Natural Fibers with Cultivation & Uses

(Leaf Fibres, Bast Fibres, Flax, Hemp, Jute, Knaf, Ramie, Sunn or Sunn Hemp, Abroma Augusta, Sisal, Mauritius Hemp, Pineapple Fibre, Caroa Fibre, Abaca or Manila Hemp, Coir or Coconut Fibre, Coco Fibre, Kapok Fibre, Akund Floss)
Fiber or fibres (see spelling differences) are a class of hair-like materials that are continuous "'filaments'" or are in discrete elongated pieces, similar to pieces of thread. They can be used as a component of composite materials. They can also be matted into sheets to make product such as paper or felt. Fibers are of two types: natural fiber, which consists of animal and plant fibers, and man-made fiber, which consists of synthetic fibers and regenerated fibers. The earliest evidence for humans using fibers is the discovery of wool and dyed flax fibers found in a prehistoric cave in the Republic of Georgia that date back to 36,000 BP.
Natural fibres are generally considered more environment friendly than synthetics in their production and disposal. However, there is great variation depending on the fibre and the growing conditions. Many chemicals are used to contain pests and weeds. Chemicals are also used in the processing and dyeing which can lead to water contamination. Processing of some natural fibers can lead to high levels of water pollutants, but they consist mostly of biodegradable compounds, in contrast to the persistent chemicals, including heavy metals, released in the effluent from synthetic fiber processing. Farming and production of natural fibres also plays a significant role in eradicating poverty as an important source of farming income and contribution to food security in developing countries.
Demand for natural fiber composites are largely driven by increasing environmental awareness. Due to low cost, low density, acceptable specific properties, ease of separation, enhanced energy recovery, CO2 neutrality, biodegradability and recyclable properties, natural fiber use in composites is gaining as demand grows for component materials that are durable, reliable, light weight, with mechanical properties better than those of traditional materials. Total global natural fiber composite market expected to grow at 11% CAGR.
Market Outlook

India accounted for 7.3% of World's manmade fibre/filament output with production volume of 6.4 million tons. India is a major exporter of cotton fibre, ranking second in 2014. In 2014, India produced 4.14 million tons of manmade fibres 6.4 million tons of cotton.
India’s Share in World Production

<table>
<thead>
<tr>
<th>Material</th>
<th>India</th>
<th>Rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>24.60</td>
<td>75.40</td>
</tr>
<tr>
<td>ASF</td>
<td>4.26</td>
<td>95.74</td>
</tr>
<tr>
<td>Nylon</td>
<td>2.38</td>
<td>97.62</td>
</tr>
<tr>
<td>PFY</td>
<td>8.43</td>
<td>91.57</td>
</tr>
<tr>
<td>PSF</td>
<td>7.30</td>
<td>92.70</td>
</tr>
<tr>
<td>VFY</td>
<td>14.73</td>
<td>85.27</td>
</tr>
<tr>
<td>VSF</td>
<td>9.18</td>
<td>90.82</td>
</tr>
</tbody>
</table>
The NFCs market was worth USD 3.36 Billion, in 2015, and is projected to reach USD 6.50 Billion in 2021 expected to register a CAGR of 11.68%, between 2016 and 2021. Natural fibers have become crucial in technical composite applications due to the demand for recyclable and biodegradable raw materials.

The market size is projected to reach USD 6.50 Billion by 2021, at a CAGR of 11.68%, between 2016 and 2021.
# Table of Contents

1. INTRODUCTION

   The Occurrence and Nature of Vegetable Fibres
   Bast Fibres
   Leaf Fibres
   Fibre Identification
   Testing of Fibres
   Chemical Analysis
   Fibre Fineness and Commercial Use

[www.entrepreneurindia.co](http://www.entrepreneurindia.co)
2. FLAX FAMILY (LINACEAE)

Flax (Linum Usitatissimum)
Conditions Necessary for Growing Flax
Varieties
Cultivation
Harvesting
Pulling
Drying
Retting
Dew Retting
Water Retting
Warm Water Retting
Leaching
Double Retting
Aerated Retting
Green Flax
Scutching
Flax in the U.S.S.R
Flax in Belgium
Flax in Other Countries
China
Japan
Egypt
India
Australia
New Zealand
Kenya
Uganda
Grading of Flax
Properties of Flax
Trade
3. MULBERRY FAMILY (MORACEAE)

Hemp (Cannabis Sativa)
Botany
Breeding Experiments
Cultivation
Harvesting
Yield
Retting
Breaking and Scutching
Hemp in China
Hemp in Chile
Quality of Hemp
Properties and Uses of Hemp

www.entrepreneurindia.co
4. LIME FAMILY (TITLIACEAE)

Jute (Corchorus Capsularis and C. Olitorius)

Cultivation
Soil
Preparation of the Soil
Sowing
Varieties
Harvesting
Retting
Extraction of Fibre
Cost of Production
Jute in Brazil
Jute in China
Production in Taiwan
Experiments on Mechanized Production of Jute Varieties
Cultivation
Harvesting
Ribboning
Scutching
Retting
Washing
Drying and Storage
Sorting and Grading

www.entrepreneurindia.co
Production of Jute in Other Countries
Burma
U.S.S.R
Borneo
Malaya
Philippines
Thailand
Nepal
Vietnam
Iran
Peru
Miscellaneous Countries
Sorting and Grading of Jute
Uses of Jute
The Jute Trade
Triumfetta Species
Honckeney Ficifolia
Funga Fibre (Cephalonema Polyandrum)
5. MALLOW FAMILY (MALVACEAE)

Knaf (Hibicus Cannabinus)

Varieties
Sowing
Harvesting
Growth Phases
Retting
Pests and Diseases
Kenaf in India
Kenaf Production in Various Other Countries
Argentina
China
Egypt
Guatemala
Haiti
Italy
Mexico
Mozambique
North Africa
Papua and New Guinea
Peru
Southern Rhodesia
Spain
Thailand
South Africa
Economics of Kenaf
The Use of Unretted Kenaf Ribbons for Sack Manufacture
Properties of Kenaf
Roselle (Hibiscus Sabdariffa)
Fibres From Other Species of Hibiscus
Urena Lobata
Cultivation
Retting
Yields
Distribution
Labour Requirements in Fibre Preparation
Grading of the Fibre
Properties and Uses
Trade
Abutilon Species
Sida Species
Pavonia Species
Thespesia Species
Miscellaneous Fibre Plants of the Malvaceae
6. NETTLE FAMILY (URTICACEAE)

Ramie (Boehmeria Nivea and its Var. Tenacissima)
Varieties
Soils and Growing Conditions
Planting
Harvesting
Yields
Replanting
Fibre Extraction
Degumming
Problems of Ramie Degumming
Drying
Ramie in China
Varieties in China
The Ramie Industry in Japan
Varieties Grown
Pests and Diseases
Grading of Ramie in Japan
Spinning of the Fibre
Ramie in Taiwan
Ramie in Brazil
Ramie in Other Countries
Uses of Ramie Fibre
Properties of Ramie
The Trade in Ramie
Other Fibre Yielding Plants of the Urticaceae
7. PEA FAMILY (LEGUMINOSAE)

Sunn or Sunn Hemp (Crotalaria Juncea)
Varieties in India
Growing Conditions
Harvesting and Yield
Retting
Washing and Stripping
Preparation of Hanks
Cleaning and Dressing
Grading
Cost of Production
Sunn Hemp in Ceylon
Properties and Uses of Sunn Hemp
Trade and Prices
Spanish Broom (Spartium Junceum)
Sesbanaea Aculeataa
8. STERCULIA FAMILY (STERCULIACEAE)

Abroma Augusta
Cultivation
Harvesting
Yields
Fibre Extraction
Properties of the Leaf
9. THE MECHANIZED PRODUCTION OF STEM FIBRES

Large Labour Requirements of Non Mechanized Production
Advantages of Mechanized Production
Harvesting Mechanically
Ribboning Machines
Problems of Ribboning
Drying
Retting
Washing
Costs of Mechanized Production
10. AGAVE FAMILY (AGAVACEAE)

Agave Species
Botany
Fibre Yields of Various Species
Breeding Experiments With Agave Species
Nature of the Fibres in the Agave Leaf
Sisal (Agave Sislana)
Cultivation
Climate and Soil
Preparation of the Land
Planting
Fertilizers
Harvesting
Yields
Decortication and Decorticating Machines
Flume Tow
Structure of the Sisal Industry
Drying
Artificial Drying
Brushing
Grading
Baling
Labour Requirements for Sisal Production
Production in Other Countries
Properties of Sisal
Uses of Sisal
Trade
Henequen (Agave fourcroydes)
Cultivation
Harvesting
Decortication
Drying
Uses
Trade
Cantala (Agave Cantala)
Cultivation
Harvesting
Retting
Uses
Trade
Agave Leтонae
Fibres from other Agave species
11. NARCISSUS FAMILY (AMARYLLIDACEAE)

Furcrea Species
Mauritius Hemp (Furcrea Gigantea Var. Willemettiana)
Yields
Extraction of the Fibre
Retting
Uses of the Fibre in Mauritius
Properties of the Fibre
12. LILY FAMILY (LILIACEAE)

New Zealand Flax (Phorium Tenax)
Production of Phormium in New Zealand
Varieties
Propagation
Cultivation
Diseases, etc.
Harvesting
Stripping
Washing & Bleaching
Scutching
Baling and Grading
Advantages and Disadvantages of Phormium Production
Production and Costs
Phormium Tenax in Argentina
Phormium Tenax in South Africa
Phorium in Other Countries
Properties of Phorium Fibre
Trade
Sansevieria Species
Propagation and Cultivation
Lily Family (Liliaceae)
Extraction of the fibre
Production in Mexico
Other Countries
Yield
Properties
Yucca And Some Relatives
13. PINEAPPLE FAMILY (BROMELIACEAE)

Pineapple Fibre (Ananas Comosus)
Cultivation
Production in the Philippines
Production in Other Countries
Extraction by Machine
Pita Fibre or Silk Grass (Aechmea magdalenae)
Harvesting
Yield
Caroa Fibre (Neoglazovia variegata)
Fibre From Other Members of the Bromeliaceae
14. BANANA FAMILY (MUSACEAE)

Abaca or Manila Hemp (Musa Textilis)
Varieties
Cultivation
Propagation
Diseases and Pests
Harvesting
Extraction of the Fibre
Grading of the Fibre in the Philippines
Production of Abaca in Central America
Cost of Producing Abaca
Production in Borneo
Abaca in Malaya
Canton And Pacol Fibres
Properties of Abaca
Uses
Trade
Fibres From Other Species of Musa and a Related Genus
15. PALM FAMILY (PALMAE)

Coir or Coconut Fibre (Cocos nucifera)
Collection of Fruit
Removal of Husks
Retting
Production of Coir Yarn
Grading of Yarn
Costs of Production
Cost of production of Fibre and Yarn
Mattings
Bristle or Coco Fibre
Dyeing of Coir Fibre
Mattress Fibre and Combings
Production of Coir Fibre in India
Production in the Philippines
Machine Extraction of Coir Fibre
Properties of Coir
Trade
Crin Vegetal (Chamaerops humilis)
Botany
Distribution
The Industry in Morocco
Extraction of the Fibre
Uses of the Fibre
Technical Characteristics
Trade
Tucum Fibre (Bactris Setosa)
Date Palm Fibre (Phoenix Dactylifera)
Doum Fibre (Hyphaene Thebaica)
16. BOMBAX FAMILY (BOMBACACEAE)

Kapok (Ceiba Pentandra)
Soils
Propagation
Yields
Harvesting
Hulling
Drying
Removal of Seeds
Baling Kapok in India
Collection of the Floss
Preparation
Grading
Baling
Properties of Kapok Fibre
Uses of Kapok
17. MILKWEED FAMILY (ASCLEPIADACEAE)

Akund Floss (Calotropis Procera and C. Gigantea)
Yields
Preparation
Grading and Packing
Trade
Uses
Kendyr Fibre (Apocynum Venetum)
Asclepias Species
18. BRUSH MAKING FIBRES

Fibres Used in Earlier Times
Properties required in Brush Making Fibres
Bahia Piassava (Attalea funifera)
Botany and Germination
Collection and Preparation of the Fibre
Properties and Uses
Para Piassava (Leopoldinia Piassaba)
West African Piassava (Raphia Hookeri and R. Graolis)
Madagascar Piassava (Vonitra Fibrosa)
Mexican fibre (Agave lecheguilla)
Harvesting and Extraction of the Fibre
Cleaning and Grading
Uses
Jaumave Fibre (Agave Funkiana)
Coco Fibre (Cocos Nucifera)
Palmyra or Bassine Fibre (Borassus Flabellifer)
Kitool Fibre (Caryota Urens)
Gomuti Fibre (Arenga Saccharifera)
Broom Root (Muhlenbergia Macroura)
Italian Whisk (Sorghum Vulgare)
Palmetto Fibre (Sabal Palmetto)
19. PAPER MAKING FIBRES

Properties for Paper Making
Treatment for Conversion into Pulp
Wood
Esparto Grass
Collection from Wild Plants in North Africa
Production in Spain
Treatment and Uses
Straw
Bamboo
Bagasse
Other Materials
20. MISCELLANEOUS FIBRES

Toquilla (Carludovica Palmata)
Preparation For Making Panama Hats
Weaving and Bleaching
Alpinia Chinensis
Polygala Gomesiana And Other Sources or Rope, etc.
Vegetable Fibre Plant, Natural Fiber, Vegetables for Fiber, Jute Cultivation, Jute Cultivation in India, Jute Processing, Kenaf Production, Growing and Production of Kenaf, Kenaf Fibre Plan, Kenaf Cultivation, Fiber Production, Processing of Kenaf, Jute Cultivation and Jute Industry, Jute Processing Steps, Jute Industry in India, Jute Business, Ramie Natural Fiber, Ramie Plant, Fiber from Ramie Plant, Growing Plants for Natural Fibers, Planting Ramie, Growing Ramie, Bast Fibres Processing, Fiber Plants, Grading of Ramie, How to Grow Sunn Hemp, Sunn Hemp Cultivation, Sunn Hemp Cultivation in India, Sunn Hemp Fiber, Abroma Augusta, Sisal Plantations, Sisal Fibre, Sisal Plant, Cultivation of Sisal, Pineapple Fiber, Pineapple Leaves Fibre, Natural Fibre from Pineapple Leaf, Pineapple Farming, Commercial Pineapple Cultivation, Pineapple Cultivation, Pineapple Plantation, Pineapple Farming in India, Pineapple Farming Profitable Business, Coir or Coconut Fiber, Process of Making Coconut Fibre, Coconut Fiber Processing, Coconut Coir Processing, Coir Fibre Manufacturing Process, Coir Industry in India, Coco Fibre, Palmyra Fibre, Palmyra Bassine Fibre, Palmetto Fiber, Papermaking Fibres for Paper, Papermaking Fibres, Plant Fibre for Papermaking, Paper and Paper Making, Pulping & Conversion, How Panama Hats are Made, Panama Hat Making, Manufacturing Process of The Panama Hats, Panama Hats Manufacture, Fibre Yielding Plants of India, Extracting Fibres from Plants, Leaf Fibre Plant, Leaf Fibres From Plants or Vegetables, Flax Seed Cultivation, Growing Flax Seed,
Niir Project Consultancy Services (NPCS) can provide Process Technology Book on Natural Fibers with Cultivation & Uses (Leaf Fibres, Bast Fibres, Flax, Hemp, Jute, Knaf, Ramie, Sunn or Sunn Hemp, Abroma Augusta, Sisal, Mauritius Hemp, Pineapple Fibre, Caroa Fibre, Abaca or Manila Hemp, Coir or Coconut Fibre, Coco Fibre, Kapok Fibre, Akund Floss)

See more
https://goo.gl/xt4h5z
https://goo.gl/UhY5Eo
Visit us at

www.entrepreneurindia.co
Take a look at Niir Project Consultancy Services on #Street View

https://goo.gl/VstWkd

Locate us on Google Maps

https://goo.gl/maps/BKkUtq9gevT2

www.entrepreneurindia.co
Our inexhaustible Client list includes public-sector companies, Corporate Houses, Government undertaking, individual entrepreneurs, NRI, Foreign investors, non-profit organizations and educational institutions from all parts of the World. The list is just a glimpse of our esteemed & satisfied Clients.

Click here to take a look
https://goo.gl/G3ICjV
Free Instant Online Project Identification & Selection Search Facility

Selection process starts with the generation of a product idea. In order to select the most promising project, the entrepreneur needs to generate a few ideas about the possible projects. Here’s we offer a best and easiest way for every entrepreneur to searching criteria of projects on our website www.entrepreneurindia.co that is “Instant Online Project Identification and Selection”

www.entrepreneurindia.co
NPCS Team has simplified the process for you by providing a "Free Instant Online Project Identification & Selection" search facility to identify projects based on multiple search parameters related to project costs namely: Plant & Machinery Cost, Total Capital Investment, Cost of the project, Rate of Return% (ROR) and Break Even Point% (BEP). You can sort the projects on the basis of mentioned pointers and identify a suitable project matching your investment requisites.

Click here to go

http://www.entrepreneurindia.co/project-identification
Contact us

Niir Project Consultancy Services
106-E, Kamla Nagar, Opp. Spark Mall,
New Delhi-110007, India.

Email: npcs.ei@gmail.com, info@entrepreneurindia.co
Tel: +91-11-23843955, 23845654, 23845886, 8800733955
Mobile: +91-9811043595

Website: www.entrepreneurindia.co, www.niir.org

Take a look at NIIR PROJECT CONSULTANCY SERVICES on
#StreetView

https://goo.gl/VstWkd
Who are we?

- One of the leading reliable names in industrial world for providing the most comprehensive technical consulting services.
- We adopt a systematic approach to provide the strong fundamental support needed for the effective delivery of services to our Clients’ in India & abroad.
We at NPCS want to grow with you by providing solutions scale to suit your new operations and help you reduce risk and give a high return on application investments. We have successfully achieved top-notch quality standards with a high level of customer appreciation resulting in long lasting relation and large amount of referral work through technological breakthrough and innovative concepts. A large number of our Indian, Overseas and NRI Clients have appreciated our expertise for excellence which speaks volumes about our commitment and dedication to every client's success.
We bring deep, functional expertise, but are known for our holistic perspective: we capture value across boundaries and between the silos of any organization. We have proven a multiplier effect from optimizing the sum of the parts, not just the individual pieces. We actively encourage a culture of innovation, which facilitates the development of new technologies and ensures a high quality product.
What do we offer?

- Project Identification
- Detailed Project Reports/Pre-feasibility Reports
- Business Plan
- Industry Trends
- Market Research Reports
- Technology Books and Directory
- Databases on CD-ROM
- Laboratory Testing Services
- Turnkey Project Consultancy/Solutions
- Entrepreneur India (An Industrial Monthly Journal)
We have two decades long experience in project consultancy and market research field

We empower our customers with the prerequisite know-how to take sound business decisions

We help catalyze business growth by providing distinctive and profound market analysis

We serve a wide array of customers, from individual entrepreneurs to Corporations and Foreign Investors

We use authentic & reliable sources to ensure business precision
Our Approach

Requirement collection

Thorough analysis of the project

Economic feasibility study of the Project

Market potential survey/research

Report Compilation

www.entrepreneurindia.co
### Who do we serve?

- *Public-sector Companies*
- *Corporates*
- *Government Undertakings*
- *Individual Entrepreneurs*
- *NRI’s*
- *Foreign Investors*
- *Non-profit Organizations, NBFC’s*
- *Educational Institutions*
- *Embassies & Consulates*
- *Consultancies*
- *Industry / trade associations*
Sectors We Cover

- Ayurvedic And Herbal Medicines, Herbal Cosmetics
- Alcoholic And Non Alcoholic Beverages, Drinks
- Adhesives, Industrial Adhesive, Sealants, Glues, Gum & Resin
- Activated Carbon & Activated Charcoal
- Aluminium And Aluminium Extrusion Profiles & Sections,
- Bio-fertilizers And Biotechnology
- Breakfast Snacks And Cereal Food
- Bicycle Tyres & Tubes, Bicycle Parts, Bicycle Assembling
Sectors We Cover

- Bamboo And Cane Based Projects
- Building Materials And Construction Projects
- Biodegradable & Bioplastic Based Projects
- Chemicals (Organic And Inorganic)
- Confectionery, Bakery/Baking And Other Food
- Cereal Processing
- Coconut And Coconut Based Products
- Cold Storage For Fruits & Vegetables
- Coal & Coal Byproduct
Sectors We Cover

- Copper & Copper Based Projects
- Dairy/Milk Processing
- Disinfectants, Pesticides, Insecticides, Mosquito Repellents,
- Electrical, Electronic And Computer based Projects
- Essential Oils, Oils & Fats And Allied
- Engineering Goods
- Fibre Glass & Float Glass
- Fast Moving Consumer Goods
- Food, Bakery, Agro Processing
Sectors We Cover

- Fruits & Vegetables Processing
- Ferro Alloys Based Projects
- Fertilizers & Biofertilizers
- Ginger & Ginger Based Projects
- Herbs And Medicinal Cultivation And Jatropha (Biofuel)
- Hotel & Hospitality Projects
- Hospital Based Projects
- Herbal Based Projects
- Inks, Stationery And Export Industries
Sectors We Cover

- Infrastructure Projects
- Jute & Jute Based Products
- Leather And Leather Based Projects
- Leisure & Entertainment Based Projects
- Livestock Farming Of Birds & Animals
- Minerals And Minerals
- Maize Processing (Wet Milling) & Maize Based Projects
- Medical Plastics, Disposables Plastic Syringe, Blood Bags
- Organic Farming, Neem Products Etc.
Sectors We Cover

- Paints, Pigments, Varnish & Lacquer
- Paper And Paper Board, Paper Recycling Projects
- Printing Inks
- Packaging Based Projects
- Perfumes, Cosmetics And Flavours
- Power Generation Based Projects & Renewable Energy Based Projects
- Pharmaceuticals And Drugs
- Plantations, Farming And Cultivations
- Plastic Film, Plastic Waste And Plastic Compounds
- Plastic, PVC, PET, HDPE, LDPE Etc.
Sectors We Cover

- Potato And Potato Based Projects
- Printing And Packaging
- Real Estate, Leisure And Hospitality
- Rubber And Rubber Products
- Soaps And Detergents
- Stationary Products
- Spices And Snacks Food
- Steel & Steel Products
- Textile Auxiliary And Chemicals
Sectors We Cover

- Township & Residential Complex
- Textiles And Readymade Garments
- Waste Management & Recycling
- Wood & Wood Products
- Water Industry (Packaged Drinking Water & Mineral Water)
- Wire & Cable
Contact us

Niir Project Consultancy Services
106-E, Kamla Nagar, Opp. Spark Mall,
New Delhi-110007, India.

Email: npcs.ei@gmail.com, info@entrepreneurindia.co
Tel: +91-11-23843955, 23845654, 23845886, 8800733955
Mobile: +91-9811043595

Website: www.entrepreneurindia.co, www.niir.org

Take a look at NIIR PROJECT CONSULTANCY SERVICES on
#StreetView

https://goo.gl/VstWkd
Follow Us

- https://www.linkedin.com/company/niir-project-consultancy-services
- https://www.facebook.com/NIIR.ORG
- https://www.youtube.com/user/NIIRproject
- https://plus.google.com/+EntrepreneurIndiaNewDelhi
- https://twitter.com/npcs_in
- https://www.pinterest.com/npcsindia/

www.niir.org  www.entrepreneurindia.co
THANK YOU!!!

For more information, visit us at:
www.entrepreneurindia.co