



# Vision 2030



**National Institute of Research on Jute & Allied Fibre Technology**  
**Kolkata**

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# Vision 2030



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### FOREWORD

The diverse challenges and constraints as growing population, increasing food, feed and fodder needs, natural resource degradation, climate change, new parasites, slow growth in farm income and new global trade regulations demand a paradigm shift in formulating and implementing the agricultural research programmes. The emerging scenario necessitates the institutions of ICAR to have perspective vision which could be translated through proactive, novel and innovative research approach based on cutting edge science. In this endeavour, all of the institutions of ICAR, have revised and prepared respective Vision-2030 documents highlighting the issues and strategies relevant for the next twenty years.

National Institute for Research on Jute and Allied Fibre Technology (NIRJAFT), Kolkata has the mandate to address immediate, medium and long term research needs in the areas of fibre quality, processing, value addition and by-products utilizations in relation to all natural fibres other than cotton. The Institute has backward linkages with natural fibre production systems in terms of improvements in varieties and forward linkages with processing industries to enhance their efficiency and profitability. The Institute has been working to develop more efficient and cost-effective processing technologies for use both in production catchments and in the organized sector.

It is expected that the analytical approach and forward looking concepts presented in the 'Vision 2030' document will prove useful for the researchers, policymakers, and stakeholders to address the future challenges for growth and development of the agricultural sector and ensure food and income security with a human touch.

( S. Ayyappan )

Dated the 8<sup>th</sup> July, 2011  
New Delhi

## Preface

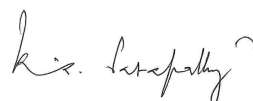
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The technological innovations in Jute sector coupled with global consciousness in favour of natural products have brightened the future of jute crop which is being threatened by its synthetic substitutes in the recent times. Jute is vital for the East and the North-East Indian economy as it sustains more than 44 lakh people directly or indirectly including the jute farmers, workers, labours, self employed artisans and weavers. Jute has already been recognized as eco-friendly, bio-degradable, and renewable natural fibre with substantial value addition at each stage of processing. Moreover, the revolutionary changes in economic, environmental and trade policies have also opened up new opportunities for the jute industry for harnessing through technological innovations. NIRJAFT has played a key role in the development of many technologies for effective utilization of jute fibre.

The Vision 2025 prepared by the Institute has enumerated a broad outline of the views and priorities of the Institute. On the verge of the 12th five year plan, the Institute has ushered in some priority areas which were untouched and uncovered a few years ago. This outlook of starting afresh has emerged as the need of the time as the Institute will soon attain its Platinum Jubilee in 2013. Under this circumstances, it become necessary to revisit the Vision 2025 document and look at the priorities and programmes afresh with an outlook for 2030. The vision 2030 document is prepared strictly in accordance with the format suggested by the Council. The mandate of the Institute has been widened in the recent past which has been further integrated in this VISION document.

As the perspective plan of the institute is ready, with active participation of a dedicated team of researchers and with the cooperation from all levels of staff members the programme envisaged would be accomplished with dedication and spirit. Appreciations for the efforts from scientists, officers, all kinds of staff members are due for bringing out this VISION statement and hope this document will illuminate the future of the Institute on the onset of her Platinum Jubilee.

June 2011  
Kolkata



(K.K. SATAPATHY)  
Director

## Preamble

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Jute, known as the golden fibre for its brilliant colour and lustre, is an important cash crop especially in the eastern and north-eastern part of India. It also contributes significantly to indian economy by supporting livelihood of four million farmers in agriculture and creating employment opportunities to one million people in organized jute mills, diversified units and tertiary sectors engaged in jute related economic activities. Jute and jute like fibres viz. kenaf and roselle have been traditionally used as flexible low cost packaging material for industrial and agricultural products. Due to global warming, world market prefers environmental friendly natural products and it has created more demand for diversified and innovative jute products in the textile sectors. National Jute Policy-2005 has defined the goals and objectives of the jute sector in order to attain and sustain a superior position of jute fibre in the manufacture and export of eco-friendly jute products with state-of-the-art infrastructure by strengthening the R&D activities with public-private partnership. The development of good quality fibre and value added diversified jute products would ensure remunerative prices to millions of farmers and benefit to other stake holders in the jute sector.

Besides jute, other natural cellulosic fibres like banana, sisal, flax, ramie, sunnhemp, coir and pineapple leaf have characteristic properties of textile fibre and possess immense potential for creating environment-friendly textile products. But such fibres are scarcely used due to lack of awareness and appropriate extraction and processing technologies for these fibres. The potentialities for utilization of these fibres into value added products may be exploited in order to increase the production of these fibres in commercially viable manner.

National Institute of Research on Jute and Allied Fibre Technology has created a vast knowledge base and developed

technologies for the medium and small scale entrepreneurs in the decentralized sector. Pioneering work has been carried out on quality upgradation, design and development of instruments for quality management, processes for diversification and value addition, technologies for utilization of fibre agro-residues, geotechnical and agro-horticultural applications of fibres, biocomposites, fibre boards, paper, etc., for jute and allied fibres. By disseminating these technologies in regular interval, opportunities have been created in employment generation and livelihood support improvement for farmers at large. With the advancement of science and technology, new approaches, improved methods and better technologies would be harnessed to meet the technological challenges of promising breakthroughs in the production of innovative and diversified product development from jute and allied fibres.

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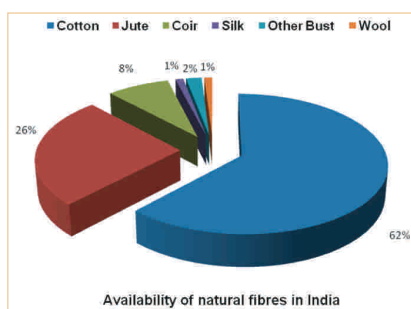
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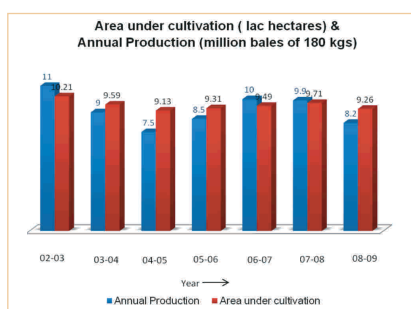


## Jute & Allied Fibres : Present Scenario

Jute and allied fibres constitute a diverse group of plant fibres catering to the various requirement of the people in the country apart from creating large employment opportunities and contributing significantly to the national exchequer through the export of jute goods. The jute sector occupies an important place in the national economy especially in the eastern and north-eastern regions as it supports nearly four million farm families generating about ten million man-days of employment in the rural India in farming activities though it shares only about 0.15% of the cropped area in the country. Besides, jute industry also provides direct employment to about 2 lakh industrial workers and livelihood to another 1.5 lakh people in the tertiary and allied sectors. The average export of jute goods per annum in last four years is 166,000 tonnes at a value of Rs.10, 756 million. Jute cultivation still remains traditional without any significant technological intervention and poorly remunerative to the cultivators who are largely marginal and small farmers with limited resource base.



The changing global environment has made the people aware all over the world to use more natural fibres and created more and new opportunities for development of jute and allied fibres which enjoy unique position as eco-friendly, bio-degradable and renewable natural fibres. Recognizing the significance of jute in India's economy, the Government of India announced the National Jute Policy 2005 to focus on thrust areas for overall development in jute sector to increase production as well as consumption and export. Other natural fibre crops viz. ramie, sisal, sunnhemp, flax, banana fibre and pineapple leaf fibres which have vast fibre yield collectively, have been scarcely utilized due to lack of standardized technology for effective utilization of those fibres for growing concern. The environment and dwindling petroleum reserves have made the future of these fibres visible due to remarkable qualities and diverse industrial potential.



### Jute textile industry

There are 80 composite jute mills in the country, of which 62 are located in West Bengal only. The total production of jute goods was 16.34 lakh tonnes in 2008-09, valued at approximately Rs. 6000 crores. The product mix of the jute industry is highly skewed in favour of low-valued jute sacks and hessian (more than 80%) due to poor quality of fibre produced. Nineteen hundred small and medium sector enterprises (SMEs) provide employment to around



Automated Jute/coconut fibre spinning machine

1.35 lakh artisans/workers who are engaged in production of diversified jute products. The jute industry has grown marginally at a cumulative annual growth rate of 0.1% in volume since 1999, but it grown in value terms largely because of increase the costs over the years. Domestic consumption of jute goods contributes to around 87% of the production and exports are in the range of

around Rs. 1050 to Rs. 1190 crores. Sacking is the key product in the domestic as well as in export market, besides the jute diversified products which include yarn, soil saver, decorated fabrics, etc. The Industry is labour intensive and as such, its labour-output ratio is significantly high compared to other industries. There has been little technological breakthrough in the production process in spite of steps taken by the Government of India for modernization since 1980s as the industry, mostly engaged in manufacturing conventional sacking and hessian, shows limited interest in adopting the new machinery and technology.

### Jute Diversification

Today, India is one of the largest producers of jute products in the world. Government of India is trying to rejuvenate the jute sector through various activities and policy decisions. The Government launched the Jute Technology Mission (JTM) spanning a period of 5 years during the 11th Five Year Plan period (2007-08 to 2011-12) for overall development of the jute industry with diversified products. There are some technological breakthroughs concerning uses of jute and allied fibres. Jute composite, geojute, paper and pulps from whole jute plant as well as from jute fibre, particle boards from jute sticks etc. are showing promise. There have been innovations in designing and manufacturing of blended fabrics, home textiles, supply bags, decorative and other non-traditional items manufactured from blended yarns



Caplon Blanket

and fabrics. There is about 16 per cent increase in the value of JDP export during 2007-08 as compared to 2006-07. The future prospect of this eco-friendly natural fibre is expected to improve with effective support from the governments of the jute producing countries through adoption of appropriate policies like banning of synthetic packaging materials and enactment of regulations favourable for its cultivation, diversification and marketing.

#### Sustainability and eco-friendliness

Natural fibres are a renewable resource and totally biodegradable at the end of their life cycle. They are also carbon neutral and generate mainly organic waste. The Kyoto protocol on global climate change has accelerated change towards a sustainable and more environmental friendly economy. International environment laws promote green economy that favours Indian scenario of growing market of technical textiles. Technical textiles from natural fibres may reduce the dependence on depleting petroleum based synthetic products. A number of new markets are emerging such as fibre reinforced composites in automotive industries, building and construction materials, biodegradable geotextiles and jute diversified products. Evaluation of jute for its ecological and environmental compliance and quality has shown that jute has high capacity of fixing atmospheric carbon and biological efficiency.



Demonstrative field trial on protection of river-bank using jute-based geotextiles

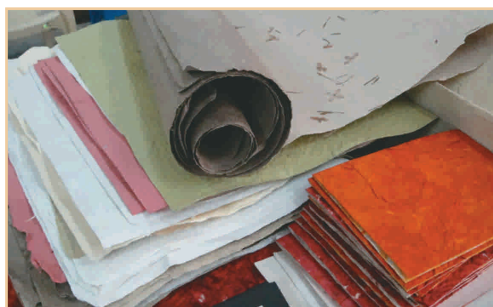
#### Technology landscape

Development in biotechnology, nano-technology and plasma technology are expected to effect a paradigm shift in processing of jute and allied fibres to provide opportunities for development of new products and productivity enhancement. These are also posing new challenges of capacity building and human resource development. There is a need to develop organizational policy and guidelines aimed at enhancing inventions and accelerating innovations in technology to harness the opportunities in the field of natural fibres especially in jute sector by integrating both modern and conventional research approaches.

#### Emergence of new business ventures

Jute has a long history of use in the packaging industry. New opportunities have emerged in the packaging segment for increase in food grains production due to green revolution. But, the major breakthrough would come when the automobile, pulp and paper, and the furniture and construction industries

use products of jute and its allied fibres such as technical textiles and composites. Jute and allied fibres have entered into various diversified sectors, where natural fibres are gradually becoming better choice. Apart from having huge export potential, jute-based companies cater to the domestic and the international markets. As the Indian jute industry is facing severe challenges



Handmade Paper from Jute

in the international market from synthetic packaging materials and from Bangladesh, the industry needs innovative processes and diversified products to overcome them. National Institute of Research on Jute and Allied Fibre Technology (NIRJAFT) through sustained research over the decades in this

area has come out with a number of technologies and diversified products with jute and other natural fibres. With an increase in consumer's preference for biodegradable products, the jute industry enjoys an advantageous position. There is an increased demand for a ban on the use of plastics in different parts of the world. This has opened up new opportunities for the jute industry. The rising popularity of ecofriendly jute items has prompted the need of small and mid-sized companies for production of ecosustainable products based on jute and allied fibres.

## National Institute of Research on Jute and Allied Fibre Technology

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National Institute of Research on Jute and Allied Fibre Technology, established in 1938, is premier institute dedicated to the cause of jute and allied fibres leading to agricultural development in one hand and industrial growth on the other. With passage of time the institute has undergone a thorough reorientation in its activities conforming to changed consumer



demand and global scenario. It has been well realized that for survival with full vigour the commodity should not be restricted in making packaging goods only. The benefit of the sector should reach the farmers, traders and industrialists in totality. It has, however, been found that farmers do not get

remunerative price for their produce and they are, in general, being discouraged to grow jute because distressed sale have become a common feature in almost all the years. This is not a healthy situation at all and the jute and allied fibre sector can only flourish if benefit can be shared duly among the farming community, traders and industries at large. The uniqueness of jute crop is its annual renewability at a low cost and farming of jute is affected by adversities of nature to a lesser extent than other crops.

With the above scenario in the background NIRJAFT has transformed itself from a mere quality testing organization to a research institute with well distinct activities viz. (a) Work on jute as well as allied fibres and their agro- and industrial residues, (b) Post harvest technology aspects and development of products from as well as allied fibres, (c) R&D activities on both woven and non-woven products to be used as domestic goods, disposable bags, floor coverings, geo-textiles, agro-textiles, other technical textiles and composites, (d) Interaction with both organized and decentralized sectors and the farming community as well as functioning in close collaboration with industries and entrepreneurs in one hand and academic institutions on the other. The challenges being faced has to be countered through extensive diversification of jute products beyond the packaging goods. For this, chemical, biochemical & nano-technological modification and development of processes & products for utilization of jute & allied fibres in new and virgin areas, development of miniature processing system, blending of jute and allied fibres with

natural/manmade fibres may be taken up as strategies. The trend shows that in the future days to come NIRJAFT will be a multi-disciplinary institute encompassing engineering, textile technology, chemical technology, electronics, bio-technology and nano technology as well.

#### Mandate

- To carry out basic and technological research on jute and allied fibres.
- To promote production of good quality fibres.
- To upgrade the fibre and the product quality.
- To find diversified uses of plant fibres, their by-products and industrial wastes in large scale and decentralized sectors.
- To act as a repository of scientific and technological information on jute and allied fibres.
- To act as a centre of human resource development in relation to jute & allied fibres and establish linkages among different scientific and industrial organizations through exchange of scientific and technological knowledge.

In the past, research contribution of the institute comprised development of various technologies for improved retting, devising system for grading jute and popularization & creation of miniature jute spinning system in decentralized sector. The institute developed several technologies for processing of under utilised fibres such as pineapple leaf, banana, ramie, sisal, etc., on jute machinery. A number of products including jute apparel, furnishing textiles, shopping bags, and garments have been developed. Different types of non-woven products and its applications as geo-textiles, agro-textiles and technical-textiles have been identified. Improved bleaching, dyeing and finishing of jute yarn and fabrics using energy saving and eco-friendly techniques helped in development of value added and diversified products. Particle board, bio-composites and moulded products and pulp and paper have been produced from jute and jute residues which were found popular in industries. A number of modern instruments were devised for evaluation of jute fibre and product quality and studies have been made on fine structure and physical properties of bast and leaf fibres. Institute has the credit of having several patents which are already granted and few of the patents are in the final stage of approval. To revamp the industry and nurture the small and medium scale entrepreneurs, business planning and development (BPD) unit has identified several technologies to turn the innovative research ideas into sound commercial ventures in technology business incubation concept.



## NIRJAFT 2030

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National Institute of Research on Jute and Allied Fibre Technology is playing a path breaking role in the field of post harvest technology on jute and allied fibres while overcoming numerous challenges for more than seven decades of its existence. The technologies developed by the institute have been adopted by the farmers and industries and applauded by the policy makers for its contribution to the society. The institute has been responsive, vibrant and sensitive to the needs of its stakeholders and it is expanding its reach for generating and disseminating new knowledge in the development of technology on natural fibres.

### Vision

To uphold the cause of jute and allied fibres in favour of farmers, traders and industrialists keeping in view the prevalent global scenario and bring back the glory of the golden fibre with socio-economic uplift.

### Mission

Exploiting the intrinsic and advantageous properties of jute and allied fibres in diverse applications and overcoming the short comings, if any, by the application of scientific tools through development of technologies, products and processes for the benefit of farmers and industries both in the large and small scale sectors.

### Focus

NIRJAFT is engaged in holistic development of natural ligno-cellulosic fibre sectors starting from production, processing, marketing and entrepreneurship development. The institute would now concentrate on the following strategic areas involving modern frontier research technologies.

- Cost-effective production, processing and value addition to jute and allied fibres and breakthrough in promising fields harnessing cutting edge technologies in today's competitive global environment
- Development of geotechnical environment and end use specific agro- and geotextile systems (woven, bonded, knitted and their combination) and establishment of their standards
- Development of water saving and eco-friendly technologies by using microbial / biotechnological intervention for faster retting and extraction of improved quality fibres with low or no-water requirement

- Instrumentation for quality management of fibre, development of finer yarn from jute and jute blends, new process line for spinning and non-woven machinery
- Development of jute and allied fibre based bio- and green-composites, non-yellowing hand-made paper from jute whole plant, green technologies utilizing eco-friendly processing and finishing chemicals
- Biotechnological and nanotechnological intervention for development of value added diversified products, nano-composites for improved microbial resistant materials
- Appropriate processing technologies for under-exploited fibres like banana, coir, sisal, pineapple leaf fibre , ramie, etc., and their agro-residues through value chain approaches
- Life cycle analysis and development of bench mark, standard and protocol for eco-labeling of jute products
- Human resource development and entrepreneurship development through business incubation, cluster development to promote livelihood through marketing of innovative natural fibre products



## Harnessing Science and Technology

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The cultivation and post-harvest processing of natural fibres being labour intensive, provides a large number of livelihood and employment generation opportunities in the rural sectors in India. Considering annual production and utilization in textiles of different plant fibres, jute ranks second to cotton in the country with an average annual production of about two million tonnes. The other plant fibres which are available in the established crops system in the country and have vast yield and utilization potential do not have any significant presence in the trade and industry. The multifarious technological challenges for extraction and utilization of these fibres and their residues would be undertaken through emerging new approaches and better technologies with the advancement of science and technology which promise breakthroughs to accomplish the goal. It would help in economic growth of the country by improving livelihood and employment generation in rural sector. Intervention of emerging power of science and technology would be made in the following areas for production, processing, and value addition to jute and allied fibres as well as in exploiting the utilization potential of their agro-residues.

### Extraction of quality fibre

One of the major problems of jute industry for diversification of and value addition to jute is the inadequate supply of high quality fibre. The quality of jute is greatly affected by imperfect retting in the traditional process due to non-availability of adequate water and washing of fibre besides high labour input, drudgery and environmental pollution involved in the process. The problem of creating adequate retting facilities and sustainable production and supply of high quality fibre in sufficient quantity has been a burning issue due to scarcity of water for retting caused by erratic monsoon and global climate change. The following alternative technologies would be explored to develop water-saving and user friendly processes for extraction of jute and jute like fibres viz. kenaf and roselle

**Ribbon retting :** Development of a high capacity machine for peeling ribbons from green plants and retting of ribbons by chemical/microbial action in minimum volume of water is envisaged for production of high grade fibre.



Demonstration of power ribboner

**Fungal retting :** Fungal retting of jute conducted by spraying with specific fungus without addition of water directly on the harvested green plant has been found effective for extraction of fibre. Development and standardization of the technology for fungal retting of jute, a technology of immense possibility, can change the paradigm of jute cultivation.

**Microwave and Ultrasound technologies :** These are potential technologies for retting jute with very little or no requirement of water. Microwaves of specific wavelength are capable of breaking the bonds between lignocellulosic material, pectin and gums that may perform miracle in retting of jute and degumming of ramie within a few minutes of exposure to specific microwave. Development of this technology can bring a real breakthrough for retting of jute and degumming of decorticated ramie fibre as pollution free and time saving method.

**Steam explosion:** Steam explosion usually involves the thermal treatment of biomass with water under pressure. Then the pressure is suddenly released, causing the biomass to break and explode, with the simultaneous fibrillation of the exploded biomass. The process has been experimented on flax and hemp extraction when short length fibre of high purity was obtained which may be processed to produce high quality yarn and fabric. The process may be explored for production of jute fibre suitable for production of biocomposites and paper pulp.

**Value chain approach for unexploited and under exploited fibres and their biomass**

A variety of other natural cellulosic fibres like ramie, sunnhemp, sisal, pineapple, flax/linseed, banana, dhaincha, bamboo, coconut, etc., are available in India which have negligible share in the trade and industry. Each of these fibres has some distinctive textile properties. Lack in sufficient information of these fibres, leads to under exploitation. Blending of these fibres with jute imparts a very special functional properties and enhances the value of product. Management of this vast resource of natural fibres and their agro-residue biomass would be given priority for integration in the system by intervention of new methods, techniques and technologies.

**Intervention of bio, nano, and plasma technology**

There is a wide scope for development of diversified textile products from ligno cellulosic fibres by its physicochemical modification. Plasma technology could be used to modify the surface of fibres for better value addition. Developing nanocomposites and nanofinishing of textiles for technical applications using nanotechnology are some of the areas of frontier research.

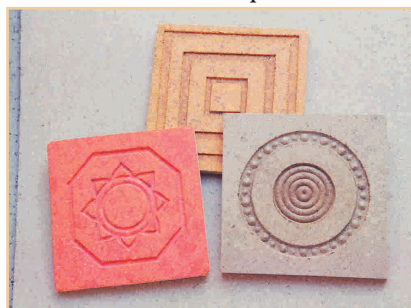
Biotechnology has a significant role and potential to address the on-going and future challenges in eco-friendly process and product development from natural fibres. Priority would be given to those areas like fibre extraction, eco-friendly chemical processing, bio-pulping, utilization of biomass for production of ethanol and other important molecules, etc. which have shown considerable research success through conventional approaches in the past. These technological interventions would be integrated in the on-going and future research programme for better outcome of research and higher achievement.



Bleached &amp; Dyed Jute Fabrics

#### Management of agro-residues

Efficient management of the huge amount of biomass generated in the extraction process of bast, fruit and leaf fibres would be given high priority for post-harvest processing, value addition and marketing. Potential applications of some fibre agro-residues for creating wealth from waste viz particle boards and fibre boards from jute retting agro-residue, energy from jute stick etc. through carbonization and pelletization, paper of different grades through pulping of agro-residues, bio-fuels like ethanol, hecogenin and pectin from sisal fibre extraction residues, bio-adhesive from agro-residue pulping and ramie degumming effluents, etc., would be explored. With the advancement of knowledge in science and technology and emergence of new tools and techniques, more focus would be given, to primary and secondary level value addition and processing of these vast resources to promote the natural fibre value chain.



Decorative Jute Stick Particle Board

#### Advanced processing and product development

Development of speciality yarns and fabrics from jute and its blends, processing of underutilized fibres like linseed, sisal, banana, pineapple, coconut etc. for value addition, jute based geo-technical and agro-horticultural textiles, bio-composites, fibre boards, etc are some of the areas in which considerable research has been carried out with some success through conventional approaches in the past. High speed, energy efficient, auto-control processes and nonconventional yarn & fabric engineering would be integrated in the on-going and future research programmes to maximize the production and marketing potential in order to meet the consumer choice and preferences.

#### Advance instrumentation and process control

Instruments for quality management and grading of jute and allied fibres, modification of existing handloom system for production of jute based speciality fabric, etc. had been developed through sustained research work in the past. Priority would be given to research in the area of instrumentation and machinery development specially for development of an integrated instrument



Digital Electrical Insulation Value Tester

system for quality evaluation and grading of fibres, upgradation of jute processing machinery including non-woven product line, process control system for efficient utilization of resources and quality improvement of products. Application of new ideas and innovations would promise technological breakthroughs to accomplish the goals.

#### Technology transfer systems

Effective delivery of the new and better technologies to the stake holders through improved knowledge management system would greatly help in realizing the potential of the technology. Dissemination techniques for transfer of technology, knowledge and information related to jute and allied fibers to the stakeholders through training, pilot plant demonstration, entrepreneurship development, business incubation in participatory model, etc. would be harnessed for effective transfer of research achievements to the end users.



#### Human resource development

Upgrading of the quality of human resource through sustained training and educational programme is essential in research organization for successful implementation of its research programme, developing technologies and dissemination of knowledge to the stake holders. Effective and need based training programme to improve the human resource through development of state-of-the-art infrastructure and enhancing the faculty competence would be undertaken to address the challenges adequately in the emerging fields of research. This would facilitate close linkage between research & development and the end-users through dissemination of technologies, knowledge and information.

## Strategy and Framework

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National Institute of Research on Jute & Allied Fibre Technology would adopt a multi dimensional strategy to achieve the visions and goals set for the period (Annexure).

- Socio economic improvement of jute growers and improvement in quality of fibre
  - Eco-sustainable system of retting of jute fibre to eliminate polluting aspects in traditional retting process
  - Efficient and user-friendly extraction and grading systems for jute and allied fibres.
  - Utilization of agro-residues by value addition through product / process development.
  - Paper and composites based on whole jute plant
- Upgradation of market driven technology and product development for growth and long-term viability of jute industry.
  - Engineering fine yarns and lighter fabrics from jute to produce high value home and packaging textiles
  - Eco-friendly and efficient jute processing system by ensuring replacement of batching oil, lowering of power consumption and improving process & productivity
  - Modern process control system to improve the efficiency, product quality and flexibility in jute industry
  - Nonwoven technology and products based on jute and allied fibres to diversify the product range of jute industry
- Innovative and cutting edge technological intervention for developing value added products from jute and agro-residues.
  - Use of nano and bio-technologies for development of value added diversified jute textiles for functional applications
  - Engineering of end use and eco-system for specific technical (geo/ agro/ packaging) textiles
  - Jute products with attribute of triggered bio-degradability to produce textiles for geo-technical applications and bio-composites
  - Bio and green composites based on jute and agro-residues – in collaborative multi-institutional approach viz. use of steam explosion/ ultrasonic techniques

- Nano composites based on cellulosic microfibrils from different sources
- Superior grade paper based on jute & allied fibres and agro-residues, suitable for producing in small scale sector
- Intellectual property right, compatible transfer of technology system for accelerated dissemination of technologies, knowledge and information
  - Capacity building and empowerment through training and technology demonstration
  - Establishment of regional centres, technology park, techno-museum and jute cluster, to enhance awareness of the potentials of natural fibres as a vehicle of wealth generation
  - Entrepreneurship development through BPD system
  - Collaboration with organizations / body of stake holders engaged in promotion of jute products for dissemination of information, transfer of technology and receiving feedback on technology/product requirement
- Efficient use of under-exploited allied fibres and agro-residues through value chain system
  - Machinery and equipment for extraction, processing and grading of allied fibres available in the region and setting up of pilot plants for demonstration at the production centres
  - Development of value-added market driven products from the extracted fibres
  - Improvement of indigenous processing technologies for the benefit of local entrepreneurs.
  - Utilization of agro-residue for creation of wealth and employment



## Epilogue

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NIRJAFT, a premier institute for technological research on jute and allied fibres has made significant achievements to promote utilization of jute and other natural fibres in diversified areas by exploiting their intrinsic properties. Some of the multifaceted areas of research the institute has addressed successfully through sustained R & D activities in the past upgradation of fibre quality through improved retting techniques, instrumentation and quality management of fibres, yarns and fabrics, process development for diversified value added products of consumer appeal, development of woven, non-woven and knitted jute based technical textiles with export potential, development of rural based low cost technologies for conversion of fibres and their agro-residues to value added products, bioenergy generation, advance chemical and biochemical finishing of fabrics and management of IPR issues. The increasing energy cost and environmental consciousness has created new opportunities in the market for development and integration of natural fibres to meet the growing demand of diversified and innovative eco-friendly products of consumer appeal from jute and allied fibres.

The emerging power of science and technology would be harnessed in the research activities of NIRJAFT for cost effective production, processing and value addition to jute and allied fibres, exploring utilization of natural fibres with new approaches and better technologies for breakthroughs in the promising fields of geo-technical and agro-horticultural applications, bio and green composites development, etc. as well as in exploiting the utilization potential of their agro-residues. Stress would be given on developing low cost and eco-friendly technologies for extraction of fibres with zero or minimum water requirement in view of water scarcity due to changing global climate and erratic monsoon.

Innovative and cutting-edge technological intervention with biotechnology and nanotechnology for developing value added products and nano-composites from jute and allied fibres would be a major concern in the ensuing research programme of NIRJAFT. Efficient utilization of under-exploited fibres like banana, sisal, ramie, pineapple leaf fibre, etc. and their agro-residues through value chain system would be given priority to accomplish the goal of empowerment of the poor and economic growth of the country by improving livelihood and employment generation in rural and semi-urban sectors. Management of IPR issues and environmental concern in R & D activities are important issues in the present context and would be addressed effectively to accelerate innovations and linking research with the stakeholders.

The vision and mission of NIRJAFT is its persistent endeavour to become the Centre of Excellence in Natural Fibres with development of state-of-the-art infrastructure and application of cutting edge technologies in research harnessing the power of science to promote innovations and sustainable development in the field.

## Bibliography

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## Annexure : Strategic framework

Goal	Approach	Performance measure
Improved quality fibre availability for high growth and competitiveness of jute sector	<p>Eco-friendly and efficient retting process</p> <p>Mechanization of fibre extraction system</p> <p>Biotechnological intervention for accelerated retting</p> <p>User friendly instruments and grading system for natural fibres</p> <p>Effective utilization of agro residues</p>	Better remuneration to jute farmers
Modernized multiproduct self sustaining jute industry	<p>Engineering of fine yarn and fabric from jute and its blends</p> <p>Development of eco-friendly and efficient jute processing system</p> <p>Modern process control system for jute industry</p> <p>Development of modern fabric preparation systems (e.g. Nonwoven, knitting, etc.)</p> <p>Development of materials property evaluation system</p>	Increased share of jute products in the global market
Increased use of natural fibre-rich innovative green products	<p>Value added textile products by the application of cutting edge technologies (Biotechnology, Nanotechnology, Plasma technology)</p> <p>Improved quality of paper, pulp and composite products from jute plant</p> <p>High performance textiles with specific functional properties</p> <p>High performance diversified bio, green-composites and moulded products</p> <p>End-use and eco system specific geo-, agro- and technical-textiles</p> <p>Jute products with triggered biodegradability</p>	Consumption of natural fibres in high end products

Annexure : Strategic framework (Contd.)

Goal	Approach	Performance measure
Value chain on unexploited/ under exploited natural fibres	<p>Machinery and equipment development for efficient extraction, processing and testing of fibres</p> <p>Effective utilization through physico-chemical modification of fibre characteristics</p> <p>Development of diversified value added products</p> <p>Improvement of local processing technologies</p> <p>Agro-residue utilization for creation of wealth and employment.</p>	Increased use of natural fibres and its products
Eco-labeling of jute product	<p>Life cycle analysis and eco labeling of jute products</p> <p>Carbon sequestration and carbon credit in jute cultivation/fibre extraction</p> <p>Identification and development of eco friendly spinning additives</p> <p>Energy auditing in jute industry and its optimization</p> <p>Identification and development of eco friendly lubricants</p> <p>Application of eco friendly / natural chemicals for dyeing, printing, bleaching and finishing</p>	Eco-labeled green products
Effective knowledge management system and Business incubation	<p>Portal based knowledge management system</p> <p>E-resource database with dynamic updating</p> <p>Decision support system</p> <p>Capacity building through training and technology demonstration</p> <p>Establishment of Regional Centres, Technology Park and Jute Cluster</p> <p>Liaison with organizations and institutions committed to the promotion of jute and jute products</p>	<p>Improved research efficiency</p> <p>Qualified / skilled man-power</p> <p>Employment generation</p>



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