region 60:40 for other regions
6.	**State Level Training (20 farmers for two days)**	**No**	Rs.40000/training	90:10 for NE region 60:40 for other regions
7.	**Distribution of Certified seed**	**kg**	Rs.100/kg or 50% of the cost, whichever is less	90:10 for NE region 60:40 for other regions
8.	**Distribution of nail weeder**	**No**	Rs.1000/machine or 50% of the cost, whichever is less	90:10 for NE region 60:40 for other regions
9.	**Microbial Consortium (CRIJAF-Sona)**	**kg**	Rs.25/kg or 50% of the cost, whichever is less	90:10 for NE region 60:40 for other regions
10.	**Local Initiatives**		As per state Specific needs	
11.	**Contingencies & Electronic print media**		Need based	DOJD, Kolkata

Annexure-XII

Allocation, Released and Expenditure (central share) NFSM-CC-Jute during 2014-15 to 2017-18

(Rs. In crores)

Year	Allocation	Released	Expenditure
2014-15	6.99	4.17	2.13
2015-16	9.27	5.77	5.99
2016-17	13.40	5.37	6.81
2017-18	11.80	10.07	12.07

Annexure-XIII

State wise Procurement of Raw Jute by JCI

Period: June-July

Qty: '000 Bales

Sl. No.	States	Quantity of Procurement				
		2007-08	2008-09	2009-10	2010-11	2011-12
1	West Bengal	503.00	101.00	0.70	21.10	18.00
2	Assam	90.00	0.30	0.43	10.70	0.00
3	Meghalaya	0.00	0.00	0.00	0.00	0.00
4	Bihar	124.00	0.00	0.00	2.30	6.00
5	Orissa	10.00	0.00	0.00	0.00	0.00
6	Uttar Pradesh	0.00	0.00	0.00	0.00	0.00
7	Andhra Pradesh	28.00	0.00	0.00	0.00	0.00
8	Tripura	1.00	0.40	0.10	0.01	0.00
	Total	**756.00**	**101.70**	**1.23**	**34.11**	**24.00**

Source: Indian Jute, NJB

Annexure-XIV

State-wise Minimum Support Price (MSP) of different varieties and grades of Raw Jute and Mesta for all over India during 2013-14 to 2017-18

Year	Crops	Variety	Grades							
			1	**2**	**3**	**4**	**TD-5/W-5**	**6**	**7**	**8**
2013-14	Jute	Tossa (TD)	2970	2830	2670	2430	**2300**	2230	2140	1995
		White(W)	2920	2780	2620	2380	2250	2180	2090	1945
	Mesta	Mesta(M)	2350	2310	2270	2210	2150	2005		
		Bimli	2362	2322	2282	2242	2182	2037		
2014-15	Jute	Tossa (TD)	3236	3053	2880	2592	**2400**	2327	2233	2082
		White(W)	3186	3003	2830	2542	2350	2277	2183	2032
	Mesta	Mesta(M)	2450	2410	2370	2310	2250	2105		
		Bimli	2462	2422	2382	2342	2282	2137		

From 2015-16 onwards number of grades for Jute were reduced from existing eight grades (TD1toTD-8) to five grades (TDN-1 to TDN-5)

Year	Crops	Variety	Grades					
			1	**2**	**TDN-3/WN-3**	**4**	**5**	**6**
2015-16	Jute	Tossa (TDN)	3375	3105	**2700**	2565	2349	
		White(WN)	3325	3055	2650	2515	2299	
	Mesta	Mesta(M)	2750	2710	2670	2610	2550	2405
		Bimli	2762	2722	2682	2642	2582	2437
2016-17	Jute	Tossa (TDN)	3750	3500	**3200**	3000	2800	
		White(WN)	3700	3450	3150	2950	2750	
	Mesta	Mesta(M)	3200	3100	3000	2900	2800	2700
		Bimli	3200	2100	3000	2900	2800	2700
2017-18	Jute	Tossa (TDN)	4050	3900	**3500**	3100	2900	
		White(WN)	4000	3850	3450	3050	2850	
	Mesta	Mesta(M)	3200	3100	3000	2900	2800	2700
		Bimli	3200	3100	3000	2900	2800	2700