

**Technical Report
Agro Processing Sector
Natural Fibers
Including
Business Feasibility Studies
and
Proposed Action Plans**

**Intended to be Used as Source Material in the
Development of Concept Notes**

Bangladesh INSPIRED

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1.0 Acronyms

BAU	- Bangladesh Agricultural University
BBS	- Bangladesh Bureau of Statistics
BFS	- Business Feasibility Study
BIO	- Business Intermediary Organizations
BRAC	- Bangladesh Rural Advancement Committee
BSIC	- Bangladesh Small & Cottage Industries
BWCCI	- (Bangladesh Women Chamber of Commerce & Industries)
DAE	- Department of Agricultural Extension
EPB	- Bangladesh Export Promotion Bureau
GoB	- Government of Bangladesh
Guidelines	- Guidelines for Applicants (SSME Competitiveness Grant Scheme
H	- Hectare (10,000 square meters = 2.47 Acres)
INSPIRED	- EU Bangladesh SME INSPIRED Grant Competitive Scheme
MCC	- Mennonite Central Committee
Mol	- Ministry of Industry
MT	- Metric Ton (1,000 kilograms = 2,204.6 pounds)
PS	- Private Sectors
SAU	- Sher-e-bangla Agricultural University
SEDs	- SEDs handicraft the name of an organization
SOURCE	- Name of an Organization working on handicraft production & marketing
Tarango	- (Training Assistance & Rural Advancement Non-Government Organization)

2.0 Executive Summary

Bangladesh is one of the densely populated poorest countries of the world and widely known for its widespread poverty, unemployment and natural disasters. Government, donor backed non-government agencies and private sectors are working hard to mitigate this situation by enhancing employment creation opportunities in the rural areas through a varieties of activities including expansion of agro-processing industries, promotion of livestock sectors, introduction of saline and drought tolerant food products, facilitating handicrafts; plus facilitating weaving and innovative options. Agricultural waste management is also an important issue in a nation with a population well over 160,000,000 confined to a very small land mass.

Innovative concepts which may lead to a reduction in waste, along with the generation of income and employment for rural poor and more specially women; plus import substitutions and increased exports certainly were considered when the Ministry of Industry (MoI) on behalf of the Government of Bangladesh (GoB) in coordination with the European Union selected Natural Fibers as one of the priority sectors within the economy of Bangladesh to target for having a high growth potential.

As an agrarian country, Bangladesh produces huge quantity of agricultural waste every year from its production process most of which are unutilized and results in pollution to soil and water bodies. However, in many other countries wastes are no longer management a burden creating pollution; but rather have become new sources of valuable resources for the country. In Bangladesh Banana, Pineapple and Coconut are major agricultural crops which produce great revenue, also produce huge leftover waste after crops are harvested. Through proper management and new product development much of this waste material can offer new employment opportunities for rural people especially women.

For thousands of years, people all over the world have used fibers from plants and animals to make cloth, string and paper, and strengthen building materials. Bangladesh is one of the major natural fibers producing country and among them Jute, Cotton, Silk and Coir products are great use in the country as well items for export market. For centuries, the chief export of the Bengal economy was silk and jute products. In the 21st century, Natural Fibers extracted from Banana and Pineapple have great promise of producing steady additional income for many people throughout Bangladesh; while at the same time reduce imports and increase exports via business activities which are currently dominated by India, Thailand, China, Philippine, Malaysia, Nepal and Vietnam.

As noted earlier in this report, Natural Fibers is one of the priority sectors selected by the MoI as having the potential for rapid expansion within Bangladesh with the goal of creating employment, import substitution and expanding exports. Silk, Jute and Cotton industries enjoy the support of the GoB due to the labor intensive nature of these business activities. Natural Fibers produced from Banana and Pineapple are now getting attention from both government and private sectors.

Bangladesh already has a vibrant and mature business activities engaged in Jute and Home Textiles. In the case of Jute, approximately 50% is exported as raw fiber, with the balance sold as manufactured items. The USA and the EU are the major export outlets. According to GoB export statistics, the tonnage of raw Jute exported is approximately 667,000 MTs annually; while the exports of products made from Jute stands at 654,000 MTs annually; for a combined value of USD \$ 672.38 million/annum. As regular trade in the above mentioned products already exists, there may be distribution and marketing synergy to products made from Banana and Pineapple Fibers resulting in entry to the export marketplace fairly quick; leading to the potential for creation of new employment & access to export markets. Based upon estimates of the annual production of Bananas and Pineapples there is no shortage of available raw product from which to extract Natural Fibers.

The Guidelines related to the EU Bangladesh INSPIRED Grant Scheme make frequent reference to new innovative concepts and value added products as hoped for outcomes of this program as envisioned by the Mol. Concepts related to Natural Fibers is specifically mentioned within the Guidelines as innovations which may be given special consideration and a relaxation of the Guideline rules as related to Grant awards. There is increasing demand from abroad for 'green' and 'natural' products of all types throughout the USA, Canada and the EU. Neighboring countries to Bangladesh are already fully engaged with active and vibrant business ventures involving Natural Fibers produced from Banana and Pineapple. Therefore, the decision by the Mol with the support of the EU to not only include Natural Fibers as a "priority sector"; but consider bending the Guidelines for Concepts which focus on the development of Natural Fiber clusters is visionary. Coconut, Banana and Pineapple fibers can be used for producing dozens of essential household products and handicraft items to meet the growing global demand for Natural products. Currently, according to GoB statistics Bangladesh is annually exporting approximately one billion U.S. dollars of home textile products. The addition of products made from Banana and Pineapple Natural Fibers could dramatically increase this impressive statistic, create employment for thousands of Bangladeshi citizens reduce imports, reduce harmful waste which is impacting land and waterways and reduce imports.

As the global population of humans continues to expand, any new business venture must consider the environmental impact. A recent study by the FAO estimated that due to the fact that the production of Jute, which cultivated by small farmsteads, only uses 10% of the energy as compared to the production of synthetic fibers, manufacturing of which is heavily dependent upon fossil fuels. The same study indicated that producing one ton of polypropylene – widely used in packaging, containers and cordage – emits into the atmosphere more than 3 MT of carbon dioxide, the main greenhouse gas responsible for global warming. In contrast, the study reported that Jute absorbs as much as 2.4 MT of carbon per MT of dry fiber. Production of Natural Fibers from Banana and Pineapple can also be expected to have similar attributes to Jute as related to impacting the environment.

According to environmental concerns in European countries, recently, natural fibers play an important role as reinforcing fillers in polymer composites. The advantages of natural fibers over synthetic fibers are their low cost, less tool wear during the process, low density, environmental friendliness and biodegradability. For that

reason, banana and pineapple fibers will be another option to be investigated for its fiber source potential. Considering the similarity in production process and end use the wastes from banana and pineapple, which are eco-friendly and are found in abundance in Bangladesh, can be used for producing fabrics for making cloths and a range of handicrafts products.

2.1 Major Findings

- Banana and Pineapple fibers are one abundantly available in the country but not in any current productive use.
- Commercial production of Bananas within Bangladesh covers 56,000 H of land and Pineapple is grown on 20,000 H of land every year; leaving behind literally mountains of leaves from both crops. From this waste, rough estimates suggest that potentially over 60,000 MT of Natural Fibers could be produced from Banana leaves and at least 15,000 MT from Pineapple leaves.
- Natural Fiber costs less to produce than synthetic products and more friendly to the environment.
- For some applications, Natural Fibers produced from Banana and Pineapple leaves can be a substitute for cotton in making home textile products.
- The USA and EU are growing market outlets for 'Naturally' produced products.
- Currently Bangladesh generates one billion USD annually from exporting home textile materials to USA and EU countries.
- Only 2% of the cotton utilized within Bangladesh is produced internally, with the balance imported from Pakistan, India and China; all of which adds to the cost of clothing produced in Bangladesh.
- After harvesting Banana and Pineapple waste products become a major management burden for producers resulting in serious pollution to land and water.
- Neighboring countries are moving fast in the production of Natural Fiber from various sources (Banana, Pineapple, Hemp, Sisal and Bamboo), thus creating new employment for the poor as well meeting increased global demand.
- There is a growing market for Natural Fiber products globally and in particular within the USA, EU, UK and Japan as well among the growing middle class within Bangladesh.
- Bangladesh has the potential of increasing production and sales of home textile products for export as China, India and Pakistan are reportedly shifting their textile industries to mechanized and automated production techniques.
- Production of cloth and other products from Natural Fibers, incorporating sound environmental practices may help improve the current negative image Bangladesh holds on the world stage as related to pollution.
- The benefits which producers of Jute have enjoyed due to the support of the GoB and private interests may soon extend to producers of Natural Fibers made from Banana, Coconut and Pineapple due to the efforts of the Mol to target this potential sector as a priority which has the promise of high growth potential. Via the EU Bangladesh INSPIRED Grant Scheme, not only producers of these Natural Fibers; but home textile operators will benefit from the emergence of this sector.

2.2 Highlights - Action Plans

- Successful Action Plans involving Natural Fibers to be produced from Banana, Coconut and/or Pineapple Leaves must consider both the 'Extraction Tier' as well as the 'Home Textile Tier' of this Value Chain.
- Managing of waste subsequent to the extraction of fibers in an environmentally sound manner must be included within any Action Plans.
- Training at all levels will be critical to the development of developing this sector.
- Field trips by representatives of the sector to production areas in other countries where Natural Fibers are being extracted and converted to marketable products will significantly add to the success of Action Plans.
- Action Plans should include promotional activities to promote Natural Fibers from Banana and Pineapple as a substitute for cotton which will result in import substitution.
- Promotional activities to enhance the marketing of products produced from Banana and Pineapple Natural Fibers should also be integral to Action Plans.
- Linking products made from Banana and Pineapple Natural Fibers with mature industrial based products intended for export will result in efficiency and improved profit margins.
- Machinery suitable for extracting Natural Fibers are accessible from neighboring countries as prototypes. However, the Light Industry sector within Bangladesh can develop similar equipment, adding to jobs within the country.
- Exposure visits to Trade Fairs in other countries should be organized as part of product development and marketing.

3.0 Background

3.1 Background of the Study

The Mol has selected eight business related sectors, including Natural Fibers, within Bangladesh as having the potential for "high growth potential". To support this targeted initiative by the Mol; the EU in cooperation with the Mol has created the EU Bangladesh INSPIRED SME Grant Scheme intended to assist clusters within the sectors. The Grant Scheme is designed to award BIO's representing clusters with grants. There are three types of grants available; two of which are intended to offer Support to clusters and value chain development. In turn, this type of grant is divided into providing grant awards to clusters in the "Early Growth Stage" and secondly to more mature clusters with the objective of stimulating "Intensive Growth and Consolidation". The third grant option is intended to directly assist BIO's with "Skills Development and Capacity Building". This entire grant program is intended to benefit Small and Medium Enterprises(SME) within the eight priority sectors selected by the Mol.

INSPIRED has authorized this Technical report and associated Value Chain Analysis as a 'tool' for grant applicants to utilize in preparation of Concept Notes; the first stage in the grant application process.

3.2 Scope

For many years the EU has been an active development partner in support of Bangladesh. INSPIRED is yet another excellent project funded by the EU intended to “Reduce poverty in Bangladesh by supporting the development of SME’s in the country”. The scope of this report as reported previously is limited to providing applicants of INSPIRED grants with practical knowledge relative to the business activities involved with the Natural Fibers value chain and in turn Proposed Actions Plans which might be taken to quickly ‘ramp up’ ventures within the ‘chain’ with the assistance of INSPIRED grants. The BFS was carried out with obvious limitations as there was virtually no information available within Bangladesh; therefore assumptions were made based upon experience and knowledge from other nations. In addition, the data on agricultural productivity in Bangladesh is seriously out of date and any current data was ‘off the record’ from verbal inquiries with sources EPB and DAE. As a result, the data presented, although relevant; should not be considered as completely accurate. However, by analyzing such factors as comparative wage rates, transport and fuel costs between Bangladesh and other competitive countries producing Natural Fibers from Banana and Pineapple the results are relevant and should be useful for BIO’s preparing Concept Notes as related to INSPIRED.

3.3 Methodology:

- Developed BFS to determine if Banana, Pineapple and Coconut based Natural Fibers could be a practical and viable business sector within Bangladesh.
- Visited organizations within Bangladesh working with natural fiber-based projects (not on Banana and Pineapple) making products like handicrafts and home textiles to determine potential synergies with development of Natural Fibers from Banana, Pineapple and Coconut.
- Discussion with producer groups/clusters relative to findings of BFS.
- Desk study collecting information from other countries where the activities on fiber-based products has evolved into substantial business sectors.
- Studied secondary literature, reports and finding available on line.
- Contacted active organizations in other countries engaged with Natural Fiber enterprises.
- Prepared Proposed Action Plans based upon the above activities.

3.4 Sources of Information:

In the absence of availability of information within Bangladesh, major sources of information collection were:

- Discussion meetings with organizations /companies involved in handicraft and textile sectors having products from Natural fibers like Jute, Silk and cotton.
- Meetings with organizations involved in Women empowerment through employment generation which unsuccessfully promoted Banana and Pineapple fiber products. Discontinued due to a lack of technology and financial resources.

- Reports and statistics from DAE (Department of Agriculture Extension).
- Communication specifically with DAE in the Rangamati and Gaibandha districts.
- E-mailing contact with companies and organizations involved in Natural Fiber production and Machinery production in India.
- Web-based information sources including reports and research findings.
- Reports from BBS (Bangladesh Bureau of statistics).
- EPB
- Official statistics on Agricultural productivity from the GoB.
- Communication with Bangladesh Agricultural University, Mymensingh and Sher-e-Bangla Agricultural University of Dhaka.

4.0 Proposed Action Plans for Concept Notes

4.1 Background:

The following Proposed Action Plans are largely based upon the results of Business Feasibility Study attached (Appendix A) relative to Banana and Pineapple Natural Fibers. Banana and Pineapple grows well in Bangladesh and are potential sources of fine quality natural fibers which are widely produced in neighboring countries to produce various valuable items like cloths, handicrafts and home textiles. These products are in high demand in the EU, USA, UK market due to current market trends. Domestically, within Bangladesh, Natural Fibers produced from Banana and Pineapple have great potential use; not only for handicraft production, but for the fabric and textile industries.

Despite abundant availability of raw materials these natural fibers still remain unexploited in Bangladesh with the exception of some experimentation done by few NGO's like Tarango, MCC and BRAC. MCC is still doing some work in very limited scale; but not commercially.

4.2 The role(s) of BMOs/BIOs/NGOs in this Sector:

In the process of developing the attached BFS, an assessment was made to understand the current state of the use of Banana and Pineapple Fibers by the handicraft organizations and NGOs. But no BMO/BIOs/NGOs were found involved in commercial production and marketing of Banana and pineapple fibers based products in the country except MCC who is occasionally doing some works in a very limited scale and with their own beneficiary groups. However, Tarango has been very strong position in the market that is commercially producing a range of products from Natural Fibers. This group has strong market linkages in the EU, USA, UK, Australia and many in other countries. Tarango has in the past attempted to develop value chains utilizing Banana and Pineapple Fibers; but lacked proper technology, machinery and financing to continue. BRAC also previously experimented with the production of papers from Pineapple leaves; but elected to discontinue the program.

However, despite the lack of current commercial activity and engagement by NGO's, BIO's and/or BMO's in the sector; there are numerous producer clusters involved

with the production of Bananas and Pineapples; plus clusters and BIO's representing these clusters engaged with home based textiles who have strong interest in exploring the potential of developing business activities related to Natural Fibers.

4.3 The existing state of data and firms on the ground:

Although there are no organizations or firms engaged in the commercial production of Banana and Pineapple Fiber based products; as noted previously there is interest in developing business ventures from clusters and the BIO's which represent the entrepreneurs within the clusters. And as also noted previously, the available data relative to this sector is primarily dated and/or non-existent.

4.4 Issues relating to EU guidelines:

Despite increasing high demand in the foreign markets and availability of abundant raw materials for Banana and Pineapple fibers, this sector has to date failed to develop within Bangladesh as has been the case in neighboring countries. There have been some attempts in the past by BIO's and their affiliated clusters to develop business activities involving Natural Fibers produced from Banana and Pineapple Leaves. However, lack of technical knowledge, skills, financing and market networks resulted in a lack of success.

The prospects for a successful Natural Fibers Sector within Bangladesh as related to the goals and objectives of the MoI as noted within the Guidelines have considerable synergy. A viable Natural Fibers Sector will be environmentally sound, create many jobs within agriculture and home based hand loom businesses, increase exports for Bangladesh of value added products and reduce imports.

The Guidelines may include some provisions leading to limitations as related to the Natural Fibers Sector. For example, as this sector is generally thought of as an Early Growth Sector; there may be issues related to the dynamics and scope of bold Proposed Actions Plans incorporated into Concept Notes and in turn full Grant applications. However, as the Guidelines state as follows..."The Conditions may be relaxed in case of new innovative products (natural fibers)"...as a result, BIO's preparing Concept Notes for this sector should anticipate that logical, well conceived Actions which show promise of leading to a viable, sustainable Natural Fibers Sector will be given serious consideration by evaluators of Concept Notes.

4.5 Action Plans from this Technical Study

It is evident from the technical study on Natural Fibers that the country is rich in the availability of Natural Fibers from various sources and among them Jute, Cotton, Silk, Banana, Pineapple, Bamboo, Coconut are major sources of raw product awaiting effective utilization. Jute, Cotton, Silk and Coconut are already in use, although in a very limited scale; but Banana and Pineapple which are widely available throughout the country are not only unused but presents a huge environmental threat by

polluting soil and water; and adds to the cost of production experienced by producers of Banana and Pineapple. These two sources of Natural Fibers have a huge potential to evolve and offer employment opportunities to rural women through promotion of a range of handicraft, home textile products and to join the exportable items coming from Bangladesh. Neighboring countries like India, Nepal, Thailand, Philippine, Malaysia and Japan have very successfully utilized Natural Fibers in creation of thousands of home-based jobs for women through promotion a range of valuable textile and handicraft products.

Despite huge availability of raw materials throughout the country, Bangladesh is far behind in productive use of these valuable natural fibers from Banana and Pineapple. Therefore, promotion of natural fiber-based industries in Bangladesh requires interventions from the bottom of the value chain to the end users. Suggested interventions should include; but not be limited to

- Formation of new clusters or reorganizing existing clusters engaged on other natural fibers like cotton, jute, silk, bamboo etc.
- Procurement of infrastructure and management services.
- Procurement of technical services (training and management) from neighboring countries such as:
 - Extraction and processing of fibers
 - Spinning and weaving
 - Varieties use of fibers in product development like textile and handicrafts sectors.
 - Product design and marketing etc.
- Procurement of machinery and equipment
- Procurement of innovation, related information & technology and communication infrastructures.
- Procurement of standards and compliance services;
- Procurement of networking capacities and capabilities;
- Procurement of market promotion services and opportunities;

The **overall result** of above interventions would be:

1. Innovation and promotion of Natural Fibers based new product chain for domestic and export markets.
2. Creation of new source of employments especially for the rural women and adolescents.
3. The availability of raw materials throughout the country will result quick expansion of Banana and Pineapple fiber-based rural industries.
4. Success will facilitate growth of other agro-based fiber products resulting in new opportunities for more income and employment for the rural people.
5. Efficient management of agricultural wastes and environmental protection.

The estimated **overall cost** for the above actions would be around 720,000 Euro or BDT 7.20 crore

Proposed Action Plan # 1: Producer clusters development and training for skill development

Background: Clusters engaged in business activities relative to Banana and Pineapple Natural Fibers will be engaged in a new ventures and therefore require basic knowledge and understanding of the process of fiber extraction and product development.

Objectives: Imparting knowledge and skills among rural women in clusters and development of efficiencies in fiber extraction and processing.

Types of activities:

- Reorganization of groups / clusters
- Training on fiber extraction & processing, spinning and weaving; as well as waste management.
- Training on machines used for fiber extraction, spinning and weaving for training and demonstration.
- Procurement of human resources related to these key activities.

Key stakeholders: Rural women and Organizations involved in other types of Natural Fiber-based product development and marketing such as Tarango, MCC, BWCCI and Banglacraft.

Time frame: Continued periodical activity throughout the life of the project throughout the project life.

Estimated cost: 150,000 Euro

Proposed Action Plan # 2: Infrastructure and Human Resource Development

Background: Enhancement of clusters engaged in Natural Fibers business activities requires development of basic infrastructural facilities, procurement and development of human resources for growth and expansion.

Objectives: Insure development of basic infrastructure, facilities and availability of well trained human resources conducive to growth of clusters engaged in this sector.

Types of activities:

- Procurement of training and production centers
- Procurement of basic support & services required for a healthy and safe working environment.
- Acquiring knowledge and skills from neighboring countries via study tours.
- Procurement of working tool, transport and stationary facilities.
- Purchasing production machinery and equipment.

Stakeholders: Organizations involved in other types of Natural Fiber-based product development and marketing such as Tarango, MCC, BWCCI and Banglacraft and organizations involved in this business from neighboring countries.

Time frame: Periodically over a 12 to 18 months period.

Estimated cost: 275,000 Euro

Proposed Action Plan # 3: Production and Innovation

Background: As a new and innovative sector, considerable time, resources and attention will be required to invest in production and product development based on existing market needs; as well as support innovation of new products for market promotion and buyer attraction.

Objectives: Promotion of Banana and Pineapple Fiber-based products (home textile and handicrafts focused) available in the global marketplace.

Types of activities:

- Extraction of Natural Fibers up through the entire value chain to finished products.
- New product development (handicraft, clothing and home textiles)
- Production of fine & coarse fibers, sorting and processing.
- Promotion of Banana and Pineapple fibers to furniture, fabric and textile sectors within Bangladesh as a substitute of cotton-based products (targeting mechanized fabric based industries).
- Develop quality control standards, methods and procedures to improve, standardize quality and insure buyers of uniformity of products.
- Train quality control personnel
- Research for innovation of high quality, lower cost fibers leading to development of new products for local and foreign markets.
- Study tours to other countries making products from Natural Fibers.
- Bring global experts to mentor, guide, recommend and train cluster members.

Stakeholders: Producer groups, technical staffs, organizations involved in other types of natural fiber-based product development and marketing like Tarango, MCC, BWCCI and Banglacraft including furniture, mechanized textile and fabric sectors.

Time frame: Continually throughout the project life (30 months period).

Estimated cost: 150,000 Euro

Proposed Action Plan # 4: Product Marketing (Fibers and Finished Products)

Background: A sound marketing program is a key challenge and necessity for any product for sustainability. Bangladesh has a shortage of cotton fiber and 98% of the cotton utilized within the textile and fabric sectors is imported from China, India and Pakistan. Therefore, promotion of Banana and Pineapple Fibers as a substitute for cotton will enhance sustainability through meeting increasing demands of these mechanized fiber based industries.

Objectives: Marketing programs targeting a broad spectrum of potential sales opportunities within Bangladesh and around the globe.

Types of Activities:

- Participation in Trade Fairs (nationally and internationally)
- Development of a robust 'online' presence as part of a comprehensive marketing program.
- Include within a marketing program a public relations and awareness campaigning promoting the importance of natural fiber-based products.
- Demonstrations of how natural fibers can be utilized as a substitute for cotton fibers.

Stakeholders: Mechanized Home Textile & Fabric sectors, EPB and BSIC. Organizations involved in other types of natural fiber-based product development and marketing like Tarango, MCC, BWCCI, Banglacraft; including mechanized textile and fabric industries.

Time Frame: 12 to 18 months

Estimated cost: 60,000 Euro

Proposed Action Plan # 5: Expansion and Networking

Background: Clusters of businesses must continually be seeking expanded and diverse marketing opportunities. Ventures relative to Natural Fibers produced from Banana and Pineapple leaves are no different in this regard. In fact, due to the fact that many potential types of potential buyers are not aware of the attributes and/or availability of Natural Fibers from Banana and Pineapple; it is even more important to budget significant financial resources to market expansion. An important component of a market expansion plan is to network with other sectors who may have an interest in Natural Fibers. Coordinating with trade organizations, BIO's and Clusters which may have synergy with Natural Fiber clusters is vital to growth of the sector.

Objectives: Expansion of market opportunities to increase productivity of Natural Fibers and fiber-based products aiming at the creation of cluster growth and

added employment and reduce environmental pollution through efficient waste management.

Types of activities:

- Local level trade fairs
- Product display and demonstration
- Seminar and workshops

Stakeholders: Other organizations involved in handicrafts and home textile sectors like BMOs, BIOs & NGOs, and relevant government agencies such as registration and export promotion authorities, BSIC, EPB.

Time frame: 8 to 12 months

Estimated cost: 75,000 Euro

Proposed Action Plan # 6: Profitable Waste Management

Background: Each Banana and/or Pineapple leaf contains approximately 3% fibers. The balance is biomass debris which if not processed causes pollution to the soil or water where it is dumped. To avoid pollution the residues of the leaves can be used for preparing vermicompost which would provide extra cluster income for the clusters and an improved environment. Vermicomposting is a simple biotechnological process of producing organic fertilizer using certain species of earthworms. The earthworm consumes the organic mass of the pineapple leaf residues to convert them into the vermicompost. Worms eat waste organic matter and produce compost.

The vermicomposting process takes about 45 days. Vermicompost from agro-waste is found to be rich in plant nutrients. The combined technology package for extraction of fibers from leaf and utilization of the residual biomass debris for vermicomposting is economically viable and remunerative for clusters. Compost can be sold to farmers.

Objectives: Reduce pollution caused by waste from extracting Natural Fibers from Banana and Pineapple. Develop an additional revenue stream for clusters involved with Natural Fibers. Improve productivity of Banana and Pineapple growing operations.

Types of Activities: Convert waste to marketable a by-product.

Stakeholders: Clusters engaged in extraction fibers from Banana and Pineapple. Farmers who purchase vermicompost.

Time Frame: 6 - 30 months

Estimated Cost: 10,000 Euro

5.0 Key Recommendations

Because of abundantly available raw materials and increasing international demand for natural fiber based products; Natural Fibers produced from Banana and Pineapple could be a one of the promising economic sectors within Bangladesh. there is a high potential for employment generation and foreign currency earning for this sector. Necessary technology and machinery is very much available from countries near to Bangladesh. With current government interest in this sector along with emerging interest from the private factors, BIO's and clusters of SME's; the business activity related to this sector could develop rapidly.

BIO's representing clusters who have the potential of engaging in business activities related to Natural Fibers may find the SME Competitive Grant Scheme could be a unique opportunity to 'kick start' this sector. However, for a cluster and the BIO representing their interests, to benefit from this unique grant program there must be an assessment of potentials as related to the links or tiers within the value chain for this sector, a review of the attached Business Feasibility Study and above Proposed Action Plans; followed by the development of a logical and well written Concept Note.