Exhibition and Seminar on
Diversified Jute Products 2002

Proceedings of the International Seminar

Organised by
Ministry of Jute

In Association with
Export Promotion Bureau (EPB)
Federation of Bangladesh Chambers of Commerce & Industry (FBCCI)
Delegation of the European Commission In Bangladesh
and
Trust for the International Jute Study Group (Formerly IJO)

Dhaka, Bangladesh
23 - 25 January 2002
The views expressed in this publication are those of the authors, speakers and participants and not necessarily of the organisers.

For any information regarding this publication

**Please contact:**

Ministry of Jute
Government of Bangladesh
Bangladesh Secretariat
Ph: 8612250, 8611647, 8614775
Fax: 8618766

Or

International Jute Study Group (Formerly IJO)
145 Monipuripara, Dhaka 1215
Ph: 9125581-5
Fax: 9125248-9
E-mail: ijoind@bdmail.net
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FOREWORD

Jute, the *Golden Fiber* of yesteryears continue to be an important commodity for jute producing countries in general and for Bangladesh in particular. It involves millions of marginal farmers for a *cash crop* and hundreds of thousands of industry workers for their wage earnings. The country also depend significantly on the foreign exchange earned through export of jute and jute goods to many parts of the world. However, jute has been facing serious threats for its survival from synthetic substitutes over the past two decades. The traditional products were systematically substituted by synthetic products creating huge structural imbalance in demand and supply of jute and jute goods whereby the farmers suffered and the industry came on the brink of sickness.

Fortunately, in the past few years, significant developments have taken place in producing a large number of new diversified items from jute which can supplement the traditional products to make it survive, sustain and perhaps eventually regain the past glory of jute. The Exhibition and the Seminar that was held from 23-25 January 2002 at Dhaka provided an insight into the various products, processes and technologies ready for commercial exploitation to produce diversified jute products with large potential consumption at home and abroad, high value addition and opportunity for creating employment particularly in the rural sector.

The Recommendations that emerged at panel discussions following presentation of number of papers by the experts and scientists are produced in this *Report* which I hope will be useful for the entrepreneurs, consumers and policy makers in the jute sector.

A F M Sarwar Kamal
Secretary
Ministry of Jute
BACKGROUND

Jute is a natural fibre annually produced by a few countries in the South East Asian Region. Kenaf is also in the same family. Total production of both jute, kenaf and allied fibres have reached 3 – 3.5 million tonnes a year. This is the second largest natural fibre next only to Cotton. It is also environment friendly, bio-degradable and recyclable.

Traditionally jute has been used to manufacture packaging materials like twines and ropes, hessian cloth, sacking and lately carpet backing cloths. The products used to enjoy a monopoly market and the farmers, manufacturers and traders were happy with the benefits reaped out of it.

But by mid sixties and early seventies, with the advent of synthetic substitutes, jute goods started loosing market particularly in the importing countries rather sharply. Demand for jute also started declining and farmers and workers started suffering in the process. There was not much of any technological innovation in the Industry and the outdated technology continued to produce traditional products to meet the market demand that was declining at a regular pace.

It was time for those engaged in the promotion of the cause of jute to divert their attention to produce innovative products which could at least supplement the traditional jute goods to make it sustain.

It is a matter of satisfaction that during the past few years, such efforts have started paying dividend and a whole host of new products based both on high technology and in the handicraft sector have been developed and their manufacturing processes established with the identification of technology. This is a time to make the consumers aware of such products and attract entrepreneurs to invest in manufacturing them to cater to the growing market at home and abroad.

With this view in mind, the Ministry of Jute in association of the Export Promotion Bureau, Federation of Bangladesh Chambers of Commerce and Industry, Delegation of the European Commission and the Trust for the International Jute Study Group (formerly IJO) organised an Exhibition and a Seminar on Diversified Jute Products from 23 – 25 January 2002 at the Bangladesh-China Friendship Conference Centre at Sher-e-Bangla Nagar, Dhaka.

The exhibition and seminar was very timely and appropriate for encouragement of those associated with development of these diversified jute products and those interested to invest in this sector.

I hope the outcome of the events that has been consolodited in this report would be useful.

Dr. R. Mandal
Officer-in-Charge
Trust for the International Jute Study Group
INAUGURAL SESSION


The Exhibition was Inaugurated on 23rd January 2002 by the Hon'ble Prime Minister, Begum Khaleda Zia and it was also graced by the presence of the Hon'ble Finance and Planning Minister, Mr. M. Saifur Rahman, Hon'ble Commerce Minister, Mr. Amir Khosru Mahmud Chowdhury and the Hon'ble Minister for Jute, Janab Hafizuddin Ahmed, Bir Bikram. The inaugural session was also attended by a large number of Ministers and Parliament Members of Bangladesh, representatives from Diplomatic Missions in Dhaka, Secretaries of various Ministries and other dignitaries. In the inaugural session, a power-point presentation was made on various diversified jute products by Dr. R. Mandal, Officer-in-Charge, Trust for the International Jute Study Group to familiarize the dignitaries and others present on a large number of products developed, processes established and technologies identified for commercial exploitation in jute producing countries to benefit both the producers and the consumers at home and abroad. A list of the projects and products is placed as an Annexure I.

The Hon'ble Prime Minister in her address emphasized that diversification was the means for revival of jute to its past glory as "Golden Fibre". She advised the private sector entrepreneurs to take full advantage of the development in diversified jute products for their commercial exploitation and assured that such efforts would be welcomed by the Government. The Hon'ble Minister for Finance and Planning explained that jute was indeed very important for the economy of the country. He expressed the view that if economically viable propositions are brought forward, financial support from the Bank may not be lagging. He suggested that the entrepreneurs should take larger equity to reduce the debt burden for establishment of such ventures. The Hon'ble Minister for Commerce strongly felt that jute is in the cycle of its revival on account of its environmental merit and all efforts should be made to increase exports of jute for more foreign exchange earnings. The Hon'ble Minister for Jute was of the strong view that the traditional jute goods would need to be supplemented by the diversified products to make jute economy sustain. He urged that the initial phase of 14 projects identified for commercial exploitation should be assisted with financial resources at relatively lower rate of interest to eliminate risk element involved in such project at their first phase.

The dignitaries advised that taking cognizance of jute as a natural fibre, it should be exploited appropriately to the International Market exposing its eco-friendly, biodegradable and recyclable properties. It was also emphasized that the Government of Bangladesh had already taken a bold step in banning the use of Poly bags of certain specifications, which will help revival of use of jute bags within the country.
TECHNICAL SESSION

Following the inaugural session of the Exhibition, a Technical Seminar was held where a number of scientists, technologists and entrepreneurs presented valuable subject oriented papers. All together thirteen (13) such papers were presented in 5 different sessions, each chaired by an expert. The final session was a panel discussions for the preparation of the recommendations for consideration and action by the concerned authorities including the Ministries of Jute, Finance, Industry, Environment and Forest and Agriculture of the Government of the Bangladesh, Industry Associations, Research & Development Organisations and Development Partner Organisations. The final session was held under the chairmanship of Mr. A F M Sarwar Kamal, Secretary, Ministry of Jute. All the papers presented in the Seminar, spread over two days, are enclosed herewith.
RECOMMENDATIONS

Following extensive panel discussions, several recommendations were made by the participants, the presenters of the papers and the chairpersons of the respective sessions. The recommendations emerging out of panel discussions are summarized as under:

(1) The Jute Sector should be given a "Thrust Sector Concept": Considering the importance of the jute economy in terms of its contribution towards cash income of the farmers, industry workers, foreign exchange earnings, etc., the jute sector should receive adequate importance for its development and sustenance. The Government should come out with strategic policy measures for the promotion of jute sector in short, medium and long terms.

The participants strongly felt that a study should be conducted to ensure the long term goal of the jute economy incorporating the medium and short term goals in them. The major terms of reference for such study should include:

(a) Total area under jute farming,
(b) Yield and production,
(c) Application and extension of high yield varieties of seeds,
(d) Productivity and quality of jute,
(e) Present state of Industry,
(f) Rationalisation of work-force,
(g) Necessary investment for balancing, modernization, renovation and extension, and
(h) Necessary marketing support.

*Action*: Ministry of Jute (MOJ)/MOC/MOF

(2) Quality and Yield of Jute has to be improved and increased: Since the quality of jute determines the quality of intermediary and end use products, it is important that high yielding variety (HYV) of seeds are developed, multiplied and extension services provided to the farm sector for adapting the application of high yielding variety of seeds to facilitate higher production and improved varieties of jute which in-turn would also generate benefit to the farmers and the Industry. Price of Jute as raw material for jute products has to be reduced. At the same time, Jute farmers should receive higher remunerative income. These contradictory aims can be achieved by substantial increase in yield and improvement of quality. Technology for this is available which should be better disseminated and extended.

*Action*: MOJ/MOA/BJRI/BADC/Directorate of Jute

(3) Jute Industry should be treated at par with the Garment Industry: 90% of the jute and jute goods produced in the country has to find export destinations since domestic consumption is very limited. The gross foreign exchange earned through export of jute and jute goods is also the net income in this sector whereas in the garment sector a substantial amount of foreign exchange earnings go out for procurement of inputs and the net value addition is only around of 30% of the gross income. Since both these sectors are export oriented, there should be no discrimination in treating these two sectors from the point of view of policies like, rate of bank interest, export benefits and so on.

*Action*: MOJ/MOF/MOC
(4) Mandatory order for packaging materials: The Government should give mandatory order to use Jute bags as a packaging materials for specific sector like food grain, cement, sugar, fertilizer, etc.

*Action: MOJ/MOI/MOEF*

(5) Restructuring of the Jute Industry: Jute industry manufacturing the Conventional Products should be restructured urgently keeping in view of the International demand and supply and a level playing field should be created for both the private sector and the public sector. Continuation of public sector with reimbursement of losses continuously has a serious impact on the health of the private sector and the economy as a whole. Accordingly, Government should come forward with necessary policy instrument to address such inequities. Measures for revival of World Bank’s Jute Sector Adjustment Credit should be undertaken urgently.

*Action: MOJ/MOF*

(6) Market Promotion: Since the individual units of the jute industry is not capable of undertaking market promotion ventures, it is necessary for the Government to come forward and organise international market promotion facilities on a regular basis and organise Buyers-Sellers Meet (BSM), participation at the International Fairs, etc., in association with the Industry.

*Action: MOJ/MOC*

(7) Human Resource Development (HRD): The Jute industry lacks adequate trained human resources at all levels of production causing serious handicaps in productivity of both man and machine and quality of products. A need assessment and comprehensive Human Resource Development programme should be prepared in consultation with the Industry and implemented through the channels of existing educational/training Institutions. In addition, the proposal for establishment of Jute Technology College should be pursued vigorously.

*Action: MOJ/ MOE*

(8) Jute Industry Park: The Government should seriously think of setting up of a “Jute Industry Park” where all the new entrepreneurial ventures in diversified jute products can be located and necessary logistics, utility and other facilities can be created and provided. This can be done in an existing closed mills or in a mill where sufficient surplus land is available.

*Action: MOJ*

(9) Industry/ R&D Organisation Interaction: The Research and Development Organisations including International promotional bodies should have a closer interaction with the Industry to understand their problems and find appropriate solutions. It should also be made mandatory that the Government R&D organisations earn a certain percentage of their budget by way of rendering services to the industry.

*Action: MOJ/ MOA/R&D Organisations*

(10) Jute Diversification Promotion Centre: Establishment of “Jute Diversification Promotion Centre (JDPC)” for providing assistance to entrepreneurs willing to
establish such entrepreneurial ventures should be expedited. Government should equally be concerned for addressing the restructuring of the existing Jute Goods Manufacturing Industry and induction of appropriate technologies for the sustenance of jute economy.

Action: MOJ

(11) Promotion of Diversified Jute Products: While promoting diversification of jute products, important issues like potential demand, value addition, technology involved, etc., should be given due consideration. High technology based products with high value addition and high volume consumption of jute should receive priorities.

Action: MOJ

(12) Standardization: In the international market, to promote new products, it is necessary to establish acceptable international standards. The Government should accordingly take necessary measures for promoting and adopting standardization of all jute and jute products. For instance, for food-grade jute bags: an International Standard IJO 01/98 has been established with specific limit of mineral oil content. Similarly, for the packaging of good grains, cement, sugar, etc. Specification of jute bags in terms of its construction, weight, etc. could be established to the best benefit of both the consumers and producers. The standardization for the diversified jute products would be more relevant in the global contexts. For instance, the composite materials should clearly indicate contents of different ingredients, and their percentage, various physical properties, chemical properties, etc. Similarly the home textiles material should indicate standardization in terms of its contents of different kinds of fibres, construction, weight, dye-staff used, etc., so that international consumers are sure of their identity.

Action: MOJ/ MOI

(13) Production of Cheaper Jute Bags: In view of the banning of poly bags below 20 microns, there is an urgent need for development of cheaper jute bags. While R&D organisations should put their concerted efforts into such development, the Government should come forward to assist such efforts to materialise.

Action: MOJ/ MOEF

(14) Assisting the new Diversified Jute Projects: The Government should extend necessary assistance both in terms of financial and materials support to establish experimental models of diversified projects already identified by the Ministry of Jute in association with the International Jute Study Group and Delegation of the European Commission. Such assistance may take the form of providing funds by way of grant for technology transfer and related training, market intelligence, survey and promotion, etc. as well as Loans for meeting part of the capital costs.

Action: MOJ/ MOF

(15) Market Promotion for Geo-Jute: Use of Geo-jute has substantial market potential both within the country and abroad. Measures should be taken for market research and intelligence as well as market promotion within Bangladesh and abroad.

Action: MOJ/ BJMC
Production of Paper Pulp from Jute: Pulp from Jute has already been produced. The World demand for pulp for printing, writing, newspaper and packaging purposes is several hundred times the current production of jute. Jute being an annual crop (with possibility for raising two crops a year), it has built in advantage vis-à-vis wood, bamboo, etc. as Fibrous Raw Materials for pulping. Dramatic improvements in yield and quality on jute pulping has been reported in various R & D Institutions all over the World. A baseline cost and feasibility study should be conducted urgently to obtain a transparent view of the cost details of the various raw materials for pulping, the various processes, major category-wise (end-use wise), world production and consumption of pulp in various countries of the world etc. A clear picture should emerge from this Study about the position of jute as raw material for pulping under various processes vis-à-vis other raw materials and processes in other major pulp producing countries. A Pulp Investors’ Forum should also be held in which, apart from prospective Investors, the R & D Organisations involved with Jute/kenaf pulping should be invited.

Action: MOJ/MOI/IJSG/EC Delegation

National/International Exposure: Exhibition of Diversified Jute Products should be held on a regular basis in order to update local and international buyers and ultimate consumers. To attract possible investment by expatriate Bangladeshis, for example in London and in New York as well as foreign buyers, International exhibitions can be organised outside Bangladesh. Moreover, design shows, fashion shows, and TV and audiovisual demonstrations in a wide scale should be organised for Diversified Jute Products. Intensive market promotion activities in the developed countries with appropriate organisations like the Chamber of Commerce, associating trading organisations, charitable associations, and environmental groups should be organised with the involvement of scientists, technologists and professionals who are involved with diversified jute products. A display centre could be located in central location of Bangladesh and abroad for permanent display of diversified jute products.

Action: MOJ/MOC/EPB

Integrated Approach: An integrated approach should be evolved to ensure that the industry and small entrepreneurs play complimentary roles to each other for promoting the cause of Jute. Through networking, the jute mills, textile mills, small-scale cottage industries producing handicrafts and decorative products, must be brought together and motivated to use jute for various kinds of products.

Action: MOJ/MI

Yarn Bank: Bangladesh has the surplus capacity to produce yarns and twines in the existing units of the composite jute mills and twine mills. These yarns could be utilised by the powerlooms and handlooms scattered all over the country through an acceptable distribution system established through NGO’s or other channels. The jute yarn bank approach may be introduced to rationalise the price and availability of jute yarn in the primary market. This will help in the availability of higher grade of jute yarn to the small entrepreneurs in the decentralised sector which will strengthen the development of diversified jute products and poly bag substitutes.

Action: MOJ/BJSA
(20) Infrastructural facilities: The Government should come forward with necessary infrastructural facilities wherever necessary for new product development, process establishment and technology innovation. Necessary support should be extended to develop new types of spinning machines/modify existing spinning frames designed specially for jute, particularly for light count yarn production.

Action: MOJ/BJRI

(21) Market Orientation: To make the jute sector productive and profitable, market oriented product development technology must be evolved. In order to project a new image of value added utility of jute products, a radical departure from commodity orientation to a customer oriented marketing approach is necessary.

Action: MOJ/BJRI/BJMC/Private sector

(22) Focus on Environmental Advantages: A holistic approach should be adopted for the market promotion of environment protective jute products like jute geotextiles, jute composites and pulp and paper from green jute. Environmental advantages of these new jute products should be focused specifically.

Action: MOJ/MOE

(23) Maximise Internal Consumption: The Government should be approached to set up some sort of mechanism to maximise internal usage of diversified new jute products including usage by the relevant government departments.

Action: MOJ/MOE

(24) Women Entrepreneurship and Employment Generation: Women entrepreneurs involved in manufacturing and marketing of diversified jute products at small scale are doing extremely well in terms of their turn over and revenue earnings. For their further development and to bring in new entrepreneurs in this field an integrated programme can be initiated. It will also create opportunity for employment of women workers.

Action: MOJ/MOWA/MOSW
CONFERENCES PAPERS
A New Approach of Blending Jute With Other Fibres for Diversified Products

Dr. Latifa Binte Lutfar, *Md. K. Kabir and **Md. Kamal Uddin
PSO in Charge, Mechanical Processing Division
Bangladesh Jute Research Institute
Manik Mia Avenue, Dhaka-1207

Jute, a major cash crop of Bangladesh, plays a very important role in the socio-economic activities of the country. Obviously, both agriculture and industry are greatly associated with jute-based activities. In fact, Bangladesh economy is still a jute based one.

Jute is a basically coarse, biodegradable, strong, less extensible, hygroscopic and cheap fiber. Therefore, years after years, it has mainly been used as coarse textiles viz. hessian, sacking, ropes, twines, carpet backing cloth etc. and served the need of heavy-duty packaging and wrapping materials. Thus, the above packaging materials once enjoyed a virtual monopoly in world markets. However, since last couple of decades the market had gradually eroded as synthetics became more widely used.

Therefore, in order to save the jute industry it has become inevitable to find remedial measures by diversification of jute. But due to some of its intrinsic or inherent characteristics viz. coarseness, meshy structure, low extensibility poor resilience, drape, brittleness, low fibre length, harsh feel etc. jute fibre, as it is, can not be used in producing quality goods with desired aesthetic and performance characteristics, specially for unconventional and diversified end uses. As a result, extensive research works are being carried out in different laboratories mainly through chemical modification or blending jute with different textile fibers to overcome these drawbacks.

Blending, an up to date and established technique of material science has already been identified as the most potential solution to the stated problem, specially in the field of textiles. Blending offers ways of reaching new and better products in which good features of one fibre augment and complement those of another. Moreover, blending is also aimed at producing a cheaper product. Thus the multi-fibre concept through the techniques of blending has been very successful in the field of textiles.

Blending of jute with different man-made fibers is aimed at accomplishing color, luster, softness, handle, fineness etc., there by increasing quality of the products. These would help to diversify the use of jute products into new areas, such as upholstery, draperies, home furnishing fabrics, blankets, handbags, apparels with special effects etc.

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* CSO, Mechanical Processing Division, BJRI
** PSO, Pilot Plant & Process Development Division, BJRI
From research works carried out in BJRI and also in different Jute and Textile Research Institutes and Laboratories of other countries, encouraging results on blending of jute with both natural and man-made textile fibers were obtained which indicated a possible breakthrough in the field of jute diversification.

Blending or mixtures only with suitable components or counterparts at appropriate proportions results in an ultimate product which take in some degree of the properties of the components in which good features of one fibre augment and compliment those of another. Thus quality and properties of all blended structures do not necessarily improve, instead may even deteriorate when incompatible fibers are blended together.

Thus, in obtaining desired properties from blending, selection and identification of suitable counterpart is most vital. Previously, attempts used to be made in modifying jute for making it as compatible as possible to other natural or man-made fibers selected or considered for blending. But, since jute is a highly variable fibre in its dimension i.e. both diameter and length, by nature, not much success was achieved in getting or transforming jute into dimension as compatible as possible to required man-made fibers.

So, this work was taken up with a new i.e. a reverse approach. Therefore, in order to produce specific products with desired properties and performance characteristics, first of all proper selection of the fibers with specific dimensions and its proportions, suitable and compatible to jute was mainly aimed at. Finally a suitable blending technique to process jute blends successfully in the conventional jute spinning machinery existing in the jute mills/industries of the country, was needed to be developed. With these ends in view this project was undertaken.

The main objectives of the work were therefore, as follows:

i) To identify textile fibres compatible to jute in blending.

ii) To devise processes and technologies associated with blending to maximize the use of jute in the possible fields of textiles.

iii) To develop techniques to manufacture fancy jute products from jute blends for diversified uses and utilization as import substitutes.

At the outset a complete and an up to date Literature Survey was made.

With the above aim, two different grades of jute fibre i.e. BWB and BTB along with three different man-made fibers i.e. acrylic, rayon and polyester, each of two different specific dimensions were procured, as the basic raw materials to be used in blends.

Before starting the trial processing, the component fibers of the blends i.e. jute (BWB and BTB grade) and man-made fibers (acrylic, polyester and rayon) were first physically characterized. Then the Control samples of 100% jute, each of BWB and BTB grade, were first processed through normal sequence of jute processing. Two different yarns of 5 and 7.5 lbs/spy count were spun using a modified apron draft spinning frame and a slip draft flyer spinning frame respectively.
From several trials carried out with jute/acrylic blends in 80/20 ratio, two processes of fibre to fibre blending, named Lattice Blending (Process A) and Stack Blending (Process B) were developed. In Lattice Blending (Process A), blending was attained by spreading the component fibres in desired proportions by weight over the Breaker Card Lattice and so is named Lattice Blending Process. In Stack Blending (Process B) jute and man-made fibers were laid on the floor in alternate layers in desired proportions by weight. Then tufts of layered/stacked fibers were fed into breaker card lattice. In both the processes hand feed was applied.

After the breaker carding stage, same usual sequence was followed for rest of the processing up to spinning. From the comparative assessment of the quality and physico-mechanical properties, the resultant yarns of 5 and 7.5lbs/spy nominal counts through blending Process A i.e. the Lattice Blending technique were found better. Considering the processing behaviour of the blends and nature of blending, Lattice Blending process was found most suitable blend process, so far developed. Thereafter, this technique of blending has been optimized from a number of trials with varying machine factors, processing parameters etc.

With the above optimized technique/process of blending, both BWB and BTB jute fibre were blended with three different man-made textile fibers viz. acrylic, rayon and polyester of different dimensions, each in the ratio of 90/10, 80/20 and 70/30. Then yarns of Nominal count 5 and 7.5 lbs/spy were processed and spun out of the above blends through modified Apron draft and Slip-draft hessian spinning frames. Physico-mechanical properties, quality and spinning performance of the yarns have been studied. Simultaneously, some chemical and finishing processes associated with blends were also developed. The blended fibers were chemically processed, texturized, finished and dyed to study its dye ability, colour fastness etc.

The three different man-made fibers used in blending with jute were found to behave differently during processing due to their physical and intrinsic fiber characteristics. Differences in the tensile properties of the component fibers are reflected in the properties of the blended yarns. Jute/polyester blends tended to form more neps in slivers and yarns, whereas jute/rayon blends were easily spinnable. Jute/acrylic formed bulks and needed very careful spinning especially in the modified Apron Draft Spinning frame.

In all three blend groups & almost in all cases with the increase of the percentage content of man-made fibers (from 10% to 30%) Tenacity, Modulus, Breaking Energy, Toughness, QR% showed more or less a decreasing trend with a few exceptions, viz. 80/20 jute/polyester. All blended yarns exhibited improved extension at break, which was even prominent in case of finer yarns i.e. 5 count yarns in line with higher extensibility of the man-made fibers. Jute/rayon blends in general rendered more uniformity with the increase of rayon content in blends as is evident from significant lowering of the CV% of breaking load of 7.5 lbs/spy yarn.

Breaking modulus, also known as Yarn Stiffness index, depicted different pictures for yarns of different blend groups especially of 7.5lbs/spy yarns. In case of jute-acrylic it decreased linearly with increase of acrylic content, whereas with the increase of rayon in the blend from 10% to 20%, stiffness has first reduced, which again increased with further increase of rayon content from 20% to 30%. With polyester blends the situation was just the reverse.
From chemical processing point of view, blending of jute with all three said fibers, rendered the blend somewhat more responsive to appropriately developed chemical finishing i.e. woolenizing, texturing and dyeing with different types of dyes.

BWB grade jute seems to be more suitable in blending than BTB jute, as most of the yarns blended with BTB jute resulted in lower tensile properties than those blended with BWB jute. In case of finer yarns i.e. 5lb/spy yarns the difference in the quality of the yarns were too significant.

With the developed gray, bleached and dyed yarns of blends, possibilities of producing various types of fabrics and products were explored in power looms, different traditional handlooms of Khadi, Jamdani, Narshingdi etc. and special & typical tribal looms of Chakmas and Manipuris. Fabrics of various constructions were thus woven for using in apparel and furnishing purposes. The aesthetic qualities of the fabrics out of the above blended yarns were found to have enhanced.

Jute/acrylic blends were found most suitable as knitting yarn substitutes. From these yarns it was possible to knit sweater, cardigan, jumper, shawl, muffler etc. both by hand and by industrial knitting machine. Some more fancy products were also produced out of the above blended yarns. Finally a wide range of diversified jute blended products of reasonable quality could be manufactured.

The Blend Process A i.e. the Lattice Blending Process, found more suitable for blending jute from the above study, is to be mechanized for more uniform blending. Quality and productivity of the jute blended yarns have scope for further improvement. But some more work is to be done for producing finer count blended yarns more efficiently.

The potential for replacing 100% coarse cotton yarn with the aforesaid blended yarns, from both property and cost consideration, may be harnessed. Prospect of chemically finished, woolenised & dyed jute/acrylic blended yarns having physical and mechanical properties comparable to commercially available woolen and acrylic yarn, is to be explored. Finally, economic and market feasibility study of various blended products of jute will have to be studied in near future.

The most significant outcome of the work is the successful blending of jute with man-made fibers like, acrylic, polyester and rayon of compatible dimensions in the conventional jute (long staple) spinning system. Almost no capital investment would be required for the adaptation of this technology/process in the existing jute industry.

Moreover, prospect for producing a wide variety of jute products thus maximizing utilization of jute in the possible fields of textiles also as import substitutes is very encouraging. Finally, this work has succeeded in creating a tremendous enthusiasm among the weavers, dyers, printers, Handicraft producers, Interior decorators, Fashion designers and some NGOs.
Production and Marketing of Jute Shopping Bags to Replace Poly Bags
A Right Step in Right Time

Mohammad Fazlul Huq Bhuiyan
Director (Research & Quality Control)
Bangladesh Jute Mills Corporation (BJMC), Dilkhusa, Dhaka.

1. In the United States, production and use of polythene bag was first started in 1958. After five years i.e., in 1963, it spread all over Asia. Production of High Density Poly Ethylene (HDPE), Low Density Poly Ethylene (LDPE) and Linear Low Density Poly Ethylene (LLDPE) shopping bag started in Bangladesh from 1982. Since then, polybags of various type, colour and design were being used for their easy availability and cheaper price causing serious threat to the overall environment of the country.

2. As far as it is known, there exists about seven hundred polybag factories in Bangladesh registered under “Plastic Goods Manufacturers Association”. In addition, there are many small factories also. Those factories were producing about two crore polybags daily of which about 60 lacs were being used in Dhaka City alone. According to expert opinion, these polybags factories consume highest amount of electricity. Besides a significant number of these factories reportedly run with unauthorized electricity connection.

3. These polybag factories used to import about 7,000 tonnes of film grade and yarn/rafia grade resins as raw materials every month and the country had to spend foreign exchange equivalent to Tk. 300 crores annually. Out of the 7,000 tonnes, about 5,000 tonnes were being used to produce poly shopping bags/carry bags and rest 2,000 tonnes for production of wrapper of various shelf-top groceries and stationeries.

4. Import duty on above two types of raw materials (H.S Code No. 3901.20 & 3901.10 respectively) has been reduced to 15% from 37.50% in the last budget which encouraged the entrepreneurs to establish more new poly shopping bag factories. For the same reason, some new factories of woven pp cloth & bags were also established.

5. Improvident and indiscriminate use of poly bags was singled out to be the major cause of environment pollution. It polluted air. The existence of fisheries, birds and livestocks are threatened by polluted water of ditches, canals and rivers. The drainage and sewerage system of towns, ports and cities became clogged, fertility of the agricultural land were affected and overall environment faced with dangerous and toxic pollution.

6. The poly bags which littered all over places were being collected and then re-processed at a temperature of 120°- 130° celsius. The exhaust fume from the burning poly bags contains Hydrogen Cyanide (HCN) which is extremely harmful for health. Experts and environmentalists opine that the amount of Hydrogen Cyanide (HCN), Carbon Monoxide (CO) and Carbon dioxide (CO\text{2}) emitted while burning a single poly bag is more harmful and dangerous than the emission of ten motor vehicles. A conscious Dhaka City dweller made the following observations on poly shopping bags:
"Polythene can not be destroyed by cutting, tearing or even burning. You can destroy it only by stopping its production. We can realize the hazards caused by this non-perishable item in the rainy day when we are to reach destination by crossing waist deep dirty water. The cause of this suffering is mainly polythene bags".

7. Since early eighties environment conscious people, citizens and people connected with jute industry expressed deep concern through their write-ups, addresses in seminar, symposium etc. about establishment of poly shopping bags factories, production, indiscriminate use of polybags. But unfortunately the policy makers appeared to be less provident about the impending menace of these indestructible item.

8. BJMC always advocated for bio-degradable and eco-friendly jute products and promoted its advantages over synthetics. For last 5/6 months, its officials worked their heart out to motivate people to use more and more jute shopping bags and discouraged use of polybags. In order to create awareness among its own people they displayed slogans painted on billboards at different strategic points of the mills of BJMC. Few of the slogans were:
   a) Use jute bags, shun polybags
   b) Products made of jute have diversified uses
   c) Jute Products are environment friendly and reusable
   d) Jute products are bio-degradable and increase the fertility of the soil
   e) Polybag destroys the fertility of the soil and pollutes the environment
   f) By using jute products, survive yourself, help the jute industry and the country survive and keep the environment pollution free.

9. An inter-ministerial meeting was held to stop production and use of polythene bags and to explore possibilities of developing alternative bags. After that in the last few months, several discussion meetings were organized by Ministry of Environment and Forest to find out source of viable alternatives to poly shopping bags. In those discussion meetings, representatives from BJMC assured about supply of enough jute shopping bags to cater to the need of the entire nation once polybag is banned.

10. The Cabinet, in its meeting held on 23rd December 2001, took a dynamic and bold decision based on information and data presented by the Ministry of Environment and Forest to ban use of polyshopping bags in Dhaka Metropolitan City with effect from 1st January, 2002.

11. A rally was organized on 27th December, 2001 by the Ministry of Environment and Forest which was led by the Hon'ble Minister for Environment and Forest himself which was participated enthusiastically by different organizations, departments, agencies and people from all walks of life. Electronic and print media and television channels gave wide coverage of this rally. The rally was also attended by BJMC officials. Afterwards, BJMC displayed a variety of jute shopping bags as most viable alternative to polybags which attracted attention of the spectators, city dwellers and general public all over the country.
12. A meeting of the Board of Directors of BJMC was held on 26th December 2001 in the wake of imposition of ban on the use of polybags with effect from 1st January 2002. In that meeting some very important decisions were taken for by supplying jute shopping bags as alternative to polybags in order to implement Government decision. The Jute Mills under BJMC were instructed to undertake steps to produce five different types of bags under five different categories of Hessian and Carpet Backing Cloth and to make them available in almost all wholesale and retail kitchen markets in Dhaka.

13. Accordingly Dhaka City was divided into six market areas and six jute mills under Dhaka area undertook programme to make jute bags available to the people in each and every kutcha bazar by deploying trucks to cover about 37 important and big kutcha bazars. In addition, arrangements were made to sell jute bags to public and traders from the Information and Display Centre located at the ground floor of Adamjee Court, Motijheel C/A and from Amin Show Room in Baitul Mukarram Market. A total of 35 lac pieces of jute shopping bags were produced during 27th December – 31 January, 2002 out of which 10 lac pieces were sold in those markets. This way BJMC ensured supply of jute shopping bags to every market and each household and made the Government decision a grand success.

14. In addition to above retail sales programme, wholesale drives were also undertaken in view of the positive response shown by the traders. A total of 3.00 lac pieces of bags were sold at wholesale prices. Steps were also taken to deliver the jute bags at the door steps of any buyer at a payment of 3% handling charge.

15. Because of this three-tier pricing policy and the aggressive market drives as mentioned above, supply of jute shopping bags to the retail and wholesale markets in Dhaka City was ensured and people were in a position to use jute shopping bags. The whole hearted and positive response shown by the general mass was unprecedented which also proved the fact that people have become more environment conscious and were aware than ever before and can rise to the occasion if a right decision was taken by the Govt.

16. Besides, Jute bags, Hessian and Carpet Backing Cloth were also sold to the buyers who want to convert those into jute shopping bags and sell them to market. To achieve this goal, the RQC Department of BJMC organized a meeting with the owners of small scale handicrafts units under Banglacraft umbrella and NGOs in September 2001 to find out the ways and means to increase production of high value added diversified jute products and also to increase their sales both at home and abroad. It was emphasized in that meeting that new and diversified commodities should be innovated by breaking away from its age old feature of packaging material. The participants were informed that necessary basic fabrics would be supplied by BJMC Mills for production of diversified items. As a result, small handicrafts units would be able to make fancy jute bags and engage unemployed youths and vulnerable women folk which in turn would help alleviate poverty.
17. With the imposition of ban on use of polybag all over the country and ensuing enactment of law to punish the violators, BJMC planned a production target and prepared itself with a stock of about 20 lac pieces of jute shopping bags to be sold till 15 March, 2002 to meet the country's emerging demand. Jute mills were also equipped to go for production of bags with short notice, if need be. Sale of jute shopping bag as well as jute fabrics is continuing on regular basis.

18. Revival of jute and jute industry solely depends on proper and coordinated planning and its implementation. Lack of coordination among the concerned ministries and departments contributes to ever diminishing size of the Jute Industry. Lost glory of jute may return if discipline can be brought back in the agriculture and industrial sector. We have to put concerted efforts in place like proper seed for cultivation, planned crop size, use of right quality of jute fabrics in the industry for better productivity, proper maintenance & modernization of age old machinery, integrated costing of the products and aggressive marketing. Jute is far too important for Bangladesh. Apart from the fact that one quarter of its population depends directly and indirectly on this sector, we can not afford to lose this natural fibre. If we do not do anything to protect and promote it, nobody will.

SUGGESTIONS:

1. Bangladesh needs 4,000 to 4,500 tonnes of jute seed annually. But our internal production is only 1,000 to 1,200 tonnes. BADC, a Govt. Corporation, supplies only 600 tonnes of certified seed. Rest 400 to 600 tonnes are procured by the farmers themselves from their jute plants. Remaining 3000 to 3300 tonnes come from across the border which often are of very low quality seeds. We need to take immediate steps to be self reliant on High Yielding Variety (HYV) jute seeds. Steps should be taken to ensure timely distribution of HYV seeds at a fair price, giving highest priority to the farmers. It has been observed that in the last few years, jute cultivation has been shifted from the mainland to border belt and to marginal land, the reasons of which are known to all of us.

2. To keep the raw jute prices stable, the production of raw jute should be limited to 50 lac bales annually to meet local and overseas demand.

3. R&D activities need to be strengthened to increase production of diversified jute products and export assistance should be increased to encourage exports.

4. Import duty on film grade resin under HS Code No. 3901.20 should be increased to previous level of 37.5% or even more because it is the basic raw material for production of poly shopping bags.

5. Import duty on yarn/rafia grade resin under HS Code No. 3901.10 should be increased to previous level of 37.5% because it is the basic raw material for woven pp cloth and bags.
6. The existing system of collecting 20% supplementary VAT on poly shopping bags and woven pp cloth and bags at the production level should be changed and this supplementary VAT should be imposed at the import level. Collection of VAT on production level is zero because of the small size of the poly bags factories whose evaluation is very difficult on the part of the customs officials. Establishment of new factories of PP bags and production can only be discouraged by exercising duty structure.

7. The internal consumption of traditional as well as diversified jute products should be increased along with its production and export. Different organization and the people should be encouraged to increase use of jute products. Awareness should be grown about the wide range of application of a varied range of products.

8. Peak hour rate of electricity should be stopped forthwith and replaced by flat rate in case of Public and Private Jute Mills. To continue uninterrupted production in jute industry, 24 hours electricity supply must be ensured declaring it as a thrust sector.

9. The bank interest for loan in jute industries should be reduced to 5 to 7% maximum.

10. For Human Resources Development (HRD) in this sector, immediate steps to be taken to establish a full fledged College of Jute Technology and new recruitment should be initiated without further delay to fill up the vacuum already created with the retirement of experienced and professional personnel at all levels.

11. Increase productivity by launching BMR/BMRE of the existing machinery.

12. Encourage jute cottage and handicraft sector through necessary incentives, inputs and market support.

13. For the survival and revival of jute industry, a new law should be enacted making compulsory use of jute bags in packing of food grains, sugar, cement, fertilizer etc. following the example of our neighboring country. The price of the jute bags should be fixed at ‘cost plus basis’ in all Government procurement programmes.

REFERENCES:

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5. Bangladesh Jute Research Institute (BJRI)
6. Bangladesh Agricultural Development Corporation (BADC)
7. A Study on Control and Management of Polythene Bags in Bangladesh. Lighter jute bags to submit polybags
Introduction

The demand for paper and paperboard has increased sharply in Bangladesh, China, India and Thailand. Per capita consumption of paper and paperboard in jute/kenaf growing countries demonstrate that there is an urgent need to develop new sources of fibrous raw material for pulp and paper production.

The forest land resource of Bangladesh is very limited. Bangladesh Chemical Industries Corporation (BCIC) is the major user of fibrous raw materials in the country and use bamboo, wood and bagasse for production of pulp and paper in Karnaphuli Paper Mills, North Bengal Paper Mills, Khulna Newsprint Mills and Sylhet Pulp and Paper Mills.

The pulp and paper industry normally uses chemical or mechanical methods or a combination of the two to produce pulp of desired character. Chemical pulping accounts for about 75% of the world pulp production in the world. It has the disadvantage of being capital and energy intensive. Mechanical pulping is electrical energy intensive and yields paper with less strength. These disadvantages limit the use of mechanical pulping in many grades of paper.

Preparation of pulp requires a large amount of chemical that makes the product costlier and also pollutes the environment and mechanical pulping requires more energy.

Increasing environmental awareness has made it necessary to investigate the methods for reducing the amount of energy, sulphur and chlorine containing compounds. This has lead to the development of biopulping and biobleaching.

After nearly a decade of research, biopulping technology for pulp and paper, has emerged as a solution to the above mentioned problems faced by pulp and paper industry.

After successful development and application of enzymes for improvement of low-grade jute, IJO has setup an enzyme plant in a jute mill of Bangladesh. It has been reported that application of microorganisms for biopulping reduces the consumption of energy by about 30%. In the bleaching process about 20 – 25% chemical consumption can be reduced in the biobleaching process.

Ministry of Industry, Govt. of the People’s Republic of Bangladesh approached IJO in 1995 to look for the availability of suitable enzyme that could be applied to produce pulp and paper.
While preparing the project the problems faced by the BCIC using green jute plant were taken into consideration.

This bio-pulping project has been designed incorporating the development and progress made in the different Institutes and paper mills of USA, Canada and Europe. This project will involve seven Institutes of five countries namely, BJRI and BCIC from Bangladesh, IBFC and Yuanjiang Mill from China, CPPRI from India, CTP from France and ATO from the Netherlands.

**Objectives**

There are 5 (five) main components of the projects. The first major component includes a set of objectives which aim at identifying and collecting microorganisms and processes currently in use and selecting suitable ones for application in jute biopulping on the basis of comparative studies of different microorganisms.

The second component envisages to develop most suitable enzymes for bio pulping and bio bleaching and to apply the same for preparing hand sheet at Bangladesh Chemical Industries Corporation (BCIC), Agro-technological Research Institute (ATO), and Central Technique du Papier (CTP).

Third component will be concerned with the management of black liquor produced during the pulping and the effluent generated during bleaching and finding suitable methods for storage of green jute.

The fourth component is large scale trial application of enzymes in different mills to determine the physical characteristics of pulp and paper and to evaluate and compare the results. Large scale production of enzymes at IJO enzyme plant and trial application at BCIC, CTP and ATO. Large-scale trials for production of pulp and paper will be carried out with the most suitable process at BCIC, CPPRI and Yuanjiang mill.

The fifth component is the dissemination of results and completion of the project.

**Isolation of Microorganisms**

Lignin degrading microorganisms, which are biological source of ligninolytic enzymes, are abundantly found in nature. They are very common in compost, rotten wood, saw dust and different forest waste lignocellulosics, where the lignin substances are being decomposed under natural conditions.

**Collection of Microorganism**

On the basis of the collected information from literature survey 12 fungal strains were collected from different Institutes of the world.
Screening of Micro-organism

Polymeric dye was used in growth medium to determine the ligninolytic capability of fungal strains, as the bleaching of the dye is associated with ligninolytic capability of fungal strains. The use of polymeric dye in lignin degrading study of *P. chrysosporium* was first described by Glenn and Gold (1983).

12 (twelve) strains were grown on solid medium containing lignin (with 0.1% glucose) as sole carbon source for enrichment of growth. All these strains were selected primarily on the basis of colony size, shape and growth rate. These strains were then finally screened on Poly-R containing solid media to detect their ligninolytic capability.

Control pulping Experiment

**Chemical analysis of whole jute, bark, core and bamboo**

Complete chemical analysis of whole jute, bark (bast fibre), core (stick) and bamboo were carried out and the results are shown in Table 1. From the results it was observed that holocellulose content in the bark is higher than the whole jute and stick. Fibre length of bark is higher.

As a result yield of pulp and strength properties will be higher with bark as a raw material.

![Table 1: Chemical Composition of whole Jute, Bark and Bamboo](image)

**Optimisation of pulping using whole jute, bark and stick separately in Soda –AQ and Kraft process.**

In order to optimise the liquor ratio with jute chips, AQ dose in Soda- AQ process and requirement of alkali percentage a number of experiments were conducted at Karnaphuli Paper Mills with a group digester (Oy. Santasalo-Sohlbergab, Helsinki, Finland) using 60g materials to produce pulp with Kappa No. 20-22.

Similar experiments were also carried out with bark and stick separately

From our experimental results obtained at KPM, it has been observed that the liquor ratio 1:5 and alkali percentage 17% (as Na₂O) have been found to be most effective for getting required Kappa No.
Similarly 12% alkali (Na₂O) and 0.05% AQ were suitable for bark and 19% alkali (Na₂O) and 0.05% AQ with a liquor ratio 1:5 was found to be suitable for stick.

Similarly optimisation experiments for kraft process were carried out using whole jute and bark separately to produce pulp with Kappa No. 20-22. It has been found that 17% alkali (as Na₂O) with 22% sulfidity produce pulp with required Kappa No. (20-22%) from whole jute whereas 15.5% alkali and 22% sulfidity is suitable for bark for producing pulp with Kappa No. 20 –22.

Table 2. Pulping of Whole Jute in Soda AQ- Process (using different liquor ratio)

<table>
<thead>
<tr>
<th>Material</th>
<th>Na₂O (%)</th>
<th>AQ %</th>
<th>M:L</th>
<th>Cooking time (min)</th>
<th>pH of liquor</th>
<th>K. No</th>
<th>S. reject %</th>
<th>Yield %</th>
<th>Burst Index KPa m²/g</th>
<th>Tear Index mNm²/g</th>
<th>Tensile index kN/m</th>
<th>Density Kg/m³</th>
<th>Freeness °SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jute Chips</td>
<td>17</td>
<td>0.1</td>
<td>1:4</td>
<td>90</td>
<td>11.45</td>
<td>15.5</td>
<td>Nil</td>
<td>45.34</td>
<td>2.59</td>
<td>8.86</td>
<td>38.17</td>
<td>510</td>
<td>16</td>
</tr>
<tr>
<td>Jute Chips</td>
<td>17</td>
<td>0.1</td>
<td>1:5</td>
<td>90</td>
<td>11.24</td>
<td>15.3</td>
<td>Nil</td>
<td>45.00</td>
<td>2.80</td>
<td>9.25</td>
<td>39.65</td>
<td>517</td>
<td>17</td>
</tr>
<tr>
<td>Jute Chips</td>
<td>17</td>
<td>0.1</td>
<td>1:6</td>
<td>90</td>
<td>11.35</td>
<td>14.8</td>
<td>Nil</td>
<td>45.12</td>
<td>2.53</td>
<td>7.15</td>
<td>36.68</td>
<td>515</td>
<td>17</td>
</tr>
</tbody>
</table>

H. Factor: 1600

For optimisation of material to liquor ratio we used different liquor ratio keeping the 17% alkali charge and 0.1% AQ. Among the three liquor ratio best result was obtained using 1:5 M:L ratio.

In order to obtain pulp with Kappa No. 20-22 we used different percentage of alkali (14 to 17%) and two different percentage of A.Q (0.05 to 0.1%). Results are shown in table 3. It has been revealed that using 17% alkali with 0.05% and 0.1% AQ we got Kappa No. 22.1 and 15.3 respectively. As the variation of AQ charge did not change the physical properties significantly we selected 0.05% AQ for future experiment for pulping with whole jute chips.

Table 3. Pulping of Whole Jute in Soda AQ- Process (using different % of Alkali &AQ)

<table>
<thead>
<tr>
<th>Material</th>
<th>Na₂O (%)</th>
<th>AQ %</th>
<th>Cooking time (min)</th>
<th>pH of liquor</th>
<th>Kappa No.</th>
<th>S. reject %</th>
<th>Yield %</th>
<th>Burst Index KPa m²/g</th>
<th>Tear Index mNm²/g</th>
<th>Tensile index kN/m</th>
<th>Density Kg/m³</th>
<th>Freeness °SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jute Chips</td>
<td>17</td>
<td>0.1</td>
<td>90</td>
<td>11.24</td>
<td>15.3</td>
<td>Nil</td>
<td>45.1</td>
<td>2.80</td>
<td>9.25</td>
<td>39.65</td>
<td>517</td>
<td>17</td>
</tr>
<tr>
<td>Jute Chips</td>
<td>17</td>
<td>0.05</td>
<td>90</td>
<td>10.81</td>
<td>22.1</td>
<td>Nil</td>
<td>46.0</td>
<td>2.53</td>
<td>9.60</td>
<td>45.21</td>
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<tr>
<td>Jute Chips</td>
<td>15.5</td>
<td>0.1</td>
<td>90</td>
<td>10.84</td>
<td>22.2</td>
<td>Nil</td>
<td>46.1</td>
<td>2.45</td>
<td>9.64</td>
<td>35.39</td>
<td>513</td>
<td>17</td>
</tr>
<tr>
<td>Jute Chips</td>
<td>15.5</td>
<td>0.05</td>
<td>90</td>
<td>10.02</td>
<td>26.4</td>
<td>Nil</td>
<td>47.2</td>
<td>2.33</td>
<td>9.80</td>
<td>30.93</td>
<td>508</td>
<td>17</td>
</tr>
<tr>
<td>Jute Chips</td>
<td>14.0</td>
<td>0.1</td>
<td>90</td>
<td>10.40</td>
<td>28.4</td>
<td>1.51</td>
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<td>13.20</td>
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<tr>
<td>Jute Chips</td>
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<td>0.05</td>
<td>90</td>
<td>9.75</td>
<td>31.0</td>
<td>5.10</td>
<td>49.1</td>
<td>1.40</td>
<td>13.10</td>
<td>25.09</td>
<td>504</td>
<td>16</td>
</tr>
</tbody>
</table>

H. Factor : 1600

In order to obtain pulp of jute bark with Kappa No. 20-22 we used different percentage of alkali (11% to 13%) using two different percentage of A.Q (0.05 and 0.1%) (Table- 4). From our experimental results we found that with 12% alkali and 0.05% AQ we obtained pulp with Kappa No. 18.9. Same alkali charges with 0.1% AQ that did not improve the yield and physical properties significantly.
Table 4. Pulping of Jute Bark in Soda AQ- Process

<table>
<thead>
<tr>
<th>Material</th>
<th>Na₂O (%)</th>
<th>AQ (%)</th>
<th>Cooking time (min)</th>
<th>pH of liquor</th>
<th>K. No</th>
<th>S. reject %</th>
<th>Yield %</th>
<th>Burst Index KPa m²/g</th>
<th>Tear Index mN²/g</th>
<th>Tensile index kN/m</th>
<th>Density Kg/m³</th>
<th>Freeness °SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bark</td>
<td>13</td>
<td>0.1</td>
<td>90</td>
<td>10.26</td>
<td>12.52</td>
<td>nil</td>
<td>49.9</td>
<td>3.90</td>
<td>20.46</td>
<td>57.07</td>
<td>520</td>
<td>15</td>
</tr>
<tr>
<td>Bark</td>
<td>13</td>
<td>0.05</td>
<td>90</td>
<td>9.95</td>
<td>15.96</td>
<td>nil</td>
<td>50.7</td>
<td>3.71</td>
<td>20.21</td>
<td>55.25</td>
<td>522</td>
<td>16</td>
</tr>
<tr>
<td>Bark</td>
<td>12</td>
<td>0.1</td>
<td>90</td>
<td>9.85</td>
<td>16.15</td>
<td>nil</td>
<td>52.2</td>
<td>3.47</td>
<td>19.78</td>
<td>65.83</td>
<td>517</td>
<td>16</td>
</tr>
<tr>
<td>Bark</td>
<td>12</td>
<td>0.05</td>
<td>90</td>
<td>9.45</td>
<td>18.90</td>
<td>nil</td>
<td>51.0</td>
<td>3.87</td>
<td>18.60</td>
<td>60.32</td>
<td>518</td>
<td>15</td>
</tr>
<tr>
<td>Bark</td>
<td>11</td>
<td>0.1</td>
<td>90</td>
<td>9.56</td>
<td>24.39</td>
<td>nil</td>
<td>53.0</td>
<td>3.27</td>
<td>20.66</td>
<td>54.46</td>
<td>518</td>
<td>16</td>
</tr>
</tbody>
</table>

Liquor ratio 1:5, H Factor - 1600

For pulping jute stick in soda process we used different percentage of alkali (16 to 18%) with two different percentage of AQ (0.05 to 0.1%). 18% alkali with 0.05% and 0.1% AQ produced almost the same result.

Table 5. Pulping of Jute Stick in Soda AQ- Process

<table>
<thead>
<tr>
<th>Material</th>
<th>Na₂O (%)</th>
<th>AQ (%)</th>
<th>Cooking time (min)</th>
<th>pH of liquor</th>
<th>K. No</th>
<th>S. reject %</th>
<th>Yield %</th>
<th>Burst Index KPa m²/g</th>
<th>Tear Index mN²/g</th>
<th>Tensile index kN/m</th>
<th>Density Kg/m³</th>
<th>Freeness °SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stick</td>
<td>16</td>
<td>0.1</td>
<td>90</td>
<td>10.10</td>
<td>26.3</td>
<td>1.20</td>
<td>43.15</td>
<td>2.12</td>
<td>12.13</td>
<td>55.23</td>
<td>490</td>
<td>18</td>
</tr>
<tr>
<td>Stick</td>
<td>16</td>
<td>0.05</td>
<td>90</td>
<td>9.65</td>
<td>29.4</td>
<td>2.25</td>
<td>43.70</td>
<td>2.36</td>
<td>10.23</td>
<td>45.20</td>
<td>500</td>
<td>18</td>
</tr>
<tr>
<td>Stick</td>
<td>17</td>
<td>0.1</td>
<td>90</td>
<td>10.73</td>
<td>23.2</td>
<td>nil</td>
<td>42.19</td>
<td>3.75</td>
<td>14.42</td>
<td>65.01</td>
<td>495</td>
<td>20</td>
</tr>
<tr>
<td>Stick</td>
<td>17</td>
<td>0.05</td>
<td>90</td>
<td>9.85</td>
<td>25.2</td>
<td>1.00</td>
<td>42.25</td>
<td>3.05</td>
<td>12.66</td>
<td>53.50</td>
<td>498</td>
<td>18</td>
</tr>
<tr>
<td>Stick</td>
<td>18</td>
<td>0.1</td>
<td>90</td>
<td>11.38</td>
<td>19.4</td>
<td>nil</td>
<td>40.71</td>
<td>3.76</td>
<td>11.52</td>
<td>68.00</td>
<td>496</td>
<td>23</td>
</tr>
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<td>Stick</td>
<td>18</td>
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<td>90</td>
<td>10.95</td>
<td>20.8</td>
<td>nil</td>
<td>41.13</td>
<td>3.65</td>
<td>11.22</td>
<td>60.35</td>
<td>500</td>
<td>19</td>
</tr>
</tbody>
</table>

Liquor ratio : 1:5, H Factor - 1600

Pulping of whole jute and jute bark in kraft process

Table 6. Pulping of whole jute in kraft process

<table>
<thead>
<tr>
<th>Material</th>
<th>Na₂O (%)</th>
<th>Sulfidity %</th>
<th>Cooking time (min)</th>
<th>pH of liquor</th>
<th>K. No</th>
<th>S. reject %</th>
<th>Yield %</th>
<th>Burst Index KPa m²/g</th>
<th>Tear Index mN²/g</th>
<th>Tensile index kN/m</th>
<th>Density Kg/m³</th>
<th>Freeness °SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>W. Jute</td>
<td>14</td>
<td>20</td>
<td>90</td>
<td>9.5</td>
<td>30.01</td>
<td>3.6</td>
<td>47.4</td>
<td>2.99</td>
<td>11.35</td>
<td>54.88</td>
<td>525</td>
<td>14</td>
</tr>
<tr>
<td>W. Jute</td>
<td>15.5</td>
<td>20</td>
<td>90</td>
<td>9.9</td>
<td>24.47</td>
<td>3.1</td>
<td>49.52</td>
<td>1.71</td>
<td>14.33</td>
<td>39.53</td>
<td>522</td>
<td>16</td>
</tr>
<tr>
<td>W. Jute</td>
<td>17</td>
<td>20</td>
<td>90</td>
<td>9.88</td>
<td>23.45</td>
<td>nil</td>
<td>41.46</td>
<td>3.24</td>
<td>15.56</td>
<td>47.30</td>
<td>530</td>
<td>17</td>
</tr>
<tr>
<td>W. Jute</td>
<td>14</td>
<td>22</td>
<td>90</td>
<td>9.75</td>
<td>28.65</td>
<td>1.5</td>
<td>46.74</td>
<td>2.99</td>
<td>11.35</td>
<td>54.88</td>
<td>518</td>
<td>14</td>
</tr>
<tr>
<td>W. Jute</td>
<td>15.5</td>
<td>22</td>
<td>90</td>
<td>10.01</td>
<td>24.58</td>
<td>1.25</td>
<td>49.53</td>
<td>3.24</td>
<td>14.53</td>
<td>59.44</td>
<td>523</td>
<td>16</td>
</tr>
<tr>
<td>W. Jute</td>
<td>17</td>
<td>22</td>
<td>90</td>
<td>10.55</td>
<td>19.05</td>
<td>nil</td>
<td>45.66</td>
<td>3.81</td>
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<td>67.77</td>
<td>525</td>
<td>18</td>
</tr>
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<td>W. Jute</td>
<td>14</td>
<td>25</td>
<td>90</td>
<td>9.6</td>
<td>28.25</td>
<td>3.5</td>
<td>48.53</td>
<td>1.82</td>
<td>11.35</td>
<td>43.85</td>
<td>520</td>
<td>15</td>
</tr>
<tr>
<td>W. Jute</td>
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<td>90</td>
<td>9.83</td>
<td>22.91</td>
<td>0.2</td>
<td>43</td>
<td>2.53</td>
<td>16.43</td>
<td>53.03</td>
<td>522</td>
<td>15</td>
</tr>
<tr>
<td>W. Jute</td>
<td>17</td>
<td>25</td>
<td>90</td>
<td>10.66</td>
<td>18.81</td>
<td>nil</td>
<td>42</td>
<td>3.29</td>
<td>17.54</td>
<td>50.10</td>
<td>526</td>
<td>14</td>
</tr>
</tbody>
</table>

Liquor ratio: 1:5, H Factor - 1600
For the production of pulp in kraft process with Kappa No. 20-22 we used different percentage of sulfidity (20%, 22% and 25%) for every percentage of alkali charge (14%, 15.5% and 17%). Best result was obtained with 17% alkali and 22% sulfidity (Table-6).

In case of bark best result was obtained with 15.5% alkali with 22% sulfidity (Table-7).

Table 7. Pulping of bark in kraft process

<table>
<thead>
<tr>
<th>Material</th>
<th>Na₂O (%)</th>
<th>Sulfidity %</th>
<th>Cooking time (min)</th>
<th>pH of liquor</th>
<th>K. No</th>
<th>S. reject %</th>
<th>Yield %</th>
<th>Burst Index KPa m²/g</th>
<th>Tear Index mNm²/g</th>
<th>Tensile index kN/m</th>
<th>Density Kg/m³</th>
<th>Freeness °SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. Bark</td>
<td>14</td>
<td>20</td>
<td>90</td>
<td>9.6</td>
<td>18.47</td>
<td>0.6</td>
<td>49.41</td>
<td>2.42</td>
<td>11.10</td>
<td>38.14</td>
<td>521</td>
<td>15</td>
</tr>
<tr>
<td>J. Bark</td>
<td>15.5</td>
<td>20</td>
<td>90</td>
<td>10.10</td>
<td>17.47</td>
<td>50.7</td>
<td>3.13</td>
<td>10.00</td>
<td>46.70</td>
<td>523</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>J. Bark</td>
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<td>20</td>
<td>90</td>
<td>10.3</td>
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<td>Nil</td>
<td>45.56</td>
<td>3.40</td>
<td>15.56</td>
<td>50.60</td>
<td>527</td>
<td>16</td>
</tr>
<tr>
<td>J. Bark</td>
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<td>22</td>
<td>90</td>
<td>9.5</td>
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<td>4</td>
<td>47.15</td>
<td>1.37</td>
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<tr>
<td>J. Bark</td>
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<td>22</td>
<td>90</td>
<td>10.2</td>
<td>17.88</td>
<td>Nil</td>
<td>52.49</td>
<td>2.25</td>
<td>14.00</td>
<td>52.85</td>
<td>521</td>
<td>15</td>
</tr>
<tr>
<td>J. Bark</td>
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<td>22</td>
<td>90</td>
<td>10.8</td>
<td>15.38</td>
<td>Nil</td>
<td>46.61</td>
<td>3.55</td>
<td>18.95</td>
<td>54.65</td>
<td>519</td>
<td>15</td>
</tr>
<tr>
<td>J. Bark</td>
<td>14</td>
<td>25</td>
<td>90</td>
<td>9.77</td>
<td>20.20</td>
<td>Nil</td>
<td>50.8</td>
<td>1.73</td>
<td>13.25</td>
<td>40.30</td>
<td>517</td>
<td>14</td>
</tr>
<tr>
<td>J. Bark</td>
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<td>25</td>
<td>90</td>
<td>9.97</td>
<td>15.50</td>
<td>Nil</td>
<td>50</td>
<td>2.22</td>
<td>13.04</td>
<td>43.93</td>
<td>519</td>
<td>14</td>
</tr>
</tbody>
</table>

Large scale trial of whole jute in both Soda-AQ and Kraft processes.

Large scale pulping was carried out in KPM in 15 litre revolving digester with the optimised alkali charge and AQ using whole jute. Similar experiments were also carried out in kraft process.

SODA AQ PROCESS

Cooking condition

Raw Material : 1000 gm
Bath Ratio : 1:5
Alkali (%) : 17 (Na₂O)
AQ (%) : 0.05
Cooking time : 90 min.
Ambient to 100°C : 30 min.
100°C to 170°C : 70 min.
at 170°C : 90 min.
Kappa no. : 20.50
Yield (%) : 48.0

Table 8. Physical properties of unbleached Soda-AQ pulp

<table>
<thead>
<tr>
<th>Material</th>
<th>Beating time (min)</th>
<th>Burst Index KPa m²/g</th>
<th>Tear Index mNm²/g</th>
<th>Tensile index kN/m</th>
<th>Density Kg/m³</th>
<th>Freeness °SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jute Chips</td>
<td>0</td>
<td>2.74</td>
<td>8.51</td>
<td>40.04</td>
<td>517</td>
<td>15</td>
</tr>
<tr>
<td>Jute Chips</td>
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<td>5.30</td>
<td>11.60</td>
<td>65.36</td>
<td>574</td>
<td>23</td>
</tr>
<tr>
<td>Jute Chips</td>
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<td>6.42</td>
<td>12.06</td>
<td>82.77</td>
<td>678</td>
<td>34</td>
</tr>
<tr>
<td>Jute Chips</td>
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<td>7.60</td>
<td>15.48</td>
<td>91.87</td>
<td>696</td>
<td>44</td>
</tr>
</tbody>
</table>

H. Factor: 1800

28
The results indicate that substantial improvement of burst, tear and tensile index with the increase of beating (in laboratory group beater). The physical strength properties of whole jute unbleached beaten soda-AQ pulp are shown in Table 8.

**Kraft Process**

**Cooking condition**

| Raw Material | 1000 gm |
| Bath Ratio   | 1:5     |
| Alkali (%)   | 17 (Na₂O) |
| Sulfidity (%)| 22      |
| Ambient to 100°C | 30 min. |
| 100°C to 170°C | 70 min. |
| at 170°C     | 120 min. |
| Kappa no.    | 20.00   |
| Yield        | 47.01   |

<table>
<thead>
<tr>
<th>Table 9. Physical properties of unbleached beaten Kraft Pulp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Jute Chips</td>
</tr>
<tr>
<td>Jute Chips</td>
</tr>
<tr>
<td>Jute Chips</td>
</tr>
<tr>
<td>Jute Chips</td>
</tr>
</tbody>
</table>

H. Factor: 2000

The physical strength properties of whole jute unbleached beaten kraft pulp results also indicated that substantial improvement of tear, burst and tensile index with the increase of beating.

**Bleaching**

The pulps were bleached by CEH sequence.

4.4% of chlorine (kappa no. x 0.22) was applied on unbleached whole jute pulp of Kappa No. 20.

Alkali Extraction stage:

Alkali extraction was carried out at 65°C for 60 minutes at 5% consistency. The detailed bleaching conditions are shown in Table 10.
Table 10. Bleaching condition of Kraft Pulp

<table>
<thead>
<tr>
<th></th>
<th>Chlorination 1hr. at 25°C</th>
<th>Alkali extraction 1hr. at 65°C</th>
<th>Hypo stage 2hrs. at 40°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Chlorine</td>
<td>4.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>% NaOH</td>
<td>-</td>
<td>2.0</td>
<td>-</td>
</tr>
<tr>
<td>% active Cl₂ from hypo</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Consistency %</td>
<td>2.5</td>
<td>5</td>
<td>8.0</td>
</tr>
<tr>
<td>Residual Cl₂</td>
<td>0.9</td>
<td>-</td>
<td>0.49</td>
</tr>
<tr>
<td>Residual pH</td>
<td>1.8</td>
<td>10.93</td>
<td>9.2</td>
</tr>
<tr>
<td>Relative Viscosity</td>
<td>8.56</td>
<td>6.87</td>
<td>6.21</td>
</tr>
<tr>
<td>Brightness (% elrepho)</td>
<td>42.0</td>
<td>43.2</td>
<td>80.0</td>
</tr>
</tbody>
</table>

Table 11. Physical properties of whole jute beaten Kraft bleached pulp

<table>
<thead>
<tr>
<th>Beating time (min)</th>
<th>Burst Index KPa m²/g</th>
<th>Tear Index mN/m²</th>
<th>Tensile index kN/m</th>
<th>Density Kg/m³</th>
<th>Freeness °SR</th>
<th>Brightness (% elrepho)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.57</td>
<td>9.94</td>
<td>35.85</td>
<td>549</td>
<td>15</td>
<td>80.00</td>
</tr>
<tr>
<td>6</td>
<td>4.82</td>
<td>13.10</td>
<td>64.62</td>
<td>621</td>
<td>23</td>
<td>79.60</td>
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<td>10</td>
<td>5.85</td>
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<tr>
<td>17</td>
<td>6.23</td>
<td>15.53</td>
<td>86.23</td>
<td>663</td>
<td>31</td>
<td>79.10</td>
</tr>
</tbody>
</table>
Fibers used for textile applications can broadly be classified into four categories based on their origins, namely natural fibers, man-made fibers, synthetic fibers and mineral fibers. Within these four categories there are a variety of different types of fibers, each having its own physical, mechanical, chemical and thermal properties. Based on these properties, the industry has come up with different textile processes for producing textile products for a huge variety of end uses in the arena of apparel, upholstery, home furnishings, high-performance technical textiles, geo-textiles and so on in woven as well as in non-woven forms. In this whole gamut of end uses, jute unfortunately occupies a miniscule piece of the pie and that also in low-value products, such as gunny bags, twine and carpet backing cloth for so long. We have also limited ourselves for far too long in thinking that the major use of jute is for low-value textile applications as I mentioned earlier. Having considered the various properties of jute compared to other textile fibers the scientific community at home and abroad has been able to incorporate jute either in this entirety or in blends with other suitable and compatible fibers or in a modified form for several other end uses. We have to harness the unused, unseen or the overlooked part of jute fiber properties to graduate from low-value packaging applications to high value added applications in the field of apparel, home furnishings, upholstery, technical textiles, composite materials and paper pulp to name a few.

While the scientific community has already developed several new applications, the industry, barring a few, has been unable to adopt the processes for commercial production in a large scale.

The jute industry survived for well over 100 years seeing many changes in its turbulent lifetime. But the challenges it faces today are more formidable than ever before. The existing woven jute industry is in the midst of a crisis with antiquated machinery and over-capacity in a falling market, causing downward pressure on prices, pressure on margins and thus curtailing the ability of the industry to invest and modernize. The advent of polyester, polypropylene and other synthetic fibers as well as bulk handling techniques have virtually destroyed the niche market enjoyed by jute, thus affecting the jute industry and the livelihood of millions of people in the jute producing countries.

The traditional products of the existing jute industry namely, Hessian, sacking, CBC and twine represent almost 90% of all jute production worldwide. These products are under most threat from alternatives. A substantial portion of the market worldwide has been lost to synthetic substitutes and alternative packaging methods. The remaining market also happens to be a target for synthetic companies wishing to expand, offering large volumes of standard product requiring fairly low technology and relatively little investment. The jute industry producing Hessian, sacking, CBC and twine are ill equipped with very old technology
requiring high labor and energy inputs. Little has been done in product innovation or production methods to reduce costs and enable it to compete with cheap synthetic substitutes. The market for these products will continue to erode unless modern production methods are introduced to reduce labor and energy costs to make it more competitive.

Jute carpet backing cloth (CBC) had a virtual monopoly for many years for primary carpet backing. Unfortunately polypropylene has taken over the entire market and jute is being used for secondary backing only. Today, due to price fluctuations and supply difficulties major buyers are switching to polypropylene.

The major market for jute yarn worldwide today is for woven carpets and here fortunately demand continues to grow as demand for rugs continue to grow worldwide.

Considering the present situation, it would perhaps be appropriate to look at some of the future possibilities where substantial development work has already been done by the research organizations and the industry at home and abroad as follows:

<table>
<thead>
<tr>
<th>Woven</th>
<th>Non-woven</th>
<th>Composites material</th>
<th>Paper pulp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Home textiles</td>
<td>1. Geo textiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Fabric for Apparel</td>
<td>2. Insulation Material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Geo textiles</td>
<td>3. Industrial Filters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Home Textiles and Apparel**

Home textiles is an area with tremendous potential. Substantial value additions can be made with some additional machinery to be used in conjunction with existing machinery in the mills. Some of the products in this range have been displayed in this exhibition. This is only the tip of the iceberg. With installation of fine yarn spinning and weaving machinery we should be able to produce fine fabric made of pure jute or jute blended with other fibers which can be used for fine home furnishings as well as for apparel. The opportunities here can be enormous, given the fact that there exists a very large garments industry in Bangladesh. A point to note is that there are internationally accepted standards to be maintained for each and every textile product as far as strength, wash fastness, light fastness, rubbing fastness etc. are concerned, depending on the end product. The industry must educate itself continuously regarding the standards and requirements as they embark on such a project.

**Technical Textile**

Technical textile is an area where jute fabric can play an important role as a base fabric for different industrial applications. The jute fabric of different constructions can be coated, laminated or treated with specific chemicals for specific purposes.
Geo-jute

At present, synthetic materials, such as polypropylene, polyethylene and polyester, dominate the geo-textiles market. The majority of these are comparatively simple fabrics. Approximately 75% are non-woven and take the form of heat bonded continuous filament or needle-punched filament. Woven fabrics hold about 15% of the market and range from inexpensive, lightweight woven polypropylene film to complex multi filament polyester yarn fabrics up to 2000 gm/square meter. Geo-jute accounts for a tiny proportion of total geo-textile consumption, but have considerable potential in a range of applications, including erosion control and even as base layers for turf, asphaltic overlays and reinforcement in temporary haul roads. Geo-jute could have a competitive edge given the increasing tendency to use environment friendly products.

The market for geo-textiles is mainly concentrated in Western Europe, North America and Japan, each accounting for a about a third of global consumption.

Composite Materials

Agro-based composites are traditionally thought of as solid, e.g. Wood. However there has been a trend away from solid wood for many traditional applications toward smaller member composites. These new products started with glue-laminated lumber, to plywood, to flake-board, to particle-board and finally to fiber-board. Using jute fiber for composites however, has many advantages. Jute is renewable, versatile, non-abrasive, porous, hydroscopic, biodegradable, combustible and compostible to name a few. Some might consider part of these properties as disadvantages, particularly biodegradable and combustible, but these features provide a means of predictable and programmable disposal not easily achieved with other resources.

It is also possible to use the whole jute plant for fiberboard. By doing this, the retting process is avoided. The jute farmer can sell his jute crop directly to a board processing center, saving time and allowing them to put in another crop in the same year.

Paper Pulp

Jute, as well as its allied fibers like Mesta and kenaf can be developed into commercially viable raw materials for papermaking. Jute is an annual renewable resource whereas the cycle for hard wood and bamboo is much longer. Jute has less lignin content compared to bamboo or wood and its long fiber character gives much better machine runability. Its pulp has a fiber length quite close to softwood fiber and develops strength at comparatively lower wetness levels. Paper made with jute pulp is more durable and its opacity is better compared to softwoods. This is an area where very large consumption of jute can be achieved.
The above are only some of the possibilities for diversification of jute. We need an awareness campaign of what is possible with jute. Fairs and exhibitions are an excellent way of gaining exposure and access to international markets. There are fairs held all over the world for diverse fields as home textiles, floor coverings, engineering materials and so on. It is important to exhibit our new products in these fairs to let the world know what jute can be used in. Most people in the world do not know of jute. For them it could be a new thing, and a new discovery.

The industry does not have the strength to go to these fairs totally on their own. We need assistance from the government as well as the international community and organizations to organize participation in fairs to widen publicity of the eco-friendliness, bio-degradability etc of jute. Mere lip service by the policy makers is not good enough. The industry requires real assistance now.

In order to reverse the declining process of the jute industry, the policy makers at the national as well as at the international level need to put in place all out policy and fiscal support for protection of the existing industry and make funds available to the jute industry on softer terms to install modern plants and equipment required for high value products. This will not only protect the interest of the millions of farmers engaged in the production of a renewable source of natural fiber and ensure employment of hundreds of thousands of people working in the mills but also provide employment to the hundreds of thousands still waiting to be employed.
Diversification of Jute Products in Bangladesh

N. I. Patwari
Managing Director
Sonali Aansh Group
Lal Bhaban
18 Rajuk Avenue, Dhaka-1000

We would like to thank the Honourable Minister for Jute, People’s Republic of Bangladesh and Dr. Mondal of “Trust for the International Jute Study Group (Ex. IJO) for organising such a Seminar and Exhibition. This is 1st of its of kind in the Bangladesh.

I am personally delighted and thankful to the Organising Authority for inviting me to speak on such an important issue like Diversification of Jute products.

Jute is a raw materials traditionally processed in the Jute Industries for production of “packaging materials” all over the World and as a natural fabric it is the cheapest raw materials for the purpose.

Our Industries used to consume up to 35 Lac bales of Raw Jute a year eqvt. 6 Lac tons of Jute goods. In recent year competition of Synthetic has drastically reduce the demand for Jute which in turn adversely affect in our Economy. Therefore, our Govt. as well as all related International Organisations have given utmost importance to reviving the Jute Sectors on health reason to. Future of Jute Industry depends on successful diversification of Jute Products.

The age old uses of Jute as Packaging materials viz (a) Sacking bag (b) Hessian (c) CBC.

Proposed Diversification can be summarised as follows:

a) Wall Covering  
b) Coloured Yarn/Cloth  
c) Pulps for paper  
d) Jute PP Mixed Sheets making Sliver Can, Boat and etc.  
e) Jute Braid /Sole  
g) Espadrilles / Jute Shoes  
h) U.S. A Luggage in the shape of Suit Cases  
i) Rug, Mats and Carpet

Latest innovation of Jute Cloth as Soft as Silk having Linen feeling, totally soften and dehaired:

With this kind of innovating fabric one can easily replace Heavy Textile Cloth for use of Curtain, Chair Cover, Cushion Cover, Sofa Cover, Table Cloth, Mattress and based on this products one can easily go on large commercial scale for following.

a) Furniture & fixtures  
b) Manufacturing of Suit Cases and Luggage Bags.
A Brief History of Diversification

I have travelled many Countries; have visited many Industry & Traders all over the Globe since 1962. I saw 1st heard other Countries & Industries utilizing Jute for different purposes other than our Traditional use as Packaging Materials.

During 1975-82 I witnessed numerous European Companies such as Sidlaw & Fischer in Germany using Jute to produce wall covering by coating PP. There was great demand for such product during that time. Based on which Sonali Aansh Industries procured related technology & machinery to produce this. Unfortunately by 1983 demand for Jute Wall Covering ended. Therefore, we kept all related loom idle invested huge amount of money to afterwards we procured the technology & machineries to produce Jute Soles as well as Espadrilles. France & Southern European Countries has been making these Jute Shoes for nearly century & kept the Technology to themselves. Due to extremely short summer for continuous 4/5 years we lost a sizeable business on these too.

We also developed coloured Yarn & Cloth in consultation with South Korean Associates for the luggage Industry. This venture also ended after 6 years due to lack of demand. We again had to close down related loom & unit.

Jute rope supplied to Japanese market is also very seasonal demand. Once again special unit dedicated for Iranian Carpet Industry totally stopped after 4/5 years due to war & our investment of 5/7.5 Crore on the following on diversified machines mostly remain unutilized & idle.

a) Ropes machine  
b) Heavy count frame  
c) Braiding Unit  
d) Stitching unit  
e) Vulcanizing unit  
f) Cops machines  
g) Modern Looms  
h) Coloured Unit  
i) Sizing, Dying & finishing unit

Very lately in consultation with the then IJO and extensive Co-operation of Dr. Mondal and continuous assistance of NORAD after long we went on the following:

1) De-haired Soften Cloth as Soft as Silk having linen feeling that can easily be used for Sofa, Curtain, Chair, Upholstery, Mattress Cover and we have been mostly succeeded and this is a new innovation in the Jute Sector all over the Country which even India could not succeed despite of their huge investment.
2) For the purpose in consultation with IJO/NORAD we again invested in the following M/cs. Highly Sophisticated Frame with 10,000 RPM for making Light Count Yarn ranging 6 lbs to 3 count yarn.

3) Latest type of Looms to weave light cloth Ex. Light Yarn.

4) Simultaneously the relative very expensive “dying and finishing unit” with the facilities of starching, Calendering, Boiler is required to be set up.

Marketing

To develop Diversified product a continuous demand is a must. As such one has to market these innovative items by display in International Fairm such as Heimtextile, Domotex etc. which is very expensive. Home consumption of such named Diversified items are completely out of range for most people (Though Govt. recent decision to abolish plastic bag is a step in the right direction to encourage local use of jute products).

Various promotional activities on diversification

After successful completion of diversification, one has to creating continuous demand & for the purpose Govt as well International Agencies must come forward for promoting of marketing.

IJO initiated projects are to be appraised in following 2 Groups

a) Projects relating to improvement & innovation of the existing Jute Mills & its products are required to be financed as Grant or Subsidised.

b) Projects for New products viz
   - Pulp paper
   - Mixed products of Hardboard/Furniture, Medicine & Chemicals.

These projects are to be financed with very low rate of interest.

Diversification needs lot of investment, concentration, research and lot of development. Finally easy available fund and the demands as such Entrepreneurs are shaky and for private Entrepreneur it is not viable to concentrate/invest on such uncertain products unless a assured market is required. So far we have been followers of the European in diversification. By the time reached the market with the product demand has already diminished. We need to be leaders in marketing new products & creating demand with this new jute cloth. I am confident we are the 1st one to develop this product. Now if we can successfully market them we will be the winners.
In view of above, we suggest that Ministry of Jute should take steps in the shape of the then EPIDC to set up such project and to start production and then hand over to private concern for continuous production.

Other Suggestion

In order to avail of the opportunity of closure of PP Bags or Replacing of PP Bags a bold attempt as initiated by our Govt. of PP Bags we must come out of new innovation of jute products viz. Net Bag out of Jute Yarn, Jute Products out of very Light Cloth and various Sophisticated Laminated Jute Bags / Shopping Bags, Coloured and Soften Cloth. Lot of Home Industries / Handicraft Unit Similar to JMDC in India who have over 2000 Factories near Kolkata/ Southern India producing numerous Bags and Jute Items and must have to develop and to be guided by a Marketing Corporation under Ministry of Jute.

A mandatory order to be en-acted, thus marketing compulsory use of Jute Products, in Govt. offices viz Sofa, Chair, Curtain & etc. & all other products as initiated by IJO.

Despite of all above, for promotion of Diversification, one needs round the Clock protection till it reaches the age of creation of continuous demand & mass consumers accepting & perfect products.

We once again thank for allowing me to speak in a such honoured occasion.
ESHEETA : A Success Story of a Women Entrepreneur

Mrs. Sakina Dewan
Director, Esheeta
House 27, Road 18, Block-J
Banani, Dhaka-1213

I am Sakina Dewan. Esheeta is the name of my establishment. Since long, I have been engaged in exporting hand embroidered household items. I have started Esheeta exclusively at my own initiative without any financial assistance or support from any foreign organisations, government or banks. It is a craft centre having specialisation on making hand embroidered products. It exports all categories of home textiles in many countries all over the world. I have also some local expatriate customers for my products. I cannot sell my products in the domestic market mainly because of limited capacity of my firm. Initially, I preferred to work with 100 per cent cotton and silk. Afterwards, I have started working with jute fabrics as well. Presently, near about 300 workers are working with me. All of them are literate and have received at least primary education. I think because of their educational background they pick up their work quickly and are able to deliver the products as per my as well as my client’s expectation. Initial training on needle works is given by me. However, I have three assistants to help me in this job.

Workers of my centre are divided into small groups and a group leader heads all such groups. The group leader is held responsible for the performance of her respective group. I have achieved satisfactory results through this working arrangement. Moreover controlling quality become much easier following this process.

These female workers mainly take their assignments from me and work at home in between family chores. In this way after disposing of their family/household responsibilities they can bring in additional income for their family. A female worker can earn from Taka 500.00 to Taka 5,000.00 per month. I learnt from them that they are very happy with their work as it helps them it contributing to their family.

I proudly admit that the needle and embroidery works of my centre are of high quality and exclusive in nature. I am very strict on maintaining quality of work and put emphasis on timely delivery of consignment. I used to get frequent repeat orders from my customers mainly because of quality of product and punctual services rendered to them. I have some renowned stores, famous boutiques and fashion houses in my regular customers list. It is my observation that if you are sincere with your works and have properly trained workers, you will be successful with your work how ever delicate it might be.

As I have been engaged for quite sometime in exporting household items as well as specialised national costume to Norway, I was invited to join “Jute From Bangladesh” project of Norway in August 1998. At initial stage, I myself was confused whether it would be possible to make embroidery or fine needle works on unblended (pure jute) jute fabrics. Afterwards, to my great surprise, I found out not only embroidery, fine needle works are also possible on jute fabrics. After providing necessary training, I have now dedicated one of the women groups to work with jute fabrics only to meet the growing demands.
I have attended Frankfurt Home Textile Fair from this NORAD project “Jute From Bangladesh” for consecutive three years. I have seen the buyers from renowned fashion houses of Europe were quite astonished to see my products made from pure jute fabrics. At initial stage, I must admit, I was not ready for such overwhelming responses. We are highly encouraged by the interest shown by such high class buyers.

I should thank NORAD for helping us to take these jute based home textile products to the world market.

I should also mention here that many people, even of our own country, were still ignorant of the latest development that high quality product could be produced from jute. In Frankfurt fair, many foreign buyers asked me whether my products were originally made of jute fabrics, and whether produced in Bangladesh. They have their suspicion that this high quality products were produced in India or any other country. Before introducing any new product in the market awareness creation is very much needed in the marketing efforts which was not properly done in case of jute products, I must say. If such steps could be taken we should not have faced such embarrassments. In this connection, I will put forward my suggestions to the government and relevant organisation to organise fairs in our country or facilitate participation in international fairs and also to take publicity/marketing drives both at home and abroad for creating awareness of the customers. It helps the producers in sensing about the market demand and enriches them with creative ideas, designs. Moreover, such measures provide them with the opportunity to interact with the prospective buyers and their demands.

The high quality jute fabrics presently I am using for my products are so far as I know is being made only by Pubali Jute Mills and Sonali Aansh. We are to buy these fabrics at a very high price. As a result the price of the finished products also go up significantly. Consequently, many limitations arise in marketing of final products at our end. If we could buy such fabrics even at 25% lower price we could export some of our products to fair price chain stores. That will also help us in increasing our market span as we are now selling to the up scale markets only. Moreover this will help us to cater to domestic market to some extend, as products would come within the purchasing strength of the local buyers. I can confidently say, such a situation would help me not only to increase production but to increase the number of workers, at least three times more than the existing level. Many women showed their interest to be engaged in embroidery works at my centre but because of limited market access, I have to refuse them. I am hopeful that with a decline in raw material price I will be able to expand my capacity as well size of manpower.

With this, I would like to add that we, the small entrepreneurs, would need government assistance since we are introducing jute in a new phase by exporting non-traditional jute goods and also bringing foreign currency at home though not significant from national context. If little assistance is given, many women like me, would be encouraged and come forward in these activities and subsequently increased consumption of jute and more employment generation of women could be made possible.
Modification of Existing Spinning Frame for Production of Fine Jute Yarn

Md. Osman Ghani Miazi, Md. Khairul Kabir and Latifa Binte Lutfar
Bangladesh Jute Research Institute
Manik Mia Avenue, Dhaka -1207

ABSTRACT

An Apron Draft Spinning machine was converted into ring spinning system. In this conversion, rings and travellers were used and fine yarn upto 103 tex (3lb/spy) was produced. It was shown that the converted machine was capable of producing fine yarn which was not possible by existing flyer spinning machine. The speed of the spindles increased upto 8000 rpm from its original flyer speed 4250 rpm. Bangla Tossa B (BTB) and Bangla White C (BWC) grade Jute fibers were used for producing Fine Jute Yarn. The spinning performance and physical properties of produced yarns are found comparable with standard fine yarns. The Fine Jute Yarns can be used as diversified product such as Fine Fabric, Curtain Cloth, Bed Cover, Shopping bags, Bottle bag, School bag, Ladies purse etc.

INTRODUCTION

Jute is natural cellulosic bast fibre. It is a textile fibre of good spinnable character. At present there is large number of man - made fibre in the world textile market. Jute fibre has been facing a tough competition with man-made fibre since their presence in the world textile market. To overcome this competition it is necessary to produce fine jute yarn by developing/modifying the existing jute machinery. Through this development it may be possible to make fine jute yarn which can be used for diversification of jute, such as light weight shopping bag, furnishing fabric, decorative fabric etc. As a result, jute fibre may be used in the production of Fabric, which leads to increasing its uses in various fields of textiles. The aim of this study is to develop a technique for the production of fine jute yarn by the developed spinning system.

There are various methods of jute spinning both in the conventional area and in the non conventional area. Under the conventional area the following methods have been used. They are cap spinning, Mule spinning, Flyer spinning, Ring spinning, Centrifugal spinning etc.

Flyer Spinning: This is the most popular and widely used spinning system. Here jute spinning frame inserts the twist by means of overhung flyers suspended above the bobbin. The flyers are carried on ball bearing. Wharf's are mounted in the front of the frame at about waist-height. The wharf is driven by cotton flat belt from the main cylinder of the machine. This system is not suitable for producing fine count yarn due to the presence of drag force during spinning.
Apron Draft Flyer Spinning Machine: This machine is the latest addition by James Mackie and Sons Ltd. to their range of jute manufacturing machinery (Fig. 1). This machine is definitely an improved version spinning frame with higher rate of production.


Fig. 1 Existing apron draft flyer spinning machine

Drafting of material in the machine is by means of moving apron which provide a very good control of material through out the entire drafting zone. As a result, the yarn produced is more regular than a conventionally spun yarn. This regularity in the yarn brings in good appearance and increased strength.

Two types of spinning frame with this apron draft arrangement are available, that is 10.8 cm frame and 12 cm frame of 100 and 80 spindles per frame and better appearance but also reduces the number of breaks per unit time.

This apron draft flyer spinning frame has an automatic cleaner which traverses full length of machine and thus increase yarn cleanliness reducing operators work load. The apron for drafting is removable to ensure cleaning and replacement of new apron if necessary.

All rollers are mounted on ball and roller bearings to allow smoother running, reliability and durability. However the machine can not produce finer yarn like 3 lb/spy.
Ring Spinning: The system is suitable for producing fine jute yarn. In the system rings and travellers are used instead of flyers. There are different types of ring spinning

a) The Weller Ring Spinning Frame: The machine is of rigid construction and vibration free but noise level is higher. There is no on-winding tension.

b) The Bolleli Ring Spinning Frame: The ring spinning frame is available with single draft or double draft, being able to draft long fibres from 40 mm up to 350 mm. The speeds of the frame can be varied by moving a knob. The range of draft is from 4 to 120.

Centrifugal Spinning (Gardella spinning frame):

The Gardella is a centrifugal type dry spinning system. The machine is of 40 spindle running at 9000 rpm. The yarn can be spun from 72 tex (2.08 lbs/spy) to 276 tex (7.74 lbs/spy).

Presently ring spinning frame and centrifugal spinning machine like Gardella spinning are producing fine yarn but initial investment of this machinery are exorbitantly high which leads to the higher production cost of fine yarn.

**LIMITATION OF FLYER SPINNING IN PRODUCTION OF FINE YARN**

Spinning tension of yarn is an important criterion for spinning of a desired count of yarn. Two levels of tension are generally encountered, on winding tension and transmitted tension. On winding tension is the tension developed in the part of the yarn between the flyer eye and the surface of the bobbin. Transmitted tension is the tension in the part of the yarn above the wharf-cap. The transmitted tension is always lower than the on-winding tension.

The relationship between the on-winding tension and the transmitted tension is given by \( T_t = T_o \exp (\mu \theta) \), where \( T_t \) is the transmitted tension, \( T_o \) the on-winding tension, \( \mu \) is the coefficient of friction of jute yarn on steel and \( \theta \) is the total angle of warp on the flyer leg and any other bearing surface.

In the Flyer spinning system the spinning tension is comparatively higher than that developed in the ring system. The fine yarn, less than 5 lb/spy, cannot withstand the developed level of tension in the flyer system. As a result fine yarn like 3 lb/spy can not be produced by the flyer spinning system. Since on-winding tension is higher than the transmitted tension, it is observed that yarns always break at the on-winding part. On the 10.8 cm frame a popular choice of hessian yarn, the on-winding tension is normally 0.8 kg, although wide variation in these values are found.

For producing 8 lb/spy jute yarn this may be around 1-1.5 kg. From this value the on-winding tension should be 0.375-0.562 for the spinning of 3 lb/spy yarn. But the actual tension in flyer spinning system is 0.8 kg, which is about twice than the acceptable on-winding tension. So it is not possible to make fine yarn like 3 lb/spy by the flyer system.
The limitation of producing fine yarn due to spinning tension of flyer spinning system may be overcome by introducing ring system in the flyer spinning machine. In the ring system, on winding tension is negligible because there is no drag force which is developed by the bobbin carrier of the flyer spinning system. It may be possible to produce fine jute yarn through introducing of ring system by eliminating flyer and bobbin carrier of existing flyer spinning system.

**MATERIALS AND METHODS**

The following materials were used for the modification of the flyer spinning frame into ring system:

<table>
<thead>
<tr>
<th>Name</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) M.S. Roller</td>
<td>90 cm x 13.5cm</td>
</tr>
<tr>
<td>b) Bearing</td>
<td>No. 6203</td>
</tr>
<tr>
<td>c) Roller stand</td>
<td>36cm x 20 cm</td>
</tr>
<tr>
<td>d) Cotton flat belt</td>
<td>2 cm x 1mm</td>
</tr>
<tr>
<td>e) U channel</td>
<td>10 cm x 5 cm x 124 cm</td>
</tr>
<tr>
<td>f) Ring</td>
<td>75 mm</td>
</tr>
<tr>
<td>g) Traveller</td>
<td>No. 1.0</td>
</tr>
<tr>
<td>h) Yarn guide</td>
<td>74 mm</td>
</tr>
<tr>
<td>i) Bobbin</td>
<td>23 cm x 25 cm x 2 cm</td>
</tr>
<tr>
<td>j) Spindle</td>
<td>22 cm</td>
</tr>
</tbody>
</table>

In this modification, there is no on-winding tension due to replacement of flyer and existing bobbin by introducing ring and traveller. But proper spindle speed is essential for making a yarn of definite linear density. The proper spindle speed was fixed by series of trials. From the result of trials it was found the machine can produce fine yarn between 6000 to 8000 rpm spindle speed.

In this experiment apron draft ring spinning machine was used (Fig.2). Two tests were conducted. One was carried out by Bangla Tossa B and another was conducted by Bangla White C grade jute fibre. The finisher drawing slivers were taken from the experimental spinning mill of BJRI. In both cases, it was possible to produce fine yarn upto 103 tex. Slightly heavier yarn was possible to produce through this developed system. In this experiment the back processing of jute fibre was the conventional system and the draft of the spinning machine was 20. The only change was done at its twisting and winding zone.

The physical properties of yarns were tested by a Computerised Instron Machine of testing and standardization department of Bangladesh Jute Research Institute under standard atmospheric condition, 65 + 2% R.H and 20°C.
RESULTS

Tests results of jute yarn varied from one to another due to presence of thick and thin places in the produced yarn. To achieve an acceptable result various samples were taken for each tests and their mean was tabulated.

The test results of produced yarns are given in the following tables.

Sample: Jute Yarn, Linear density: 103 tex (3lb/spy)
Bobbin Speed: 7000 rpm.

Table 1: Physical properties of jute yarn produced by the modified system from BTB Jute fibre

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Load at Break (kgf)</th>
<th>Strain at Break (%)</th>
<th>Tenacity at Break (N/Tex)</th>
<th>Textile Modulus (N/Tex)</th>
<th>Quality Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.785</td>
<td>1.247</td>
<td>0.075</td>
<td>6.04</td>
<td>58.4</td>
</tr>
<tr>
<td>2</td>
<td>0.786</td>
<td>1.307</td>
<td>0.074</td>
<td>5.70</td>
<td>57.8</td>
</tr>
<tr>
<td>3</td>
<td>1.114</td>
<td>1.535</td>
<td>0.106</td>
<td>6.88</td>
<td>81.9</td>
</tr>
<tr>
<td>4</td>
<td>1.221</td>
<td>1.534</td>
<td>0.116</td>
<td>7.55</td>
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<tr>
<td>5</td>
<td>1.263</td>
<td>1.447</td>
<td>0.120</td>
<td>8.28</td>
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</tr>
<tr>
<td>6</td>
<td>1.182</td>
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<tr>
<td>7</td>
<td>1.149</td>
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<tr>
<td>8</td>
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</tr>
<tr>
<td>9</td>
<td>0.995</td>
<td>1.406</td>
<td>0.094</td>
<td>6.71</td>
<td>73.1</td>
</tr>
<tr>
<td>10</td>
<td>1.040</td>
<td>1.726</td>
<td>0.099</td>
<td>5.72</td>
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<tr>
<td>11</td>
<td>1.350</td>
<td>1.644</td>
<td>0.128</td>
<td>7.78</td>
<td>99.2</td>
</tr>
<tr>
<td>Mean</td>
<td>1.077</td>
<td>1.476</td>
<td>0.102</td>
<td>6.91</td>
<td>79.1</td>
</tr>
<tr>
<td>S.D</td>
<td>0.184</td>
<td>0.150</td>
<td>0.107</td>
<td>0.97</td>
<td>13.5</td>
</tr>
<tr>
<td>C.V</td>
<td>17.050</td>
<td>10.014</td>
<td>17.050</td>
<td>13.99</td>
<td>17.0</td>
</tr>
</tbody>
</table>
Table 2: Physical properties of jute yarn produced by the modified system from BWC Jute fibre

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Load at Break (kgf)</th>
<th>Strain at Break (%)</th>
<th>Tenacity at Break (N/Tex)</th>
<th>Textile Modulus (N/Tex)</th>
<th>Quality Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.998</td>
<td>1.556</td>
<td>0.094</td>
<td>6.02</td>
<td>72.6</td>
</tr>
<tr>
<td>2</td>
<td>1.178</td>
<td>1.420</td>
<td>0.112</td>
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<td>3</td>
<td>0.505</td>
<td>1.287</td>
<td>0.048</td>
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<td>4</td>
<td>0.743</td>
<td>1.144</td>
<td>0.070</td>
<td>6.15</td>
<td>54.6</td>
</tr>
<tr>
<td>5</td>
<td>0.647</td>
<td>1.163</td>
<td>0.061</td>
<td>5.27</td>
<td>47.5</td>
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<tr>
<td>6</td>
<td>0.796</td>
<td>1.343</td>
<td>0.075</td>
<td>5.72</td>
<td>58.5</td>
</tr>
<tr>
<td>7</td>
<td>0.592</td>
<td>1.131</td>
<td>0.056</td>
<td>4.99</td>
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<td>8</td>
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<td>1.447</td>
<td>0.117</td>
<td>8.12</td>
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<td>9</td>
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<td>0.045</td>
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<td>6.09</td>
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<tr>
<td>Mean</td>
<td>0.796</td>
<td>1.273</td>
<td>0.075</td>
<td>5.87</td>
<td>58.5</td>
</tr>
<tr>
<td>S.D</td>
<td>0.265</td>
<td>0.170</td>
<td>0.025</td>
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<td>9.04</td>
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<td>C.V</td>
<td>32.236</td>
<td>13.387</td>
<td>33.236</td>
<td>22.53</td>
<td>33.2</td>
</tr>
</tbody>
</table>

Table 3: Comparison between properties of yarns produced by Gardella Spinning Machine and modified ring spinning machine (103 tex, BWC jute fibre)

<table>
<thead>
<tr>
<th>Name of the machine</th>
<th>Load at Break (kgf)</th>
<th>Strain at Break (%)</th>
<th>Tenacity at Break (N/Tex)</th>
<th>Textile Modulus (N/Tex)</th>
<th>Quality Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gardella Spinning</td>
<td>0.873</td>
<td>1.528</td>
<td>0.083</td>
<td>5.70</td>
<td>64.50</td>
</tr>
<tr>
<td>Modified ring spinning</td>
<td>0.796</td>
<td>1.273</td>
<td>0.75</td>
<td>5.87</td>
<td>58.50</td>
</tr>
</tbody>
</table>

DISCUSSION

In this study, the experiments were carried out on two samples, BTB and BWC. In both cases their spinning performance, like load at break, %strain, tenacity and textile modulus were satisfactory. The quality ratio is an important criteria for assessing a yarn. In this study it was shown that the quality ratio is 79.1 (Table 1) for BTB fibre and 58.5 (Table 2) for BWC fibre and 64.5 (Table 3) for the yarn produced from BWC fibre by the Gardella spinning frame. The jute fibre of BTB is better than BWC. So the quality of yarn produced from BTB is better than the yarn produced from BWC. So it is preferred better quality jute fibre for making fine yarn. The yarn produced by the standard Gardella spinning machine from the same grade of jute fibre was compared and shown in Table 3. It is shown that yarns produced by the modified machine are comparable and the machine can be able to produce fine yarn like 103 tex (3 lb/spy). As a result the modified system can be introduced in the jute mills. The mills will be able to produce fine jute yarn at a competitive cost by using developed technology.

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RECOMMENDATION

1. The developed technology can be applied in the existing Apron Draft-spinning machine.

2. The present jute mills of Bangladesh can use the developed technology for the production of fine jute yarn (60-150 tex).

3. The produced fine yarn can be used in production of shopping bag, decorative fabric, Tailoring & fine fabric etc.

4. The developed technology through this extensive study could be transferred to the existing jute mills in the flowing ways.

   A) A consultant/firm can be appointed to transfer the technology from BJRI to the Mills.

   B) BJRI can directly transfer the technology to the mills by using its expertise.

REFERENCES


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Prospects on Non-Woven Jute Products

Mr. Mushtaq Hussain
Managing Director
The Golden Fibre Trade Centre Ltd.
751 Satmasjid Road, Dhanmondi, Dhaka

First of all, on behalf of all entrepreneurs venturing in Diversified Jute Products (DJP), I would like to express my highest regard and deep respect to our Hon'ble Prime Minister Begum Khaleda Zia. We are really thankful for her timely response, firm interest and assurance to extend necessary co-operation and assistance to help develop the diversified Jute Industry.

Secondly, also we are grateful to the Hon'ble Jute Minister for putting priority emphasis on setting up industrial plants on DJPs. We are happy and hopeful that his active effort will definitely help make our holy endeavor a success.

Finally, it would be unwise if we don’t mention the name of Dr. R. Mandal, who has been very much vocal and active in promoting the idea of DJPs even after the liquidation of International Jute Organization (IJO) (predecessor entity of Trust for the International Jute Study Group - TIJSG).

Also, we are appreciative to those serious thinkers who had invented the idea of DJPs and it is because of their historic steps we are here today.

It is needless to say, Jute, the golden fibre has gained immense popularity around the globe because of its biodegradable character. Being a major Jute growing country, Bangladesh has earned a profound reputation in producing Jute Goods those are mostly traditional in nature and created a niche all over the world.

From late 70”s, this versatile natural fibre 'Jute' was facing stiff competition from synthetics primarily with respect to price. Although, still there is prevalence in use of traditional Jute Goods as the viable packing materials, certain extra ecological factors necessitated the end users to look for cheaper substitutes to keep the supply flow uninterrupted. In the background of an increasingly shrinking world Jute market, IJO undertook several projects to introduce new products and uses for Jute, Non-Woven Jute Products (NWJP) is one them.

Non-Woven Products (NWP) and Use of Jute

NWP are the products that are manufactured through a special type of techniques without spinning or weaving by using the penetration and compressive mechanical action of barbed needles to interlock fibers to produce a homogenous mass of interlaced fibers. These are produced in the form of felts (a special variety of fabrics). The majority of non-woven is produced from synthetic fibres, but to make it environment-friendly, incorporate recyclability and programmed biodegradability, Jute and other plant fibres are being used.
Non-Woven Jute Products (NWJPs)

The different properties of Jute Fibres could be exploited to manufacture good quality NWJPs. Cost of raw material (in this case Jute fibre) happens to be most important component in the manufacturing of non-woven. Depending on the price level, the cost of fibre accounts for 50% or more of the total cost. This is due to the fact that nonwoven processes are fast, use energy efficiently and require less machinery, which usually operate simultaneously as a continuous integral line. As a result, they also require less floor space, lower maintenance and fewer operatives. All these factors combined lead to higher productivity, greater tonnage and lower conversion costs than encountered in traditional textile manufacturing sectors.

Though Jute is an inexpensive fibre, alone it is incapable of meeting all the properties of desired Jute Products. Hence, in order to meet the requirement and at the same time to be cost effective, Jute has to be blended with other fibres. The most commonly used such fibre is polypropylene.

The Stages of production for non-wovens generally include:

- **Opening:** first, the fibres that are received in bale or chopped form are opened and blended.
- **Fleece Preparation:** Production of uniform, wide and thick fibrous mats by using cards and cross layers or through the use of air-laying machines which arrange the fibres in a sheet or web.
- **Bonding:** the web has little strength unless bonded and so a bonding process imparts strength. Generally, there are as many as five bonding techniques: Adhesive Bonding, Needle Punching, Stitch Bonding, Hydro-Entanglement and Thermal Bonding.
- **Finishing:** the Bonded non-woven sheet can be modified or enhanced through various optional treatments such as Flame Retardancy, Water Repellency, Dyeing and Printing.

As far as the technological and logistic endowment and the properties of the used fibres in Bangladesh are concerned, Needle Punch Non-woven would be the most viable one. To give a versatile scope of product-mix range, both the single and double side-punching machine can be used and given the production condition, to have an excellent finishing effect, Raising and Calendering machines should be included in the process. Taking the Needle Punch bonding technique, with 100% capacity and on the basis of 2 shifts and 300 working days per year, around 15-million sq meter of product can be produced. To install such production plant a plot of land of 3-4 acres will suffice.

NWJPs for Commercialization

In early 90's, IJO initiated a three-phased project and title of the first two was "Development of Non-Woven Products from Jute and Jute Blends and Test Marketing" with funding from Common Fund for Commodities (CFC) and British Textiles Technology Group (BTTG) was assigned as the Execution Agency (EA). After the completion of evaluation of works of first
two phases in May 1995, execution of final phase (titled as “Development of Specific Applications of Jute-Based Non-wovens to Enable Commercialization”) commenced in June 1996. Although, The Textiles Consultancy Ltd. (TTC) was the EA of the third phase, but the product development part was subcontracted to BTTG.

As the outcome of the above project, wide ranges of prototype non-woven of different fibre compositions were developed. These materials were tested extensively for their various physical properties and also compared with the commercially available non-woven. Their suitability was then reassessed for uses in major market sectors on the basis of specific requirements of each sector. If all the elements of development technology are employed, it is possible to produce an extraordinary wide variety of textiles having technical specifications of 70-2000 gsm, 0.5-50 mm thickness, and average width 1.5-2.0 meters.

Some of them are hinted below:

| Household/Contract | Secondary Backing for carpets, rugs, tiles etc.; Underlay; Integral backing to replace Foams, mats, short-life floor covering; Fillings and other structural components for mattresses and upholstered furniture. |
| Automotive | Underlays, Noise Reduction layers, moulded components such as dash-boards, parcel trays, door panels and headliners. |
| Agriculture/Horticulture | Mulch Matting, pre-sown seed matting, windbreakers, frost protectors, trunk wraps and root protector, bedding materials for livestock and poultry |
| Filtration | Dust filter panels, filter pads for air Inlets on machinery |
| Footwear/Luggage | Toe and heel Stiffeners, Insoles, Components for luggage and bags |
| Others | Oil absorbents, protective wrapping, packaging material |

Initially 8-10 marketing sectors were targeted for the commercialization of NWJPs. Finally, for immediate application, three marketing sectors were considered as most effective. These are: Footwear Components, Floor coverings and Automotive Interior Components.

**Market Potentiality of NWJPs from Global and Local Perspective**

Bangladesh, being a major Jute producing country over centuries, have developed an organized Jute Industry mainly engaged in conventional Jute products. With the technological progress, nowadays, some forward-looking entrepreneurs have become very much concerned about DJPs and submitted their project proposals, out of which 14 were short-listed by the Ministry of Jute.
In case of NWJPs, we must have a comprehensive approach to address the issue as to how the industry would be developed. Much before the commencement of the projects, appropriate policy guidelines should be devised. We can organize the industry from three different perspectives in order to attain maximum economic effect:

- For the Jute felt producing companies in abroad, we can supply cut Raw Jute. At the grassroots level, these industries are effective as because technological and financial involvement is very minimal.
- Setting up of Felt producing plants for the supply to targeted market sectors in abroad specially in developed countries. Creating awareness amongst potential users, local market also can be developed here. However, primary emphasis should be laid on export market.
- Finally, in a broader spectrum, the forward linkage industries can be set up. For immediate development, it is difficult as because it requires huge financial and technical involvement.

In order to ascertain prospects of NWJPs, both the export and local market should be taken into consideration. These two should compliment each other, but primarily, it has to be an export-oriented industry.

**Export Market Potential**

There is an enormous potential of NWJPs in abroad. Already, in Europe, using their existing set up several felt manufacturing plants are producing Jute non-woven and so far, have been operating successfully targeting the three core marketing sectors like footwear components, floor coverings and automotive interior components. These companies are regularly importing cut raw Jute from Bangladesh for the production of the felts. So, instead of exporting cut raw Jute, we can add more value to our products by setting up of plants in Bangladesh and export the non-wovens as per the requirement of target markets.

In footwear Industry, a variety of materials are used as insoles and toe and heel stiffeners. These are generally based on heavily impregnated/laminated non-woven constructions with weights from 400-1500gsm, uniform thickness of 1-3 mm and are dense and stiff to fulfill the required functions. It has been demonstrated that the technology can produce insole board containing 60-70% Jute to the highest industry standards. In year 2000, Asia accounted for 82% of total world footwear production and its market size is huge. Already some of the world giants like Nike, Reebok and Adidas showed their strong interest.

As far as the floor coverings are concerned, using this technology, specific support/substrate/underlay materials can be produced, although the technology is appropriate to produce an alternative carpet backing (which would, of course, compete not only with synthetics, but also with traditional woven Jute). The products are meant to be used in conjunction with other technologies (such as crumb rubber, sponge or PU foam) and vary considerably in weight and thickness. In the technical composition, portion of Jute is 70-100%. As per the latest data, worldwide, annual production of tufted carpet is 2.701m sqmt and in case of
woven carpet and needled carpet, the figure is 1.254 m sqmt and .720 m sqmt respectively and only in Western Europe, annual production of secondary carpet backings is 373.2 m sqmt. So, undoubtedly, there is a tremendous scope, provided existing products can be slightly upgraded and price is made competitive.

The use of natural fibres in automotive interior dates back to 1994/5 and it was introduced by Mercedes. In 1997, world vehicle production was 55.42 million and now it is substantially increased. If 10% of the automotive interior’s market were captured, the resultant market volume of non-woven would be almost 70,000 MT. It was proved that non-woven technology offers the best prospect in case of wide range of interior substrates like door casings, parcel shelves, floorpan and bootliner substrates, structural headliner substrates and NVH sound control felts etc. Blending some other artificial fibre with around 50-70% Jute, automotive interiors are being manufactured. The big conglomerates like Oertel, Lear Corporation, Johnson Controls, MagnaInterior Systems, HP Chemie Pelzer, Midland Industrial Plastics, Rieter Group, Kinpac Automotive etc are manufacturing their products using non-woven mats and subsequently, many others are now replicating their experiences.

Induced by the successful commercialization of NWJPs in core marketing sectors, several others might follow, which will eventually broaden the scope for penetration of non-woven into the future target markets. So potentiality is immense and sky is the limit.

**Domestic Market**

So far, there had not been any scientific research or study to assess the prospect of non-woven in the local market. Practically, there is no manufacturing plant that is operating for the production of non-woven. That is why there is no apparent demand for NWJPs, but some sectors can be targeted who might become potential users of non-woven. In this backdrop, for local market penetration, following items can be considered:

Furniture Seat Backing: Amongst the higher and higher middle segment households, upholstered furniture covered with synthetic leather is quite popular and this synthetic can be well replaced by Jute non-woven.

Floor Carpet Underlay: With the growing market of wall-to-wall carpet, the market for the carpet underlay is also improving. Usually, foam, rubberized coir and synthetic non-woven felts are widely used for this purpose. As per the result of a study, present market size of underlay is about 20% of the total quantity of carpet market. Jute non-woven can be a good substitute here.

Structure Needled Carpet: Using 30% Jute blended with 70% polypropylene, this type of carpet weighing 928 gsm can be manufactured for local market by needle punching technology. The product has a splendid market potentiality.

Composite Materials: Recently, in India, some industrial plants are manufacturing different types of composite materials using Jute non-woven mat by applying thermo-setting moulding
technique. As the materials are having equal strengths, these are used as a close substitute of wood. So successful launching of any non-woven project can create a scope for development of composite industry based on Jute non-woven products.

So, in this regard, what we need to do is to create awareness through conducting a massive promotional campaign and at the same time, price should be made competitive at par with imported ones.

**Profitability Consideration**

In a feasibility study carried out by local experts, it was projected that with a total investment of Tk 16 cr., around 31.03% net profit can be obtained within just three years of operation. Pay Back of Investment is projected to be neutralized within 1 year and 10 months of operation at more than 60% Internal Rate of Return.

**Conclusion and Recommendation**

Unlike all other exportable of Bangladesh, Non-woven Jute Products have equal prospects both in local and export market. Bearish trend in one might not mean the overall disaster. Moreover, being the second largest Jute growing country, in many respects, we would be having competitive edge over others. Also use of indigenous raw material would definitely have better economic effect in terms of value addition. As far as the profitability of the projects is concerned, all the feasibility studies suggested for immediate launching of the plants. When, almost all of the Jute Industries are operating at loss and government mills are being provided Tk 600 cr just to keep their production units running, considering the volume of estimated returns, immediately we should go for implementation, although some risk might be involved with it. For an instance, in India, almost interest free credit was extended to some of the ambitious projects and so far, the projects are running successfully and recovery rate is more than 90%. In this regard, in our country, government should play a vital role. Creating a fund either from its own source or donor agencies', same sort of credit scheme can be launched for immediate commencement of the projects. So, under this situation, it is imperative to come out with fruitful and pragmatic decision and quick action, rather than wasting time on meetings and seminars, because opportunity will not wait forever. History is the cruel and silent witness.

Now, discretion is ours how quick we will start and when the industry will grow. It should be considered as blessing that an opportunity is explored to help revive the glory of our Jute. By any chance, we should not make mistake.
Prospects on Jute Composites

A Samanta
Managing Director
A B Composites Private Limited
1/1B/18, Ramkrishna Naskar Lane, Kolkata-700 010 (India)
Tel: 350-5982/6348/353-8578, Fax: 033-351 0305
E-mail: anukul@cal2.vsnl.net.in

It is my great privilege to present my paper about prospects on Jute Composites in front of all distinguished and honorable members present in this auspicious gathering.

Everybody present here has the right to know about the scope of Jute Composites in future. Firstly, I am willing to give the details about the background of the origin of these composites. Generally, we have seen that jute grows abundantly in Eastern Part of India (i.e. West Bengal) and Bangladesh. It is mainly used for carrying goods from one part to another in the form of gunny bags beside that it is also used for making some types of decorative materials for household purpose i.e. cushion, carpet, ropes, decorative wall cloth, calendars etc. Therefore, the jute was used for very limited purposes although these natural fibres should have been used for various purposes. So, we want to bring an innovative jute composite by using our own R&D along with our indigenous technology, which actually plays a major role to substitute another natural fibre, i.e. wood.

Composite material is an invention by the sheet supremacy of human knowledge. It is evolved by using phenolic resin with jute cloth and by applying our indigenous technology. The strongest material has been come out from these composites. Now, we are in a position to replace the wood, plywood, asbestos and aluminium Therefore, we can use our jute composite products in place of any usage of wood, plywood, asbestos aluminium.

These jute composites not only give us the strongest material but also have incorporated some unique properties like fire retardant, water resistant, U-V ray resistant, thermal and electrical non-conductive, easily bio-degradable and Eco-friendly in nature. We can proudly say that it is already being used in Indian and Bangladesh Railway for last couple of years successfully and in domestic field it is being used for doors, windows, furniture, paneling, ceiling, corrugated roofing sheet and prefab shelter. It is recognised by getting approval from CPWD (Central Public Works Department), MES (Military Engineering Services) of Government of India and many other organisations with repute. Hence, in near future sales potential of domestic range of products will be increased enormously along with its huge industrial requirements.
Therefore, it has a great prospect in future in the field of making numerous items for the benefit of mankind. It also allows to sustain the growth of human civilisation by way of making products environment friendly. It can also use as a shield against misuse of natural resources from extinction and in and around twenty years from now, the woodcutting will be totally banned throughout the universe. Then the usage of the jute composite will be multipurpose and we will not be able to get supply as per our requirement of production. Ultimately, it can give the scope to jute producers and cultivators to turn around from their bleak future. At this moment our monthly requirement of jute cloth is 38 MT and manpower orientation is 150. Within coming 5 years the jute cloth requirement will be 125 MT per month and manpower requirement will be 500. In Bangladesh it has huge scope which may kindly be recommended.

I do hope that from this natural fibre, we can able to create the modern outlook that could be replaced the old one and would be the determining factors for writing the new history of human civilisation.

It is my request to all end users to use this material for protection towards the conservation of natural resources, which can ultimately give our future generation a Pollution Free New Globe.

Lastly, thanks to all my friends for sharing the valuable time with me.
Particle Boards Made from Jute Sticks

Md. Yunus
Technical Director
Star Particle Board Mills Ltd., Partex
195 Motijheel C/A, Dhaka -1000

Partex Group of Industries is the leading manufacturer of jute stick based Particle Board in the country. In fact until very recently, it was the only manufacturer in this field. Accordingly, the brand name Partex has become the generic name for all kind of particle boards sold in the country.

The Star Particle Board Mills, where the boards are produced, is in operation since 1964. It was taken over by the present management in 1983. Since then it has gone through a series of BMRE. This has enabled a continual improvement in quality and output. Just recently a new automatic production line has been added. So, the Mill is now producing world class multy-layer board.

This paper discusses the various benefits of this industry to the consumer, and to the nation. It also highlights some of the current issues that need to be addressed for the further progress of this industry in the country.

1. It is based on marginal agricultural material

Before the establishment of our board plant, Jute stick was used as fuel, and for making fencing in village huts, and sheds for betel leaf plants. For this only a small portion of Jute stick was used, and the farmers had to leave the bulk of sticks in the fields as wastage. The situation changed with the commencement of the board plant in mid 60’s. However, board production was very low in those days and only a very small part of the jute stick produced in the country was used for making board. With the taking over of the plant by the present management in 1983, the production level has increased year by year, and accordingly, the consumption of Jute stick has also increased. Therefore, jute stick, which was earlier a waste material, has now become as economic as the main crop, that is, jute.

There are many areas in Bangladesh where farmers can cultivate only jute in the rainy season. But because of low price of jute they were discouraged to grow it in the past, as the cost of cultivation was higher than the selling price of the fiber. Nowadays, farmers take into account of the price of jute stick along with jute, and are encouraged to grow it, thus utilizing an otherwise unproductive land.

2. Utility of Particle Board

The Particle Board is a substitute of timber. But in many respects it has an edge over timber. As we know, natural timber has some difficulties:

a) Its dimension changes with seasons
b) It needs seasoning to make good furniture, but even them its large panels tend to warp.
c) It is hard to work, and needs a great deal of carpentry input, and time, to make a furniture item.

d) It is not amenable to mass scale production

e) If not seasoned properly it may be affected by micro-organism

f) It comes from Forest resource, which needs to be preserved for ecological reasons

g) Moreover quality matured timber is in short supply, and also expensive.

**Particle Board has an edge over wood on all these counts**

It shows no seasonal change of dimension.

It does not need any seasoning.

Its large panels do not have any joints, and do not show any sign of warping or bucking, and are free from sap and cracks.

It is easy to saw, does not produce much of dust, and is ideal and cost effective for making many domestic and office items, such as false ceilings, partitions, bed room and kitchen cabinets, flush doors, office cabinets, work stations, computer tables and all sorts of executive tables.

It is amenable to mass scale production.

It is not affected by micro-organisms.

It is more eco-friendly as it comes from yearly crop.

It can be laminated to give an excellent texture to match any kind of timber and to create innovative shades.

3. **It saves Foreign Exchange**

The country is very short in timber resource and has to import timber to meet its needs. So, particle board, being timber-substitute, is an import substitute, and saves foreign exchange for the country. That is, if particle board was not produced in the country, more timber was to be imported, at the cost of additional foreign exchange, to meet country’s needs. Moreover, with recent globalization, this board would have come to the country at the cost of foreign exchange, So this industry is a big saver of foreign exchange.

4. **It creates Employment opportunities**

The industry employs thousands of people in the procurement, production and sales and distribution cycle. In our estimate at least 2000-3000 families earn their livelihood from this operation.
5. Export potentials

Jute stick based particle board is superior to wood based and other particle boards sold in the world market:

1) It is lighter and so more suitable for making false roofs, and for high gloss, and light shade finish.

2) It has better acoustic properties.

As jute cultivation is likely to increase with increased demand of jute bags in the country - with the recent banning of thin polythene bags, the supply of jute sticks is also expected to increase. At the same time, a number of Production units have come up in the country. So there will be surplus board available for export.

6. Current Issues

We would like to draw the attention of the Government in the following areas:

i) There is surplus capacity in the country. So the Government should be extremely careful while sanctioning any additional plant.

ii) The Government should give special incentive to the existing producers as they are not only converting a waste material into a valuable product, which is an export substitute - but also contributing to the growth of rural economy. At the least, the industry should be completely exempted from VAT.

iii) The Government should assist in the export of this board by giving special incentives to the potential exporters. Export of this product will create a new avenue for earning foreign exchange. Since it is made out of an agricultural waste, its export will not cause any internal shortage of essentials that happens while exporting food items. Moreover, the processing of the board requires a relatively small cost in foreign exchange. So the foreign exchange return from any potential export is very high. It is therefore proposed that, at the least, the Government should consider waiving of all import duties on the raw materials corresponding to the exported goods.

iv) Recently, the EEC has declared that it will give special subsidy to agro-based products exported from Bangladesh. This Particle Board is an ideal item in this category, and should be actively promoted by the Government.

It must be understood that if exports are not made in the very short run, local plants will be under-utilized as there is surplus capacity in the country, and end up competing with each others and will be financially not viable.
Experience of Creation in Making Hand Made Paper and Products

Mr. Rashedul Karim
Managing Director, Creation Ltd.
1/69 Eastern Plaza, Hatirpool, Dhaka

This is Md. Rashedul Karim Munna, Managing Director, Creation Pvt. Ltd. Creation is a specialised center for hand made paper and paper products made of waste jute, waste cotton, water hyacinth and different types of straws. Creation was established in 1997 with a vision to do some thing non-traditional with locally available and natural raw material. Employment and income generation of rural people particularly for women was the prime objective of this endeavor rather than making only profit. I am happy to inform today that 95 percent of our total workforce are women.

We are among the pioneers, who started making hand made papers and products from jute on commercial basis and have them marketed in local and international markets. I must admit that it was not that easy task at the beginning but we took the challenge to market hand made papers and paper-products made from waste-jute both in domestic as well as in international market.

From the beginning our main focuses were on:

a) Commercial utilization of waste jute;
b) Socio-economic empowerment of distressed women;
c) Use of natural and environment friendly raw materials for keeping ecological balance;
d) Development of labor-intensive industries;
e) Earning foreign currencies; and
f) Contribute in development of local rural based industry.

With the help of appropriate technology, we tried to utilise local resources as much as possible in making paper. Waste jute, the main raw material has plenty of supply. We usually collect it from jute mills. From these hand-made papers, we produce greeting cards, wedding cards, visiting cards, gift boxes, shopping bags, diaries, note books, writing pads, files etc. which are traded both in local and international markets with value addition. Women workers produce different categories of attractive and sophisticated products of different designs with their hard labour, devotion and creativity. Over a period of five years, Creation has created jobs for around 500 workers, employed in different plants amongst whom more than 95% are women. Working here is convenient for women workers as they live in nearby villages. They are paid their remuneration in cash which contribute significantly in improving their standard of living. Moreover, economic independence makes them aware of their own rights. These women, as earning members of the family, get more importance in the family as well as in the society.
Jute being a natural commodity, there exists no chance of environment pollution in manufacturing process. Final products are biodegradable. Therefore, there are not any chance at all to cause any harm to the environment. Moreover, it saves jute mills from possible fire hazards, as waste jute are highly hazardous to fire.

Thousands of tons of jute are used in different jute mills in our country. While producing jute products from raw jute, 5% of the total raw materials are wasted in the process. With each ton of waste jute 16,000 jute bags can be produced. I would like to draw the kind attention of the government and private entrepreneurs to find out appropriate technologies for converting waste jute into cheap shopping bags which could be a suitable substitute of poly bags.

As a new industry, I have faced problems like lack of skilled human resources, shortage of capital and limited access to the local and foreign markets. However, I feel government patronage is needed, at least at the early stage of a new industry to grow up from the infant stage.

Using the local technology and raw materials efficiently, we have been exporting products for the last 3 years to foreign countries like USA, Germany, UK, Sweden, France and few other countries. We urge to the government for its support/assistance to participate in the international competitive market. Government incentives is very much needed, mainly for export promotion of the products.

The quality of paper mainly depends on the type of fibres of the raw material used. The greatest advantage of jute fibre is that it is stronger than other alternative fibres. Thus the paper produced from it is harder in nature in comparison to others and it is the main comparative advantage we get over paper products made from other fibres in the international market.

Till now most of us consider jute as a raw material for making bags and hessians only. But a host of new diversified products could be produced from jute with the help of advanced technology. It should be our initiative to identify those technologies vis-a-vis products as we have plenty of this raw material in our country.

We have been already working in 8 districts including Dhaka. So far, we have not resorted to loans or assistance for our venture. Our guiding force was our relentless efforts and will power. We use local resource as raw material and local workforce for earning foreign exchange for the country and a better living for the distressed women and their children. We are happy with our achievements and will continue to proceed with our efforts with similar objectives for betterment of our nation.
At the end I have following suggestions to the policy makers for this new industry:

1) Mass publicity and advertisement from both public and private sector is required for this new industry.

2) Government is offering incentives on export of jute and jute related products. The same incentives should be offered on the export of hand made papers and paper products, as its basic raw material is Jute. Hand made paper and products should be considered as jute based products.

3) For market expansion and promotion in international arena, government should offer financial support/ aid to participate in different international fairs.

4) To compete in the international market, financial support for designs and developments is very much needed in order to match with changing taste/choice of the customers.

5) For expansion of this sector, an initiative can be taken to establish a pilot project on a joint venture basis.

Ministry of Jute on behalf of the Government and Trust for the International Jute Study Group (IJSG) may kindly consider the above proposals.
Making of Hand Made Paper from Jute

K A Reza
Senior PDO
Mennonite Central Committee (MCC)
Agailjhara, Bangladesh

Mennonite Central Committee (MCC) was established in 1920 and came to Bangladesh for distributing relief in 1970 after the cyclone of 1970. Since then MCC is working as an international NGO in the field of agriculture, health, homestead development, social service and job creation. The beneficiaries are poor landless women who are head of household.

MCC’s Job Creation Program develops projects for employment of poor women who are head of household. Nine such projects employ over 750 women, these projects make variety of goods such as handmade paper and paper products, jute bags, dried coconut power, keya palm handicrafts and sunn-hemp twine and twine products. Locally available raw materials are used and almost all the products are exported to ATOs in USA, Europe, Japan, Australia and New Zealand.

One such project Shuktara Handmade Paper Project (SHP) makes jute handmade paper and paper products. It started research on handmade paper making 1983. Jute was used for making paper as jute is readily available and it is available throughout the year. Locally developed machines, equipments and technologies were used.

Shuktara Handmade Paper Project (SHP) started exporting jute made handmade paper and paper products from 1988 to Alternative Trading Organizations (ATO) in USA and UK. In 1988 the export was slightly over Tk. 105,000. It has grown to over Tk. 5,200,000.00 per year now. From 1988 till now Shuktara has exported jute handmade paper and paper products worth over Tk. 43,458,000.00.

MCC has two other projects that make paper from sunn-hemp, water hyacinth, wheat straw etc. The paper and paper products made from these projects are also exported. MCC has exported handmade paper and paper products worth over Tk. 21,400,000.00 in the last nine months.

The process developed by MCC for making handmade paper is as follows:

Waste jute twine is used for making paper, caddies is not used as it gives black spots in the paper, the process is as follows:

Cutting waste jute twine to 1" - 2"
Soaking in caustic and heating for 8 hours
Washing
Mechanical beating in beater for 4 hours
Bleaching and washing
Paper lifting in vats by hand with the help of lifting screens
Pressing out water
Applying sizing
Drying in sun or mechanical dryers
Calendering

The size of paper lifted is 18" x 28". Two thickness of sheets are lifted and the weight of sheets vary from 30 gm/sheet to 100 gm/sheet.

Undyed thin sheets are sold at Tk. 7.00 each, and the undyed thick sheets are sold at Tk. 12.00 each.

The cost distribution is as follows:

<table>
<thead>
<tr>
<th></th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>11.2%</td>
</tr>
<tr>
<td>Labor</td>
<td>34.8%</td>
</tr>
<tr>
<td>Manufacturing overhead</td>
<td>17.1%</td>
</tr>
<tr>
<td>Administrative overhead</td>
<td>14%</td>
</tr>
<tr>
<td>Marketing expenses</td>
<td>7.3%</td>
</tr>
<tr>
<td>Research &amp; development</td>
<td>1.6%</td>
</tr>
<tr>
<td>Profit</td>
<td>14%</td>
</tr>
</tbody>
</table>

The process followed by Shuktara is mostly labor intensive. Seventy-two women producers are employed each earning about Tk. 3,500.00 per month. The cost of paper produced from jute in capital intensive mills will be less but in a country like Bangladesh where capital is scarce and expensive and where chronic unemployment prevails, we should try to develop industries that are labor intensive and try to use the products of such labor intensive industries even though they may be expensive than imported products.
INTRODUCTION

With the tangible depression in the Global demand of conventional jute goods, it’s diversified use becomes a crying demand in the context of Bangladesh. Although the combined Jute Sector including the raw jute and jute goods is the second largest Foreign Exchange Earnings Avenue (next to Readymade Garments) yet now. It’s financial expectation is to be considered as a prime factor of Industrial as well as Man-power employment context.

This is our great opportunity that International Jute Organization (IJO) was convening an “Investment Forum” in Dhaka to Promote and attract in invest Jute Diversification activities in Bangladesh. That is why our Project has been identified as one of the Prominent Avenue in the diversified use of Jute as basic Raw Materials for Carboxy Methyl Cellulose (C.M.C.) manufacturing.

WHAT IS CARBOXY METHYL CELLULOSE

To define the Carboxy Methyl Cellulose before we would like to see what is Cellulose. Cellulose is the chief constituent of the plant fibers; Cotton, for instance, is nearly pure cellulose and is very widely distributed. It is a straight chain polysaccharide composed entirely of D-glucose units. These are joined by β-glycosidic linkages between C-1 of the one glucose unit and C-4 of the next glucose unit. The molecular weight of cellulose ranges from 50,000 to 5,00,000 (300 to 2500 D-glucose units).

Two unlinked molecules of β-D-glucose are pictured below:

\[
\begin{align*}
&\text{CH}_2\text{OH} \\
&C_6 \quad \text{O} \\
&C_15 \\
&\text{H} \\
&\text{OH} \\
&\text{C}_4 \\
&\text{H} \\
&\text{OH} \\
&\text{C}_13 \\
&\text{H} \\
&\text{OH} \\
&\text{C}_1 \\
&\text{H} \\
&\text{OH} \\
&\text{C}_3 \\
&\text{C}_1 \\
&\text{O} \\
&\text{C}_1 \\
&\text{CH}_2\text{OH}
\end{align*}
\]

Percentage of cellulose in different plant cells:

- Cotton seeds contains - 90 to 95%
- Wood contains - 45 to 50%
- Flax contains - 80 to 85%
- Jute contains - 60 to 65%

Carboxy Methyl Cellulose is an extremely versatile product. Its application into numerous industries is a function of its various physical properties; solubility, theology and absorption on surfaces. Although Carboxy Methyl Cellulose can be produced from Wood, waste cotton/Garments. But it is very much costly to produce CMC from other than raw jute.
OTHER DERIVATIVES OF CMC FROM WASTE JUTE

If we can establish CMC manufacturing unit from waste jute, the following derivatives can be produced from CMC, which is more valuable than the CMC.

- Methyl Cellulose
- Ethyl Cellulose
- Hydroxy Ethyl Cellulose
- Hydroxy Methyl Cellulose
- Hydroxy Propyl Methyl Cellulose
- Hydroxy Propyl Ethyl Cellulose

PROCESS FLOW CHART
Chemical Composition of Raw Jute

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-cellulose</td>
<td>58% - 62%</td>
</tr>
<tr>
<td>Hema – Cellulose</td>
<td>21% - 22%</td>
</tr>
<tr>
<td>Legnin</td>
<td>12% - 14%</td>
</tr>
<tr>
<td>Protin, Pectin, Fat, wax etc.</td>
<td>Rest %</td>
</tr>
</tbody>
</table>

Usage of Carboxy Methyl Cellulose (CMC)

Carboxy Methyl Cellulose or CMC producing from jute is the new technology in the context of Bangladesh. Jute and mainly waste jute is the basic material with some chemical to make the CMC. It is a new concept and diversification of jute products for our Country. In the Food and Pharmaceuticals Industry, CMC enhances product quality by acting as a stabilizer, binder and thicker while also performing as a moister retainer as well as crystallization controller. Through research and product development CMC has ideal performances in the following categories:

- Ice Cream and Yogurt Drinks
- Fruit and Beverages
- Creamy Soups and Sauces
- Processed Foods and Instant Noodles
- Pharmaceuticals and Cosmetics (Toothpastes, Shampoos, Lotions etc.)
- Ceramics (Glazed Roofing Tile, Pottery, Fire - Resistant Mortar)
- Battery (Cr-Ni)
- Oil Drilling Industry
- Detergents
- Various Health and Personal Care Products

Newly discovered, CMC has its functions in some products such as

- In Textiles - Printing Paste, Wrap Sizes, Laundry Sizes, Back Sizing for Carpets and laundry Starch.
- Medicines – Medical Tablets, Syrups etc.
- Other Uses – Oil Drilling, Mining Industry, Detergents, Welding Rods, Electronics, Cigarettes, Mosquito-repellent incense and also wheaten foods processing.

ECONOMICAL ASPECT

The following advantages will be gained, if CMC manufacture in our Country:

- Specially in Pharmaceuticals Formulation Company, Food Manufacturing Company able to reduce their investment to avoid the huge Import of bulk Chemicals.
- Excess CMC will be exported and day-by-day it will be increased.
- It will be helpful to establish new Industry and will help the Government to the employments.
SAVINGS OF LOCAL CURRENCY

If we manufacture CMC in our Country then the purchase value will be Tk. 55.00 per Kg., when the current purchase rate is Tk. 300.00/Kg. As CMC will be manufacture from waste jute so the production cost will be very low.

At present every year almost 3200 M.Ton CMC is required for the following sectors in our Country, which is showing with the courtesy of Bureau of Statistics Report 1999-2000:

1. Food Grade - 375 M.Tons
2. Pharmaceuticals Grade - 450 M.Tons
3. Textile Grade - 750 M.Tons
4. Electrode Grade - 125 M.Tons
5. Detergent Grade - 600 M.Tons
6. Printing / Paint Grade - 850 M.Tons

In the following chart, figure is shown in Metric Ton

To buy these huge quantity of CMC at the rate of US$5.17/Kg every year we spend US$ 16,544,000.00. But if we manufacture CMC in our Country then we can save US$16,544,000.00 per year. Apart from this we can export the rest of the CMC and can earn more foreign currency.

More on Carboxy Methyl Cellulose (CMC), the following advantages will achieve gradually:

- Savings of valuable foreign currency
- Encies to avoid of Import of CMC.
- Reduce the dependency on Imported Raw materials.
- Very minimum cost for Local manufacturing Industries
- Employments opportunities in our Country.
- Earnings of valuable foreign exchange through export
WHAT IS NOVIANT

CMC APPLICATIONS

- Food industry
- Pharmaceutical industry
- Personal care industry
- Paper industry
- Oil drilling industry
- Textile industry
- Ceramic industry
- Detergent industry
- Other application areas
- Research and development
- Environment

What is CMC used for?

- Cellulose-based, water-soluble white or off-white powder
- Made of wood-based cellulose or cotton linters
- Odorless, non-toxic and biodegradable
- Produced in three main product categories: food grade, purified and technical CMC
- Technical CMC contains salts as by-products originated from the production process
- In the manufacturing process of food grade and purified CMC the byproducts such as salts are washed out

What is CMC used for?

- In over 200 different industrial applications
- Industries using CMC include

- Food processing
- Pharmaceuticals
- Personal care and cosmetics
- Paper
- Detergents
- Oil drilling
- Ceramics
- Textiles
- Mining

- CMC is used for example as a

- Thickening agent
- Protective colloid
- Water retention agent
- Binding agent
- Stabilizing agent

Only a few of the great number of applications of CMC will be reviewed on this site. The versatility and interesting potential is strongly underlined by the extensive number of publications and patents regarding CMC released every year. On average during the last decade a total of about 1000 articles and patents have been published every year. With over 50 years of CMC production experience, we have extensive know-how of the product and production. If You have further questions please contact us. We are ready to assist You.
## Annex I

### List of Projects on Diversified Jute Products

(Amount in Thousand Taka)

<table>
<thead>
<tr>
<th>Name of the project</th>
<th>Products</th>
<th>Estimated cost of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Jute Thermosetting Composite Products Unit</td>
<td>Furniture, Corrugated Sheets, Roof Sheets, Floor Boards, Door and Window Frames etc.</td>
<td>110,574</td>
</tr>
<tr>
<td>2 Jute Re-inforced Plastic Products Unit</td>
<td>Toys, Garden Fences, Street lamps, Gate lights, Letter Box, Toilet doors, Swing and Garden Accessories, Pool Side Chairs, Garden Furniture, Garbage collector, Partition Wall, Wall Paneling, Kitchen/ Bathroom cabinet etc.</td>
<td>74,465</td>
</tr>
<tr>
<td>3 Mini Spinning Plant for Jute blended Yarn</td>
<td>Jute and cotton blended yarns in 5s to 10s count to cater to the textile sector.</td>
<td>36,507</td>
</tr>
<tr>
<td>4 Fine Yarn Spinning Unit</td>
<td>Finer quality jute yarn blended with cotton, viscose, polyester, acrylic etc for use as textile grade material.</td>
<td>109,650</td>
</tr>
</tbody>
</table>
| 5 Manufacturing of Jute-Blended Multi-Component Yarn Using DREF-2 and DREF-3 Technology | DREF-2: Coarser quality yarn to produce curtain, bed cover, bed sheet, pillow cover, sofa set cover, mattress cover, wall mat, prayer mat, dhury towel etc.  
DREF-3: Finer quality yarn to produce soft luggage, bags, blankets, shoe uppers, denim, jackets, wrappers, mufflers, caps etc. | 65,960 |
| 6 Jute Blanket Unit | Cheap Blankets to be used by the poorer strata of the society. | 22,500 |
| 7 Production of jute-based Non-Woven products | Jute non-woven products to be used as floor covering, shoe insoles and automotive products. | 160,000 |
| 8 Manufacturing Unit for Carboxyl Methyl Cellulose (CMC) | CMC to be used as inputs for various products such as jam, detergent powder, tooth paste, lotion, hair color, antacid tablet and suspension, paracetamol and other drugs and steel electrodes etc. | 84,500 |
| 9 Composite Plant to Manufacture Jute Blended Yarn and Fabric | Jute blended Denim fabric | 95,000 |
| 10 Production Unit for Flexible Jute Bag | Flexible jute bags to be used for tea packaging | 25,563 |
| 11 Integrated Dyeing, Bleaching and Finishing Unit | Bleaching, dyeing and Finishing of fine yarn on service charge basis. | 33,850 |
Annex II

**Programme**

**Seminar on Diversified Jute Products**
Venue: Bangladesh-China Friendship Conference Centre
Sher-e-Bangla Nagar, Dhaka

**Date: 23 and 24 January 2002**

**Wednesday, 23 January 2002**

**Session 1**
Chairman: Alhaj Shamsul Huda Ahmed, Alpha Consultants Ltd

2:00 -2:15 PM A new approach of blending jute with other fibre for diversified products by Dr. Latifa Binte Lutfar, Principal Scientific Officer, BJRI

2:15-2:30 PM Lighter jute bags to substitute poly bags by Mr. Fazlul Huq Bhuiyan, Director (R&QC), BJMC

2:30-3:00 PM Discussion

**Session 2**
Chairman: Mr. Ahmed Hossain, Bangladesh Jute Spinners Association (BJSA)

3:00 -3:15 PM Application of bio-technology in making paper pulp from green jute by Dr. G. Mohiuddin, Project Leader, Bio-pulping Project, Trust for the IJS and

Mr. Mizanur Rahman, Deputy Chief Chemist, Karnaphuli Paper Mills, BCIC

3:15-3:30 PM Need for market promotion for diversified jute products by Mr. Kamran T. Rahman, Deputy Managing Director, Pubali Jute Mills

3:30-4:00 PM Discussion

**Session 3**
Chairman: Professor Masuda M. Rashid Chowdhury, Director, FBCCI

4:00-4:15 PM Problems and prospects of diversification in Jute products by Mr. Nurul Islam Patwari, Managing Director, Sonali Aansh

4:15-4:30 PM Potential for womens’ entrepreneurship development in diversified jute products by Mrs. Sakina Dewan, Director, Esheeta

4:30-5:00PM Discussion

5:00 PM Tea Break
Thursday, 24 January 2002

Session - 4
Chairman: Dr. A B M Abdullah, Director, Bangladesh Jute Research Institute (BJRI)
10:00 - 10:15 AM Modification of existing spinning frame for production of fine yarn by Mr. Osman Gani Miazi, Principal Scientific Officer, BJRI
10:15 - 10:30 AM Prospects of non-woven jute products by Mr. Mushtaq Hossain, Managing Director, The Golden Fibre Trade Centre Ltd.
10:30-10:45 AM Prospects of jute composites by Mr. A. Samanta, Managing Director A B Composites (P) Ltd, India and Mr. Pradip Chopra, Managing Director, Amarnath Enviroplast Ltd, India
10:45 - 11:15 AM Discussion
11:15 - 11:30 AM Tea break

Session - 5
Chairman: Mr. M. A. Halim, Delegation of the European Commission, Dhaka
11:30 - 11:45 AM Particle boards made from Jute Sticks by Mr. Md. Yunus, Technical Director, Star Particle Board Mills Ltd.
11:45 - 12:00 Noon Making of hand made paper from Jute by Mr. Rashedul Karim Managing Director, Creation Ltd. and Mr. K. A. Reza, Senior Project Development Officer, Job Creation Program, Mennonite Central Committee
12:00 - 12:15 PM Production and use of CMC and other derivatives from jute waste by Mr. Md. Rahmat Ullah, Managing Director, Ethical Drugs Ltd.
12:15 - 1:00 PM Discussion
1:00 - 2:00 PM Lunch

Session - 6
Chairman: Mr. A F M Sarwar Kamal, Secretary, Ministry of Jute
2:00-3:50 PM Panel Discussion and Preparation of Recommendations

Discussants:
1. Alhaj Shamsul Huda Ahmed, Alpha Consultants Ltd
2. Mr. Ahmed Hossain, Bangladesh Jute Spinners Association (BJSA)
3. Mrs. Masuda Rashid Chowdhury, Director, FBCCI
4. Dr. A B M Abdullah, Director, Bangladesh Jute Research Institute (BJRI)
5. Mr. M. A. Halim, Delegation of the European Commission, Dhaka
6. Mr. Humayun Kabir, General Manager, Beximco Jute Division
7. Dr. R. Mandal, Officer-in-Charge, Trust for the IJSG
3:50-4:00 Conclusion and end of the Programme.
## Annex III

### List of Participants

**Ministry of Jute**

1. **Mr A F M Sarwar Kamal**, Secretary, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 2250, Fax: 861 8766
2. **Mr Benoy Gopal Chakraborty**, Deputy Secretary, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 4775
3. **Mr Nurul Islam**, Joint Secretary, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 0380
4. **Dr Tarun Kanti Sikder**, Senior Assistant Secretary, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 0380
   E-mail: sikder777@yahoo.com
5. **Mr Mahfizur Rahman Sarkar**, Senior Assistant Secretary, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 0379
   E-mail: sikder777@yahoo.com
6. **Mr Delip Kumar Bhadra**, Senior Assistant Secretary, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 1477
7. **Mr M A Bari Mollah**, Assistant Secretary, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 8614775
8. **Mr Anjan Kumer Dev Roy**, Assistant Chief, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 1655
9. **Mr Md Abdus Salam**, Assistant Chief, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 1655
10. **Mr Dilip Kumar**, Administrative Officer, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka
11. **Mrs Helen Serao**, Administrative Officer, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 0380
12. **Kh. Shahed Hassan**, Administrative Officer, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 0380
13. **Mr Ajit Kumar Chowdhury**, Personal Officer, Ministry of Jute, Government of the People’s Republic of Bangladesh, Bangladesh Secretariat, Dhaka, Tel: 861 4775
14. **Mr Musharrof Hussain**, Assistant Chief, Ministry of Textiles, Government of the People’s Republic of Bangladesh, Building No. 6, Room No. 1104 (11th floor), Bangladesh Secretariat, Dhaka, Tel: 861 5220
Bangladesh Jute Research Institute (BJRI)

15. Dr A B M Abdullah, Director, Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 911 1658, 911 1097(R)

16. Mrs Ltifa Binte Lutfar, Principal Scientific Officer, Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 911 6580, 831 7701, Fax: 911 8415, E-mail: biri@bdmail.net

17. Mr Md Osman Ghani Miazi, Principal Scientific Officer, Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 911 6580 Fax: 911 8415, E-mail: biri@bdmail.net

18. Mr Md Mahbubul Islam, Principal Scientific Officer (Plant Pathology), Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka-1207

19. Mr Md Kamal Uddin, Principal Scientific Officer, Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 911 6506

20. Mr Md Abu Taher, Principal Scientific Officer, Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 911 9489 E-mail: biri@bdmail.net

21. Dr Isidore Gomes, Principal Scientific Officer, (Biotechnology Division), Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka Tel: 911 0975, 910 3686, E-mail: isidore@bdcom.com

22. Mr Mohiuddin Ahmed, Principal Scientific Officer, (Pilot Plant Division), Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 812 1929-34

23. Mr M A Quashem, Principal Scientific Officer (in-charge), Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka

24. Mr Md. Mohiuddin Mallick, Principal Scientific Officer, (Engineering and Maintenance Division), Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 912 3410

25. Dr Selina Begum, Principal Scientific Officer, Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 812 0303, 911 8371

26. Mr Md Kamal Uddin, Principal Scientific Officer, Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 328 564

27. Mr Md Khairul Kabir, Chief Scientific Officer, Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 911 5413, 812 1929 , Fax: 9118415, 934 1206, E-mail: biri@bdmail.net

28. Mr Md Shahid Ullah, Senior Scientific Officer, Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 911 6506

29. Mr Md Samiul Haque, Senior Scientific Officer, (Physiology Division), Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 812 0303, E-mail: biri@bracbd.net

30. Mr Md Mujibur Rahman, Senior Scientific Officer, (Farm Division, Agril. Research on Jute), Bangladesh Jute Research Institute (BJRI), Manik Mia Avenue, Dhaka, Tel: 812 1928 E-mail: biri@bracbd.net
31. Mr C K Saha, Senior Scientific Officer, Bangladesh Jute Research Institute (BJRI)  
   Manik Mia Avenue, Dhaka, Tel: 813 0158
32. Mr Md Matiur Rahman, Senior Scientific Officer, Bangladesh Jute Research Institute (BJRI),  
   Manik Mia Avenue, Dhaka
33. Mrs Nazmina Chowdhury, Scientific Officer, Bangladesh Jute Research Institute (BJRI),  
   Manik Mia Avenue, Dhaka, Tel: 911 6580
34. Mr Md Nazrul Islam, Scientific Officer, Bangladesh Jute Research Institute (BJRI), (Entomology  
   Division), Manik Mia Avenue, Dhaka, Tel: 911 6240
35. Mr A T M Morshed Alam, Scientific Officer, Bangladesh Jute Research Institute (BJRI),  
   (Agronomy Division), Manik Mia Avenue, Dhaka, Tel: 911 8371, E-mail: biri@bdm.net
36. Mr Md Nasir Uddin, Scientific Officer, Bangladesh Jute Research Institute (BJRI), (On Farm  
   Research Division), Manik Mia Avenue, Dhaka, Tel: 812 0742
37. Mr M M Alamgir Sayeed, Scientific Officer (Tech.), Bangladesh Jute Research Institute (BJRI),  
   Manik Mia Avenue, Dhaka, Tel: 911 7169, E-mail: mma-sayeed@yahoo.com
38. Mr Ahsansul Haque, Scientific Officer, Bangladesh Jute Research Institute (BJRI),  
   Manik Mia Avenue, Dhaka, Tel: 911 6240, E-mail: bjri@bdm.net
39. Ms Jabun Naher, Scientific Officer, Bangladesh Jute Research Institute (BJRI),  
   Manik Mia Avenue, Dhaka, Tel: 812 1929-35, E-mail: biotech@gononet.com
40. Ms Aleya Nasreen, Scientific Officer, Bangladesh Jute Research Institute (BJRI),  
   Manik Mia Avenue, Dhaka, Tel: 812 0303
41. Mr Md Golam Mostofa, Scientific Officer, Bangladesh Jute Research Institute (BJRI),  
   Manik Mia Avenue, Dhaka, Tel: 813 0507

FBCCI

42. Professor Masuda M Rashid Chowdhury, Director, Federation of Bangladesh Chambers of  
   Commerce & Industry (FBCCI), “The Rashids”, 2-A Outer Circular Road, Maghbazar  
   Dhaka-1217, Tel: 831 1010, 933 1860, E-mail: sanjeed@aitlbd.net

EC

43. Mr M A Halim, Senior Development Officer, Delegation of the European Commission for  
   Bangladesh, House 7, Road 84, Gulshan-2, Dhaka, Tel: 882 4730-32, Fax: 882 3118

IJSG

44. Dr R Mandal, Officer-in-Charge, Trust for the International Jute Study Group (IJSG)  
   145 Monipuripara, Tejgaon, Dhaka-1215, Tel: 9125581 -5, Fax: 9125248, 9125249
45. Dr G Mohiuddin, Project Leader, Bio-pulping Project, Trust for the International Jute Study Group  
   (IJSG), 145 Monipuripara, Tejgaon, Dhaka-1215, Tel: 9125581 -5, Fax: 9125248, 9125249  
   E-mail: ijpulp@bdm.net
46. Mr Shish Haider Chowdhury, Finance and Administrative Officer, Trust for the International Jute Study Group (IJSG), 145 Monipuripara, Tejgaon, Dhaka-1215, Tel: 9125581-5
   Fax: 9125248, 9125249

47. Ms Fatima Yasmin, Project Officer, Trust for the International Jute Study Group (IJSG)
   145 Monipuripara, Tejgaon, Dhaka-1215, Tel: 9125581-5, Fax: 9125248, 9125249

Bangladesh Jute Mills Corporation (BJMC)

48. Mr Mohammad Fazlul Huq Bhuiyan, Director (RQC), Bangladesh Jute Mills Corporation (BJMC),
    Adamjee Court, 115-120 Motijheel, Dhaka-1000, Tel: 956 5519, Fax: 956 7508, 956 4740

49. Mr M M Mustafizur Rahman, General Manager (Research), Bangladesh Jute Mills Corporation
    (BJMC) Adamjee Court, 115-120 Motijheel, Dhaka-1000, Tel: 955 8198, 955 8182
    Fax: 956 4 4740, 956 7508

50. Mr S M Aminul Rahman, Deputy Manager, Bangladesh Jute Mills Corporation (BJMC)
    Adamjee Court, 115-120 Motijheel, Dhaka, Tel: 956 0769

Bangladesh Jute Spinners Association (BJSA)

51. Mr Ahmed Hossain, Chairman, Bangladesh Jute Spinners Association (BJSA)
    55 Purana Paltan (3rd floor), Tel: 955 1317, Fax: 956 2772

52. Mr Shahidul Karim, Secretary, Bangladesh Jute Spinners Association (BJSA)
    55 Purana Paltan, Dhaka Tel: 956 2772, 955 1317, Fax: 956 2772

Sonali Aansh

53. Mr Nurl Islam Patwari, Managing Director, Sonali Aansh, 18 Rajuk Avenue, Lal Bhaban,
    Motijheel, Dhaka, Tel: 955 6251, Fax: 956 2076

54. Mr Mohammed M R Patwari, Director, Sonali Aansh Industries Ltd., 18 Rajuk Avenue, Lal
    Bhaban, Motijheel, Dhaka, Tel: 956 3322, 955 6251, Fax: 956 2076, E-mail: sonali@citechco.net

55. Mr A B M Asaduzzaman, Deputy Manager (Dev.), Sonali Aansh Industries Ltd., 18 Rajuk Avenue
    Lal Bhaban, Motijheel, Dhaka, Tel: 955 6251, Fax: 956 2076

56. Mr Kazi Reazul Hasan, Sonali Aansh Group, Plot E-6, Paribagh Housing Society, 4 Paribagh,
    Dhaka Tel: 861 4337, E-mail: hasans@agri.com

Pubali Jute Mills Ltd.

57. Mr Kaihan N Rahman, Executive Director, Pubali Jute Mills Ltd., Chand Mansion (6th floor)
    66 Dilkusha C. A, Dhaka-1000, Tel: 955 2567, 955 0626, 955 1218, Fax: 956 4485

58. Mr Kamran T Rahman, Deputy Managing Director, Pubali Jute Mills Ltd., Chand Mansion
    (6th floor), 66 Dilkusha C.A, Dhaka-1000, Tel: 955 2567, 955 0626, 955 1218, Fax: 956 4485
59. Ms Amna Rahman, Director, Pubali Jute Mills Ltd., Chand Mansion (6th floor), 66 Dilkusha C. A, Dhaka-1000, Tel: 955 2567, 955 0626, 955 1218, Fax: 956 4485

60. Mr Obaid-ul Haque, Marketing Executive, Pubali Jute Mills Ltd., Chand Mansion (6th floor)
66 Dilkusha C.A, Dhaka-1000, Tel: 955 2567

Esheeta

61. Ms Sakina Dewan, Director, Esheeta, House 27, Road 18, Block J, Banani, Dhaka, Tel: 988 0626 Fax: 882 3024, E-mail: tdewan@bangla.net

62. Ms Semina Dewan, Director, Esheeta, House 27, Road 18, Block J, Banani, Dhaka Tel: 988 0626, Fax: 882 3024

The Golden Fibre Trade Centre Ltd.

63. Mr Mustaq Hussain, Managing Director, The Golden Fibre Trade Centre Ltd., 751 Satmasjid Road, Dhanmondi, Dhaka-1209, Tel: 911 5786, 911 2711, 911 3718, Fax: 811 3165
E-mail: golden@citechco.net

A B Composites Pvt. Ltd.

64. Mr A Samanta, Managing Director, A B Composites Pvt. Ltd. 1/1B/18 Ramkrishna Naskar Lane, Kolkata 700010, India, Tel: 350 5982/6348, Fax: 351 0305

Star Partex Group

65. Mr Md Yunus, Technical Director, Star Particle Board Mills Ltd. Ispahani Building (4th floor) 14-15 Motijheel C.A, Dhaka-1000, Tel: 956 4499, Fax: 955 5650

66. Mr Tawhid Shams Haque, Deputy General Manager (Marketing), Partex Group, Sena Kalyan Bhaban (16th floor) 195 Motijheel C.A, Dhaka-1000, Tel: 955 0555, Mobile: 018 220 410 Fax: 955 6515, E-mail: tawhid@partex.net

Mennonite Central Committee (MCC)

67. Mr K A Reza, Senior Project Development Officer, (Job Creation Program), Mennonite Central Committee (MCC), 1/1 Block-A, Asad Gate Road, Mohammadpur, Dhaka-1207 Tel: 911 7065, 815 756

68. Mr M Ghayasuddin, General Manager, Mennonite Central Committee (MCC) 1/1 Block-A, Asad Gate Road, Mohammadpur, Dhaka-1207, Tel: 911 7065, 815 756

69. Ms Shahin Akhter, Marketing Manager, Mennonite Central Committee (MCC) 1/1 Block-A, Asad Gate Road, Mohammadpur, Dhaka-1207, Tel: 911 7065, 815 756

Ethical Drugs Ltd.

70. Mr Md Rahmat Ullah, Managing Director, Ethical Drugs Ltd., 9 Haikhola Road (1st floor) Dhaka-1203 Tel: 956 6802, 955 9427, Fax: 956 5038
71. Mr Faruque Ahmed Chowdhury, Director (Tech & Engg.), Bangladesh Chemical Industries Corporation (BCIC), BCIC Bhaban (4th floor), 30-31 Dilkusha C.A, Dhaka-1000, Tel: 956 5691 Fax: 956 4120, E-mail: bcic.comp@bangla.net

72. Mr Md Shahidullah, General Manager, Bangladesh Chemical Industries Corporation (BCIC) BCIC Bhaban (17th floor), 30-31 Dilkusha C.A, Dhaka-1000, Tel: 955 7764, 955 7752 Fax: 956 4120,E-mail: bcic.comp@bangla.net

73. Ms Jeyaunnahar Begum, General Manager, Bangladesh Chemical Industries Corporation (BCIC) Shilpa Bhaban, 30-31 Motijheel, Dhaka-1000, Tel: 955 1087, Fax: 956 4120 E-mail: bcic.comp@bangla.net

74. Khandakar Abdul Bashar, Deputy General Manager (Retd.), Bangladesh Chemical Industries Corporation (BCIC), Shilpa Bhaban, 30-31 Motijheel, Dhaka-1000

75. Mr Kalipada Biswas, Additional Chief Chemist, (Research & Productivity Division), Bangladesh Chemical Industries Corporation (BCIC), BCIC Bhaban (17th floor), 30-31 Dilkusha C.A, Dhaka-1000, Tel: 955 7764, 955 7752, Fax: 956 4120, E-mail: bcic.comp@bangla.net

76. Mr Nadir Ahmed, Managing Director, Sylhet Pulp & Paper Mills Ltd., Chhatak, Sunamgonj, Bangladesh, Tel: 08723 88012, Fax: 08723 88043, C/o. SPPM, Bangladesh Chemical Industries Corporation (BCIC), Shilpa Bhaban, 30-31 Motijheel, Dhaka-1000, Tel: 966 3233, Fax: 956 4120, E-mail: bcic.comp@bangla.net

77. Mr Murshed Alam, Deputy Chief Chemist, Sylhet Pulp & Paper Mills Ltd., Chhatak, Sunamgonj, Bangladesh, Tel: 08723 88012 211, Fax: 08723 88043

78. Mr Arabindo Mitra, Executive Engineer (Chemical), Sylhet Pulp & Paper Mills Ltd., Chhatak, Sunamgonj, Bangladesh, Tel: 08723 88012 141, Fax: 08723 88043

79. Mr Md Abdur Razzaque, Additional Chief Chemist (Technical), Karnaphuli Paper Mills Ltd. Chandraghona, Rangamati, Tel: 031 624 337, Enterprise of BCIC, Shilpa Bhaban, 30-31 Motijheel, Dhaka-1000

80. Mr Mizanur Rahman, Deputy Chief Chemist, Karnaphuli Paper Mills Ltd., Chandraghona, Rangamati Tel: 031 624 337, Fax: 031 612 833, E-mail: kpm@globalexg.net, C/o. Enterprise of BCIC, Shilpa Bhaban, 30-31 Motijheel, Dhaka-1000

Kumudini Welfare Trust of Bengal (BD) Ltd.

81. Mr Rajiv Prasad Shaha, Managing Director, Kumudini Welfare Trust of Bengal (BD) Ltd., P.O. Box 62, Narayanganj – 1400, Tel: 971 6520, 971 5248, Fax: 971 5318, 971 6592, E-mail: kimudini@ncll.com, Dhaka Office : Kumudini Welfare Trust of Bengal (BD) Ltd.) 74 Gulshan Avenue, Dhaka-1212, Tel: 882 2778, 882 0397, E-mail: kimudini@ncll.com

82. Khandker Afsaruddin, General Manager, Kumudini Welfare Trust of Bengal (BD) Ltd. P.O. Box 62, Narayanganj – 1400, Tel: 971 3640, 971 6520, 971 6815, Fax: 971 5313 E-mail: joya@bdonline.com
Banglar Mela

83. Mr Lutfullahil Mazid, Chairman, Banglar Mela, House 155E, Road 11, Banani, Dhaka
Tel: 881 9594, 011 811 440

84. Mr Md Abu Yousuf Alam, Executive, Banglar Mela, House 155E, Road 11, Banani, Dhaka
Tel: 8819594, 802 0209, E-mail: banglar-mela@yahoo.com

85. Mr Sakhawat Hossain, Banglar Mela, House 155E, Road 11, Banani, Dhaka, Tel: 881 9594

Heed Handicrafts

86. Mr John Baroi, Administrator, Heed Handicrafts, Plot B/17, BSCIC Industrial Area, Tongi,
Gazipur-1710 Tel: 980 2610, 980 3632, 980 3829, Fax: 980 2974, E-mail: hhcrafts@citechco.net

Sadat Jute Industries Ltd.

87. Mr Najmul Huq, Managing Director, Sadat Jute Industries Ltd., SMC Tower (3rd floor), 33 Banani
C.A, Dhaka, Tel: 988 8419, 988 8698, 988 8671, Fax: 988 1207, E-mail: jasahuqs@accessitel.net

Shilpalaya Ltd.

88. Mr Emdad Ahmed, Managing Director, Shilpalaya Ltd., 45 Sonargaon Road, Hatirpool
Dhaka-1205 Tel: 862 8132, 500 111

89. Mr Mollah Mahbub Ahmed, Director, Shilpalaya Ltd., 45 Sonargaon Road, Hatirpool
Dhaka-1205, Tel: 862 8132, 500 111, Mobile: 017 116 465,
E-mail: onc@alpha.consul.com

Patuakhali Jute Mills Ltd.

90. Mr A F M Fazle Rabbi, Chairman, Patuakhali Jute Mills Ltd., Rajuk Annex Building (4th floor)
Dilkusha C.A, Dhaka-1000, Tel: 955 2220, 955 2222, Fax: 956 4208, E-mail: pjm@spaninn.com

91. Mr Istiaque Parvez Rabbi, Patuakhali Jute Mills Ltd., Rajuk Annex Building (4th floor)
Dilkusha C.A, Dhaka-1000, Tel: 955 2220, 955 2222, Fax: 956 4208, E-mail: pjm@spaninn.com

Corr-The Jute Works

92. Mr Milton S Ratna, Information Officer, Corr-The Jute Works, 30 Senpara, Parbata, Mirpur,
Dhaka-1216 Tel: 801 1470, 801 2589, 801 5019, Fax: 801 3536, E-mail: jutework@citechco.net

Uttama Ltd.

93. Ms Selina Sheikh, Managing Director, Uttama Ltd., House 8, SWI Gulshan-1, Dhaka-1212
Tel: 9880799, 882 3355, Fax: 881 4358
Swajan Crafts

94. Mr Hannan Sarker, Managing Partner, Swajan Crafts, House No. 6, Road No. 23/A, Gulshan-1 Dhaka-1212, Tel: 988 9061, Fax: 881 7607, E-mail: swajan@bdonline.com

95. Mr Idris Ali Talukdar, Manager, Swajan Crafts, House No. 6, Road No. 23/A, Gulshan-1 Dhaka-1212 Tel: 988 9061, Fax: 881 7607, E-mail: swajan@bdonline.com

Alpha Consults Limited

96. Mr Shamsul Huda Ahmed, Managing Director, Alpha Consultants Limited, 45 Sonargaon Road Dhanmondi, Dhaka-1205, Tel: 861 2813, 500 111

97. Mr Md Shahjahan, Jute Expert, Alpha Consultants Limited, 45 Sonargaon Road, Dhanmondi, Dhaka-1205, Tel: 862 8132, 500111

98. Mr Md Anwar Hossain, CEO, Alpha Consultants Limited, 45 Sonargaon Road, Dhanmondi, Dhaka-1205 Tel: 862 8132, 500111, E-mail: ancbd@alphanc.com

Concern

99. Ms Nilufar Nahar, Marketing Officer, Concern Bangladesh, House No. 7, Road No. 12 (new) Tel: 811 2795-96, Fax: 811 5973

Craftvision Ltd.

100. Mr Ibrahim Khalil, Managing Director, Craftvision Ltd., House 35/B (4th floor), Road 9A Dhanmondi Dhaka-1209, Tel: 017 541051, 911 1763, 912 5641, Fax: 912 6181 E-mail: tvision@.net

Bengal Crafts

101. Mr Sanjeeed Rashid Chowdhury, Director, Bengal Crafts, “The Rashids”, 2-A, Outer Circular Road Maghbazar, Dhaka-1217, Tel: 831 1010, 933 1860, E-mail: sanjeed@aitlbd.net

Grameen Fund

102. Mr Md Altaf Hossain, Deputy General Manager, Grameen Fund, Grameen Bank Complex, Mirpur, Dhaka-1216, Tel: 900 5257-69 Ext.1297, Fax: 900 4083, E-mail:a.hossain@grameensoftware.com

Basic Bank Ltd.

103. Mr Mehdi Mahmud Chowdhury, Assistant Manager, BASIC Bank Limited, Sena Kalyan Bhaban (6th floor), 195 Motijheel C/A, Dhaka-1000, Tel: 956 7910, 956 8190, 966 6452 Fax: 956 4829, E-mail:basicho@citechco.net

Banaj Barnali

104. Ms Nasira Mustaque, Proprietor, Banaj Barnali Ltd., House 41, Road 3A, Dhanmondi, Dhaka Tel: 966 1738, 506 155, Fax: 811 3661, E-mail: ahmeda@netnb.com
BIDS

105. Mr Dilip Kumar Roy, Research Fellow, Bangladesh Institute of Development Studies (BIDS)
17 Agargaon, Sher-e-Bangla Nagar, Dhaka-1207, Tel: 812 9625, Fax: 811 3023
E-mail: dilip@sdhbd.org

106. Mr Abdul Hye Mondal, Research Fellow, Bangladesh Institute of Development Studies (BIDS)
E-17 Agargaon, Dhaka-1207, Tel: 812 0765, 831 4839(R), E-mail: nigar@bdonline.com

Barisal Jute Mills Ltd.

107. Mr A Naser A Khan Rumi, Chairman, Barisal Jute Mills, 1/1 Block-D (Ground floor), Lalmatia
Dhaka-1207, Tel: 911 3975/Extn. 140, Tel: 812 6392 (R), E-mail: moynrumi@bol-online.com

Sumiya Cottage

108. Mr Md Shahidul Alam Mona, Proprietor, Sumiya Cottage, 199 Maradia, Bhuayanpara Road
Khilgaon, Dhaka-1219, Tel: 721 2413, Fax: 721 2413, E-mail: sumiya@bdcom.com

109. Mr Al Nahar Ar Rahman, Marketing Officer, Sumiya Cottage, 199 Maradia, Bhuayanpara Road,
Khilgaon, Dhaka-1219, Tel: 721 2413, Fax: 721 2413, E-mail: sumiya@bdcom.com

110. Mr Kaddush Khan, Public Relation Officer, Sumiya Cottage, 199 Maradia, Bhuayan-para Road
Khilgaon, Dhaka-1219, Tel: 721 2413, Fax: 721 2413, E-mail: sumiya@bdcom.com

111. Mr A K M Baizidur Rahman Khan, Administrative Officer, Sumiya Cottage, 199 Maradia,
Bhuayanpara, Road, Khilgaon, Dhaka-1219, Tel: 721 2413, Fax: 721 2413
E-mail: sumiya@bdcom.com

Desh Karupannya Ltd.

112. Mr Sohel Ibna Hamid, Director, Desh Karupannya Ltd., 333 Elephant Road, Dhaka-1205
Tel: 966 3856, Fax: 966 3856, E-mail: deshkaru@prodesta.net

113. Mrs Sultana Sohel, Designer, Desh Karupannya Ltd., 333 Elephant Road, Dhaka-1205
Tel: 966 3856, Fax: 966 3856, E-mail: deshkaru@prodesta.net

North Bengal Paper Mills Ltd.

114. Mr Md Rabiul Alam, Deputy Chief Chemist, North Bengal Paper Mills Ltd., DCC, Paksey, Pabna,
Tel: 07326 340, Fax: 07326 655

Mony Jute Goods & Handicrafts Ind.

115. Mr Md Jul Hossain Joy, Manager, Mony Jute Goods & Handicrafts Ind., 82-E-1 Madértak
(Pabnapara) Bashaboo, Dhaka-1214, Tel: 729 0227
Mowada Traders

116. Syed Md Hussain, Proprietor, Mawada Traders, 27/Ka, Zikatola (2nd floor), Dhaka-1209
Tel: 966 3419 Fax: 862 3181, E-mail: mawada@bangla.net

Shudeepta Trade Co. and M Tarek Co. Ltd.

117. Mr Mohammed Tarek, Chief Executive, Shudeepta Trade Co, and Managing Director of M Tarek & Co. Ltd. House No. 60 (new), Road No. 16(new), Dhanmondi R.A, Dhaka-1209
Tel: 913 2617, 811 8470, 911 9010, Fax: 911 9010 E-mail: stcbd@btib.net.bd

Team

118. Mr Mohammad Nur Alam, Team Manager, Team (Topaz Earthen Artifact & Management)
240 Tejgaon Industrial Area, Dhaka, Tel: 882 8942, 881 3143, Fax: 882 5965
E-mail: tpxgmts@citechco.net

Safroz

119. Mr Sikder Abul Quashem, Proprietor, Safroz, M/I Noorjahan Road, Mohammadpur Dhaka-1207, Tel: 911 7262

A K Khan & Company Limited

120. Mr A K Shamsuddin Khan, Managing Director, A K Khan & Company Limited, Batali Hills, Chittagong 4000, Tel: 611 050-2, 613 953, Fax: 031 610 596, Dhaka Office: HBFB Building (1st floor) 22 Purana Paltan, Dhaka-1000, Tel: 956 2492, 956 2554, 955 2767, Fax: 956 1147
E-mail: aktd.bdm ail.net

121. Mr Zahiruddin Khan, A K Khan & Company Limited, Batali Hills, Chittagong 4000
Tel: 611 050-2, 613 953, Fax: 031 610 596, Dhaka Office: HBFB Building (1st floor) 22 Purana Paltan, Dhaka-1000, Tel: 956 2492, 956 2554, 955 2767, Fax: 956 1147, E-mail: aktd.bdm ail.net

ITDG-Bangladesh

122. Mr Veena Khaleque, Country Director, ITDG-Bangladesh, House No. 32, Road No. 13A, Dhanmondi R. A, Dhaka-1209, Tel: 911 0060

123. Mr Abdur Rob, Manager (Small Enterprise Unit), ITDG-Bangladesh, House No. 32, Road No. 13A, Dhanmondi R A, Dhaka-1209, Tel: 811 1934, Fax: 811 3134, E-mail: rob@itb.bdm ail.net

Bengal Braided Rugs Limited

124. Mr Shahedul Islam, Managing Director, Bengal Braided Rugs Limited Tel: 811 1125, 912 4982
Fax: 913 2074, E-mail: bplsadi@bol-online.com

Hai & Sons

125. Mr Md Zakir Hossain, Managing Director, 10/20 Kallyanpur Housing Society, Dhaka-1207
Tel: 900 5766, Fax: 956 5506, E-mail: gbs@bangla.net
Asuya Composite Knit Complex

126. Mr Zakir Hossain, Managing Director, Asuya Composite Knit Complex, 21 North Goran (3rd floor), Dhaka, Tel: 721 6695

Survey Research Group of Bangladesh

127. Mr M Saidul Haq, President, Survey Research Group of Bangladesh, 396 New Eskaton Road, Dhaka-1000, Tel: 935 1102, 831 2450, 935 3350, Fax: 935 1103, E-mail: mshaq@bangla.net

Young Women's Christian Association

128. Mrs Shefali Margaret D’ Costa, Manager (Craft Centre), Young Women’s Christian Association, 10-11 Green Square, Green Road, Dhaka-1205, Tel: 966 4150, 966 8645, Fax: 966 4150, E-mail: dywca@bdonline.com

Global Paper Craft

129. Mr Kazi Jamal Naser, Managing Partner, Global Paper Craft, House No. 61, Road No. 17/C, Banani, Dhaka-1213, Tel: 601 151, Mobile: 019 387 135, E-mail: junaid@agni.com

Supreme Jute & Knite Ltd.

130. Mr Md Jahangir Hossain, Director, Supreme Jute & Knite Ltd., House No. 98, Road No. 9/A, Dhanmondi R A, Dhaka-1209, Tel: 811 1994, 811 3202, Fax: 811 1650, E-mail: shams@agni.com

Jute Spinners Ltd.

131. Mr Muhammad Shams-ul Huda, Director, Jute Spinners Ltd., House No. 98, Road No. 9/A, Dhanmondi R. A, Dhaka-1209, Tel: 811 1994, 811 3202, Fax: 811 1650, E-mail: shams@agni.com

Bangladesh University of Engg. Technology

132. Dr M A Rashid Sarkar, Professor, Bangladesh University of Engg. Technology, (Mechanical Engineering Department), Dhaka-1000, Tel: 966 5636, Fax: 861 3046, 861 3026, E-mail: rashid@mebuet.edu

133. Dr Abu Md Aziz-ul Huq, Professor, Bangladesh University of Engg. Technology, (Mechanical Engineering Department), Dhaka-1000, Tel: 966 5636, Fax: 861 3046, 861 3026, E-mail: amazh@citechco.net

Department of Agril. Extension (DAE)

134. Mr Md Anwar Ali Khan, Deputy Director (Jute Marketing), Cash Crop Wing, Department of Agril. Extension (DAE), Khamarbari, Farmgate, Dhaka-1215, Tel: 812 0825

Alib

135. Mr Sajjadur Rahjman Khan, Executive Director, Alib Action Learning Institute of Bangladesh, 10/22 Iqbal Road, Mohammadpur, Dhaka-1207, Tel: 811 6111, 812 7645, Fax: 811 6341, E-mail: alib@btbt.net.bd
De Montfort University

136. Dr Parvez I. Haris, Principal Lecturer, Editor-in-Chief Spectroscopy – The International Journal, Department of Biological Science, De Montfort University, The Gateway Leicester, United Kingdom, E-mail: pharis1999@hotmail.com

Expert

137. Mr A K M Rezaur Rahman, Retd. Additional Secretary, Government of the People’s Republic of Bangladesh, 159 Pisciculture Housing Society, Mohammadpur, Dhaka, Tel: 811 7311 E-mail: rezaur@bol-online.com

Reporters

138. Mr Ashique Adnan, Staff Reporter, Daily Bhorer Kagoj, 8 Link Road, Bangla Motor, Dhaka Tel: 966 4442

139. Mr Md. Shamsuddin Ahmed, Staff Reporter, The Daily New Nation, Tel: 956 5428 Fax: 911 2138

140. Mr Md Zakir, Staff Reporter, Daily Dinkal, Dhaka, Tel: 956 5423, Fax: 911 4762 E-mail: Z.H.@.shapla.bd.com

141. Mr Monjurry Aziz, Chief Reporter, The Daily Ittefaq, 45 West Hajipara, Malibag, Dhaka Tel: 934 8390 Fax: 831 1934

142. Mr Md. Zamal Uddin, Staff Reporter, The Daily Rupalidesh, Tel: 011 781 017, Fax: 955 6234

143. Mr Kismat Khondokar, Staff Reporter, The Daily Manabzamin, Kazi Nazrul Islam Avenue Dhaka Tel: 966 1122, Fax: 861 8130, E-mail: mzamin@bol-online.com