



**INVESTORS' FORUM  
ON PULP AND PAPER  
FROM  
JUTE / KENAF  
25 - 26 SEPTEMBER  
2002**







**INVESTORS' FORUM  
ON PULP AND PAPER  
FROM  
JUTE / KENAF  
25 - 26 SEPTEMBER  
2002**

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



## Message

I am delighted to know that an **Investors' Forum on 'Making Pulp and Paper from Jute/Kenaf'** is going to be organised in Dhaka from 25 - 26 September 2002.

Jute is an environment-friendly biodegradable natural fibre, having versatile usage. Jute, principal cash crop of Bangladesh, is providing livelihood for millions of people including growers, industrial workers and traders. But large-scale use of synthetic substitutes and artificial fiber has drastically reduced the demand for and prices of both raw jute and jute goods in the domestic as well as international market. Since the prospect of traditional jute products is not bright, diversification is considered to be the only option to salvage the jute sector. I am happy to note that jute, kenaf and allied fibres have been successfully used as raw materials for making pulp and paper of different grades in Bangladesh, China, India, Thailand and the USA.

The Ministry of Jute with the assistance and support from the Government of France, the International Jute Study Group (IJSJ), Common Fund for Commodities (CFC) and the Delegation of the European Commission (EC) in Bangladesh is going to organise the Forum. I welcome the initiative of the Ministry and thank others for their support.

Various development partners including CFC and EC have played a key-role in the research and development of raw jute and finished products and thereby supporting the economy of Bangladesh and other jute growing countries. The establishment of IJO, which has been succeeded by the IJSJ, further strengthened these efforts. The organisation acted as an effective forum for dialogue and cooperation between the jute producing and consuming countries and helped improve the quality of jute fibre and develop diversified jute products. The new organisation, I believe, shall carry forward its mandate with renewed vigour and enthusiasm.

I hope, the prospective investors will appreciate the long-term advantages of jute as raw material for making pulp and paper, and this forum will attract new investment in Bangladesh and other jute growing countries.

I wish this forum all success.

Allah Hafez, Bangladesh Zindabad

**Khaleda Zia**

Prime Minister

Government of the People's Republic of Bangladesh





## Message

I am happy to know that the Ministry of Jute, Government of the People's Republic of Bangladesh in collaboration with the Government of France, International Jute study Group (IJSJ), Common Fund for Commodities (CFC) and the Delegation of the European Commission (EC) in Dhaka is going to hold an **Investors' Forum on 'Making Pulp and Paper from Jute/Kenaf'** during 25 - 26 September 2002.

I am also delighted to know that, enormous scopes have emerged for producing pulp and paper on a large scale using jute as raw material. Since the world market has a huge increasing demand of pulp and paper, jute might have a chance to be crowned with a very bright future if the industrial processes could have produced pulp and paper on a commercially and economically viable way. Moreover, such efforts may generate enormous scopes for earning huge foreign exchange through export of paper pulp made from jute.

I understand that the processes developed so far have scopes for further refinement and up-gradation to make it internationally competitive and the scientists and researches will leave no stone unturned in doing that.

I wish the forum a complete success.

**M. Saifur Rahman**

Minister

Ministry of Finance and Planning  
Government of the People's Republic of Bangladesh



## Message

It gives me immense pleasure that the Ministry of Jute, Government of the People's Republic of Bangladesh is organizing an **Investors' Forum on 'Making Pulp and Paper from Jute/Kenaf'** in collaboration with the Government of France, International Jute Study Group (IJSG), Common Fund for Commodities (CFC) and the Delegation of the European Commission (EC) in Bangladesh during 25 - 26 September 2002 in Dhaka.

Jute has been a major source of foreign exchange earning in Bangladesh. It continues to provide livelihood for millions of farmers, industrial workers and traders. Jute sector has been facing stiff competition from synthetic substitutes for the latter being relatively cheaper and easier to handle. There is little likelihood for jute sector to regain its past status with traditional products. Large-scale use of jute in production of high value added diversified products could open up a new horizon for jute sector. The tireless efforts of the scientists and researchers have created prospects for production of pulp and paper using jute as raw material. We must exploit these opportunities to the fullest extent in order to regain its past glorious position.

The forum would provide an in-depth perception to interested entrepreneurs on the processes and technologies involved in making various grades of pulp and paper products. I hope this will lead to development of entrepreneurship in the field of pulp and paper industry and provide the much-needed support to jute sector.

I am confident if pulp and paper could be produced in bulk and in a cost-effective way as compared to international price standard, jute could also earn huge foreign exchange through export. This venture would open a new horizon in the jute sector and ensure exploitation of this ECO friendly product to a great extent. In order to achieve that we should attain a preferential status so far as the international cost competitiveness is concerned.

I wish the forum all success.

**Hafiz Uddin Ahmad, BB**

Minister

Ministry of Jute

Government of the People's Republic of Bangladesh





## Message

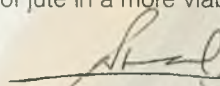
I am extremely delighted in having the opportunity to say a few words on the occasion of the **Investors' Forum on 'Making Pulp and Paper from Jute/Kenaf'** organized by the Ministry of Jute, Government of the People's Republic of Bangladesh in association with the Government of France, International Jute Study Group (IJSG), Common Fund for Commodities (CFC) and the Delegation of the European Commission in Bangladesh on 25 - 26 September 2002.

Jute/Kenaf is a sort of natural fibre produced annually by few countries in South and South-East Asian region. Traditional jute products like twine, hessian, sacking and carpet backing cloths are striving hard due to inroad of various synthetic products and artificial fibres. Both the demand and price of such products have fallen drastically in the domestic as well as international markets. Further, the production cost of jute goods does not commensurate with sales price. Nonetheless, research and development activities undertaken by various research institutions through collaborative efforts of development partners, private entrepreneurs etc. have invented a set of non-traditional items which have increased the chance of making jute competitive against synthetics. Production of pulp and paper is an important area where jute can be used in bulk, thus brightening its future.

The growing demand of pulp and paper worldwide on a continuous basis and increase of public awareness on environmental issues have created conditions to check depletion of forest resources through using jute/kenaf for producing pulp and paper. The forum will attract entrepreneurs to invest in manufacturing different grades of pulp and paper to cater the growing market demand at home and abroad. Use of jute in this field will increase its domestic consumption to a great extent. Further, use of jute for making pulp and paper will help improve the balance of payment situation of the country through import substitution. I am confident that if pulp and paper could be produced in bulk and in a cost-effective way compared to international price standard, jute could also fetch huge foreign exchange through export, in addition to meeting the domestic demand.

I hope the forum will let the prospective entrepreneurs know the processes and technologies of making pulp and paper, their economies of scale and finally their adaptability. I would also expect that the researchers and scientists will continue to put their best efforts in inventing new technologies and process development so as to make pulp and paper out of jute in a more viable way from economic and commercial view point.

I wish the forum a grand success.

  
**A F M Sarwar Kamal**  
Secretary

Ministry of Jute  
Government of the People's Republic of Bangladesh



## Message

I am happy to know that an **Investors' Forum on 'Pulp and Paper from Jute/Kenaf'** is going to be organized by the Ministry of Jute, Government of the People's Republic of Bangladesh in collaboration with the International Jute Study Group (IJSJ), Common Fund for Commodities (CFC), the Government of France and the Delegation of the European Commission (EC) to Bangladesh.

The jute sector has been facing great difficulties, particularly due to the advent of synthetic substitutes. The Government of Bangladesh has already initiated a number of programmes including production of paper pulp from green jute. I am pleased to know IJSJ has already started a project on 'Biotechnological Application of Enzymes for making Paper Pulp from Green Jute/Kenaf' jointly funded by the Common Fund for Commodities (CFC), European Commission, Government of France and the Government of Bangladesh. This project, if successfully implemented, will make use of green jute as raw material for Pulp and Paper. This, in turn, would reduce the dependence of the paper industry on forests and give the necessary filling to the growth of the jute sector.

The Commission used to support a number of projects in the jute sector of Bangladesh through grants under COMPEX. The essential objectives were to assist Bangladesh in overcoming the problems associated with the gradual decline of export of jute and jute products. In this context, the potential for making pulp and paper from jute was one of the areas which was explored with the expectation that it would open the door for export diversification as well as for domestic consumption. I am confident that the Government of Bangladesh will continue to put endeavour in improving the jute sector.

I believe this Investors' Forum will open up new horizon for jute and pave the way for a very promising future.

I wish every success to the Forum.

**Esko Kentrschynskyj**

Ambassador

Head of Delegation

Delegation of the European Commission to Bangladesh





## Message

It gives me immense pleasure to learn that an **Investors' Forum on "Pulp and Paper from Jute/Kenaf"** is going to be held on 25 - 26<sup>th</sup> September 2002 under the auspices of the Ministry of Jute, Government of the People's Republic of Bangladesh in collaboration with International Jute Study Group (IJSJ), Common Fund for Commodities (CFC), Government of France and the Delegation of the European Commission (EC) in Bangladesh.

Jute is a versatile, biodegradable natural fibre widely grown in Asia, particularly in Bangladesh, China and India. Thousands of families of Bangladesh and India are dependent on the production and trade of jute. It is also a major source of foreign exchange earning for Bangladesh.

As the jute sector is facing a number of problems for its survival, it has become imperative to find newer uses of jute in bulk quantity. It is pleasing to know that IJSJ is implementing a project on "Biotechnological Application of Enzymes for making Pulp and Paper from Green Jute/Kenaf" jointly funded by the Common Fund for Commodities (CFC), the European Commission, the Government of France and the Government of Bangladesh. The successful implementation of the project will facilitate bulk use of jute/kenaf as raw material for pulp and paper. This would reduce the dependence on the dwindling forest resources of Bangladesh.

It should also be mentioned that, with the similar objective of jute products diversification, France has been actively promoting a joint research venture between the Jute Research Institute (BJRI) and the French Institute for Textile and Clothing (IFTH) which has been supported by the European Commission in its first stage. This project is aimed at producing new yarns and materials for household uses and clothing by way of blending jute with other natural fibers such as flax and cotton.

Such projects are a firm indication of the commitment of all the agencies and governments genuinely involved to sustainable development in Bangladesh.

I wish every success to the Forum.

**Michel Lummaux**

Ambassador of France

Ambassador Extraordinary and Plenipotentiary, Embassy of the Republic of France



## Message

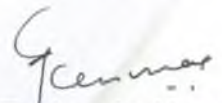
The Investors' Forum on Pulp and Paper from Jute and Kenaf is the first major event being organised by the International Jute Study Group (IJSJG) after it came into force on 27 April 2002. In accordance with its commitment to promote jute as a versatile fibre and in consonance with its charter to involve the private sector extensively in its activities, the group is attempting to provide a platform for better interaction between scientists and prospective investors.

The meeting will be attended by eminent scientists from the major institutes concerned with pulp and paper, industrialists who have used jute as a raw material for making pulp and prospective investors interested in the use of jute as a raw material for pulp and paper. Though the project "Biotechnological Application of Enzymes for making Paper Pulp from Green Jute/Kenaf (The whole Plant)" sponsored by the Common Fund for Commodities (CFC), Government of France, Delegation of the European Commission in Dhaka/Government of Bangladesh and implemented by UNIDO through institutions in France, China, the Netherlands, India and Bangladesh, is expected to be completed only by December 2003, the initial results available are expected to be disseminated to prospective entrepreneurs to enable them to maintain and develop useful contacts with technology institutions.

This new approach is an attempt to bring together industrialists and technology institutions early in the project to create synergy. It is our hope that prospective investors would find this approach worthwhile and use the forum as an effective platform for taking investment decisions.

We believe that the successful commercialization of technologies for using jute in the production of pulp and paper will not only benefit the jute sector but also help the paper industry in the long term. We hope this Forum will produce and open up new opportunities for the jute sector.

I place on record our gratitude to the Government of Bangladesh, Delegation of European Commission in Dhaka, Government of France, Government of India, Government of the Netherlands and the Government of China, for their support to the project and to the Forum.

  
**T. Nanda Kumar**  
Secretary General  
International Jute Study Group



# An Overview

Dr. G. Mohiuddin  
Project Leader



The forest resources of Jute/Kenaf growing countries are very limited. With increase in the population of these countries, pressure on land has increased which has resulted in the large- scale destruction of forests.

**Table 1. Total Land area, forest area and per capita consumption of Jute/Kenaf growing countries.**

Country	Land Area (Km2)	Forest Area (Km2)	Per capita consumption in Kg.
Bangladesh	143,998	13000 = 9.027%	3.1
China	99,596,961	1,337,000 = 13.42%	29
India	3,287,263	663,000 = 20.168%	5
Thailand	513,115	129,722 = 25.281%	32

Source: PPI July 2002 and PPI July 2001

Demand for pulp and paper has increased significantly in Bangladesh, China, India and Thailand. Bangladesh Chemical Industries Corporation (BCIC) is the major user of fibrous raw material in the country and use bamboo, wood and bagasse for the production of pulp and paper.

Private sector paper and board mills are small and rely on imported pulp and waste paper. The paper industry of the country is small compared to present day world standards. Yet, traditionally Bangladesh is a paper exporting country, especially newsprint.

**Table 2. Pulp, Paper and Board Consumption and Production of 5 major Jute/Kenaf Producing Countries**

Country	Year	Number of Mills		Per Capita Consumption (Kg)	Consumption '000 tons		Production '000 tons	
		Paper & Board	Pulp		Paper & Board	Pulp	Paper & Board	Pulp
Bangladesh	1999	25	7	2.9	360	215	215	140
	2000	-	-	-	387	299	299	200
	2001	23	6	3	389	300	312	150
China	1999	4,750	5000	28.4	35,860	19,518	29,608	16,425
	2000	-	-	-	37,113	20,474	30,900	17,150
	2001	4,700	4,500	29	37,581	22,464	33,400	17,570
India	1999	400	131	4.1	4,020	2,475	3,795	2,320
	2000	-	-	-	4,160	2,782	3,850	2,581
	2001	395	120	5	4,444	2,888	4,049	2,645
Nepal	1999	3	3	1.4	32	6	8	5
	2000	-	-	-	33	6	7	4
	2001	3	3	1.5	34	33	8	5
Thailand	1999	44	6	34.4	1,820	880	2,434	756
	2000	-	-	-	1,960	868	2,312	764
	2001	45	5	32.5	2,070	895	2,445	919

Source: PPI July 2002 and PPI July 2001

Recently annual plants have become preferred raw material in the world for pulp and paper. Jute/Kenaf is an annual plant. The stem of jute/kenaf consists of two fibrous components, both of which are suitable for producing paper and paper board products. The bark fibre is about 2.5 mm in length, constitutes 25 to 35% by weight, and shorter core fibre about 0.6 mm in length constitutes 60-65% by weight of the stem. The bark (fibrous material) is suitable for quality paper making and is similar to softwood fibres. Core fibre has strength properties similar to that of hard wood fibres. Jute has been traditionally used for the packaging, transport and storage of agricultural products including sacks, bags, carpet backing cloth, etc. But traditional products are facing severe competition due to the emergence of synthetic substitutes.

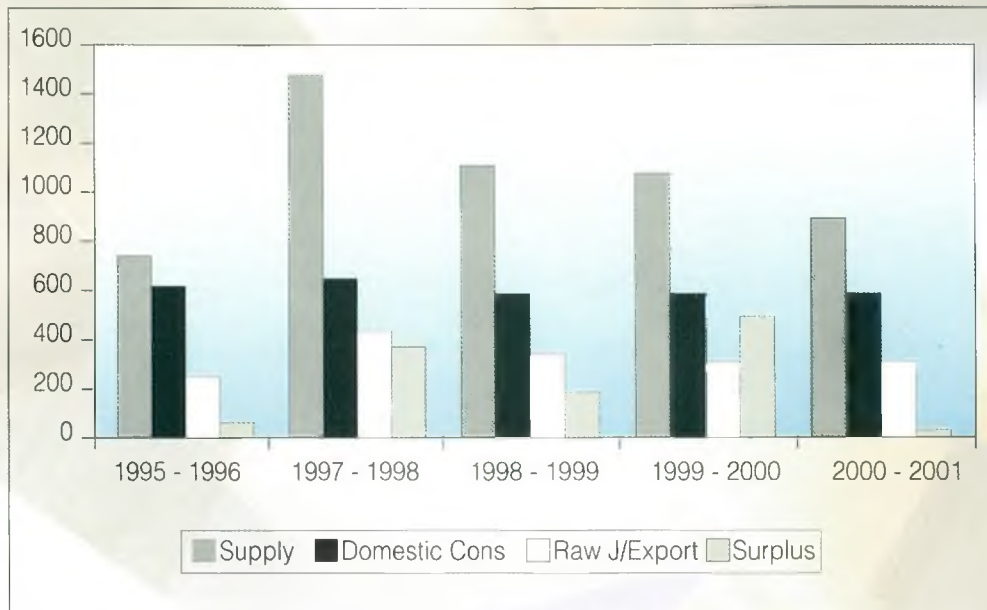
Both producing and consuming countries are trying to utilize jute/kenaf for diversified products. In the recent past, attention has been given to utilize jute/kenaf as an alternate raw material for pulp and paper.



Whole jute/kenaf has been successfully tried as a raw material for pulp and paper in Bangladesh, China, India, Thailand and USA.

From the figures for last 5 years, it appears that, on an average, there is a surplus of 100,000 MT of jute fibre in Bangladesh alone, which means that dried whole plant of 300,000 MT will be available.

#### Availability of Jute fibre as a raw material for Pulp and Paper ('000 tons)



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. 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 chemicals which make the product costlier and also pollutes the environment. Mechanical pulping, on the other hand, requires more energy.

Increasing environmental awareness made it necessary to investigate methods for reducing the amount of energy and sulphur and chlorine containing compounds. This led 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.

Ministry of Industry, Govt. of the People's Republic of Bangladesh approached the then 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 BCIC using green jute plant were taken into consideration.**

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

**There are 5 (five) main components of the project.** 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 development of 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).

The third component is 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 Paper Mills.





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

### **Pulping of whole jute in Soda AQ and Kraft Process**

In order to optimise the process of pulping of whole jute in Soda-AQ process, experiments were conducted at KPM (BCIC), CTP and CPPRI. All these institutes have optimised the condition. In all these three Institutes bleachable grade pulp with yield of 48% was obtained. Similarly at BCIC and CPPRI bleachable grade of pulp of Kappa No. 20 was obtained with 48-50% yield in Kraft process. Yield and quality of this pulp is similar to that of bamboo and bagasse. IBFC (China) has optimised the process of kraft pulping using Kenaf.

### **Pulping of Jute Bark**

In addition, IJSG and BCIC have optimised the condition for pulping with jute bark (unretted fibre). It has been observed that better quality pulp was produced with higher yield (52-55%) and with less chemical requirement. Quality paper can be produced from this pulp.

### **Bleaching**

Bleaching of jute pulp was carried out at CTP, BCIC and CPPRI. ISO brightness of 80-81% was obtained using various sequences of bleaching.

### **Biopulping**

Energy requirement for making high yield pulp is normally very high. Through the application of a biotechnological method on wood, it had been possible to reduce energy consumption by 20 to 30% and burst and tear indices were also found to be better. Application of bio-technological methods on jute and kenaf in the chemical process of pulping has already been conducted.

Mechanical pulping was carried out at ATO. They have conducted several trials. CTP also shared their knowledge with ATO for pulping in Bivis (extruder) process. Some more experiments are to be conducted to optimise the process.

- With optimum conditions obtained at KPM (BCIC), CPPRI (India) and CTP (France) for bleachable grade pulp of Kappa No. 20, biopulping experiments were conducted using different microorganisms.
- In Soda AQ Process Kappa no. can be reduced by 15% with the same alkali charge. Desired Kappa No. can also be obtained by reducing the alkali charge (9%).
- In Kraft process cooking can be reduced by 50% (i.e. from 2 hour to 1 hr) with Kappa No. more or less same (19 to 21). **As a result, cooking cycles can be increased which will facilitate to have more throughput in the existing paper mills.**

Microorganism and process of biopulping have been given to CPPRI (India), ATO (the Netherlands) and IBFC (China) to conduct similar trials at CPPRI (India), IBFC (China) and ATO (the Netherlands)

## Bio-bleaching

Bio-bleaching of jute pulp has been conducted at CTP, France with one commercial enzyme. It has been observed that chemical requirement is reduced by 30%.

## Developed Enzyme

Enzyme has already been developed by IJSG for conducting bleaching experiment. Commercial and developed enzyme will be used in trial experiments to compare and assess the performance and cost effectiveness.

Extensive research Works by scientists from various Institutes and pulp and paper mills led to the conclusion that most conventional pulping techniques, such as Kraft, soda, neutral sulfite, mechanical such as thermomechanical pulp (TMP), chemico-thermomechanical pulp (CTMP), Chemicomechanical pulp (CMP), are suitable for jute kenaf pulping (2,3,4).

In this Forum, scientists from Bangladesh, France, India, Norway, Thailand and USA will participate and present papers. Entrepreneurs from Bangladesh and India have been invited to attend the forum. It is expected that the Forum will be able to generate interest and enthusiasm among the entrepreneurs about the utilization of jute as a raw material for pulp and paper.

The Forum is expected to provide an in-depth perception to interested entrepreneurs on the processes and technologies involved in making various grades of pulp and paper products. It is hoped this will lead to the development of entrepreneurship in the field of Pulp and Paper Industry and provide the much needed support to the jute sector.

## Brief Resume of Speakers

**Dr. A.G. Kulkarni**, Director Central Pulp & Paper Research Institute (CPPRI) Saharanpur, Uttar Pradesh, India has been with the CPPRI since its inception. He holds a Master degree in Chemistry & Doctorate in Black Liquor and Lignin Chemistry.

He pioneered the research work on Desilication of black liquor with eventual development of mill scale plant, installed at Hindustan Newsprint Ltd., Kerala and High Rate Biomethanation of black liquor rich effluent and a mill scale unit is successfully operating at Satia Paper Mills. His contribution in the area of physicochemical & thermal properties of agro- residue non-wood black liquors has now made it possible to process this liquor in chemical recovery boilers. He has published more than 300 scientific papers in Indian and International journals. He has traveled Europe, South East Asia, and Australia and has been on several foreign missions as UNDP/ UNIDO Consultant.

His areas of specialization include pulping and bleaching, black liquor-its chemistry & processing, environment and energy management. Dr. Kulkarni holds several patents-important ones being on Desilication of black liquor, thermal



treatment of black liquors and Direct Alkali Recovery System etc. He is a member of several National and International Scientific & Technical organizations and also on board of Directors of Paper Mills & Research organizations.

**Dr. Aziz Ahmed** obtained his B.Sc. degree in Chemical Engineering from the Bangladesh University of Engineering and Technology (BUET), Dhaka in 1971. He started his career in the Chemical Industries Corporation of Bangladesh and later joined the Department of Applied Chemistry, Dhaka University as a lecturer. Dr. Ahmed obtained his M. Sc. and Ph.D. degree in Chemical Engineering from Laval University, Quebec. He started as a research scientist in the pulp and paper research center at the University of Quebec, Trois-Rivieres. He worked as a consultant for a Malaysian company in Kuala Lumpur to study the feasibility of producing pulp from palm oil plants. In 1997 Dr. Ahmed joined USDA Forest Products Laboratory, Madison, Wisconsin. He established Crescent Technology, LLC. in Middleton, Wisconsin in 2001. He has many joint projects and research contracts with many countries including the USA. Dr. Ahmed is a specialist in mechanical and chemical pulping, bleaching and paper making from both wood and non-wood fiber sources. He has more than seventy publications in national and international journals, and has attended numerous pulp and paper conferences. Currently, he holds two patents on pulping.

**Mr. Bernard Brochier** is a graduate in Industrial Chemistry from Paris. He joined Centre Technique du Papier (CTP) in wood chemistry and pulp technology division. From 1982 he is involved with activities of mechanical, thermomechanical and bleaching unit. He is a Project Leader in the Fibre Resources Division at CTP and in-charge of pilot plant testing and virgin fibre studies, especially annual plants.

**Dr. Eric Chao Xu** obtained his Ph. D degree from the University of Victoria, Canada in 1991. Since 1995, Dr. Xu is involved in supervising, processing, research and development activities at Andritz Pilot Plant and R&D Lab, Springfield. He has conducted investigations on various chemical mechanical pulping processes with different raw materials (wood and non-wood fibers). He developed a new patent-pending chemical mechanical pulping process concept: P-RC APMP.

He also conducted various chemeco-mechanical (APMP, AP-TMP, BCTMP ) pulping system start-ups and assisted in a number of chemeco-mechanical pulping project developments activities. Dr. Xu is the author of 15 research papers and 25 technical papers published in the national and International journals Dr. Eric is a professional member of TAPPI, PAPTAC, APPITA, ACS and received Douglas Attack Award by CPPA (PAPTAC), Mechanical Pulping Committee (1996 & 1997)

**Dr. Ghulam Mohiuddin** is the Project Leader of IJSG's Project Biotechnological Application of Enzymes for making Paper Pulp from Green Jute/Kenaf (the whole plant). He was a Project Leader of another IJO Project and developed an enzyme for the improvement of low grade jute and cutting. He trained scientists of several countries on the production and application of enzyme. He was involved with a joint collaborative research with University of Laval, Canada in 1990.

He received his M. Sc. in Biochemistry from Dhaka University in 1965 and Ph.D. in Biochemistry from UK in 1977. Dr. G. Mohiuddin has 70 publications in reputed national and international scientific journals and presented papers in various International and National Conferences and workshops. He is a member of Technical Association of the pulp and paper industry (TAPPI), USA.

**Prof. Liisa Viikari** is a Research Professor at VTT Biotechnology, Finland. Prof. Viikari obtained her M. Sc (Eng) in Biotechnology from Helsinki University of Technology in 1974 and Licentiate in Technology in 1981. She obtained her Ph. D degree in 1986 and Docent in Biochemical Process Technology from Technical University of Lappeenranta in 1989. She was awarded honors and grants from a number of organisations for her outstanding achievements in the field of Biotechnology and Environment. Her specific research areas are Enzyme technology, production, isolation and characterization of carbohydrate, especially biomass degrading and oxidative enzymes, development of biotechnical applications for pulp and paper industry, chemical industries and biotechnology for the utilization of renewable raw materials. She has 100 scientific publications and 150 congress publications/ reviews and 25 patents.

**Dr. Mizanur Rahman** is a Deputy Chief Chemist of Karnaphuli Paper Mills Limited, an enterprise of Bangladesh Chemical Industries Corporation (BCIC). He obtained B.Sc (Hons) and M.Sc degree in Chemistry from the University of Chittagong in 1981 and 1983 respectively. He got his Ph.D. degree in 1989. He has started his carrier as a Research Chemist in the Bangladesh Council of Scientific and Industrial Research (BCSIR) Laboratories, Chittagong in 1989.

In 1990 he joined Karnaphuli Paper Mills Ltd as a Chemist. He completed one-year post graduation course on Pulp and Paper Technology from the Norwegian University of Science and Technology (NTNU), Norway.

**Prof. Per Koch Christensen** received his M.Sc. in 1949 from Norwegian Institute of Technology, (NTH), Trondheim. He also studied at the University of California, Berkeley from 1951 - 1952 and Food oil industry from 1952 - 1954. He worked in SINTEF, Trondheim from 1954 - 1959. He did his Ph.D. in 1959. He did his Post graduation in 1961 at the University of Colorado. He also worked in various organisation in Sweden and USA.

**Mr. S. K Mittal** is a Deputy Managing Director of Phoenix Pulp and Paper Public Co. Ltd, Thailand. He received his M.Sc degree from Agra University, India in 1965. Mr. Mittal is involved in production of pulp and paper from non-woods and hardwoods as well as environmental management for 34 years.

He is a member of Technical Association of Pulp and Paper Industry, USA, Canada, New Zealand and Environmental Engineering Association in Thailand. He has 22 research papers published in national and international journals. He also attended a number of Seminars and Conferences in home and abroad.



**"JUTE INVESTORS' FORUM"**  
INAUGURAL SESSION  
DHAKA, 15 APRIL 1999





Organised by :

**Ministry of Jute, Government of the People's Republic of Bangladesh**

In association with :

**Government of France**

**Common Fund for Commodities (CFC)**

**Delegation of the European Commission in Bangladesh (EC)**

and

**International Jute Study Group (IJSJG)**

