



Declining Trend of Jute Cultivation in Nagaon District: A Micro Economic Study

Final Report
Of the
Minor Research Project

Submitted to
University Grants Commission

Submitted by
Mr. Kulen Chandra Das
Department of Economics
Nowgong Girls' College
Nagaon - 782002
Assam

Acknowledgement

The idea of doing an MRP (Minor Research Project) was instilled on me by the NAAC team, which visited our college way back in 2003. Before 2003, on many occasions, my senior colleague, Mr. Jayanta Kr. Sarma and I were wandering in different parts of countryside of Nagaon district to have an understanding about various socio-economic issues of the people living in those areas. On one occasion, we had been to the chars of Brahmaputra passing through Juria, Sutirpar, etc. We saw lots of raw jute being transported to unknown destinations. We, on our way, stopped some of them to know about the cultivation of it. I was very much enthusiastic getting to know about the economy of it and saddened by the fact that this environment friendly and biodegradable product is being discarded by the farmer over the last couple of years owing to lots of difficulties. I decided then to go deeper into the larger scenario of the jute cultivation in the district. Mr. Jayanta Kr. Sarma, encouraged me to do the study and Dr. A. D. Bordoloi, Principal, inspired me to carry out the study in the form of an MRP. Therefore, first I must express my thankfulness to all of them.

Secondly, I owe my sincere gratitude to all the people of our college, who somehow interacted with me on this issue. Mr. Rajen Debnath, HoD of Mathematics Department, instantly agreed to accompany me to the Dhing Jute Mandy and helped me interacting with the growers visiting the Mandy. I must thank my friend Jitumoni Bora for accompanying me in my field visit to the villages of Batadrba Development Block.

I am also indebted to my family members, i.e., Runumi, my wife; my sisters, my parents and our daughter Pahi for all kinds of supports they extended during the period of the study.

Last, but not the least, I must thank my friends from both the academic and non-academic fraternity for inspiring me to complete the task.

Kulen Chandra Das
Nagaon - 782002

Contents -----

Chapter 1	Introduction	page no. 4
Chapter 2	Methodology	page no. 8
Chapter 3	Nagaon District: An Overview	page no. 13
Chapter 4	Anatomy of Jute: An Outline	page no. 29
Chapter 5	Jute Vs Plastic: The Environmental Effect	page no. 54
Chapter 6	Jute Processing: The Mechanism	page no. 57
Chapter 7	Assam Cooperative Jute Mill: A Synopsis	page no. 64
Chapter 8	Assam Jute Products	page no. 73
Chapter 9	Issues of Jute Cultivation: An Analysis of Jute Scenario of Nagaon District	page no. 76
Chapter 10	Reference	page no. 98

Introduction

After more than half a century of planned economic development and high levels of aggregate growth over the last two decades, the Indian economy still remains predominantly rural. In 1999-2000, 72 percent of the population and 76 percent of the workforce in India were rural (Reddy and Mishra, 2008). Rural India, however, never closed to or isolated but had its own dynamism and was on a steady path of articulation with the rest of the Indian economy and the world at large. Much of this transformation, during the post-independence period, was due to a series of development programmes where the state had a dominant, protective as well as promotional role. However, during the last two decades, especially since the early nineties, as a part of the neo-liberal wave of globalization aided by the revolution in Information and Communication Technology (ICT), which has compressed time and space drastically, rural India too, somewhat rudely, has been exposed to the surge towards integration into the global market economy. Within rural India, agriculture continues to still be the dominant occupation. There is hardly any substantial increase in the rural non-farm sector employment.

Jute and Mesta are the two most important commercial crops in India next to cotton. In trade and industry, both the crops together are known as raw jute. The fiber is obtained from the stem (bark) and is known as bast fiber or phloem fiber. The jute fiber is obtained from the species belonging to Tiliac-eae family viz. *Corchorus capsularis* known as white jute and *Corchorus olitorius* known as tossa jute. The share of jute in total raw jute production is about 85 percent while that of the Mesta is 15 percent.

Jute cultivation in the country started in the early 19th century. Before 18 hundred, it was even not known to the people of India. Towards the end of the 18th century, the East India Company engaged Mr. Roxburg, a Botanist, to

identify some fiber crops which can substitute the flax or hemp fiber for the manufacture of packaging materials and it was he who identified jute along with other fibers. During the year of partition of the country in 1947, the major jute growing areas went to East Pakistan but the jute industries remained in India. During 1947-48, the country's jute area was 2.64 lakh hectares and the production was only 16.71 lakh bales as against a requirement of over 60 lakh bales. It was then only that the emphasis was given on extending jute production in the country in different five year plans.

Raw jute (jute and Mesta) plays a pivotal role for the country's economy, particularly, for the eastern and north-eastern part of India. It provides sustenance to a large number of farm families, industrial workers, traders and others. It has got high socio-economic importance and being an environmental friendly crop, its importance is gradually increasing in the world. Considering the agro-climatic requirements of jute, the cultivation is mainly concentrated in the eastern and north-eastern states. However, Mesta is grown throughout the country. The area under jute and Mesta has been stabilized at nearly 8 lakh ha under jute and 2 lakh ha under mesta. The average raw jute production is around 93 lakh bales annually with fluctuations year to year. It has been observed that even though the area under jute is declined but there is an increasing trend in the productivity. The productivity of jute from a level of about 11 qt per ha during the first plan period has reached to around 14 qt per ha during the 6th plan period and now reached a level of 19 qt per ha.

Near about 15 percent of jute products are exported about 120 countries in the world. The major exporting commodities are carpet backing, Hessian and most of the diversified products. India has substantial demand for jute goods especially for packaging material for storage and transportation of food grains and other marketable commodities. In 2000-01, such demand was to the tune of 1435.01 metric tonnes. After meeting up the home consumption demand, India could export 255.1 metric tonnes of jute goods, in the same year to about 120 countries

in the world. Exports of jute goods from India to other countries were to the tune of Rs. 572.3 crores in the year 1996-97. The average national export during the year 1992-97 was near about 500 crores. It increased to Rs. 694.7 crores in the next year only to fall to Rs. 582 crores in 1998-99. It kept fluctuating and reached a peak of Rs. 916.6 crores in 2002-03 again to decrease 839.6 crores in the very next year (Dhar, 2006).

Assam is situated in the North-East corner of India and lies between $24^{\circ} 13'$ to $28^{\circ} 16'$ North latitude and $89^{\circ} 42'$ to $96^{\circ} 30'$ East longitude. The state enjoys hot and humid climate throughout the year barring the winter season. Annual rainfall varies from as low as 1255 mm in some parts of Nagaon district to 3500 mm in Cachar district. However the distribution of rainfall throughout the year is not uniform. About 86 percent of total annual rainfall is received during April to September while only 4 percent rainfall is received during the winter months, i.e., November to February. The mean annual maximum temperature between July to August varies from 33.4°C in Lakhimpur to 37.3°C in Goalpara while the mean minimum temperature during December to January varies ranges from 5.5°C in Lakhimpur to 11°C in Cachar. The soil of Assam, in general is Acidic in reaction having pH between 4.5 and 6.5 except in new alluvial soil which is neutral in reaction. Overall nitrogen and potash contents are medium while phosphorus content is low. Based on the rainfall pattern, terrain and soil characteristics, the state of Assam has broadly been delineated into six agro-climatic zones viz. North Bank Plains, Upper Brahmaputra Valley, Central Brahmaputra Valley, Lower Brahmaputra Valley, Barak Valley, Hill Zone.

Jute is the most important fiber crop of Assam which occupies third position in the country in respect of area and production. However, the productivity of jute fiber in Assam is only 17.43 q/ha as against the national average of 19.18 q/ha. The share of jute in Assam is only 11.6 percent as compared to the all India jute area. Because of lower productivity, the share of production is only 10.5 percent of the all India production. Out of the gross cropped area of 39.84 lakh ha in

Assam, jute occupies 0.95 lakh ha in 1997-98 (anonymous, 2002). Though the area of jute cultivation is only 2.37 percent to the grossed cropped area of the state, it plays a prominent role in the state's economy by generating employment and earning foreign exchange to the country. Since the year of independence, the jute area in Assam has been increasing gradually from 84.6 thousand ha in 1947-48 to 149 thousand ha in 1973-74, however, thereafter the area decreased with ups and downs in succeeding years to reach 69 thousand ha in the year 2004-05. Likewise, the production is also increasing with ups and downs from 5.4 lakh bales to 7.14 bales in the year 2001-02 (anonymous, 2004).

In Assam, jute is grown in all the districts; however, in most of the districts its area is very low. Out of all the districts, only three districts, namely, Dhuburi, Darrang and Nagaon district, areas are more than 10,000 ha and in another five districts, viz. Kokrajhar, Bongaigaon, Kamrup, Barpeta and Marigaon, jute areas are more than 5,000 ha. Hence, the jute area in Assam is concentrated in the lower and central region of the Brahmaputra valley.

The jute area in Nagaon district has been declined significantly due to the separation of the district into two viz. Nagaon and Marigaon, in the year 1989-90. During the year 1989-90, the total area under jute was 17,725 ha which decreased to 12,890 ha in the very next year.

Objectives:

The study was designed with the following objectives in mind:

- ✓ To review the situation of jute cultivation of Nagaon district
- ✓ To find out the factors responsible for the declining trend of jute cultivation
- ✓ To extract some kind of solutions, if any, in the light of environment-friendliness of the product.

Methodology

Data base:

Both the secondary and primary data were used in this study.

Secondary data about the background and area under jute cultivation, production and productivity, etc. were collected from various government sources and the demographic change the data was collected from the census report.

As far as the primary data is concerned about the method of cultivation, individual area under jute cultivation, marketing, finance, etc were collected from the individual farmers in three different phases. In the first phase a reconnaissance visit was given in order to get a birds' eye view of the area along with some information regarding the concentration of the jute cultivation in specific area. In the second phase RRA (Rapid Rural Appraisal) method was applied to gather information about the method of cultivation, area under jute, productivity and production, finance, marketing of jute and its various constraints, etc. In the second phase individual farmers were contacted at their door. In the third phase data were collected from the farmers at their selling centres, i.e., market. It was almost a focused participatory discussion. Various markets were visited in this phase and farmers were met collectively in the market. They were very outspoken here to tell everything frankly to the investigator.

Primary data was collected from the field through different approaches of field studies and impact assessment as mentioned below.

Phase	Strategy	Target
Phase – I	Reconnaissance study	to get a birds eye view of the area along with basic information
Phase -II	Rapid Rural Appraisal (RRA) at village level	To gather information about individual area, production, productivity, etc.
Phase – III	Focused participatory discussion	To collect information about the marketing of jute and its constraints in marketing.

Apart from this, the DPCs were also visited by the investigator to get an understanding about the intricacies, if any, in the procurement process of jute. The officials put forwarded their own views about the cultivation and JCI.

Tools of data collection:

In order to collect various information, question schedule was prepared to interview the farmers. Apart from the schedule open ended questions were also asked to get their opinion about different aspects. Here the field note, which was prepared during the reconnaissance visit, was taken into consideration to get different information.

Sampling frame:

Method of stratified random sampling was used to select the villages for the study. At the very outset the information regarding the jute cultivation and its concentrated area was collected from the District Agricultural Office and according to that the villages were selected randomly.

Study area:

The study covered various parts/villages of Juria, Dhing and Rupahi of Nagaon district. As mentioned earlier the areas were selected as per the direction of the officials of the District Agricultural Office. In the selection of the villages priority was given to those villages where there is a concentration of jute cultivation.

The profiles of the areas covered in the study are placed in the table given below (as in map -1).

Table -1 Profile of the area covers in the study

Sl.no.	Name of the village	Blcok
1	Salpara	Juria
2	Simalu Ati	-do-
3	Garoimari Pam	-do-
4	Kirimiri	-do-
5	Dagaon	-do-
6	Afala Balisatra	Batadraba
7	Patia Sapari	-do-
8	Upar Doomdumia	-do-
9	Katimari	Dhing
10	Magurmari	-do-
11	Kandhulimari	-do-
12	Garukhuti	-do-
13	Mahkhuti	-do-
14	Barbil	-do-
15	Silghat Jute Mill	
16	Assam Jute Products	

Significance of the study:

Despite being termed as the sunset industry, jute is still being regarded as the most fruitful alternative to plastic and synthetic in the present day environment sensitive world. Jute is one of the important products earning foreign exchange to the country to the tune of Rs 839.6 in the year 2003-04. If we analyse the jute economy of the country it reveals us the tremendous importance of jute in the country's economy. Though, over the years it is suffering most as a result of the competition from the cheap plastic and synthetic products. The country's jute industry is also not in a position to face such a competition due to its age-old machineries. The jute industry should go in for rapid modernisation to meet the current challenges. This is because jute happens to be a natural fibre and is eco friendly and the global preference is for such natural fibres in the wake of pollution hazards and threat from green house gases.

Though Assam is securing second position in case of jute cultivation in the country, the prospect of jute here is very bleak. Having only one industry in the cooperative sector, most of the raw jute is to be exported to other states of the country. Moreover, the middlemen operating in the marketing chain is depriving gravely the farmers of the actual profit and is becoming a disincentive in increasing the jute productivity and production in the state. Having faced with lots of hurdles, the farmers now are losing interest on jute cultivation. But, as we know, jute and its products are getting a good market in the developed countries since it is bio-degradable. Jute being biodegradable enjoys advantage over synthetic packaging despite its cheapness and hence, the jute industry can be revived if adequate measures are taken.

Looking into all these facts, it is very much desirable in the grass root level to encourage the farmers to increase the production and productivity of jute. In doing so, it will be very much helpful to have a clear picture of the problems entangled with the cultivation which are standing as obstacles in the way of

increasing total production. After finding the obstacles only, one can go for proper policy to increase the production. This study is assumed to be a small step in that direction.

Limitation of the study:

The investigator of this project was very keen to do a proper and fruitful study and also very sanguine about its outcome. But, both tangible and intangible factors operated upon and made the investigator himself very suspicious about its outcome. Some limitations can be cited as below:

- Time Factor: The investigator's work was limited by the time factor. The college assignment and classes made the investigator slow in going to the field. The monsoon period also stood as hurdle in going to the field.
- Selection of the villages: Due to the time factor many villages having good production and productivity could not be covered. In that sense the sample size may be small to have any generalized inference.

Nagaon District – An Overview

1. Nagaon District: –

A History: Nagaon, earlier spelt as Nowgong was carved out as a separate district administrative unit in 1833. Located in Central Assam, the eastern, western and southern segments of the newly organized district were once ruled by different small time feudal kings or their agents. As extensive and undulating plain intersected by big and small hills and rivers – the geography of the segments determined who their masters ought to be. The residual effects of the rule of the Barabhuysans were imaginatively utilised and reorganized by Momai Tamuli Barbaruah, an intrepid officer of the Ahom King Pratap Singha in the first half of the seventeenth century. This area, until then, was more of strategic than administrative concern. Newly organized village system hence called 'Nagaon', 'Na' means 'new' and 'gaon' means 'village'.

At the social level, a great majority of the people were the vaishnavites. Sankardeva, the great saint of the Bhakti movement era was born at Bordowa, at a distance of fifteen kilometers from the district headquarter town. His life and work had been social exemplifiers and anyone can feel the long shadow of his influence even in the remotest part of the district (of course in the state also).

The thickly populated parts of the district were the chosen targets of violence and terror during the Burmese rule. There was no leadership to organize resistant movement against the Burmese. The people heaved a sigh of relief when the British came down heavily on the Burmese and compelled them to retreat. Following the treaty of Yandaboo in 1826, this central part of the province passed silently into the hands of the British. It took a couple of years before the British finally settled on the present site on the bank of the Kallong river as the district headquarter. Earlier, they

experimented from Puranigudam and Rangagora. The district headquarter was called Nagaon and gradually it emerged into a town. It became a municipality in 1893. Nagaon district follows the pattern of any other district of the Lower Provinces east of the Ganga. It is basically a rural conglomerate of agricultural population.

Conscious of its strategic location, the administration of the district was always entrusted to officers of extraordinary merit. A local peasant uprising at Phulaguri in 1861 against government's taxation policy was enough of an indication that the peasantry was not altogether a stolid and docile lot. The peasantry was also an active participant in the various stages of the National Freedom Struggle. The national leaders like Rajendra Prasad, Mahatma Gandhi and Pandit Nehru were impressed by their spirit and enthusiasm.

The entire credit of introduction of the modern education in the district goes to the Christian Missionaries. Of them, the name of Miles Bronson, the American Missionary, shines as brilliantly as ever. The apostle of the new age Anandaram Dhekial Phukan spent the best part of his life at Nagaon. His spiritual successor Gunabhiram Barua also worked in Nagaon for about two decades.

1.2. A Glimpse: The Central Assam District of Nagaon (spelled by the British as Nowgong) is one of the largest districts of Assam. It sprawls across almost four thousand square kilometers of fertile alluvial plains and thickly forested hills. Lakes and marshes dot the landscape of Nagaon. The mighty river Brahmaputra flows along the northern periphery of the district. Other major tributaries meandering through the district such as Kollong, Kapili and Jamuna drain into the Brahmaputra.

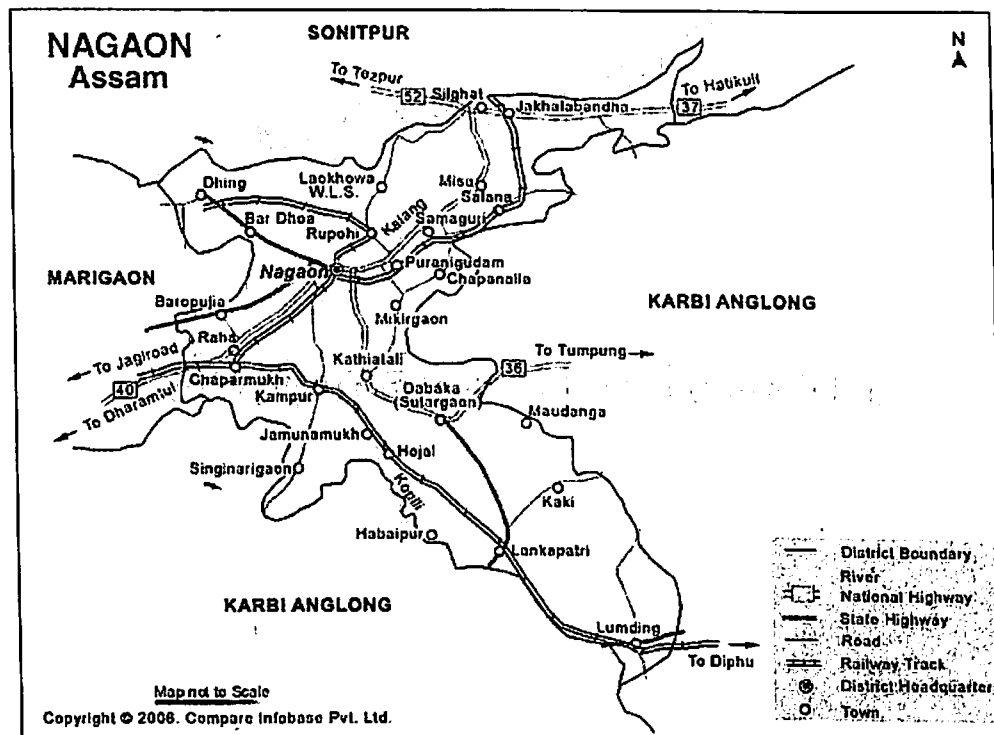
Lying at a distance of 123 kilometers by road from Guwahati, Nagaon town constitutes a vital corridor linking the upper Assam districts of Golaghat, Jorhat, Sivasagar, Dibrugarh, Tinisukia and North Assam districts of North Lakhimpur, Sonitpur and Dhemaji. The famous Kaziranga National Park stretches from the north eastern parts of the districts and spills into bordering Golaghat.

The history of the districts as an administrative unit can be firmly traced only from the time of the British annexation, Nagaon passed into British hands in 1826 and was declared a district in 1833. The headquarter of the district was established in Nagaon 1839. At one time, a large chunk of the Naga Hills, the Mikir Hills and North Cachar Hills were part of the district. With the passage of time, they were sliced away to form separate tribal districts with autonomous hill council.

During Freedom struggle, freedom fighters of Nagaon district actively participated in the struggle. The year 1942 saw the martyrdom of four freedom fighters at Barhampur, when police opened indiscriminate firing on a group of people who had assembled to have a community feast after peacefully snatching back a Shanti Sena camp nearby. Those who sacrificed their lives there included the 57 year old Bhogeswari Phukanani, apart from Lakshmikanta Hazarika, Thagiram Sut and Boloram Sut. At Bebejia, also in Nagaon district, were killed Kalai Koch and Hemkanta Barua, while two others Hemaram Keot and Gunabhiram Bordoloi laid down their lives at Jongalbalahu, followed by the martyrdom of Tilak Deka at Barapujiya.

2. Geographical Features:

2.1. Location and Boundary: The Nagaon district is located in the extension $25^{\circ}-45'$ to $26^{\circ}-45'$ North Latitude $92^{\circ}-33'-6''$ East. In the North is bounded by Sonitpur district & the Brahmaputra River, south is bounded by West Karbi Anglong and North Cachar Hills, East is bounded by East Karbi Anglong and Golaghat district. It covers an area of 4435.3 Sq.Km.



2.2. Physiography, climate and drainage:

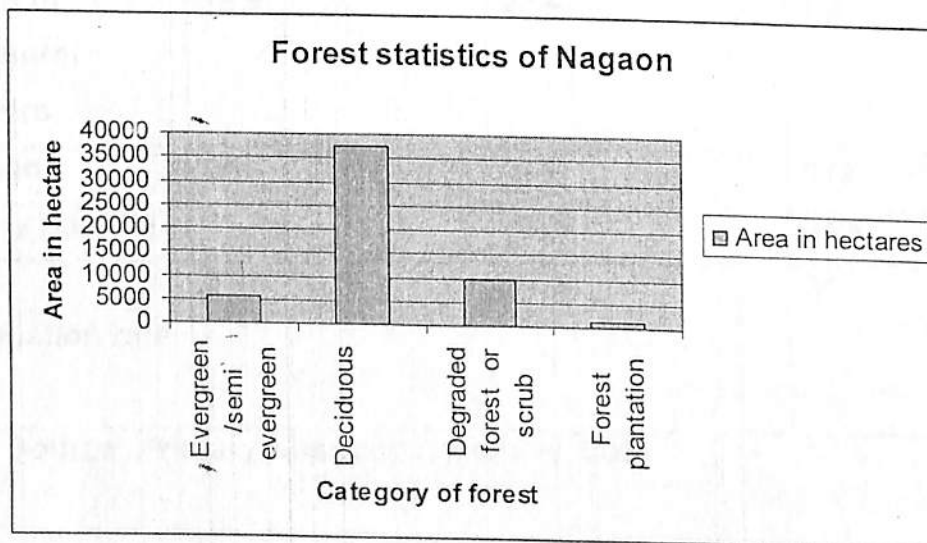
It is an extensive plain area with deposition of new alluvium and sand. The average altitude from mean sea level is 60.06 meters. There are certain pockets of hills. Major such hills are Hatimura parbat (186.5mtrs.) Barkandali (853meters) Kamakhya parbat (244 meters).

The climate of this district is in general Monsoon type of climate. But it has some special characteristics. It divides the province in two halves climatically. From this district to western side up to Dhubri rain falls in increasing rate, again from here to east ward up to Tinsukia rainfall is also in increasing rate. Here, the climate is in extreme type. The pattern of rainfall is such that south is dry, north is rainy area, rainfall from south to north is 1000 mm per year to 2000 mm per year. Lanka area is in rain shadow Zone. It experienced with Cold season from December to February. Probability of occurrence of flood in the district is from June to October. April to May is pre Monsoon period. October to November is only Post Monsoon. Average rainfall is 1750 mm (last 50 years data base).

Beels and lakes and marshy lands are other significant water bodies of the area.

There are several beels, marshy lands and swamps which are in reality old abandoned channels of Kalong and Kopili rivers. These are Marikalong, Potakalong, Haribhanga, Jongalbalahu, Samoguri beel, Urigadang and Nawbhanga. Nagaon has highest numbers of wetland in the state.

2.3. Forest:



It is seen from the above figure that Nagoan district has basically four categories of forest, namely, Evergreen/semi evergreen, Deciduous, Degraded forest or Scrub and Forest plantation. The forest characterizing deciduous is found in ample amount in the district. Degraded forest is securing the second position in the district.

3. Demographic features:

Growth in Population:

	Numbers	Rural	Urban
Total Population	2,66,55,528	2,32,16,288	34,39,240
Male	1,37,77,037	1,19,39,945	18,37,092
Female	1,28,78,491	1,12,76,343	16,02,148
ST population	33,08,570	31,54,546	1,54,024
SC population	18,25,949	15,53,691	1,54,024
Number of Households	4,10,882	3,57,383	53,499
Percent of cultivators	38.4	43.2	2.4
Percent of agricultural labourers	19.9	22.4	1.6
Sex ratio	944	948	912
Literacy rate (%)	61.7	58.3	84.6
Work participation rate (%)	31.4	31.5	31

Source: Primary Abstract of Census, 2001

Density, Sex-ratio and Literacy Rate: Having 4,10,882 households, the district is one of the most densely populated districts of the State. The density according to 2001 census is 604. Overall sex ratio of the district is 944, which is 948 for rural areas and 912 for urban areas. The most astonishing fact is that though the urban area has attained a higher literacy rate, girl child is still seemed to be neglected. The literacy rate of the district is 61.7 percent. Rural area has attained a rate of 58.3 percent as against 84.6 percent literacy attained by the people living in the urban area.

The Rural-urban Composition: In Nagaon district, according to the 2001 census, the total population living in the rural areas are 2,32,16,288 and 34,39,240 people live in urban areas. It means 87 percent of the total population used to live in the rural areas reflecting a purely rural demographic character of the district.

The Work Force and Its Occupational Pattern: Work force participation rate in the district is 31.4. There is not much difference in case of work participation rate between the people of rural area (31.5%) and urban people (31%). The percentage of cultivators is 38.4 (43% for rural and 2.4% for urban area) and the agricultural labourers are 19.9 percent (22.4% and 1.6% for the rural and urban areas respectively).

- 4. The Economy:** Most of the people of the district live on agriculture. Total cultivated area of the district is 2,92,700 hectare. Net sown area and area under HYV are 2,39,002 ha and 1,10,694 ha respectively. The numbers of cultivators, as on 31.03.2000, is 2,48,200 out of which, the numbers of small and marginal farmers are 210987. The numbers of agricultural laborers are 24,357. Most of the farmers are using the traditional methods of cultivation. Net irrigated area is 35.57% of the total cultivated area. The areas irrigated are 37,102 ha by canals, 39,226 ha and 27,807 ha are by wells and other sources respectively. Farmers are basically small and marginal farmers. The numbers of farmers having cultivated area less than a hectare are 99,288, holding a total of 1,17,080 hectares.

Per Capita Income of the people of Nagaon is Rs. 5991/-. People living below poverty line are 34%.

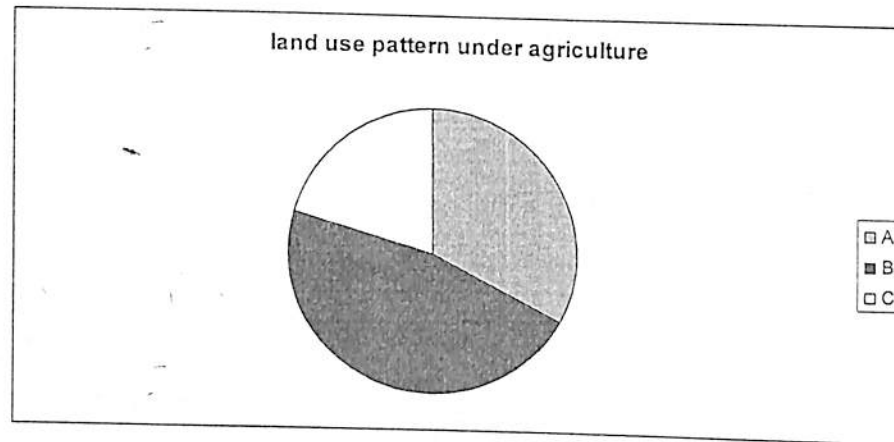
The Agricultural and other Industries of the District: The economy of Nagaon District is purely agrarian. Agriculture is the backbone of the of its economy providing livelihood to about 78% of the total population. Rice is the staple food and paddy is the principal crop of the district. Flood however is a major impediment in the development of this sector. The average land holding size of the farmers of the district is low at 0.9 hectare.

Fertilizer consumption: The productivity of various crops grown in the district is not very high and hence there is a need to increase it at least to national average. To do this it is very much important to increase the fertilizer consumption from the present level of 56.46 kg/ha. But, care shall have to be taken to curb indiscriminate use of fertilizer. The state average of fertilizer consumption is 40.70 kg/ha.

Irrigation facility: As far as the irrigation facility is concerned the district is lagging behind. At present only 30 percent of the gross cropped area is under irrigation. Micro irrigation, feasible in vegetable growing areas has many advantages over conventional methods. Micro irrigation system, i.e., low pressure irrigation system like, sprinkler irrigation, drip irrigation is in a nascent stage in the district. Only 25 hectares of land are under these irrigation systems.

Pesticide consumption: Though attack of pests causes the production and productivity to suffer, but in the district only 50 percent of the gross cropped area has been covered by its use.

Land use pattern under agricultural practices: Though there is a need to bring all the land under use into double and triple cropping in order to increase the productivity of various agricultural products to feed the growing population but a large share of the gross cropped area is still under mono-cropping. The present status of the land use pattern under agriculture can be shown in the following diagram:



A – Mono-cropping area, B – Double cropping and C – Triple cropping area

Mechanisation: In order to raise cropping intensity and productivity, use of mechanical through agricultural machineries and equipments is indispensable. Present status of the farm power is as below:

Status of mechanisation in agriculture

Category	Use of power
Optimum	1 horse power per hectare
National	0.8 hp/ha

State	0.3 hp/ha
Nagaon	0.4 hp/ha

Source: Vision Nagaon 2010

It is targeted to reach the national level of 0.8 hp/ha by the year 2010. TO achieve this target, the district will need more numbers of water lifting pumps (STW/LLP), tractors, power tillers, sprayers, etc. The existing numbers are presented below:

Item	Existing status
STW/LLP	33,000
Tractor	209
Power tiller	527
Sprayer	6742

Source: Vision Nagaon 2010

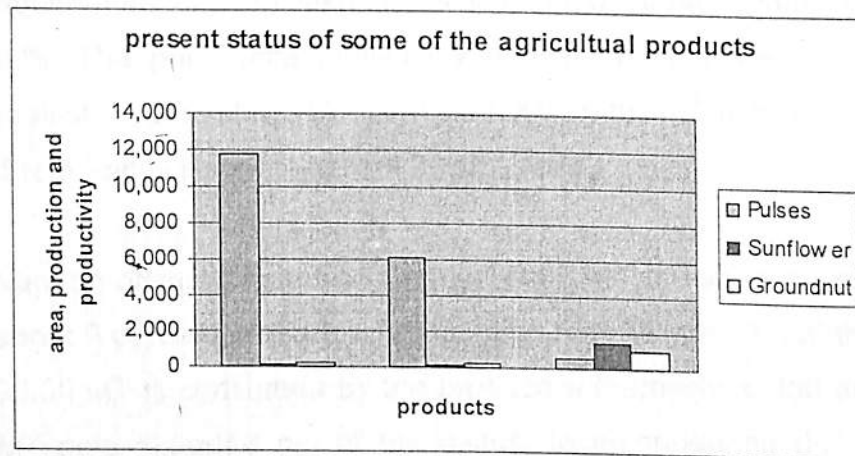
In Nagaon district, out of the net cropped area of 2,19,000 hectare, 41,000 ha are chronically flood prone and 21,475 ha are chronically drought prone area. There is no scientific rural go down and cold storage at present in Nagaon district.

Pulses and Nuts: Total area under pulses in Nagaon district is 11,786 ha which covers only 3 percent of the grossed cropped area of the district and the productivity is 559 kg/ha which is at par with the state average. Total production is 6129 million tones as against the requirement of 27,044 MT. However, there is a scope for extension of area under Arhar, Green Gram, Black Gram, Pea and Rajmah and for increasing productivity also.

Oilseeds: Sunflower and Groundnut are the principal oilseeds of the district. Sunflower matures in a period of 85-95 days and oil content is 32-36 percent. Groundnut is a 120 days crop having 40 percent extractible oil content. But, due to marketing problems, both the oilseeds could not be popularized.

The area, production and productivity of the pulses, sunflower and groundnut have been shown with the help of the following diagram:

Area, Production & Productivity of Pulse and Oilseed



Source: Vision Nagaon 2010

It is seen from the above diagram that though the area under pulses is the highest in the district, but the productivity of Sunflower is the highest. It is therefore, needed to give due emphasis on expanding the area under this oilseed and establish a proper marketing linkage so that the farmers can fetch better prices and get encouraged.

Fisheries: Considering the fact that Assam gets a lot of rainfall and that fish is an integral part of the diet of the people of Assam, it would be reasonable to expect Assam to be a major fish producer state in the country. But, unfortunately Assam produces just about 5.7 percent of the total freshwater fish production in India.

"Fishery is one of the important sectors of rural economy in Assam. The gross value of fisheries production in the state has been estimated to be more than Rs. 620 crores in addition to providing part time/full time employment to about 4,75,000 fishermen population. About 90% of the population in the state relish fish as an essential supplement to their staple food. Fish production from all resources during 1999 – 2000 was 1.597 lakh tones as against projected requirement of 2.53 lakh tones leaving a demand supply deficit of 36%. The per capita availability of fish in the state is at 6.70 Kg against a desirable rate of 11.00 Kg/annum" (NABARD document "State Focus Paper – Assam 2002 –2003").

Nagaon district produces roughly 14000 MT of fish in a year which is about 9 percent of the total production in the state. Out of this, around 3,500 MT is consumed by the producers themselves and about 5,000 MT gets exported out of the district to neighbouring districts/states. Only about 2,500 MT reaches the organised wholesale market while around 3,000 MT reaches the retail markets directly in the rural areas.

Poultry: People in the district of Nagaon are predominantly non - vegetarian and prefer both eggs and meat of birds of local variety. Production is less than the demand in the district. Therefore, to meet the local demand, eggs are procured from far-off places like Hyderabad and Delhi. As per the 1997 Livestock Census, the number of Poultry (excluding ducks) in the district is 7,38,929 nos. and the

number of Ducks is 2,12,945 nos. The poultry population consists of about 74% local variety. Remaining is of improved variety. Ducks constitute about 22% of total egg-laying bird population and include varieties such as local cross-bred and exotic Khaki Campbell. Improved varieties of ducks constitute about 45% of total duck population.

Handloom & Textile: Nagaon district presents a unique picture in the Handloom and Textile sector. Weaving of fabrics is a way of livelihood of large number of rural families and artisans. Looms are part and parcel of rural households and weaving is an integral part of rural livelihood. Jajori, which is located about 17 Km from Nagaon town is a very important centre of handloom production. Famous for its "Kacha Pat" products, there are approximately 6,705 numbers of weavers here covering most of the families of the place. However, this important sector is yet to be exploited commercially. It needs to be kept in mind that weaving is only a part time activity and not the primary bread earning activity. As a result, Handloom has not been able to develop to its fullest potential.

Handicrafts: Handicraft is an important cottage and household industry sector, which is largely emphasised for providing self-employment opportunities in the rural areas to supplement/augment their earnings. The main thrust may be given to development of (1) Kuhila craft of Bordowa, (2) Pottery & Terracotta at Raha, Samaguri & Kaliabor, (3) Cane & Bamboo products at Juria, Dakhinpat area and a part of Panigaon area, (4) Rantholi Jewellery.

Industries: The district of Nagaon is practically dependent on Agriculture and industry has not yet assumed a dominant role in employment generation.

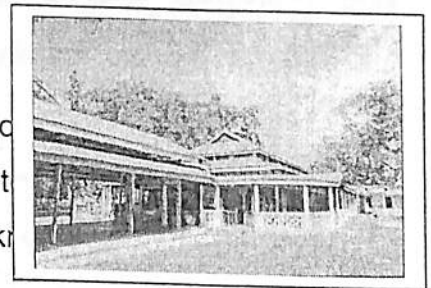
Tea Manufacturing is the predominant industry in the district. There are 23 Tea gardens covering a total area under cultivation of 7071 hectares.

In the medium scale industry sector, in addition to Tea Industry, Assam Co-operative Jute Mill Ltd. (commissioned in the year 1976), Kampur co-operative Sugar Mill (Commissioned on 1st, March '1987), Katimari Weaving Project (Commissioned in Dec'86) and Sack Craft paper project at Dhing (taken up in the year 1986-87) are the main Industrial projects taken up in Co-operative and State sector. Whereas the Jute Mill at Silghat is flourishing, the Kampur Sugar mill has already been closed down. The other two Mills never took off.

Tourism:

Places of tourist importance:

Bardowa: The birth place of Mahapurush Srimanta Sankardeva, the great artist, author, founder of Vaishnava Religion, dramatist, etc of Assam. It is situated at a distance of 18 km from the district headquarter.



Pakhi Tirtha - (Samaguri Beel): Here migratory birds from different place of the world comes in winter season. It is situated at a distance of 16 km towards the east from Nagaon town.

Laokhowa: Apart from Kaziranga, Laokhowa, the wild life sanctuary is situated at Lowkhowa

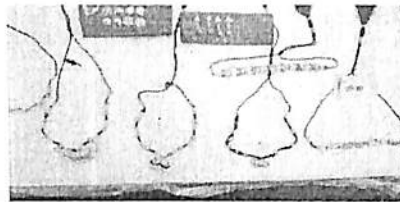


namely "Lowkhowa Avayaranya" covering an area of 70 sq km. It is in a distance of 25 km towards north from the head quarter. Its main attraction is the Great Indian One-Horned Rhinoceros. Other animals are Tiger, Leopard, Asiatic Buffalo, Wild Boar, Hog Deer, etc.

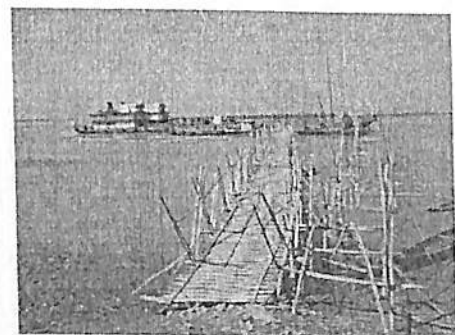
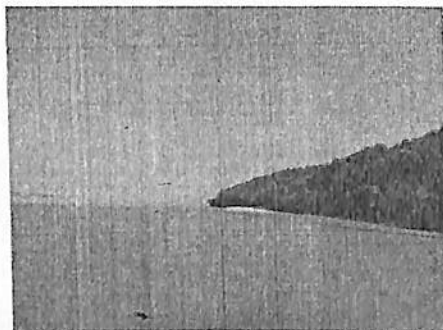
Champawati Kunda: The famous fall
Champawati is situated at Sapanala.



Ranthali: This village is famous for making the Assamese Gold Plated (traditional) ornaments, situated at a distance of 4 km from the Nagaon town.



Silghat: Situated at a road distance of 55 kms from the Nagaon town, this is a vital and picturesque river port lying on the South bank of the mighty river Brahmaputra.



Infrastructure: Road infrastructure is a must to ensure development whether in the agro sector or industrial sector. Nagaon is relatively well placed in road infrastructure as compared to other districts. The district has 800 km of black topped roads and 1578 kms of gravel roads under PWD. There are three National Highways, namely, NH-37, NH-36 and NH- 54 crossing the district with a total road length of 258 kms.

Railway: Though the district has a divisional railway headquarter at Lumding which falls on the main Guwahati-Dibrugarh railway line, Nagaon town does not fall on this line. Nevertheless, Nagaon town is connected to this main line by a branch line.

Anatomy of Jute: An Outline

Prelude: Jute is a long, soft, shiny vegetable fiber that can be spun into coarse, strong threads. It is produced from the plants in the genus *Corchorus*, family *Malvaceae*. It is one of the cheapest natural fibers and is second only to cotton in amount produced and variety of uses. Jute fibers are composed primarily of the plant material cellulose (major component of plant fiber) and lignin (major component of wood fiber). It is thus a lingo-cellulosic fiber that is partially a textile fiber and partially wood. The industrial term for jute fiber is raw jute which is off-white to brown and 1 – 4 meters (3 – 12) feet long.

Jute is one of the strongest natural fibers. The long staple fibre has high tensile strength and low extensibility. Its luster determines quality; the more it shines, the better the quality. It also has some heat and fire resistance. The biodegradable features of jute are becoming increasingly important.

White Jute (*Corchorus Capsularis*) W: In several historical documents during the era of great Mughal Emperor Akbar states that the poor villagers of India used to wear clothes made of jute. Simple handloom and hand spinning wheels were used by the weavers, who used to spin cotton yarn as well. History also states that Indians, especially Bengalis, used rope and twines made of white jute from ancient times for household and other uses.

Tossa Daisee Jute (*Corchorus Olitorius*) TD: Tossa Jute is an Afro-Arabian variety and a member of the Mallow Plant family. Tossa jute fiber is softer, silkier and stronger than White Jute. This variety astonishingly showed good sustainability in the climate of Ganges Delta. Along with White Jute, Tossa Jute has also been cultivated in the soil of Bengal from the start of the 19th century. Currently, the Bengal region (West Bengal of India and Bangladesh) is the largest producer of the Tossa Jute variety.

History: For centuries, jute has been an integral part of Bengali culture. In the 19th and 20th centuries, much of the raw jute fiber were exported to the UK, where it was then processed in mills concentrated in Dundee, but this trade had largely ceased by about 1970 due to entrance of synthetic fibers. As the use of polythene and synthetic materials as a substitute for jute started to capture the market, most economists said that the jute industries are experiencing a declining.

When Pakistan and India became two separate countries, the tension rose between them and Pakistan decided to stop exporting raw jute to Indian mills (as most of the jute field feel in East Pakistan), then the jute industries in India started suffering and even closure and forced India to go for jute harvesting.

For several years, farmers in Bangladesh burnt their crops as they did not get adequate price. The long decline in demand forced the largest jute mill in the world (Adamjee Jute Mill) to close. Despite this, the farmers did not stop cultivating jute since there was internal demand for jute in the market. But, of late, the jute market turned back again and the price of raw jute increased more than 50% due to high demand of jute products worldwide.

Jute is cultivated in India for centuries. In Europe towards the end of the eighteenth century, East India Company introduced jute fiber in their search as a substitute for flax in packaging application. It was 1793 when the first despatch of about 100 tons of raw jute left India. The first Jute Mill was set up in Dundee in England in the year 1830. During the war of Crimea in 1853 the supply of sunnhemp from Russia fell short in European market culminating the export of Bengal's jute to Europe at a fast rate. During the 40 years from 1828 to 1868, the export of raw jute from Bengal jumped from 1200 tones to 2, 62, 800 tones. Throughout this period Dundee of Scotland maintained the dominance in the production of jute goods. Later on, the British industrialists diverted their attention

to establish jute mill in Bengal due to availability of raw jute and skilled labor at low wage.

The landmark in the history of jute industry in India dates back to 1854, when the British industrialist George Auckland set up the first jute mill at Rishra in the Hoodly district of West Bengal. In 1870, altogether five jute mills started production in Bengal. These five mills were run by 5000 workers through 950 looms.

During the first four decades of the 20th century the number of jute mills as well as the number of workers increased at fast rate as indicated in the table below:

Jute Mills and the Workers in the Early Century

Year	No. of Jute Mills	No. of Workers
1912	61	1, 99, 725
1921	77	2, 81, 848
1926	86	3, 27, 547
1931	93	2, 68, 289
1941	101	2, 86, 181

The total investment in jute also increased significantly, from 6.08 crore in 1904 to 26.85 crores in the year 1924.

Unfortunately, during the post independence period, when the ownership of jute mills was transferred to Indian Industrialists, there had been significant downfall in the industry as noted from the table below:

Year	No. of Jute Mills	No. of Workers
1951	95	2, 55, 581
1961	83	1, 92, 130
1971	75	2, 11, 847
1981	60	1, 80, 000
1991	57	1, 70, 000

Uses: Jute is the second most important vegetable fibre after cotton; not only for cultivation, but also for various uses. Jute is used chiefly to make cloth for wrapping bales of raw cotton, and to make sacks and coarse cloth. The fibers are also woven into curtains, chair coverings, carpets, area rugs, hessian cloth, etc. While jute is being replaced by synthetic materials in many of these uses, some uses take advantage of jute's biodegradable nature, where synthetic would be unsuitable. Examples of such use include containers for planting young trees which can be planted directly with the container without disturbing the roots, and land restoration where jute cloth prevents erosion occurring while natural vegetation becomes established.

Traditionally jute was used in traditional textile machineries as textile fibres having cellulose (vegetable fibre content) and lignin (wood fibre content). But, the major breakthrough came when the automobile, pulp and paper, and the furniture and bedding industries started to use jute and its allied fibres with their non-woven and composite technology to manufacture nonwovens, technical textiles and composites. Therefore, jute has changed its textile fibre outlook and steadily heading towards its newer identity, i.e. wood fibre. As a textile fibre, jute has reached its peak from where there is no hope of progress, but as a wood fibre jute has many promising features.

Jute can be used to create a number of fabrics such as Hessian cloth, sacking, scrim, carpet backing cloth (CBC), and canvas. Hessian, lighter than sacking, is used for bags, wrappers, wall-coverings, upholstery, and home furnishings. Sacking, a fabric made of heavy jute fibres, has its use in the name. CBC made of jute comes in two types. Primary CBC provides a tufting surface, while secondary CBC is bonded onto the primary backing for an overlay. Jute packaging is used as an eco-friendly substitute.

Jute can be used to create a number of fabrics such as Hessian cloth, sacking, scrim, carpet backing cloth (CBC), and canvas. Hessian, lighter than sacking, is used for bags, wrappers, wall-coverings, upholstery, and home furnishings. Sacking, a fabric made of heavy jute fibres, has its use in the name. CBC made of jute comes in two types. Primary CBC provides a tufting surface, while secondary CBC is bonded onto the primary backing for an overlay. Jute packaging is used as an eco-friendly substitute.

Diversified jute products are becoming more and more valuable to the consumer today. Among these are espadrilles, floor coverings, home textiles, high performance technical textiles, Geotextiles, composites, and more.

Jute floor coverings consist of woven and tufted and piled carpets. The traditional Satranji mat is becoming very popular in home décor. Jute non-wovens and composites can be used for underlay, linoleum substrate, and more.

Jute has many advantages as a home textile, either replacing cotton or blending with it. It is a strong, durable, color and light-fast fibre. Its UV protection, sound and heat insulation, low thermal conduction and anti-static properties make it a wise choice in home décor. Also, fabrics made of jute fibres are carbon-dioxide neutral and naturally decomposable. These properties are also why jute can be used in high performance technical textiles.

Jute has many advantages as a home textile, either replacing cotton or blending with it. It is a strong, durable, color and light-fast fibre. Its UV protection, sound and heat insulation, low thermal conduction and anti-static properties make it a wise choice in home décor. Also, fabrics made of jute fibres are carbon-dioxide neutral and naturally decomposable. These properties are also why jute can be used in high performance technical textiles.

Another diversified jute product is Geotextiles, which made this agricultural commodity more popular in the agricultural sector. It is a lightly woven fabric made from natural fibres that is used for soil erosion control, seed protection, weed control, and many other agricultural and landscaping uses. The Geotextiles can be used more than a year and the bio-degradable jute Geotextile left to rot on the ground keeps the ground cool and is able to make the land more fertile. Methods such as this could be used to transfer the fertility of the [Ganges Delta to the deserts of Sahara or Australia.

Moreover, jute can be grown in 4–6 months with a huge amount of cellulose being produced from the jute hurd (inner woody core or parenchyma of the jute stem) that can meet most of the wood needs of the world. Jute is the major crop among others that is able to protect deforestation by industrialisation.

Thus, jute is the most environment-friendly fibre starting from the seed to expired fibre, as the expired fibres can be recycled more than once.

Features: The features of jute fiber are as below:

- a) Jute fiber is 100% biodegradable and recyclable and thus environmentally friendly.
- b) It is a natural fibre with golden and silky shine and hence called *The Golden Fibre*.
- c) It is the cheapest vegetable fibre procured from the bast or skin of the plant's stem.
- d) It is the second most important vegetable fiber after cotton, in terms of usage, global consumption, production and availability.
- e) It has high tensile strength, low extensibility, and ensures better breathability of fabrics. Therefore, jute is very suitable in agricultural commodity bulk packaging.

f) It helps to make best quality industrial yarn, fabric, net, and sacks. It is one of the most versatile natural fibres that has been used in raw materials for packaging, textiles, non-textile, construction, and agricultural sectors. Bulking of yarn results in a reduced breaking tenacity and an increased breaking extensibility when blended as a ternary blend.

g) The best source of jute in the world is the Bengal Delta Plain in the Ganges Delta, most of which is occupied by Bangladesh.

h) Advantages of jute include good insulating and antistatic properties, as well as having low thermal conductivity and a moderate moisture regain. Other advantages of jute include acoustic insulating properties and manufacture with no skin irritations.

i) Some noted disadvantages include poor drapability and crease resistance, brittleness, fibre shedding, and yellowing in sunlight. However, preparation of fabrics with castor oil lubricants result in less yellowing and less fabric weight loss, as well as increased dyeing brilliance. Jute has a decreased strength when wet, and also becomes subject to microbial attack in humid climates. Jute can be processed with an enzyme in order to reduce some of its brittleness and stiffness. Once treated with an enzyme, jute shows an affinity to readily accept natural dyes, which can be made from marigold flower extract. In one attempt to dye jute fabric with this extract, bleached fabric was mordanted with ferrous sulphate, increasing the fabric's dye uptake value. Jute also responds well to reactive dyeing. This process is used for bright and fast coloured value-added diversified products made from jute.

Cultivation:

Jute is a rainy season crop, sown from March to May according to rainfall and type of land. It is harvested from June to September depending upon whether the sowing are early or late.

Climate:

Jute is a crop which thrives with good rain and sunshine. Jute fibre quality is highly influenced by the fluctuations in the relative humidity during its growth period. In general, relative humidity of 93% with narrow diurnal difference during actual plant development period from July to September is conducive to fibre quality and yield. The best temperature for jute growth is 34°C. Rainfall distribution is one of the important factor which determines the efficiency of the area for its cultivation. The ideal rainfall pattern for jute has three distinct phases.

a) **Pre-monsoon period:** This phase extends from mid March to mid April. During this period there should be enough rains to permit land preparation, sowing and germination. Any shift in beginning of rains results in early or late sowing. In case of late sowing, yield is adversely affected. However, low rains can be substituted by irrigation.

b) **Dry period:** This period extends for 30 -40 days after sowing when practically no rains are required, so as to permit the two intercultural operations i.e. weeding and thinning to be completed, efficiently. Usually light irrigations at ten days interval do not disturb but heavy rains spoil the crop.

c) **Monsoon period:** The monsoon period extends from May to September, during which rains alternating with sunshine and wind favors plant growth and development. However prolonged cloudy sky, rains and stagnation of water in the fields are harmful.

Soil:

Jute can be grown in almost all types of soils varying from loamy soil, loamy alluvial soil, and the new grey alluvial soil of good depth. It can also be grown on sandy loam and clay loam soils but heavy clay soils are unsuitable for its cultivation. Soils with low pH give a poor crop. Red soil with heavy manuring and balanced use of chemical fertilizers can also be used for its cultivation.

Land Preparation:

Jute seeds are very small and require a well prepared seedbed with a fine tilt. Land preparation involves deep ploughing with soil turning plough to loosen the soil and bury weeds or residues of previous crops. This is followed by 2 -3 ploughing with soil stirring plough or bar harrowing the field to pulverize the soil and to take out root stubbles etc. After each ploughing, planking is done. The land is prepared about 40-50 days before the regular monsoon rains occur.

Seed and Sowing:

Proper selection of variety, seed treatment, seed rate and timely sowing are important key factors to influence the jute yield. These are described here.

1. **Selection of Variety:** Depending upon the type of land and distribution of rainfall, the varieties of jute to be sown has to be decided. In low-lying areas only varieties of Capsularis can be sown because varieties of olitorius cannot withstand water logging. Capsularis varieties can however, be sown in low, mid and high lands. In general, they are suitable for early sowing from March onwards. Varieties of Olitorius have to be sown only in mid and high lands. Sowing may begin from mid-April. All the Olitorius varieties except JRO-878, are likely to flower prematurely if sown earlier than the middle of, April.

2. **Seed Treatment:** Before sowing, the seed should be treated with Agrosan GN or Ceresan @ 5g/kg of seed against attack of seed-borne pathogens. Seed requires treatment before sowing by soaking them in hot but not boiling water for about half an hour. This speeds up germination at a satisfactory level.

3. **Time of Sowing:** Time of sowing differs from place to place on the basis of variety, temperature, relative humidity and onset of the monsoon. Thus in general, in the northern hemisphere mid-March sowing is optimum for all

Capsularis varieties and of the Olitorius varieties. The best time of sowing for JRO-632 and other Olitorius varieties is mid-April. However, sowing of jute stretches from late February to May. Winter jute is sown during December.

4. Seed Rate: The number of jute seed sown is much in excess of the required plant stand in the field. If germinability is about 95 per cent and if each seed sown germinates even then the seed rate is such adjusted that nearly 84 percent or more of the emerging seedlings may be removed during weeding and thinning. Only 16 percent or less is retained for maturity.

Most of the jute is sown by broadcast method. The seed rate for broadcast sowing is as in table 1. Jute sown in lines requires half the quantity of seed required in broadcast method.

Table 1: Seed rate for jute crop sown by broadcast method

Sl.No	Germinability %	Capsularis seed variety kg/ha	Olitorius seed variety kg/ha
1	95	7.5	4.5
2	90	8.0	4.8
3	85	8.5	5.1
4	80	8.5	5.4
5	75	9.5	5.8
6	70	10.0	6.0

5. Spacing: One month old seedlings sown by broadcast method are thinned out to maintain a plant to plant spacing of 10 to 15 centimetre. When crop is sown in lines, a row spacing of 30 cm is kept. Seeds are dropped 1 cm or closer, later the emerging seedlings are thinned out to 7.5 cm.

6. Method of Sowing: Jute is generally sown by broadcast method. The seeds are spread over the land twice, first length wise and secondly widthwise. This method is fastest and suits for quick sowing. A simple hand-push seed drill has been developed to suit small plots. A disc with grooves 1 cm apart on its rim carries two seeds from the hopper and drops them between the wings of a furrow opener. Two soil gatherers behind the furrow opener cover the seeds. A wheel packer then packs the soil. Since the drill sows one row at a time, it takes more than 10 hours to sow one hectare of land. The field for seed drill sowing should be prepared well to fine tilth.

7. Intercultural Operation: Intercultural operations in Jute consist of thinning, mulching and weeding. Thinning is an essential operation which must be carried out after 20 days of sowing when seedlings are about 10 cm tall. At this stage seedlings are much crowded; therefore manual thinning is preceded by light raking. Raking is never done in wet soil. It is followed by light turning of the soil, by a wheel hoe between rows to achieve mulching and to remove the weeds. This is accompanied by hand weeding for spacing the plants. During its interculture operation, the gap between the plants is still less than the desired final spacing. The second or final interculture operation is done about 2 weeks later, when plants are about 15 - 20 cm high and are properly spaced at 10 -15 cm apart.

Manures and Fertilizers:

The application of manure is not normally necessary for soils where silt is deposited annually. Application of Cattle or other animal manure before sowing at the rate of 10 -12 tonnes per hectare gives good results, but the application of potassium fertilizer is of particular importance on soil which are deficient in this element. It is difficult to recommend a general schedule for jute without soil test but the maximum dose may be suggested. For Capsularis, nitrogen is applied @ 40 -60 kg/hectare and for olitorius 20-40 kg/hectare. Depending on the soil, phosphorus may be at half the dose of nitrogen or less or even may not be

required in some areas. Requirement of potash is usually at half the dose of nitrogen or at equal dose at some places. In the areas where jute -potato, jute -wheat, jute -paddy etc. rotations are practised, phosphorus or potash may not be necessary. In these areas the requirements of nitrogen per hectare may not be more than 20 kg for olitorius jute and 30 kg for capsularis jute.

The entire quantity of phosphorus and potash should be applied at the time of land preparation. Half the quantity of nitrogen is applied as top dressing when the crop is about 30 -35 days old and the remaining half when the crop is about 50 -55 days old.

Foliar application of urea as a supplement to soil application of nitrogen is useful under certain conditions, such as when (i) fertilizer is in short supply, (ii) soil application is difficult due to drought, flood or excessive weed growth and (iii) in areas where leaching is a severe problem. About 10 -12 kg of nitrogen per hectare may be applied in two spraying with about 14 per cent urea concentration using ultra low volume power sprayers. Spraying of urea is effective only between 30 -60 days of plant age. Spraying should not be done when it is likely to rain or there is high wind on under scorching sun.

Multiple Cropping:

Land used for growing jute is often planted with alternate crops since jute has a very short life span. Three to five crops can be grown under irrigated condition in the same field. Some examples of multiple cropping, involving jute are as described below.

A. Sole cropping

Jute -paddy -potato or jute -paddy wheat can be grown as sole cropping. Jute variety JRO-878 is sown before mid-March and harvested during first week of August. Paddy crop variety TN-1 is transplanted during second week of August

and harvested during first week of November while Potato variety is sown during third week of November and harvested during the last week of February.

B. Relay cropping

Paddy-Potato + wheat + jute can be grown as relay cropping. In this relay cropping system, rice variety Ratna is grown in nursery outside the field. It is transplanted in the field during second week of the August and harvested during first week of November. Potato variety Kufri Chandramukhi is sown during second week of November. Wheat variety Sonalika is sown between two rows of " potato, just after final earthing up during first week of December. Potato is harvested during the last week of February. At the same time moong variety PS - 16 is relay cropped in between two rows of wheat. At the end of March, wheat is harvested and two rows of jute JRO 524 are relay cropped in between two rows of moong. Moong is harvested in the first week of May and Jute during first week of the August. In this way, in one year five crops namely paddy, potato, wheat, moong and Jute can be growth from the same field.

C. Intercropping

Jute can be grown as intercrop with moong and groundnut. Moong is sown in line 40 cm apart. After one month, jute variety JRO-878 or JRO- 7835 is sown in lines 20 cm apart i.e. 10 cm from each side of moong rows. Similarly, groundnut is sown in 60 cm rows in mid January and jute JRO -878 or JRO 7835 may be sown 30 cm apart between two lines of groundnut in the end of March.

Harvesting:

Jute crop may be harvested for fibre purpose at any time before flowering between 120 and 150 days after sowing. However, it is very difficult to tell when jute fibre crop is mature, because fibre formation starts early and continues beyond flowering, there are always quantities of over-mature, mature and immature fibre along the stem. Early harvesting yields thin plants, that ret quicker and in a uniform manner. The resulting fibre would be of good quality with less percentage of over -mature fibre would be of good quality with less percentage of

over, mature fibre as compared to that from late harvest. Delayed harvesting results in increased yield but the fibre quality is coarse. Too early harvesting may also produce low yield and weak fibre. Therefore, right stage of harvesting is late flowering or early pod stage.

The plants are cut at the base, very close to the ground with a sickle. In flooded or waterlogged areas, the cutter may have to dive under the water to carry out the operation of cutting or pulling out the whole plant.

In some highland areas, the harvested plants may be sun dried for about two or three days to desiccate the foliage, after which the stems are tied into bundles about 12 cm in diameter. They are then taken to retting pool or ditches. In low land areas, where the jute is flooded at harvest time, retting is carried out soon after harvesting. Jute harvesting in a plot must be completed on the same day otherwise difference will be reflected in unequal retting. Thin plants ret earlier than thick ones. Therefore, all cut plants are sorted into two or more groups like thin, thick or medium.

They are dried in the field for 3 days. The defoliated light plants are tied into bundles of 12 cm in diameter. Sometimes, drying is done by stacking the bundles in the field the wet bundles are sent for retting without drying.

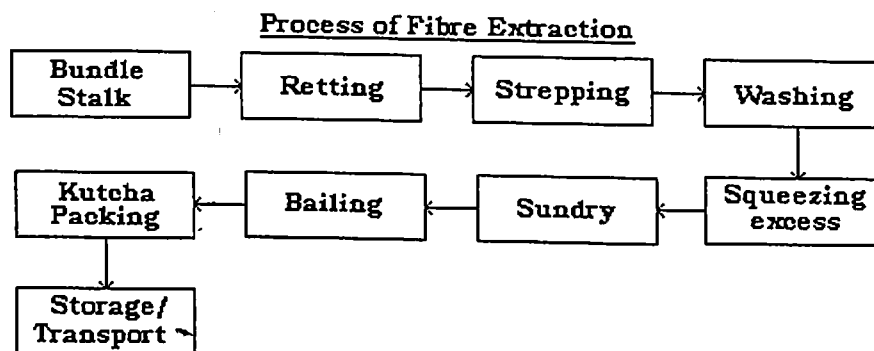
Yield:

The green matter harvested from one hectare may amount to 40 tonnes depending on the growth of the crop. The average yield of jute fibre per hectare is between 1000 to 1500 kg for capsularis and 1500 to 1900 kg for olitorius varieties. Plants grown for seed are harvested late the yield may vary from 300 to 350 kg dry seed per hectare. Fibre yield is normally 5 -6 per cent of the green weight of the stem. Chemically, the fibre consists of about 75% cellulose, 11 % lignin and 12% xylem tissue.

The fibre is stronger when it is dry, bleaching reduces the fibre strength. The strength, fineness, colour, uniformity, luster and length all contribute to the determination of fibre quality for industries.

The Fiber Extraction:

The jute plant's fibers lie beneath the bark and surrounded the woody central part of the stem. To extract the fibers from the stem, the process is carried out in the following stages:



Retting:

Retting is a process by which the fibre in the bark get loosened and separated from woody stalk. It consists of two. Steps, pre- retting treatment and retting process.

A. Pre retting treatment

The jute plants harvested on the same day are sorted into similar size group. Their branches at the apex are removed, since they contribute very little fibre. The farmer generally dries them in the field before making bundles. The other useful practice is the splitting of the bark by 'malleting' the periderm -bond thick basal portion of the reed. This facilitates entry of retting bacteria and consequently hastens retting, and contributes to fibre quality improvement. Then jute plant bundles are kept standing for 2 -3 l. days in water, keeping half -metre basal part of the bundles submerged. These lower portions have thicker stem and hard bark and require longer time to ret. Thus this treatment ensures more uniform retting.

B. Retting Process:

It is a fermentation or decomposition process in which the soft tissues surrounding the fibre in the bark are disintegrated or loosened by submerging the tied bundles in pools or ditches of water. For this purpose the harvested bundles are brought to ditch, pool, tank or preferably to a slow flowing canal. The basal part of the bundles are then kept standing in 30 -60 cm deep water for 3 - 4 days, because the lower portion of the stem being thicker requires longer time to ret. The bundles are then arranged side by side in a single or double layer. They are tied to form a sort of platform called 'jack' or float. Before weighing them down, they are to be covered with water plants like water hyacinth, shoti, coconut, jute sticks, straw etc. Since the jack tend to float, they are to be kept at least 10 cm below the surface of water. The weighing agents for submergence may be seasonal log, concrete slabs or stone blocks but not tannin. Care is to be taken to see that the jack does not touch the bottom of the retting tank. The ratio between plant materials to retting water should be at least 1: 20.

The jack remains in this condition for about 7-8 days, at the end of which one plant (reed) is pulled out from any of the bundle to examine whether the bark separates easily from the wood. Normally, when temperature is around 34°C the bundles become ready for extraction of fibres between 8th and 12th day. Over retting results in 'dazed' and weak fibers. The time required for completion of retting depends mainly on (a) temperature (b) initial pH of water (c) initial quantum of microbe inoculums in the retting tank (d) stage of harvesting of the crop and (e) Volume and depth of water.

Stripping (Fiber Extraction): Stripping is a process of removing the fibers from the stalk after the completion of retting. Fibers are removed from the stalk by any one of the following methods:

- i) single plants are taken and their fibers are taken off
- ii) taken of a handful of stalks, breaking it in a to and fro motion in water

- iii) washing the stalks first by standing in waist deep water and then stripping afterwards.

When there is plenty of water, bundles of stalks are laid in the pond ditches or slow moving streams and left for 5 – 15 days under water. The bunch of stem is held in one hand and the root end tapped lightly with a mallet. After loosens the rest of fibers, fibers are extracted and washed.

Washing and Drying: Extracted fibres are washed in clean water. The dark colour of fibres can be removed by dipping them in tamarind water for 15 to 20 minutes and again washed in clean water. After squeezing excess water the fibres are hang on bamboo railing for sun drying for 2-3 days.

Bailing and Packing: The jute fibre is graded into tops, middles, B, C and X-bottoms. Packing into Kutcha bales. They are transported to jute market or direct to jute mills.

Gradation:

Jute fibers after extraction are graded by Kutcha Balers as:

Top - Very strong fibres, good lusture and colour.

Middle - Strong fibre and average colour and lusture.

Bottom - Sound fibre, medium strength.

B-Bottom - Sound fibre, medium strength, not suitable for higher grades.

C-Bottom - Medium strength fibre, any colour.

X-Bottom - Weak ha jute.

(Cross-Bottom)

Grading method presently in operation in our country is based on certain quality characteristics which are considered at time of their utilization for production of different materials out of the fiber. Raw jute is further classified for trading and for manufacture into jute products on jute mills on the bases of length, strength,

fineness, lusture and colour. According to quality, the entire fibers produced in the country have been standerdised in eight grades:

White jute is available in the following 8 grades as:

W-1, W-2, W-3, W-4, W-5, W-6, W-7, W-8.

Tossa jute is available in 8 grades as :

TD-1, TD-2, TD-3, TD-4, TD-5, TD-6, TD-7, TD-8

Obviously, TD₁ or W₁ stands for best quality and TD₈ or W₈ stands for the worst fiber 'Habi-jabi'.

The present system of grading is largely scientific. But, when the buyers and sellers have to transect huge business within a short span of 2/3 months, it becomes physically impossible to carry out instrumental measurements of fiber properties methodically. Therefore, objective assessment of 'hand-and-eye' method as per specifications has been accepted for normal transactions.

The classifications of each grade are based on six quality characters, eg., i) Strength, ii) Root content, iii) Defects, iv) Colour, v) Fitness and vi) Density. Depending upon the importance of th quality parameters different weightage have been given for grading of fiber. If we consider 100 marks for good quality fiber then the weightage of different quality parameters are indicated below:

Quality Parameters	Weightage
i) Stréngth	28
ii) Root content	33
iii) Defects	22
iv) Colour	12
v) Fineness	5
vi) Density	2

- i) **Strength:** It refers to the force required to break a tuft of fiber of fixed length and of fixed unit of length. To compare strength valise therefore,

a tuft of approximate size has to be held about 5cm. apart and broken longitudinally without jerk. The whole range of strength has been divided into five classes, namely, i) very good, ii) good, iii) fairly good, iv) fair average and v) average.

- ii) **Root content:** Hard barkly region at the lower end of root which requires additional softening for use and is normally known as 'cuttings'. The specifications give root content in terms of percentage by weight. This need the root portion to be out and weighted separately and the percentage is calculated on the basis of the weight of the whole reed.
- iii) **Defects:** Factors causing serious or partial damage to the quality of fiber are commonly known as defects. In all 12 defects have been detached in the body of the fiber which have broadly been classified in two groups, namely, a) major defects and b) minor defects.

Major defects	Minor defects
i) Over-retted fiber	i) Loose leaf
ii) Dazed fiber	ii) Loose sticks
iii) Center root	iii) Spocks
iv) Runner	iv) Gummy fiber
v) Knots	v) Croppy fiber and weak croppy ends
vi) Entangled sticks	
vii) Mossy fiber	

Grade	Defects rejected/allowed	Score marks
W ₁ /TD ₁	Free from all major and minor defects	22
W ₂ /TD ₂	--Do--	22

W ₃ /TD ₃	Free from all major and minor defects except some loose leaf and a few spokes	18
W ₄ /TD ₄	Free from all major and substantially free from loose sticks and specks	14
W ₅ /TD ₅	Free from all major defects	10
W ₆ /TD ₆	Free from center root, over retted and dazed fiber and reasonably free from entangled sticks	4
W ₇ /TD ₇	All major and minor defects are allowed	

A) Major Defects:

- a) **Over rooted fiber:** Fiber which has its strength and brightness on decomposition as a result of retting for longer period than required.
- b) **Dazed fiber:** Weak in strength and dull in appearance due to storage in moist condition.
- c) **Centre root:** Fiber which is more or less clean and soft at both ends but contains hard barkly strips in the middle portion.
- d) **Knote:** Knots are stiff spots often bark, black or brown in color appearing at the nodal region of the main stem or at the branch or leaf trace.
- e) **Entangled sticks:** Sticks are remnants of woody part of jute plant over which fiber sheath is formed. Entangled sticks are broken sticks which are linked with fiber mass are not easily removable.
- f) **Mossy fiber:** It is a type of vegetation which sometimes gets attached to the jute plant during flood conditions, portions of it may remain on the jute fiber even after retting and washing.

B) Minor Defects:

Loose leaf: Dark gray leafy or paper like substance appearing on the strand. Loose leaves are those that lie loosely on the fiber and are easily removable.

- a) **Loose sticks:** It is broken sticks easily removable by shaking.
 - b) **Gummy fiber:** Fibers held together by undissolved pectinaus mater.
 - c) **Speoks:** These are barky spots, normally oval shaped, dark gray to brown in color, not larger than 1.5 cm. This may be due to punctures by emale apion, an insect, or due to infection caused by the fungi, which damage the cortical tissues. Sometimes, improper washing of fibers leave barky spots.
 - d) **Weak croppy end:** Fibers over a length of about 30 cm at the top end which has become unusually weak.
 - e) **Croppy fibers:** Fiber with top ends rough and hard caused by careless retting.
- iv) **Color:** The word color indicates he degree of cleanliness or whiteness or brightness of fiber. It also acts as a subjective indicator for strength as well as gives clear idea about the retting situation and retting method adopted.

Class	White Jute	Degree of brightness	Corresponding grades
i) Very good	Light creamy	Golden to white	1
ii) Good	Creamy pink to brownish white	Reddish to brownish white	2
iii) Fairly good	Brownish to reddish white to light gray	Reddish or brownish to gray	3
iv) Fairly average	Brownish to light gray	Light gray to copper color	4
v) Average	Gray to dark gray	Gray to dark gray	5

- v) **Fineness:** Width or diameter of filaments as judged by closely observing the filaments after the fiber strands are opened by the

manipulation of fingers. Very fine, fine and well separated fibers have been found to be significant in higher grades.

- vi) **Density:** Weight per unit volume of fiber including air space. It may be the heaviness of some fiber reeds, held within the grip and raised up and down. Only two classes, i.e., heavy bodied and medium bodied fibers have been considered.

Overall grade assessment as BIS specification for jute:

Grade	Characters	Score
W ₁ /TD ₁	Very good strength and color; very fine heavy bodied fiber; free from major and minor defects; maximum root content allowed W ₁ : 10% and TD ₁ : 5%.	100
W ₂ /TD ₂	Good strength and color; fine heavy bodied fiber; free from major and minor defects; maximum root content allowed W ₂ : 15% and TD: 10%.	85
W ₃ /TD ₃	Fairly good strength and color; well separated medium bodied fiber; free from major and minor defects except some loose leaf and a few specks; maximum root content allowed W ₃ : 20% and TD: 15%	69
W ₄ /TD ₄	Fair average strength and color; well separated medium bodied fiber; free from major defects and substantially free from specks and loose sticks; maximum root content allowed W ₄ : 26% and TD: 20%	54
W ₅ /TD ₅	Average strength and color; free from major defects; maximum root content allowed W ₅ : 36% and TD: 26%.	39
W ₆ /TD ₆	Average strength; free from center root, over retted and dazed fiber and reasonably free from entangled sticks; maximum root content allowed W ₆ : 46% and TD: 36%	20
W ₇ /TD ₇	Weak mixed fiber; maximum root content allowed W ₇ : 57% and TD: 42%	1

W ₈ /TD ₈	Entangled or any other jute not suitable for any of the above grades but of commercial value.	
---------------------------------	---	--

Testing:

Raw jute quality and jute product's quality testing is essential before export. The jute products quality includes physical, chemical and analytical, biological ingredient, jute composite and ecological test. It also requires well equipped laboratories and testing equipments. In India particularly in West Bengal many jute testing services are available. The most reliable and prominent test services are from Indian Jute Industries Research Association (IJIRA). IJIRA jute test services equipped with modern laboratory equipments and well trained experts' team.

Biodegradable Characters of Jute in an Environment Friendly World:

The past success of jute is due largely to its environmentally friendly characteristics. Jute fiber is comparable or superior to synthetic fiber in physical and chemical characteristics. Jute is an annually renewable energy source with a high biomass production per unit land area.

Jute is biodegradable and its products can be easily disposed of without causing environment hazards. By rotating with other crops, jute improves soil fertility and increases the productivity of other crops. The use of jute in the paper industry and as a geo textile will help to, at least partially solve the two biggest environmental problems we are facing today: deforestation and soil erosion.

Jute is a fast growing field crop with high carbon dioxide assimilation rate. Jute plants clean the air by consuming large quantities of CO₂ which is the main cause of green house effect.

Theoretically, one hectare of jute plants can consume up to 15 tones of CO₂ from the atmosphere and release about 11 tones of Oxygen in the 100 days of jute

growing season. Studies also show that the CO assimilation rate of jute is several times higher than the trees.

Studies show that only a modest amount of fertilizers and herbicide are required for jute cultivation. Use of pesticide is also limited because pest is not a severe problem in case of jute cultivation (Das, S. K., Saha, D, Sen, H. S., 2006). Jute produces 12.5 – 25 tones of dry matter per hectare of land. About one tone of dry matter is returned to the soil in the form of leaves. About three tones of roots remain in the soil. Thus a large amount of organic matters finds its way into the soil and improves the soil conditions.

Jute is a seasonal crop harvested at least once a year. Moreover, jute is fast growing crop, that is, it reaches a height of 1.5 – 4.5 meters in a period of 3/4 months. The average dry stem production of jute ranges from 20 – 40 tones per hectare, annually.

This contrasts with the production of the fastest growing wood plants which need at least 10 – 14 years from plantation to harvest, and produces only 8 – 12 tones per hectare annually. Because the biological efficiency of kenaf is much higher than that of the wood plants, the use of jute and mesta instead of wood to make paper pulp will lower substantially the cost of production. It will also reduce deforestation.

Socio Economic Importance of Jute:

Employment Generation: Jute being a labor intensive crop, cultivation of jute creates huge employment opportunities in rural areas. It has been estimated that jute and Mesta cultivation can generate about 25 crores working man days annually. About 40 lakh farm families derive 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 sectors.

In the jute growing rural areas, jute sticks are the main source of fuel. In view of the shortage of wood and coal, LPG, etc. jute cultivation occupies an important position as a source fuel in these areas.

After harvesting the jute crops, leaves are allowed to shed in the fields which is decomposed in the soil and served as a source of manure resulting in the increase in soil fertility. In the jute field jute follows rice in many areas. At the time of harvesting the jute field remains almost free of weeds and resulting less weed competition in the following crops.

Jute Vs Plastic: The Environmental Effect

Choosing a Jute bag (and reusing it) is an effective way you can help our environment.

Jute, the natural fibre, is losing its national importance with the emergence of its substitutes like nylon 66, polypropylene and polyethylene and other kinds of synthetic goods as an outcome of invention as well as innovation in recent times. All are by-products of naphtha cracking of crude oil and gasoline. The reason is that the market provides the incentives in favour of producing and consuming synthetic goods, which are cheap in nominal sense relative to the products of natural jute fibre.

More than 500 billion plastic bags are produced in a year in the world consuming 60 millions barrels of oil to manufacture them. The majority of the plastic bags are ended up on landfill sites or being burnt, which releases a plethora of toxic chemicals into the air. Only 1 in every 200 bags is recycled, and this requires energy and resources to collect and process the bags.

Plastic Bags are slow to decompose and cause untold harm to wild-life. Plastic manufacturing uses valuable mineral resources and also has a negative impact on carbon emissions. Billions of plastic bags are used once and thrown away. Destruction of plastic releases benzene - a known carcinogen. However plastic bag pollution is a threat to our ecosystems that we can do something about. In the marine environment plastic bag litter is lethal, killing at least 100,000 birds, whales, seals and turtles every year. After an animal is killed by plastic bags its body decomposes and the plastic is released back into the environment where it can kill again.

Plastic Vs Jute:

Plastic	Jute
Used once	Reusable
Cannot biodegrade	100% biodegradable
Synthetic and harmful to the environment	Natural and eco-friendly
Are given away and thus an expense	Can be sold creating additional revenue

The alternative is as simple as it is environmentally sound – Use an Eco bag made of jute these bags are strong, spacious and long lasting.

Some facts about Jute:

- ✓ JUTE Bags are eco-friendly.
- ✓ Jute is 100% bio-degradable.
- ✓ Jute is a fast growing crop with a much higher carbon dioxide assimilation rate than trees.
- ✓ Jute production creates much needed employment in poorer regions of the world.
- ✓ Jute bags are strong, trendy and reusable.
- ✓ Abundant availability – a renewable and sustainable resource
- ✓ Durable material – has the life span of over a thousand plastic carrier bags.
- ✓ Jute is a natural bast fibre, a vegetable fibre composed of cellulose which is the main building material of all plants, like all natural fibres jute is totally biodegradable. Bast fibre grows the entire length of the plant stalk from roots to tip. Groups of fibres are contained in the pithy layer between the thin outer bark and the woody core.

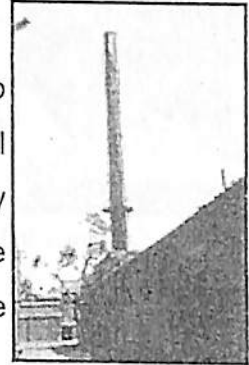
- ✓ When discarded, jute totally decomposes putting valuable nutrients back into the soil.
- ✓ Environmentally friendly – non-pollutant produces non toxic gases or harmful gases by product.
- ✓ Jute industry supports an estimated 5 million people in the poorest regions on earth.
- ✓ One hectare of Jute plants consumes over 15 tones of CO₂, several times higher than trees.

In India the plastic manufacturers are trying hard to defeat jute in its battle to capture the packaging market. The JPA (Jute Packaging Material (Compulsory Use in Packing Commodities) Act) asks for mandatory use of jute bags by some specified industries, i.e. cement, fertilizer, sugar and other food grain industries. The Cement Industry, which needs to market 50% of its output in jute bags, is urging to waive it from the JPA. In a memorandum to the Prime Minister in the year 1997, the industry stated, "It will not be out of context to mention that all over the world, the cement industry is using either hdPE/PP or paper bags but not jute bags". It is worth mentioning here that in a joint memorandum to the Prime Minister in the same year the producers of plastic bags and the industries which are compelled to use jute bags demanded that the JPA laws be phased out. The memorandum projected an annual loss of Rs.35.3bn to the Indian economy due to its requirements. Of this, a loss of Rs10 billion due to degradation in the quality of these three bulk commodities (Cement, fertilizer which need 50% to market in jute bags and sugar, which needs to market 100% in jute bags) is estimated.

Jute processing: the mechanism

Jute Manufacturing in Jute Mills

Raw jute in the form of bales are processed in jute mills to produce hessian, sacking, jute yarn, bags, and other useful products. Raw jute bales from jute fields or suppliers, carried by trucks are unloaded and stacked in the jute mills godown. The production of jute goods from raw jute processing involves the following steps:



Selection:

In the selection process, raw jute bales are opened to find out any defect and to remove the defective portion from the mora by experienced workers. Raw jute bales are of two types i.e. 150 kg weight and 180 kg weight with or without top portion cutting. The bales are assorted according to end use like Hessian weft, Sacking wrap, Sacking weft etc. After selection, jute bales are carried to softening section by workers called Gariwala and Bajawala.



Softning:

In softning process jute morahs are made soft and pileable. Two methods are used for softning; use of softning machine and use of jute good spreader. Generally an emulsion plant with jute softner machine is used to lubricate and soften the bark and gummy raw jute. The emulsion plant consists of gear pump, motor, vat, jet sprayer, nozzles, emulsion tank and the jacket. In this softning process jute becomes soft and pileable and suitable for carding.



Piling and pile Breaking:

The main function of pile breaker is to break the pile and serve it to the carding machines. The softner machine out put material carried by pilemen through bile to the pile place for piling. During piling superficial moisture penetrates inside fibre and "Thermo fillic" action take place which softner the hard portion of the root. After piling for nearly 24 hours the pile breakers carry the material to the carding machine.

Generally root cutting is done after piling near the hand feed breaker carding machine. The root weight varies from 5 to 7% of the total weight of jute.

Carding:

Carding is a combining operation where jute reeds are splitted and extraneous matters are removed. Jute fibres are formed into ribbon called "sliver". There are three different carding sections: (i) breaker carding (ii) inner carding (iii) and finisher carding

Breaker Carding:

In different jute mills the carding operations has been carried out in two ways:

- a. Hand feed breaker carding
- b. Rool feed breaker carding

The material after piling more than 24 hours is used in hand feed breaker where the material after piling for 12 hours used in the rool feed carding. In the Breaker carding machine soften jute after piling is feed by hand in suitable weight. The machine by action with different rollers turns out raw jute in the form of jute sliver for finisher carding. In this process root cutting is necessary before feeding the material to the hand feed breaker carding machine.

Finisher Carding:

Finisher carding machine make the sliver more uniform and regular in length and weight obtained from the Breaker carding machine. Finisher carding machine is identical to the Breaker carding machine, having more pair of rollers, staves, pinning arrangement and speed. Nearly 4 to 12 slivers obtained from Breaker carding machine is fed on this machine. The material thus obtained is send to drawing section.

Drawing:

Drawing is a process for reducing sliver width and thickness by simultaneously mixing 4 to 6 sliver together. There are three types of Drawing Frame machine. In most mills 3 Drawing passages are used in Hessian and 2 Drawing passages are used in Sacking.

First Drawing:

The slivers obtained from finisher carding machine is fed with four slivers on to the first drawing frame machine. The first drawing frame machines makes blending, equalising the sliver and doubling two or more slivers, level and provide quality and colour. This machines includes delivery roller, pressing roller, retaining roller, faller screw sliders, check spring, back spring, crimpling box etc..

Second Drawing:

In second drawing, the Second Drawing Frame machine obtain the sliver from the First drawing machine and use six slivers and deliveries per head. The Second Drawing machine makes more uniform sliver and reduce the jute into a suitable size for third drawing.

Third Drawing:

In the third drawing, the Third Drawing frame machine uses the sliver from second drawing. The Third Drawing machine is of high speed makes the sliver more crimped and suitable for spinning. The comparison of the three drawing process:

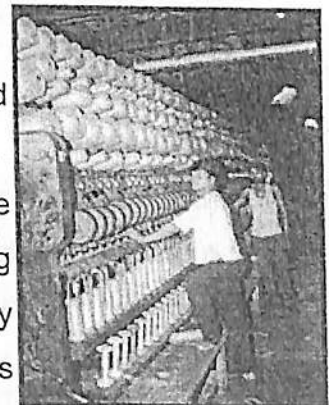
Drawing Process	Efficiency Range (%)	Productivity Mt/mc/shift
Ist Drawing	55 - 73	1.75 - 2.2
IInd Drawing	64 - 74	1.62 - 1.9
IIIrd Drawing	67 - 70	1.31 - 1.4

Spinning:

Spinning is the process for producing yarn from sliver obtained from Third drawing.

In the spinning process slivers are elongated and fibres are twisted into yarn to impart strength. spun yarns in the spinning process are wound onto Bobbins. after to fill the empty bobbins with yarn machine is stopped, replace these bobbins by empty bobbins. The entire time is called an average cycle

time. The time for replacing the bobbins full of yarn by empty bobbins is called softing time.



The jute spinning frame machine is fitted with slip draft zone and capable of producing quality yarns at high efficiency with auto-drafting arrangements also. A 4', pitch slip-draft sliver frames available of 20 spindles 100 spindles, having a production range 8 uls to 28 uls with a flyer speed of 3200 to 4000 RPM. Spinning of several types of yarn is processed by spinning frame machine using different kinds of bobbins, such as: Food Grade HCF, Sacking Wrap, Hessian Wrap, Hessian Weft.

Winding:

Winding is a process which provides yarn as spools and cops for the requirement of beaming and weaving operations. There are two types of winding:

- ✓ Spool Winding and
- ✓ Cope winding

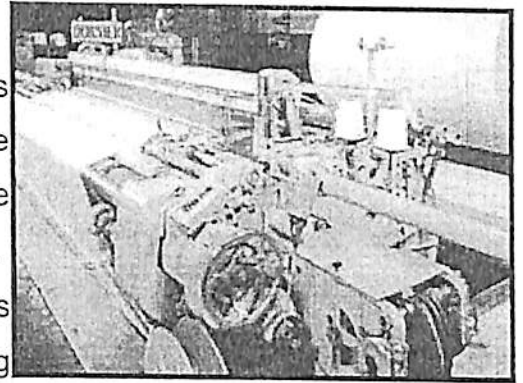


Spool Winding:

In Spool Winding yarn is produced for warp (the longitudinal yarn). Spool winding machine consists of a number of spindles. There is wide variation in the number of spindles per machine from one make to another. Productivity of spool winding depends on the surface speed of the spindle and machine utilisation.

Weaving:

Weaving is a process of interlacement of two series of threads called "wrap" and "weft" yarns to produce the fabric of desired quality. There are separate looms for hessian and sacking in weaving section. The Hessian looms, shuttle which contents cops (weft yarn) is manually changed. The sacking



looms are equipped with eco-loader to load a cop automatically into the shuttle.

Dumping:

Dumping is the process in which the rolled woven cloth is unrolled and water is sprinkled on it continuously to provide desired moisture. Each roll is generally 104 yards or 95.976 meters. Damping is done manually.



Calendering:

Calendering is a process similar to ironing of fabric. After damping the damped fabric passes through pairs of heavy rollers rendering threads in fabric flattened and improve the quality and appearance.

**Lapping:**

Lapping is the process in which Hessian fabrics are folded into the required size used in "Bale press" operation on the lapping machine.

Cutting:

Cutting is the process where the sacking cloth is cut to the required length for making bags for different size such as A-Twill bags and B-twill bags of 100 kg capacity.

Hemming:

In Hemming process, the raw edges of sacking cloth cut pieces are shown by folding it with sewing machine.

Herackele Sewing:

In Herackele sewing the sides of sacking cloth cut pieces are shown to make a complete bag.

Bailing:

Bags or Bale processing cloths are pressed compactly according to buyers need.

Assam Cooperative Jute Mill: A Synopsis

The History of Establishment of the Mill: After the partition of Bengal, it had been observed that jute production field fell in East Bengal, whereas the Jute Mills were on the side of West Bengal. Then Lokpriya Gopinath Bordoloi pondered over to establish a jute mill in Assam to give boost to jute cultivation in Assam. The then Finance and Revenue Minister Mr. Motiram Bora imposed a tax of 50 paisa on exported jute to collect fund to establish a jute mill at Guwahati, but the dream did not come true. But, in the later stage, the MLA of Kaliabar Legislative Assembly Late Lilakanta Bora pioneered to establish the Assam Cooperative Jute Mill on the south bank town of Silghat, with the help of some of his social worker friends. It was registered in the year 1959 but struggled to get the license for another ten years. In the year 1970, the then central minister Mr. Fakhruddin Ali Ahmed inaugurated the mill. After one year of experimental production, the mill finally took off to production on commercial basis from the year 1971. The state government gave an assistance of Rs. 60 lakh and IDBI lend 78.50 lakh to help run the mill. Another 10.28 lakh was collected from various sources, i.e., farmers, cooperatives, etc.

The crisis Period: Though the mill employed thousands of people in Assam directly as well as indirectly, the rosy expectation of people did not last long. Many factors were perceived to be responsible for such a grim performance of the mill. The principal causes were,

1. The mind set of the then people were not industry family. They could not overcome the farmers' mentality. Also, the labourers were not skilled.
2. Goofy management

3. Burden of loans (from different sources) from the very inception of the mill
4. Low quality production
5. Absence of local markets
6. Hike in transportation costs
7. Lack of devotion of the laborers
8. Absence of adequate infrastructural requirements.

As times crawled by, losses mounted and these factors got accentuated and finally gobbled up the mill. The mill renounced the responsibility of 1,100 numbers of employees and passed into oblivion for quite some time from 6th March, 1984.

Rekindling of the Jute Mill: In the Assam Accord which was signed after Assam agitation, it was emphasized to open up the mill again from 1st June, 1986. During these two years of closed down, credit mounted to 87 lakh from 45 lakh. To revitalize the mill the Central Government sanctioned Rs. 240 lakh. The State Government on its part waived the loan of Rs. 142 lakh. Moreover, it supplied 50% of total electricity requirement up to 1990 as assistance. The IDBI and other loans were repaid with the money sanctioned by the Central Government. Two generators were purchased to mend the shortage of electricity.

Nevertheless, the jute mill could not come out of the pass of economic stress until 1990. The then MD of the mill Mr. Biswanath Bora strived a lot to increase the mobility of the production and ended up in taking loans of Rs. 45 lakh under the expansion activities. Adding another Rs. 42 lakh from the working capital of the mill, he bought improved / highly sophisticated machines to increase production.

Though the mill was cocooned in the government's assistance constantly, the precipitous fall in the efficiency of the management and scarcity of the working capital stymied the rejuvenation of the mill. By the time Mr. Najrul Islam Lakar took over the charge of the MD in 1992 and the beleaguered finally rekindled. Since 1993, the mill has been doing a lucrative business. The gloating mill has repaid all its previous loans taken from the Apex Bank. After paying the mandatory tax, providing the employees with required public provident fund, it has been mustering profits for last few years. It is the result of the meticulous planning of the mill management which is showing profits like below:

Year	Total Production (metric ton)	Amount of Profit (Rs. Lakh)
1998-99	3929.12	30
1999-2000	4142.85	43
2000-01	4492.51	47
2001-02	5145.71	80
2002-03	5085.36	112
2003-04	4933	121
2004-05	5026	118
2005-06	5223.48	92
2006-07	5416.73	

Source: Both Primary and the MoU signed between the Assam Cooperative Jute Mill Ltd and the Cooperation Department, Government of Assam for the financial year 2006-07.

It is very apparent from the above table that the mill has been constantly making profit which rose from Rs. 30 lakh in 1998-99 to reach the peak of Rs. 121 lakh in 2003-04 again to fall to Rs. 92 lakh in the year 2005-06. Production is also increasing rapidly during the same period from 3929.12 MT to 5416.73 MT in 2006-07.

Production of the Mill: The Assam Cooperative Jute Mill (Silghat Jute Mill) produces jute bags, Hessian cloths, odorless Hessian and multi-fold yarn. Out of all total production 80% is jute bags and remaining 20% is the other products. For all these products grade 5 – 7 is needed. Grades above these also can be used if available. The mill requires almost 6000 ton raw jute a year. The daily requirement varies from 20 to 22 tons. The mill has almost 25 registered suppliers of raw jute. In the year 2006-07, raw jute was purchased at the rate of Rs. 1100 – 1700/- per quintal. This year (2007-08), the mill has purchased it at the rate of Rs. 1000 – 1500/- per quintal. The raw materials come from the neighboring districts of Nagaon, Sonitpur and Darrang. Ambagan, Juria, Rupahi, Dhing are some of the areas of Nagaon district from where raw jute is procured by the mill.

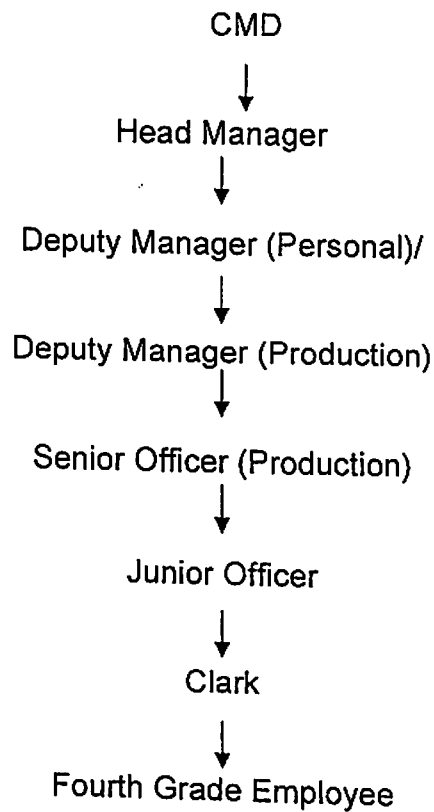
Labor requirements: Total numbers: 900

- i) Permanent: 500 (in the scale of 900 - 2800). The laborers receive the DA (Dearness Allowance at the rate of the central government employees. Medical allowance is fixed at Rs. 350.). The permanent laborers receive, apart from the salary, the facilities of PF (Provident Fund), GI (Group Insurance) and Gratuity. Rs. 500 is the employees share in the PF. The amount of gratuity is Rs. 24, 000/- and GI is amounting to Rs. 70, 000/-.
- ii) Temporary: 200 -250 (these laborers are basically act as helper to the permanent labor.)
- iii) Any other: Apart from the permanent and semi-permanent, there are casual or Badliwala laborers in the mill.

Most of the laborers (80%) are from the nearby locality. Remaining is from other distant places. The mill provides residential facilities for almost 300 of its laborers.

a) Officials: 52

b) Management structure:



Total production – for last couple of years (category wise):

The production of the mill in the year 2005-06 was 5098.480 Metric tonne and in 2006-07 was 5416.738 MT. The mill produces 18 to 20 metric tonne products daily. The production is increasing at an increasing rate. The factors behind this increasing rate of production are: a) Renovation of the machines, b) Work efficiency of the workers are increasing as the mill enjoys the benefit if the large scale production like, division of labor, c) Mitigation of power crisis as a result of installing high vault power generators in the mill (one 380 kv, 280 kv and 200 kv).

Marketing of the final products: The needy states place the order with the Jute Commissioner through the Director General (Disposal). The Jute Commissioner, then give the allocation to various Mills and the Mills sell their allocated products to the respective states. The Directorate of quality Assurance of the Central Government does the required inspection and then the price is paid to the Accounts of the respective mills.

Direction of sale: The Mill sells its products locally as well as to the states like, Punjab, Haryana, UP, WB, Chattisgarh, MP, etc.

Sale price: The price is fixed by the Jute Commissioner for the government sale. For others the mill follows the price quoted in the daily price bulletin (published daily) named '*Gunny Trade Association*'.

Mode of transport: The products are transported to Tezpur by roadways and then by railways to its destinations.

Profit Sharing of the Mill: The profit is shared among the shareholders in the form of dividend and the remaining part is spent on developmental works, like infrastructures of the mill, renovation of the machineries, refurbishing the residential quarters, construction of LP School building, free medical health facilities for the laborers and their families, etc. Initially, when the mill was established, there were 8000 share holders, but, it has been reduced to approximately 1700. These share holders are those who turned out and responded to the Annual General Meeting (AGM) of 2002-03. In the AGM, a 10% dividend was declared and that is still being prevalent. Apart from the individual share holders, there are approximately 13-14 cooperative societies and the government holds the largest share of approximately 97%.

Division of work:

The Mill has nine work divisions.

- a) Go down,
- b) Batching,
- c) Spinning,
- d) Cop/roll winding,
- e) Brimming,
- f) Weaving,
- g) Finishing,
- h) Maintenance
- i) Electrical, water supply and sweeping.

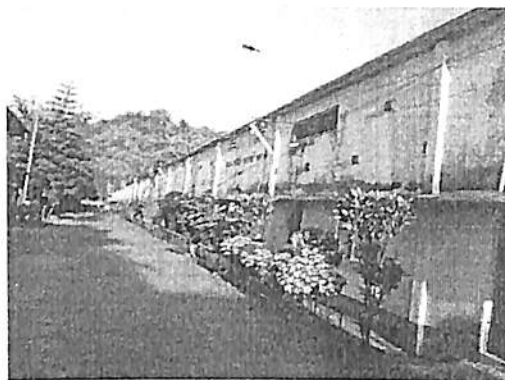
The workers work in three shifts, namely A, B and C shift. A shift works from 6 AM in the morning to 11 AM and again from 2 PM to 5 PM. B shift workers start their work at 11 AM in the morning to 2 PM and then again from 5 PM to 10 PM. The workers of the C shift work continuously from 10 PM to 6 AM. There is no break for the night shift workers unlike the other two shifts.

Threat to the Jute Cultivation and Jute Mills: The major threat to the jute cultivation (products) is the competition from the synthetic products. For the encouragement of the jute farmers, laborers and the expansion of the jute industries, the central government enacted the Jute Packaging Material Act in 1987. But, from the inception of the act, it spared the Cement and Euria industries. The Act was made flexible in its amendment in 1989 and made it possible for all products other than food grains to utilize 10% other materials for the purpose of packaging. Gradually it became more flexible even for food grains also. In 2003, such flexibility became 50% and soon the act would get diluted. In such a situation, the future of the people, who are directly and indirectly involved in the jute mill (and cultivation), is getting iffy.

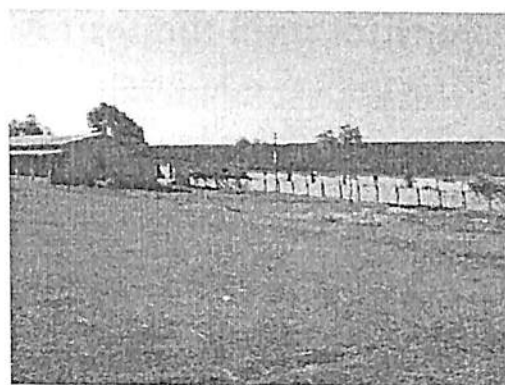
Apart from this, there are some other problems also as was come out in the discussion with the officials and labourers of the Mill. Among them high labour cost and the obsolescence of the machineries are the prominent ones.



Gateway of the Mill



Front view of the mill



Back view of the mill

For Fostering the Growth of the Jute Mill:

To rejuvenate the Jute Mill, by overcoming all these problems, one needs to do the following activities:

- ✓ Increase the amount of investment in R&D,
- ✓ Technology up gradation
- ✓ Infrastructures for storage to be developed
- ✓ The marketing of raw jute also needs to be looked after
- ✓ Product and market development activities for jute and diversified products are to be developed.

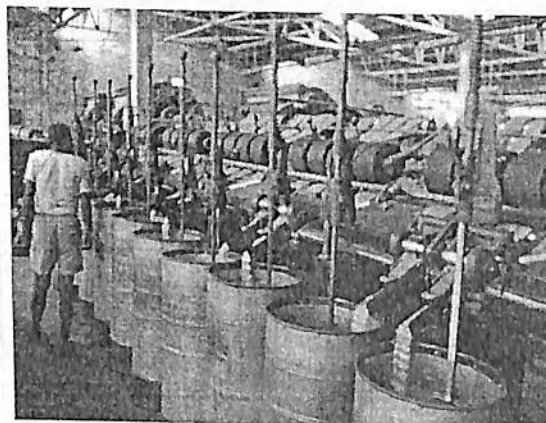
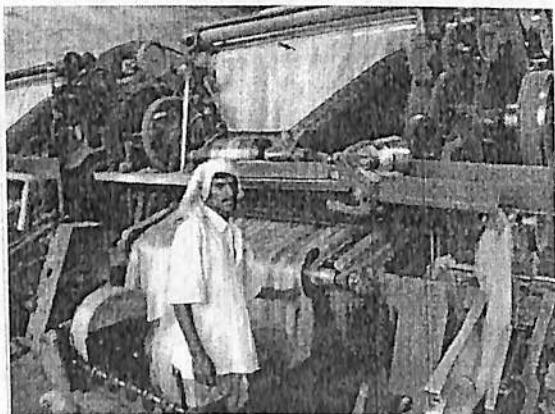
Conclusion:

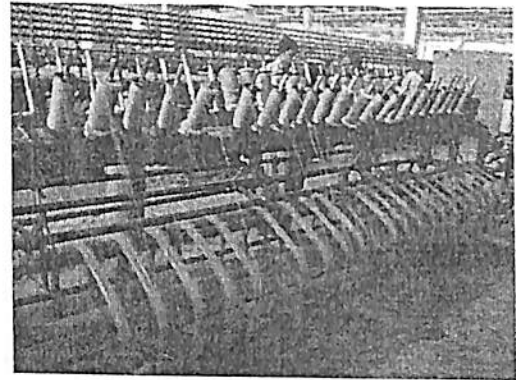
The Assam Cooperative Jute Mill was established mainly for two objectives, namely, to procure the raw jute of the jute growers of Assam and to employ the local unemployed people of the state. The Mill, over the years, has been fulfilling both the objectives to a great extent. But, the amount of raw jute, the state produces, cannot be procured by the Mill alone. Therefore, the government can think about establishing a new Mill in the region. At the same time, the government should ensure a reasonable market for jute products by containing the ongoing policy of reserving food grains and sugar to be packed in packaging materials made from jute.

Assam Jute Products: A tiny but long journey

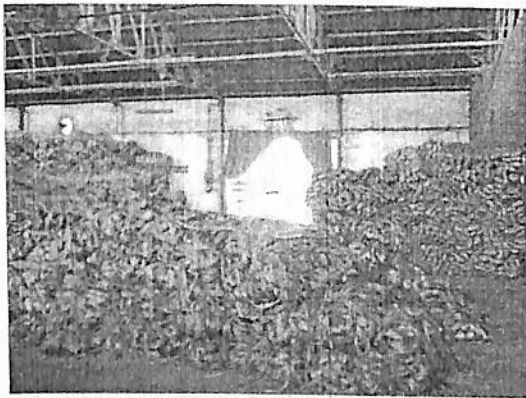
Assam Jute Products, a tiny mill in the Nagaon town itself, was established way back in the year 1977, with an installed capacity of 5 tones daily. Its main product is *Sutli* for which the low quality jute only is needed. The Mill procures raw jute for its production from all over the Nagaon and Marigaon district. It has no permanent contractors for supplying raw jute. They purchase from whoever comes with raw jute them. The Mill, since it is a tiny one, does not purchase from the JCI. The purchase price ranged between Rs. 360 – 370 per mound. The Mill has 130 labourers both permanent and temporary. All the workers are paid on weekly basis. Some of the permanent workers stay within the Mill campus in the quarters provided by the Mill owners. There are almost 60 quarters for the labourers.

The finished product, whose cost of production is Rs. 9/- per kg, are sold mainly in the market of Uttar Pradesh. For transportation, the Mill owner relies on the roadways only. The transportation cost of one truckload of Sutli to Uttar Pradesh may be up to Rs. 37, 000/-. One truck can carry up to 15 tones of sutli in one go.

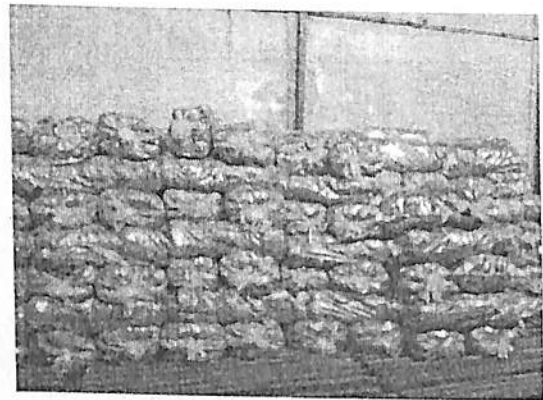




Mill workers busy at their work in the day shift in Assam Jute Products (AJP)



The stock of raw materials



The finished product of AJP, tied in a bundle of 20 kg, for sale

The Assam Jute Products is really doing a commendable job in the locality. Though, the Mill owner does not want to sell its product in the local market, yet a good amount of Sutli is sold locally. Apart from meeting the local demand of Sutli, the Mill is providing bread to a good number of people. It's a good venture on the part of the Mill owner. Apart from this, there are two more such tiny mills, one at Guwahati and the other at Kharupetia of Darrang district. Looking into the roles played by these tiny mills in the local economy in particular and the economy of Assam as a whole, more such ventures should be encouraged by the concerned authority/government.

Issues of Jute Cultivation: An Analysis of Jute Scenario of Nagaon District

Prelude: Jute is a natural fiber popularly known as the golden fiber. It is one of the cheapest and the strongest of all natural fibers and considered as fiber of the future. Jute is second only to cotton in world's production of textile fibers. India, Bangladesh, China and Thailand are the leading producers of Jute. It is also produced in southwest Asia and Brazil. India is the largest producer of jute goods in the world, while Bangladesh is the largest cultivator of raw jute.

World Scenario of jute: Jute is grown in many countries of the world and basically in those countries where labor is cheap. Following are some of the major jute producing countries along with their production and productivity:

Area, Production and Yield of Jute and Allied Fibre in Major Producing Countries

Area (A): '000 Hect.		Production (P): '000 bales				Yield (Y): Kg/hect.	
Year	Symbol	Banglade sh	China	India	Myanmar	Nepal	Thailand
-	A	698.1	162.1	1114.5	43.1	11.0	74.5
1997-98	P	6903.9	2386.1	11114.8	183.9	86.1	591.1
-	Y	1780.0	2650.0	1795.0	768.0	1409.0	1428.0
-	A	477.5	92.7	1025.4	37.3	12.3	69.7
1998-99	P	4732.8	1377.8	9811.2	186.1	84.4	565.0
-	Y	1784.0	2675.0	1722.0	898.0	1235.0	1459.0
-	A	408.9	65.0	1035.6	37.4	11.7	19.9
1999-	P	3955.5	916.7	10533.7	186.1	84.4	190.6

2000							
-	Y	1741.0	2539.0	1831.0	897.0	1302.0	1728.0
-	A	408.9	50.0	1024.0	36.6	14.5	19.2
2000-01	P	3955.5	699.9	10375.9	185.6	84.3	186.7
-	Y	1741.0	2520.0	1824.0	912.0	1044.0	1748.0
-	A	408.9	50.0	1050.0	43.9	11.3	19.2
2001-02	P	3955.5	755.5	10416.6	232.9	91.1	186.7
-	Y	1741.0	2720.0	1786.0	953.0	1452.0	1748.0

History of Jute: Jute is cultivated in India for centuries. In Europe towards the end of the eighteenth century, East India Company introduced jute fiber in their search as a substitute for flax in packaging application. The landmark in the history of jute industry in India dates back to 1854 when the British industrialist George Auckland set up the first jute mill at Rishra in the Hooghly district of West Bengal. In 1870 altogether five jute mills started production in Bengal. These five mills were run by 5000 workers through 950 looms.

Jute in India: Jute occupies an important place in Indian agriculture and the goods manufactured from jute are a valuable source of Forex, though over the years it has been declining. Jute was one of the most important items initially and contributed Rs. 213 crores, i.e., about 20% of the total exports earnings. But, its share gradually declined to 12.4% in 1970-71 and further to only 0.29% in 2001-02. India is one of the major jute exporting countries. India's main markets are Arab Republic of Egypt, Iran and Argentina.

The cultivation of Jute in India is mainly confined to the eastern region states - West Bengal, Bihar, Assam, Tripura, Meghalaya, Orissa and Uttar Pradesh. Nearly 50 percent of total raw jute production in India alone figures in West Bengal. In the year 1997-98, in West Bengal, the area under jute cultivation was 641.6 hectare which was reduced to 612.1 hectare in the year

1998-99 and remained almost stagnant till 2000-01. The corresponding figure for Bihar was 147.5, 146.3 and 111.2 hectare. In case of Orissa it was 16.7 hectares in the year 1997-98, which decreased to 5.3 hectares again to increase to 39.2 hectares in 1999-2000. It then gradually decreased to 13 hectares in 2000-2001. In case of UP it marginally increased to 0.5 in 2000-2001 from only 0.1 hectare in the year 1997-98. So far as the productivity is concerned, West Bengal tops the list with 2197 kg per hectare. Though the acreage of Orissa is much lower than Bihar, but the per hectare yield registers higher at 1541 kg per hectare and this figure is 1358 kg/ha for UP, whereas it cultivates a very tiny portion of its cultivable land than Bihar.

Economy of jute: Jute is playing a vital role in our economy. In India 4,000,000 families are involved in the cultivation of raw jute and majority of such farmers belong to small and marginal categories. Further, the cultivation of jute generates employment (seasonal) of more than 10 million mandays per season. Individual operations of about 76 jute mills in the country are a vital segment of the national economy. Nearly 1, 37,679(Oct.2001) people are employed in these mills. In addition to these about 0.5 million people are engaged in raw jute and finished goods trading and ancillary activities. India is also self sufficient in the jute seed production. More than 90 percent of seeds are produced by the **State Seed Corporation** of Andhra Pradesh and Maharashtra.

India has substantial demand for jute goods especially for packaging material for storage and transportation of food grains and other marketable commodities. In 2000-01, such demand was to the tune of 1435.01 metric tones. After meeting up the home consumption demand, India could export 255.1 metric tones of jute goods, in the same year to about 120 countries in the world. Exports of jute goods from India to other countries were to the tune of Rs. 572.3 crores in the year 1996-97. It increased to Rs. 694.7 crores in the next year only to fall to Rs. 582 crores in 1998-99. It kept fluctuating and

reached a peak of Rs. 916.6 crores in 2002-03 again to decrease 839.6 crores in the very next year (Dhar, 2006).

NE Scenario of Jute in special reference to Assam: Among the NE states, main producers are Assam, Meghalaya, Nagaland and Tripura. In Nagaland and Meghalaya it is cultivated mostly in the foothills and plains of the states. The state of Assam and Meghalaya also produce a small quantity of mesta

Assam is holding 3rd place among the jute producing states with 13% of total production. West Bengal tops the list with 68% of total production of the country followed by Bihar comprising 19%. But, the productivity of jute is more than Bihar. In the year the yield per hectare in Bihar was 1620 kg as against 1722 kg in case of Assam and the corresponding figures were 1715 and 1625 kg respectively in the year 2001-02. The major jute and mesta producing districts are Goalpara, Darrang, Kamrup, Nagaon, Dhuburi and Barpeta. At present, 90% of its production moves to places like Delhi, Amritsar, Kanpur, Mumbai, Kolkata and Lahore.

Assam is the largest producer of raw jute amongst the North Eastern states (see table below) and has the 3rd largest crop in the country. More importantly, Assam produces some of the best quality raw jute in the country. More than half a million farmers are directly involved with this cash crop. More than 70% of the raw jute is sold outside the North East due to lack of adequate processing facilities in the region. Within the region itself, jute finds manifold uses, both for home consumption as well in the mill sector.

**State-wise Area, Production and Yield of Jute During
9th Plan (1997-98 to 2001-02)**

	Symbol	Assam	Meghalay	Tripura
	A	94.5	4.2	1.4
1997-98	P	904.1	34.7	13.0
	Y	1722.0	1487.0	1671.0
	A	78.7	4.2	1.3
1998-99	P	687.2	27.1	10.0
	Y	1572.0	1161.0	1385.0
	A	73.5	4.2	0.9
1999-2000	P	657.5	27.1	6.8
	Y	1610.0	1161.0	1360.0
	A	78.0	4.3	1.4
2000-01	P	689.0	33.2	12.3
	Y	1590.0	1390.0	1581.0
	A	75.0	4.3	1.3
2001-02	P	714.6	34.0	11.7
	Y	1715.0	1423.0	1620.0

In Assam, it is apparent from the table (above), a declining trend has set in motion regarding the area under jute cultivation. In the year 2002-03 it increased to 90 thousand hectare which again declined to 72 and further to 69 thousand (projected) hectares in 2003-04 and 2004-05 respectively.

Trends of jute cultivation in the central Assam district of Nagaon: Agriculture is the mainstay of the district's economy and more than 75% of its working population derives their livelihood from agriculture. Due to the general characteristics of the soil, the district is best suited for the cultivation of paddy. Besides paddy, maize, arhar, and other cereals, jute, mesta, cotton, sugarcane and lots of vegetables are also grown in the district. Nagaon district covers more than one fourth of the total jute area in the state.

Jute fibre is obtained from *Corchorus Capsularies* (white jute), popularly called Tita Mora in Assam and *Corchorus Olitorius* (tossa jute), popularly known as Deo or Mitha Mora. Jute areas in the district are fluctuating. The Assamese Hindu people are giving it up, while the Immigrants Muslims (Assamese) have started doing it. The main reason is that being labor intensive, the growers (Assamese) cannot afford hired labor and they do not have their own labor also since they prefer small family. On the other hand, opposite is the case with the immigrant Muslim people. Secondly, the Assamese people are very leisurely and the Immigrants are very hard working. Thirdly, being mostly illiterate, they cannot opt for job either and have no option other than getting engaged in agricultural sector.

The trend of Jute cultivation in Nagaon District:

The trend of jute cultivation is shown in the following table.

Area, Production and Productivity in Nagaon District

Year	Area (in hectare)		Productivity (kg per hectare)	Production (in Million tonnes)	Bales (180kg=1bale)
	TD (Deo or Mitha Mora)	W (Tita Mora)			
1993-94	11873	1438	2011	23641.92	131344
1994-95	15642	1897	1836	28717.74	159543
1995-96	15118	1758	2480	37489.14	208273
1996-97	15382	1754	1934	29718.02	165288
1997-	15530	1663	2397	37225.41	206793

98					
1998-99	11964	1850	1850	277804.08	1104176
1999-2000	9113	1024	2065	NA	104176
2000-01	10362	1630	2060	NA	118047
2001-02	10666	1663	NA	NA	NA

Area under jute cultivation is fluctuating and ultimately a declining trend has been seen from the table. The trend is more palpable in the production of Tita Mora. Production is also fluctuating, reaching a peak of 37489.14 million tones in 1995-96 from 22837.68 million tones in 1990-91 again to fall to 27780.08 million tones in 1998-99. Rosy picture in one year, due to rising prices, leads to more jute cultivation in the next year culminating into a fluctuating trend in case of the area under jute cultivation. In other words, if price moves in favor of the jute in the current year, acreage under jute has also increased in the next year and vice-versa.

This is not that only in case of jute cultivation of Assam the area is depleting, but the trend is seen at national level also. The whole agricultural sector is undergoing such an experience (Chand, Raju and Pande, 2007). The reasons behind this are:

- a) The area is declining as a result of expanding urbanization and industrialization
- b) Stagnant crop intensity
- c) Poor progress of irrigation and fertilizer
- d) Declining or absence of power in the agricultural field.

Though the productivity of jute is high (in comparison to other jute growing states), but there are rooms to further augment this. But, for this, the network

of input distribution is to be improved, credit facilities are to be simplified and expanded and public investment in irrigation and other infrastructures is to be enhanced (Chand, Raju and Pande, 2007).

Market prices vs. support prices and the Plight of the farmers:

Year	Support price		Market Price	
	W5	TD5	W5	TD5
1993-94	420	450	404	425
1994-95	440	470	619	665
1995-96	460	490	1003	1106
1996-97	480	510	891	1018
1997-98	530	570	-	-
1998-99	600	650	395-715	560-885
1999-2000	700	750	550-770	770-985
2000-01	735	785	625-750	850-950
2001-02	760	810	700-900	850-1400

It is crystal clear from the above table that the market price of W5 and TD5 grade of jute is much higher for almost all the years and it is very substantial for the year 1995-96. As far as the sale of the jute is concerned, farmers have two options, i.e., either they can sell it in the open market when the price is high and reap the benefit of the rosy market conditions or can sell to the JCI only to get the support price. At this point they face the real hardship. The farmers neither can sell their product to the JCI directly (due to the existence of middlemen) nor can get their product to the mandies, situated in the town areas. The poor farmers living in the interior villages with rudimentary roadways can't think of coming to the mandies. Thus, their cravings for higher prices are subjugated under the pressure of moneylenders and finally sell their product to the existing middlemen. This is the plight of most of the small

and marginal farmers who are the victims of the legacy of the defective marketing system of our country.

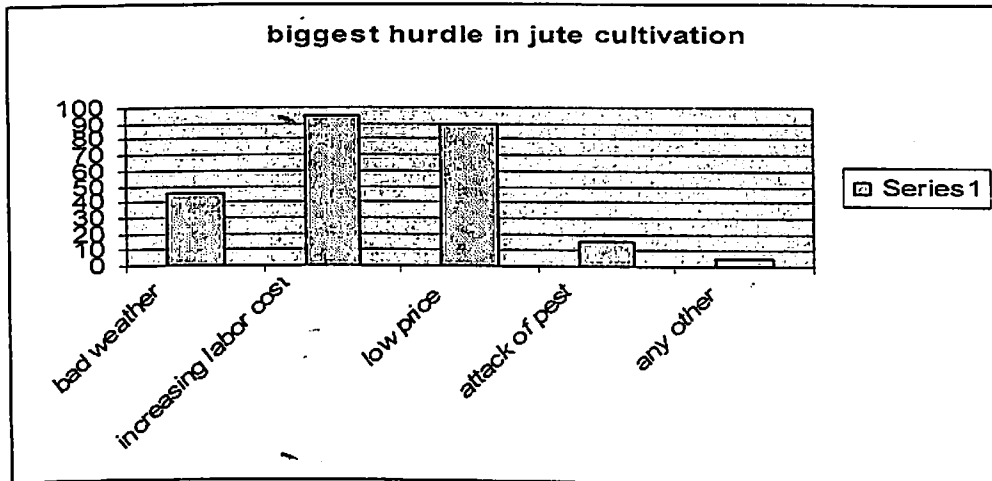
Correlation between Support Price and Acreage: There is a highly negative correlation between the support price and the area under the jute cultivation in the district. The correlation was calculated for the year starting from 1993-94 to 2001-02 and taking the support price as variable x and the area as variable y and found a highly negative correlation of -0.78973. It indicates that the support price is not being enough to motivate the growers to grow more of the product. Rather, they are being de-motivated due to a number of reasons and diverting from jute to produce other crops culminating into declining area under the crop.

Some Issues of Jute with the Growers of Nagaon district:

During the interaction with the growers, it was observed that most of the growers are not at all satisfied with the roles playing by the JCI in their locality. They believe from the very core of their heart that there is a strong nexus between the middlemen and the JCI officials for which the JCI is very reluctant to purchase jute directly from the growers in the guise of lots of things. Apart from this various other issues came up in the course of interaction with the growers. Some of them have been shown below:

Hurdles in Jute Cultivation:

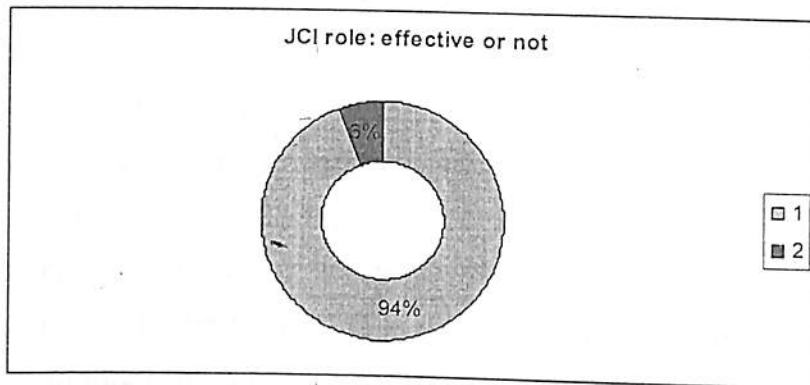
One thing became very clear that during past several years the area under jute cultivation has been declining. There are more than one factor behind it. Out of all the possible causes they placed their opinion as is presented in the following diagram:



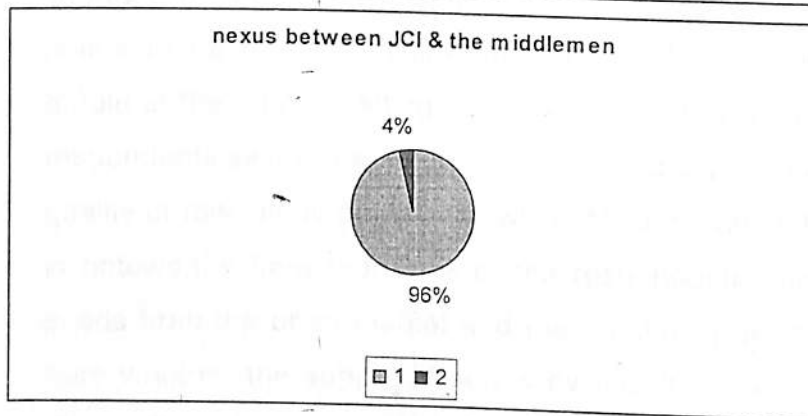
Most of the growers placed increasing labour cost in the first place as a disincentive factor in the way of doing jute in their area. Second important cause, according to them is the low price of the jute they fetch everywhere, be it the open market, DPC of JCI, or the middlemen. Bad weather and attack of pests are some other minor hurdles.

In asking whether the price they fetch in the open market or in the JCI adequate, 92 percentages of the growers say that the price is not adequate. Only 8 pc of them opined that price was adequate. Most of this 8 pc of the growers were having more than 10 bighas of land under jute cultivation. It seems that the small and marginal farmers are among the most deprived section.

Their opinion about the role playing by the JCI in their area is not at all satisfied. 94 percentages of the growers feel that the JCI is not playing what it should be playing. And above all 96 percentages of the growers believe that there is a strong nexus between the middlemen and the JCI officials. The Departmental Purchase Centres (DPC) of JCI are thereby not eager to procure from the actual growers.



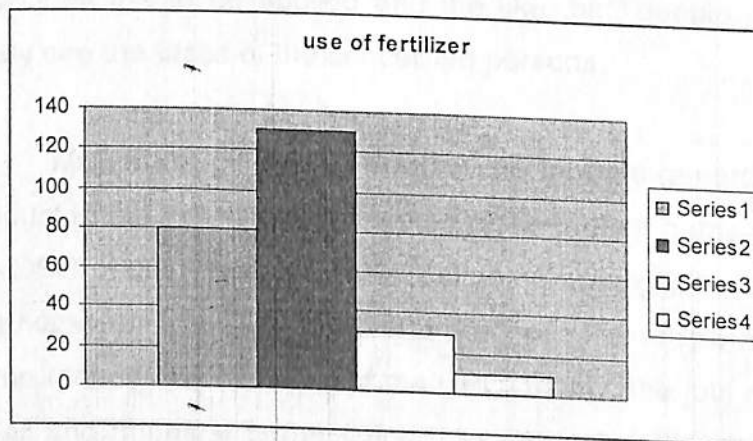
1- not effective
2- effective



In this figure:
1- represents having nexus between the JCI and the middlemen
2- no nexus

Use of fertilizers:

Most of the growers use various kinds of fertilizers, but DAP and Urea is the prime one on which they rely upon. 32% of the respondents use DAP and 52% apply Urea while 12% use both the DAP and Urea and only 4% of the respondents apply other kind of fertilizers, like, cow dung and the like. It can be represented by the following diagram:



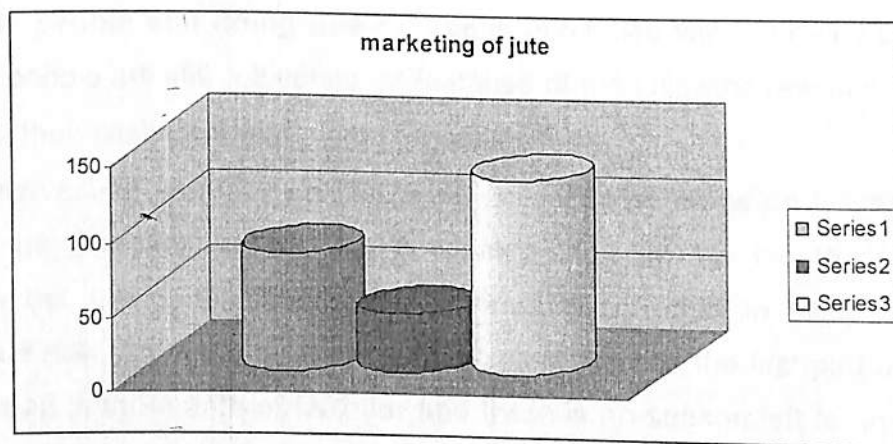
Series 1: DAP, series 2: Urea, series 3: both, series 4: any other

Factors behind low quality of jute:

It was very apparent from the interaction with the jute growers that the quality of jute is degrading along with the quantity of it. They attributed it to variety of causes. 68% of the respondents said that it is the bad weather condition for which the quality is degrading. If rainfall in a year is not sufficient it affects the cultivation in different manner. Scanty rainfall means there is a shortage of water for the retting purposes. To get better quality of jute one needs to ret the jute in flowing water. But, insufficient rainfall causes the hurdle in the rimè of retting culminating into low quality of jute. 11.2% of the respondents said it was the low quality seed supplied by the JCI for which the quality of raw jute is degrading, while 8% attributes it to the attack of pests. It is noteworthy here that 71% of the respondents said that they receive the seeds from the open market and the remaining get it from the JCI. It seems here whether the supply of seeds by the JCI is adequate. In the course of discussion, it came out that the JCI supplies seeds in a good quantity. But, the problem is that the seeds reach the market lately and hence the growers require to depend on the seeds they get in the open market. It is interesting to note that the growers possess minimum knowledge of the effectiveness of the varieties of pesticide available in the market. It is the responsibility of the agricultural department officials to come and advise the growers about the pesticides, i.e., which are the quality pesticides, what quantity of that pesticides are to be applied and the like, but, people complained that they rarely see the faces of the concerned persons.

Marketing of the product: - The farmers generally prefer to sell their product in the open market situated close to their home. They do not sell it to the DPC of JCI, because, it discriminates among the actual growers and the businessmen. The DPC prefers to purchase from the businessmen. There are some reasons for such act of the DPC. Firstly, the jute growers are generally small and marginal farmers and they sell only a tiny amount of the product.

On the other hand, the businessmen bring bulk amount of the product. Secondly, if the growers need to sell jute, they have to bring it to the DPC and in the process they have to bear a transport cost (Rs.20/- per quintal by Push Cart). The people do not have any problem in incurring the cost, but, after reaching the DPC, many times they found that the DPC does not purchase jute on that very day. People are not sure whether it would purchase the next day. In that case, the farmers have to either halt there or get back with their jute and they have to bear the transportation cost next time. If the DPC is purchasing jute on that very day, then the people may have to wait for very long to come their turn, because, the employees of the DPC give preference to their friends, big farmers and the businessmen. Therefore, the people get irritated and cannot do anything except bearing with the system and hence decide to sell it in the local market and avoid all the harassment. The following diagram shows the sale of jute in various markets:



Series1: middlemen, series2: DPCs of JCI and series3: open market

Problems entangled with jute cultivation: - Apart from the marketing difficulties, which have been analysed above, the growers are fetching some other problems also. They are:

- Erratic rainfall during the time of cultivation and especially at the time of retting. Jute needs flowing water at the time of retting, which is not available in most of the places.
- The growers are deprived of the adequate prices due to the existence of middlemen. Most of them cannot see and wait long for prices to come up sufficiently.
- Quality of jute is degrading.
- Attack of pests. Poor farmers cannot afford high doses of pesticide. The pests are resistant to most of the commonly used pesticide.
- Lack of capital. Due to this they cannot make improvement of their cultivated land.
- But, the biggest hurdle, the growers are facing is the ever increasing labor costs. The wage rate has reached a peak of Rs. 100/- this year. Only the rich farmers can afford such high wage rate.

Why then the people still doing jute? If jute is entangled with so many problems then why the people are still cultivating it? Because of the following reasons:

- It fulfils their cash requirements to a great extent.
- After harvesting jute they can cultivate rice or other crops on the same plot since the gestation period of jute is very short. In the month of August-September jute is harvested and without much effort in tilling they can cultivate rice. On the other hand, jute which is sown in the first part of May, is harvested in the month of October and there is no season left to do cultivate rice and they use the plots for growing mustard plant. It means that if people do grow jute, they can utilize the same land for growing other agricultural products also and this multi cropping is very beneficial to them. Thus, cultivation of jute and rice or other agricultural items fulfill their demand of food grains and cash money.
- Profitability of jute is very high in comparison to the crop that can be raised in that season (Ahu paddy). Another fact is that, previously people used to do Ahu rice in these areas. But, due to the various reasons, profit of Ahu rice is

declining over the years. 'Growing Ahu rice means growing fodder,' – one farmer stated 'people do not get any rice'. It means that the next best alternative is jute. (Comparative economy of jute and Ahu paddy is shown on the table below).

Comparative Economy of Jute and Ahu Paddy

Various stages of production ↓	Name of the crops ↓		Remarks ↓
	Jute	Ahu rice	
Preparing land	Rs. 400/- (tractor); Rs. 280/- (bullock)	Rs. 400/- (tractor); Rs. 280/- (bullock)	Because the land is prepared by the family members which is not accounted for cost
Purchasing seed	Rs. 150/- per packet	Rs. 30/- (own)	Jute seed contains 2 kg in a packet. For rice seed is kept by the farmers themselves, need not buy from the market
Weeding (twice) per bigha	Rs. 1500 – 2000/-	Rs. 150/-	Generally weeding is not done in case of rice
Cutting to extracting fiber	Rs. 700- 800/-	Rs. 200/- (cutting & carrying)	It is done by the family members
Application of pesticide (per bigha)	Rs. 20- 30/-	Rs. 20 - 30/-	
Application of fertilizer (per bigha)	DAP (8-10 kg) Rs. 80 – 160/-	Rs. 80 – 160/-	People do use cow dung also as

bigha)	Urea (8-10 kg)	Rs. 60 – 75/-	Rs. 60 – 75/-	manure. (In Ahu, people generally do not use fertilizers).
Total cost →		Rs. 2790- 3615/-	Rs.820- 1045/-	
Productivity per bigha (mounds)		8 - 15	5 - 8	
Market price (Rs. Per mound)		Rs. 320 – 550/-	Rs. 150 – 220/-	In the month of June, 2007, the price of jute in the market is Rs. 320.

[It is very apparent from the above table that cost involved in the production of jute varies from Rs. 2790/- to Rs. 3615/- and at the same time one gets up to Rs. 8250/- (Rs.550 x 15) as income if he is clever enough to sell at the right time. But, in case of Ahu rice the cost is Rs. 820 – 1045/- per bigha. But, he can get an income of not more than Rs. 1720/- (Rs. 220 x 8). Therefore, the net income in case of jute and rice is Rs. 4635 (Rs. 8250-Rs. 3615/-) and Rs. 675/- (Rs. 1720-Rs. 1045/-) respectively. It indicates why people prefer jute to rice.]

- People need to invest partly in jute, viz., at the time of sowing, at the time of weeding and at the time of harvesting, etc. It indicates that people need not invest at a time. On the other hand, they get the income together.
- Jute sticks fulfill their need of fuel wood to a great extent. Further, jute sticks are also utilized to thatch the roofs of the houses and maintenance cost of this is very low, since it lasts long for six/seven years.
- Young leaves are used as a substitute for spinach and are cooked as vegetables.
- Most importantly, the local Assamese people are doing it not by choice, but by compulsion. The first choice of most of the youths is a government job,

but, since they could not manage any, therefore, tried their hand in the jute cultivation.

Perception of the growers about the JCI:

Marketing of raw jute- as far as procurement is concerned, JCI does not purchase raw jute from the farmers directly. In between the JCI and the actual jute growers there are a large number of middlemen (Dalal), who is funded by the JCI and receive a large sum of commission – the growers feel. The growers think that JCI does purchase on bulk which they cannot provide as they are small and marginal farmers. This is going on and on for years and now the Dalals have created sort of a monopsony and pressurize JCI not to purchase directly from the farmers.

Now the growers prefer to sell their product in the open market. There are various reasons for such act. They are:

- ✚ Middlemen bring huge amount but, the growers are small and bring only tiny amount and thus get discriminated and discouraged at the DPCs (Departmental Purchase Centres).
- ✚ The growers need to incur the transportation cost of Rs. 20/- per quintal (by push carts). Middlemen collect jute from home. (But, of late, middlemen have almost ceased to come to the villages and if come, approach only the big growers).
- ✚ The growers are ready to incur the transport cost, but there is no guarantee that they could sell their product the very day. If they cannot, then they need to get back and the next day again has to incur the transport cost.
- ✚ If the DPCs purchase on that very day, the farmers need to wait a long to come their turn, since the employees give preference to their friends, big farmers and middlemen and the growers get irritated.
- ✚ After that also, if somebody is able to sell his product to the DPCs, it is after a lot of persuasion.

Perception of the JCI workers

The officials of the Dhing DPC feel that the JCI has not been able to procure even 30% of the total production of raw jute in the state. The MSP in Assam is lower than the MSP of the neighboring state of West Bengal. The DPCs of the state are facing lots of problems at present. Some of them are, shortage of workers, quota in purchasing (250 -300 quintals per day, but more can also be purchased with due permission of the Regional Manager), purchase order comes from above, etc. The growers are not at all willing to sell their jute to the JCI due to many reasons. One of the reasons is that the JCI make delayed payment and the small and marginal growers cannot wait for that period. Most of the time the DPCs pay them in cheque (20% in cash and 80% in cheque) and the illiterate and poor farmers don't want to receive their payment in the form of a cheque.

Now the JCI need to compete with the private mill owners, who control and regulate the whole market of raw jute in the country. Market price fluctuation is due to their acts. These mill owners do not want JCI to function, since the MSP is the toughest hurdle for them in the way of getting raw jute at a through away price. If the market price falls below a certain level, the growers will sell their jute to the JCI. So the MSP is the floor and the price cannot be driven down that floor. The agents or the mill owners resort to various such ways in order to avoid various taxes and thus the state government is loosing a huge amount of revenues. These mill owners are creating a new grade of jute, i.e., 'grade 9', which is in practice absent (since the JCI has classified the raw jute quality into eight), in order to cheat the growers. The jute cultivation is declining and if the price does not increase, soon people will stop growing jute.

The JCI does not purchase 'grade 7-8' since they cannot sell it and hence there is huge stock of jute seen in the go down of the DPC.

There is need for more industry based on jute, people of the area feel. Late Digen Bora, the Industry Minister, AGP government initiated and established a paper mill, which would absolutely depend on jute for its raw materials, but could not start production.

Jute seeds of JCI: The jute seeds are distributed by the JCI at a subsidized rate. But, by the time the seeds of JCI reach the hands of the growers, it is too late to sow and hence they purchase seeds from the open market and that to at a very high price. The sowing season is Feb-April, but JCI provides seed in the month of May-June, which is of no use to them.

On the other hand, the quality of jute seed, procured by the JCI is low. Some growers observed that the bark of jute grown of seeds procured by the JCI is thinner than the jute grown out of the seeds procured from the open market.

10/15 years back people used to keep their own seed. But, now the seed is very much available in the open market and JCI also provide.

The growers' observation: -

- The fiber of jute seeds provided by the JCI is very light,
- Jute fiber is not thick if the color of the basal part of jute becomes red,
- The seeds are not of fine quality,
- One of the fine quality seeds was NHC -524, (not available in the market now). Only duplicate variety is found in the market.
- If jute flowers come early, then also quality gets degraded.

Intervention by the JCI: - "Earlier, in Nagaon district lot of Mesta and white jute were produced, which was almost 90% of total jute production in the District," – a jute official commented. But, it has declined significantly to become almost only 5–10% of total jute production. Three factors are acting upon it, namely,

- i) productivity of white jute and mesta is less than the TD variety
- ii) the price of both white and mesta is also less than the TD variety and

iii) the gestation period of mesta is long and after harvesting mesta cultivation of rice is not possible.

Hilly areas are basically more suitable for mesta cultivation.

Earlier, Grade II, III and IV were produced which have been declining with the passage of time. But, now situation has turned upside down, i.e., grade II, III, IV are now rare and grade V, VI, VII are very common. Grade I was always rare not only Nagaon but also in Assam. Grade I jute is produced in Bangladesh, due to favorable monsoon and adequate water availability at each stage of cultivation. Why the quality is degrading day-by-day is a pertinent question. A number of factors are responsible for this. Some of them are –

- ❖ The fertility of the soil is decreasing
- ❖ Application of chemical fertilizer
- ❖ Erratic climatic condition
- ❖ At the time of retting, to weigh down the bundle of jute mud is used and hence the color is lost and thus the quality.

Looking into all these, the JCI has decided to encourage the small and marginal growers to grow more quality jute, as there is tremendous demand of jute and jute based product in the national and international market, since jute is a bio-degradable product, by implementing a numbers of new and innovative schemes.

Jute Growers Bank Loan: The scheme is planned to implement in active cooperation with the Jute Growers Association and State Bank of India. The Association shall have the responsibility of identifying the beneficiaries. They will get financial assistance in the form of a loan, after being done the required scrutiny by the bank. Last year, the JCI in the district introduced a '**Jute Growers Bank Loan**' to emancipate the small and marginal farmers from the clutches of

the middlemen. The loan has been sanctioned from this year. Under the scheme, a farmer is liable to get a loan amounting to Rs. 50, 000/-. In the district five centers, namely, Juria, Dhing, Doomdumia, Moirabari and Ambagan, have been selected to implement the programme. From each center, 50 growers shall be selected to get the benefit of the scheme.

Mini Mission III: -

Under this mission, three things are being proposed, i.e., Tank, Technology and Go down.

Tank: Under the Mini Mission III, retting tanks are proposed to be built up for the benefit of the jute growers in a particular area, looking into the paucity of retting facilities. In the first phase, two tanks will be built up, one at Moirabari and the other at Ambagan. This will be built up with the help of a beneficiary group, having not less than five jute growing members (upper limit is no bar), investing a sum of Rs.1,00,000/-, out of which 90% will be contribution of the JCI and the remaining 10% will have to be contributed by the beneficiary group. If no beneficiary groups come up for the venture, then the right will be given to the panchayat or social organization (like club, library, etc.) and even to private individual. The maintenance cost will have to be borne by the beneficiary group or person. The group will have every right to take a user charge. And after the season is over, the tank can be used for other income earning purposes, like fishing, etc.

Technology: The JCI will demonstrate various techniques of retting, i.e., the traditional as well as the modern (ribbon retting), during which growers will come to know which technique is most suitable in their condition and also utilize that in the tank by paying a minimal user charge. It is being planned for quality improvement.

Go down: Another task is proposed in this mission is building up of go down having all types of modern facilities, facilities starting from computer, hydraulic pressing to growers rest room, canteen, etc. The total investment will be of Rs.1 crore. The regulated markets are also planned to be involved in this process. If these markets come forward, then 60% cost will be incurred by the JCI and the remaining 40% will have to be borne by the regulated markets.

This Mini Mission III is solely to motivate the small and marginal jute growers as a whole. But, time will tell whether it will really help the growers or help others' vested interest.

Conclusion: - Jute is facing sharp competition, over the years, from synthetic fiber. But, its bio-degradability and eco-friendly nature have drawn attention to the highly conscious people particularly in the developed countries. Looking into the present condition of environment degradation and concern of the people for the environment, in the near future, the demand for jute and jute-based products are likely to soar like anything. It is felt and realized and thus, by implementing the Compulsory Jute Packaging Act. 2005, Indian Government is also supporting the jute industry. Though, Assam has a substantial area under jute cultivation, but the average yield and quality of jute is depleting. The productivity and quality can easily be improved by assisting the growers with finance and modern and sophisticated technology. If appropriate technology can be transferred and the growers allegations can be meet up, both the productivity and income of the growers will increase.

References

1. Dhar, P. K. Indian Economy, 2007
2. Dhar, P. K. Assam Economy, 2007
3. Chand, Ramesh; Raju, S. S.; Pandey, L. M.: 'Growth Crisis in Agriculture – Severity and Options at National and State Levels', Economic and Political Weekly, Vol XLII No 26 (June30 – July 6).
4. Bora, K. C.; Dutta, S. K.: 'A study of jute-Ahu paddy substitution in Nagaon District of Assam', Assam Economic Journal, Vol XI, 1997.
5. Directors Report for 1998-99, Jute Corporation of India Ltd.
6. State Agricultural Policy, 2001.
7. www.jute-industry.com
8. www.worldjute.com
9. Indian Jute Industries Research Association (IJIRA)
10. Jute Manufacturing Development Council (JMDC)
11. National Centre for Jute Diversification (NCJD)
12. NIRJAFT.com
13. Employment and Environmental Aspects of Jute, Ray, Kamal; Indian Journal of Agricultural Economics, October 1 2004.
14. The Hindu Business Line, May 2007.
15. MoU signed between the Assam Cooperative Jute Mill Ltd and the Cooperation Department, Government of Assam for the financial year 2006-07.