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JUTE PRODUCTS RESEARCH
DP/BGD/75/013
BANGLADESH.

Technical report: Assistance to the
Bangladesh Jute Research Institute (Techn. Wing)
on spinning of jute *

Prepared for the Government of Bangladesh
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of B. N. Iliev
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United Nations Industrial Development Organization
Vienna

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Summary

Consultant on Textile Technology for the project DP/BGD/75/013/11-53/31.7.B Jute Products Research with the purpose to assist the BJRI-TRW to develop its physical and mechanical research programme in order to make an effective contribution to the technical problems of the jute manufacturing industry outlined the following main recommendations:

1. To the Government of the People's Republic of Bangladesh

To develop rapidly the production of fine jute and jute type blended yarns and fabrics from them through second phase of the current project and establishment of a new one which would have the purpose of providing the necessary guidance and assistance to the private and/or government jute manufacturing industry for accelerated implementation of the production of fine jute blended yarn and fabrics from them.

2. To the Management of BJRI-TRW

To develop its Annual Research Programme giving preference to projects ordered or contracted by private or government jute mills and to projects for development of the technological methods for production of fine jute blended yarns, blending jute with longer stapled natural and man-made fibres or filaments.

1. INTRODUCTION

1.1 Project background

In 1978 Jute Products Research Project Number DP/BGD/75/013 at the Technological Research Wing of the Bangladesh Jute Research Institute (BJRI-TRW) which comes within the United Nations Development Programme for Bangladesh, have been established. The project has the aim of providing assistance to develop the capability of BJRI (TRW) for technological research and development work related to the products of the jute manufacturing industry.

In implementation of this project great number of short term visits of Consultants in specific specialized fields have been arranged and respective technical report have been submitted. They are as follows: Six visits of a Jute Technologists and six Technical Reports dated December 1978, 1979, 1980, 1981, 1982 and 1983. Three visits of a Consultant on Dyeing and Finishing and three Technical Reports dated February 1982, December 1982 and March 1984. Two visits of Consultant in Organic Chemistry and two Technical Reports dated April 1984 and October 1984; one visit of a Consultant in Microbiology; and one Technical Report dated December 1984; one visit of a Designer in January 1984. Realizing the recommendations of the Project Personnel laboratory equipment, spinning, weaving and finishing machinery have already been delivered to the BJRI-TRW at a total cost of around US\$ 1,450,000 .

1.2 Official arrangements

The administrative details of the Project are as follows:

Title	: Jute Products Research
Number	: DP/BGD/75/013/D/01/37
Date of Approval	: September 19, 1978
Starting Date	: October 1978
Duration of Project	: Two years and Six months
First Revision	: Four years

Second Revision	:	Six years and nine months
Termination Date	:	March 1981
First Revision	:	September 1982
Second Revision	:	September 1984
Third Revision	:	June 1985
Executing Agency	:	UNIDO
UNDP Inputs	:	1,435,025 US Dollars
Revision "P"	:	2,927,212
Revision "Q"	:	3,045,311

In UNDP Project Document Number BGD/75/015 titled 'Jute Products Research' is specified that the project will require more use of short term consultancy services in jute spinning and weaving technology where the BJRI-TRW does not have the necessary competence to carry out the research and development work. On account of that, Consultant in Textile Technology was appointed and visited two times BJRI-TRW; first time from January 29 1984 to April 17 1984 and second time from March 11 1985 to May 10 1985.

The Consultant was attached to the BJRI-TRW and worked in close contact with counterpart Mr. S.A.K. Lodi, Chief, Mechanical Processing Division, BJRI-TRW.

The expert was supported by Dr. A.M. Bhuiyan, Director, BJRI-TRW and by Mr. Conrado I. Diala, Project Administrator and also by Mr. Vicente C. Lavidés, SIDFA, UNIDO, Dhaka.

1.3 Objectives of the mission

The objectives of the mission is assistancy to the BJRI-TRW to develop its physical and mechanical research programme in order to make an effective contribution to the technical problems of the jute manufacturing industry.
(Annex I)

2. Findings

2.1 Activities of the Consultant

During the visits in BJRI-TRV the Consultant was able:

- 2.1.1. to study and analyse the organizational set-up, the research programme and the existing facilities of BJRI-TRV
- 2.1.2. to visit several institutions and mills (Annex II)
- 2.1.3. to provide useful background information on methods of assessing the physical characteristics of textile fibres especially in relation to the characteristics of yarns spun from them.
- 2.1.4. to offer guidance in drawing up work plans for appropriate research projects. (Annex III)
- 2.1.5. to demonstrate the applicability of part of the new technological methods, developed in Bulgaria, for spinning fine blended jute yarns tes 105 to tex 40 (jute count 3 to 1.3) and to demonstrate the applicability of these yarns for production of knitted and woven fabrics. (Annex IV)

2.2 Organizational set-up of BJRI

The responsibility for carrying out technological research and development work for jute industry in the People's Republic of Bangladesh has been given to the BJRI. The Institute is located in Dhaka and administratively placed under the Ministry of Agriculture. Within the BJRI there are three wings:

- Agricultural Research Wing
- Technological Research Wing
- Seed production and Development Wing

Each of the three wings has a Director, who is the Chief Officer. The implementation of this project is carried out in the BJRI-TRW which has four research Divisions:

- Chemistry and Biochemistry
- Mechanical Processing
- Chemical Technology
- Physics and Testing

There are also library and workshop. Each division is divided into 2-3 Departments. The staff of BJRI-TRW numbers 87 at present and includes 4 Chiefs of Division, together with 55 persons in the professional grades of Scientific Officers or Technical Officers. Personal competence on both the theory and practice of jute mechanical and chemical technology are available in adequate numbers in all research divisions of BJRI-TRW. Some administrative difficulties in implementation of the research achievements of BJRI-TRW in jute and Textile Industry, which are administratively placed under the Ministry of Industry, are observed and having in mind that the future development of jute industry will be in close connection with those of the Textile Industry as a whole conclusion may be drawn that the administrative place of BJRI-TRW in the Ministry of Agriculture is not purposeful.

2.3 Research programme of BJRI-TRW

The Research Programme of BJRI-TRW is annual and every year since 1979 to 1985 is being revised. The form of the present Research Programme have been designed in 1981 and normally include 10 unchanged objectives each one divided in 2 to 8 projects.

Initially designed Objectives are very ambitious and the individual research projects grouped under them, are developing year by year, with increasing orientation to the development of improved jute products, and to the technical improvement of the manufacturing processes of jute spinning and weaving.

The objectives and the individual projects are quite excessive on number (48 for 1985) and the scientific Officers, can not be able to execute them successfully and

in sufficiently short time. It appears to be one of the main reasons, that a great number of projects are repeated year by year in the Annual Programmes and no one research result to be implemented in jute manufacturing industry.

In its present form, the Research Programme is lacking in several common characteristics of such programme:

- the time limits
- the intended or agreed consumer of the results of the project
- the required funds
- the expected outputs of the project.

2.4 Trial Production Facilities of BJRI-TRW

BJRI-TRW has a complete pilot mill with spinning, weaving and finishing departments. Fully equipped physical and chemical testing laboratories are available for any analytical work that may be required. BJRI-TRW has adequate support facilities such as a well-stocked library, a central workshop and specialists in various technologies related to textile manufacture.

2.4.1 Spinning facilities

The available equipment is generally adequate at the present time with the equipment available on the jute manufacturing industry. The production range remains conventional and limited to the spinning of jute yarns with maximum of tex 200. In Jute Technologist's Technical Report dated December 1982 (Section 5) is stated "At the commencement of the Project research into fine yarns, that is low count yarns, and the factors which determine how low a count can be spun, was thought desirable as this is a relatively unexplored area. At the time, however, suitable machinery for this purpose was not immediately identifiable, and procurement was left in obedience until such time as positive identification could be made".

It seems that the author of the above have been unaware of the fact that in Europe and particularly in Bulgaria technological methods have been already developed and patented for the production of fine jute and jute type yarns.

Jute fibres are similar in properties to flax fibres and possess high hygroscopicity, moisture regain and release, which are properties, determining the comfort in wearing the apparels. High quality jute fibres have natural lustre which gives an attractive appearance to articles made of them. These properties are not utilized when using jute fibres for production of articles for packing and technical purposes as well as for carpet backing cloth.

The new technological methods give feasibility for producing yarns with thickness of 105 tex to 25 tex and finer. This enables the production of such new jute products as furnishing fabrics, curtains, table-cloths, napkins, kitchen towels, dishcloths, bedlinens and fabrics for summer suits, coats, skirts, shirts and so forth, where the specific properties of jute can be utilised with advantage.

By shortening jute fibres up to specified lengths, mixing the jute with other natural fibres like, flax, wool, cotton or with man-made fibres and using a combination of machines in various spinning systems, fine jute and jute type yarns with definite flax character in appearance and properties, can be obtained. Jute fibres processed on these way can substitute the more expensive natural (flax, wool, cotton) and man-made fibres.

The implementation of the newly developed technological methods in BJRI-TRW respectively in jute manufacturing industry of Bangladesh is strongly desirable. However, the existing facilities in the spinning department of BJRI-TRW are inadequate for the introduction of the new technologies.

Realising the above necessity it would be advantageous to envisaged new inputs of equipment and know-how; and implementation of second phase of the project which would have the purpose of developing the new technological methods in BJRI-TRW, or directly in the jute manufacturing industry.

Advisable specifications of additional machines which may complete the Pilot line of BJRI-TMSE trial production of fine blended jute yarns are as follows:

1) Cuffing machine

- 2) Man-made fibres card equipped with: automatic feeder, breast for preliminary processing, and with 7 pairs of worker rollers and a drawing unit for two zone drawing and a coiler arrangement.

Clothing: saw tooth clothing of the breast, card sliver for the worker rollers, needle type and textolite plate for the cylinder and the doffers.
200 kg/h production

- 3) Card for flax with 10 ingoing slivers and 1 outgoing sliver 22 ktex; Two zone drawing; maximum speed of the exit cylinders 300 m/min.; Productivity- 150 kg/h.
- 4) Doubling machine equipped with intersecting; number of ingoing slivers - 10; number of outgoing slivers - 1 (12 k-tex); maximum speed of the exit cylinder 300 m/min.; productivity - 150 kg/h.
- 5) Combing machine : Number of ingoing slivers - 10; speed of the exit cylinders, 300 m/min.; productivity - 140 kg/h.
- 6) Intersecting I: Number of the ingoing slivers - 10; number of outgoing slivers - 1 (25 ktex); speed of the exit cylinders 300 m/min.; productivity 140 kg/h.
- 7) Intersecting II: Number of the ingoing slivers - 10; number of outgoing slivers - 1 (14 ktex); maximum speed of the exit cylinder - 300 m/min.; productivity - 130 kg/h.
- 8) Intersecting III: Number of the ingoing slivers - 12; Number of the outgoing slivers 2X2 5,5 ktex); maximum speed of the outgoing cylinder - 300 m/min.; productivity - 130 kg/h.

9) Ring Spinning machines for dry flax:

Spinning: Drawing apparatus - one zone; one belt, with self-loading controlling rollers; drawing -15-40 times; ring diameter - 76 mm; pitch of spindles-100mm; rotation rate of the spindles: 3000-6000 min^{-1} ; productivity 0,05 kg/h of 1 spindle.- maximum Number 12 (tex 84)

10) Frictional Spinning Machine: Speed of the outgoing cylinders - 150m/min; productivity - 0,4 kg/h of 1 head ; maximum Number 20/tex 50/

11) Wrap Spinning machine: Speed of the outgoing cylinder - 160 m/min, Productivity - 0,3 kg/h of 1 spindle; maximum Number 40 (tex 25).

The total cost of the above equipment is not likely exceed 750000 US dollars.

2.4.2 Weaving facilities

The weaving department is equipped with one Sectional Warping Machine, one Cone Winding Machine, one Gripper Loom and three Hand Looms. The workers and the Technical Officers are skilled and competent. The existing facilities are sufficient for trial production of different kinds of fabrics with doubled yarns can not be processed as warp due to the lack of Beamer and Sizing machine.

2.5 Demonstration of trial production of blended fine jute yarns and fabrics at BJRI-TRW

After studying the existing equipment in BJRI-TRW and in the visited textile mills, as well as the available raw material and textile products, the Consultant was able to carry out demonstration of production of blended yarns and fabrics on the conditions of BJRI-TRW. The types of blended fine jute yarns which were produced are as follows:

2.5.1 Yarn tex 70 (jute count 2) with fibres blend of 50% jute, 35% PAN and 15% wool (W)

Jute grade Bangladesh White C (BWC) and imported sliver with 70% polyacrylonitrile (PAN) fibres, and 30% wool (W) fibres were used for production of this yarn. Initially the blending of the jute sliver with linear density of 20 g/s

processed on the existing machinery in the spinning department of BJRI-TRW; together with PAN/W sliver with linear density 20 g/s, was done in high speed Drawing Frame in Valika Woolen Mills Ltd. Masirabad, Chittagong during the visit of the mill. Additional doubling and drafting was performed on the Drawing Machines in BJRI-TRW.

The yarn was spun on Apron draft Spinning Frame with maximum drawability 18 and twistability 320 twist, per meter. Man-made fibres of woolen or flax type which are necessary for blending with jute fibres are not manufacturing in Bangladesh. In case that the trial production facilities in BJRI-TRW would be completed with the necessary machinery as stated above in paragraph 2.4.1, for the realisation of trial production of blended fine jute yarns on a larger scale would be necessary to have in BJRI-TRW sufficient stock of Polyester (PE) PAN and Rayon fibres woolen and /or flax type.

2.5.2 Yarn tex 76 (jute count 2.2) with intimate fibres blend of 50% jute and 50% PE

Jute grade BWA and woolen type PE fibres were used for production of this yarn. Initially the fibre blend of jute fibres, processed on Breaker Card, together with PE fibres was done by hand on the floor. Consecutively the blend was processed through Finisher Card; I, II and III drawing frames. The yarn was spun in Apron draft spinning Frame.

The produced yarns (2.5.1 and 2.5.2) are with relatively small strength (8-10 CN/tex) and high irregularity-strength and thickness, due to the fact, that with the existing spinning equipment the necessary cleaning, parallelising and blending of the fibres can not be achieved. In addition, the maximum number of twist 320 t/m, which can be obtained with the Apron draft Spinning Frame is insufficient.

2.5.3 Yarns tex 100 to tex 40 (jute count 3 to 1,3) reinforced type with 50 - 80% of jute

Jute grades BWC to BWA processed in conventional jute technology to the stage of sliver with respective linear density was reinforced with PE or PAN compo-

nents on Apron draft spinning frame.

The Consultant was able to obtain from third drawing frame jute sliver with linear density 0,6 g/m suitable for spinning yarns with linear density tex 58 to tex 50 slivers with lower linear density were obtained and used for spinning finer yarns, but the difficulties in processing of the jute sliver at Third drawing frame and at the Apron draft spinning frame are not acceptable. The produced yarns possess relatively high irregularity on thickness and lower resistance at rubbing/ (easily to be stripped); due to the insufficient number of twists and inappropriate pretreatment of the jute fibres.

2.5.4 Trial production of boucle yarn.

The Consultant was able to demonstrate production of jute boucle yarn treating in soda caustic solution reinforced jute yarn tex 100 - 50/50 J/PAN. This yarns are suitable for production of knitted fabrics.

2.5.5 Trial production of fabrics.

All produced yarns were used for production of woven and knitted fabrics. The obtained fabrics (Annex IV) after appropriate finishing treatment may be used for production of shirts, trousers, skirts, cardigans polos and so on.

2.6 Liaison with Industry

For strengthening of the relationship between the BJRI-TRW and the jute and textile industry and for rapid dissemination and utilization of research findings a cooperation and coordination Committee (CCC) with representatives from BJMC, BTMC, BJMA and BJRI has been formed in 1982. ~~As already discussed~~ and in use system for mutual collaboration include: Visits to the Mills for technical service; marketing, information feed-back; technical lectures; seminars, workshops.

2.6.1. Visits

During the mission visits were made to Bangladesh Jute Mills Corporation (BJMC), coordinating the management of government owned jute mills and in addition to the Bangladesh Jute Mills Association representing private jute mills. At the two places the Consultant presented an oral description on the recent developments of the jute technology in Europe and particularly in Bulgaria. The Consultant also informed them about the recent trial products results at BJRI-TRW. As a result, both managements become eager to implement the new technological methods in the jute industry with the help of a new UNDP/UNIDO project.

The Consultant visited also two scientific institutions and seventeen textile mills located in Chittagong, Dhaka and its suburbs, which are stated in Annex II.

2.6.2. Workshop on Agricultural and Technological Research on Jute - 1985

The Consultant took part in a three-day (April 22-24) workshop on 'Agricultural and Technological Research on Jute' held at the BJRI in Dhaka.

The objective of the workshop was to review the past achievements in jute research and have interaction and exchange of ideas among the scientists, extension workers, industrialists, exporters and those who are actively involved in this sector.

The inaugural function was addressed by Agriculture Minister Major General M.A. Munis; Mr. K.M. Rabbani, Secretary, Ministry of Jute and Textiles; Mr. S.A. Mahmood, Secretary, Ministry of Agriculture; Dr. M. Ayubur Rahman, Director General, BJRI and Dr. A. Matin Bhuiyan, Director, BJRI-TRW.

Some of the recommendations made by the Consultant/^{are} included in the recommendations of the workshop.

3. Recommendations

A. To the Government

- 3.1 It is of great national interest for the People's Republic of Bangladesh, as the largest exporter of jute and jute goods in the world, to develop rapidly the production of fine jute and jute type yarns and fabrics from them. This development probably will double the currently engaged work force in the jute industry and will increase considerably the income from jute export. For achieving this target, it will be desirable:
- 3.2 To ensure sufficient support in the Third Five Year Plan 1985-90, for the accelerated development of the private and government jute manufacturing industry.
- 3.3 To propose second phase of the current project, until BJRI-TRW has fully completed its trial production facilities for the development of new jute products on the basis of fine jute and jute type yarns.
- 3.4 To request UNDP/UNIDO to establish a new project which would have the purpose of providing the necessary guidance and assistance to the private and for government jute manufacturing industry for accelerated implementation of the production of fine jute and jute type of products.
- 3.5 To place the BJRI-TRW as a separate Research Institute under the administration management of the Ministry of Industry.

B. Recommendation to the Management of BJRI-TRW

- 3.6 It is desirable the Annual Programme to be developed in such a manner, that the purposefulness and the orientation of the projects will be more responsive to the needs of the jute manufacturing industry.

- 3.7 It is advisable to give preference in the Annual Research Programme to projects ordered or contracted by private or government jute mills.
- 3.8 Specialists of the jute or textile manufacturing industry ought to be members of the research teams specially in the implementation of the findings.
- 3.9 The implementation of a detailed work plan for realisation of product development projects, suggested by the Consultant, as given in Annex III is advisable.
- 3.10 Since the BCSIR objective is development of Jutten technology, the main objective of BJRI-TRW ought to be, development of the technological methods for production of fine jute type yarns, blending jute with longer stapled natural and man-made fibres or filaments.

Annex - I

JOB DESCRIPTION
DP/BGE/1/03/1-5/3.7.9

Post title : Consultant in Textile Technology (spinning research fibre characteristics and their relation to spinning)

Duration : 2 months and 20 days

Date required : As soon as possible

Duty Station : Dhaka

Purpose of project : To assist the Bangladesh Jute Research Institute BJRI (TRW) to develop its physical and mechanical research programme in order to make an effective contribution to the technical problems of the jute manufacturing industry.

Duties : The consultant will specifically be expected to:

1. Provide background information on methods and techniques of assessing the physical characteristics of yarns spun from them on different spinning systems;
2. Conduct small seminars to discuss the application of this information to the study of jute fibres and jute spinning systems;
3. Offer guidance in drawing up work plans for appropriate research projects.

The consultant will also be expected to prepare a final report, setting out the findings of the mission and recommendations to the Government on further action which might be taken.

Qualifications : Textile Technologist, with long experience in research and development work on the spinning of natural fibres on various spinning systems.

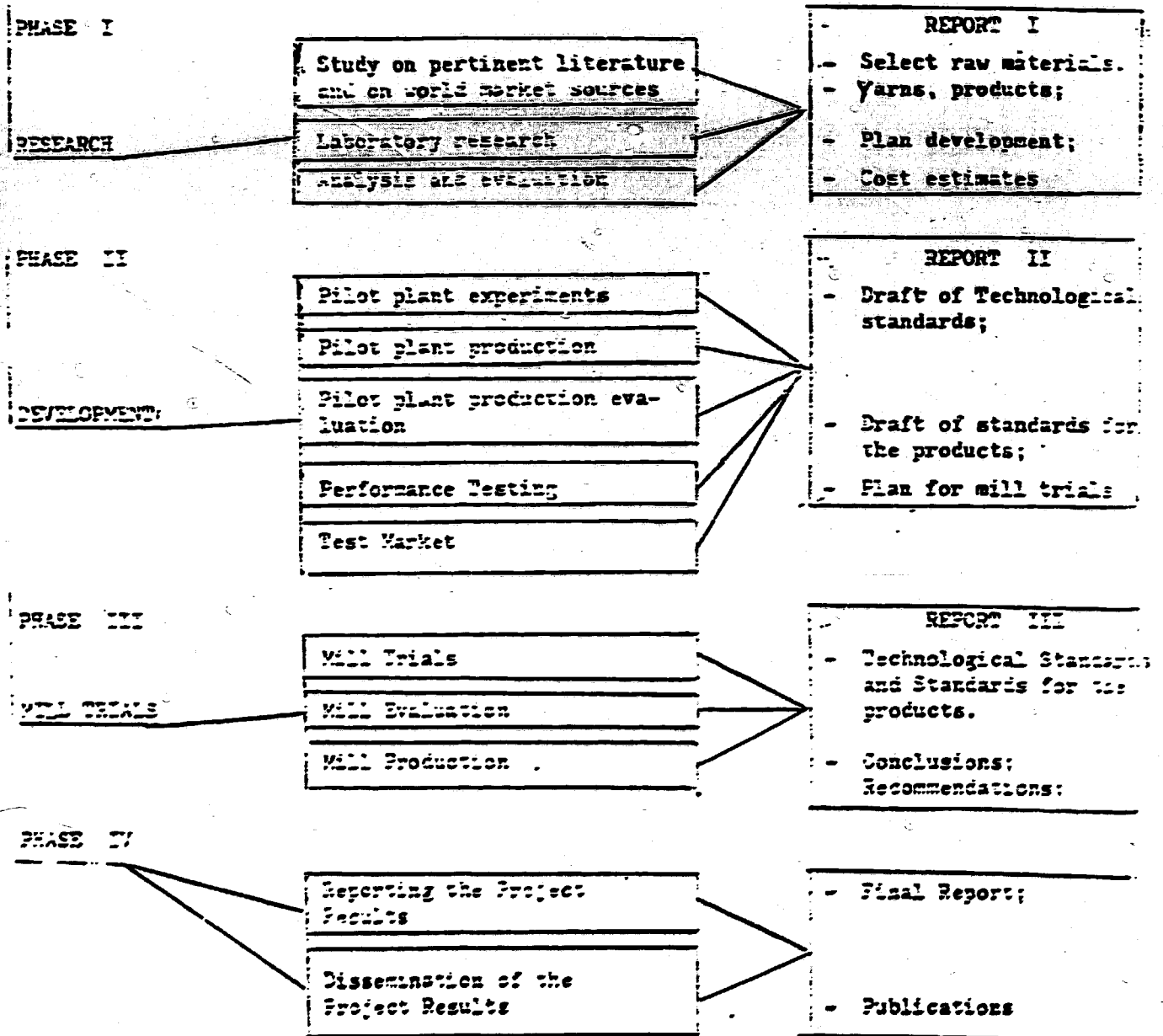
Annex II

List of the Visits

1. Bangladesh Jute Mills Corporation - Dhaka
2. Bangladesh Jute Mills Association - Dhaka
3. Bangladesh Council of Scientific and Industrial Research - Dhaka
4. College of Textile Technology - Dhaka
5. Ahmed Specialized Textile Mills Ltd., - Dhaka
6. Ahmed Fabrics Ltd. - Dhaka
7. Syntex Finishing Mills Ltd. - Dhaka
8. Narayangang Jute Fibre (S.D) - Narayangang
9. Ahmed Jutex Mills Ltd. - Narayanganj
10. Sarwar Jute Mills Ltd. - Narayanganj
11. Kerim Jute Mills - Dhaka
12. Kwality Jute Mills. Ltd., - Feni
13. Amin Jute & Carpet Mills, Sholoshahar, Chittagong
14. Baghdad-Dhaka Carpet Factory, North Kattali, Chittagong
15. Valika Woolen Mills Ltd.,, Naviratad, Chittagong
16. Chittagong Textile Mills Ltd., North Kattali, Chittagong
17. Furat Karnaphuli Carpet Factory, Rangunia, Chittagong
18. Karnaphuli Jute Mills, Rangunia, Chittagong
19. Chittagong Jute Manufacturing Co. Ltd., Kalurghat, Chittagong
20. Pylon Industries, Chittagong

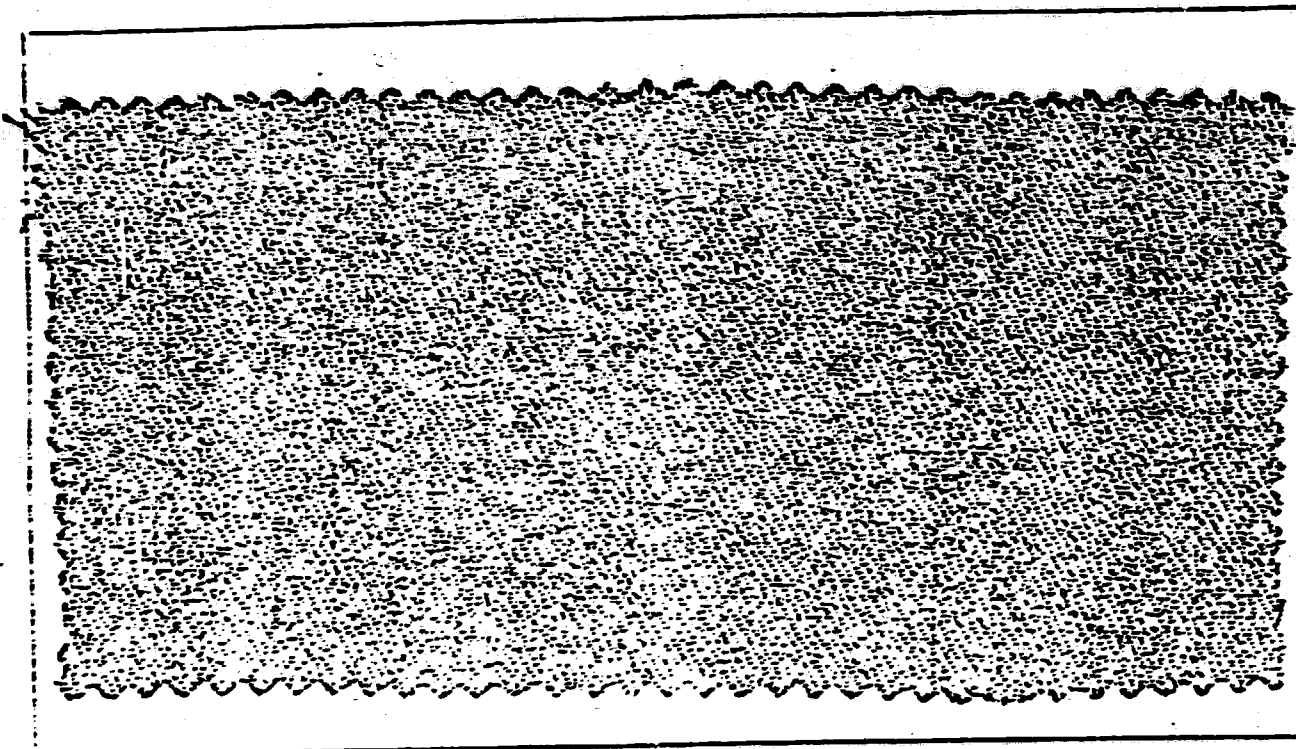
Annex III

Work Plan for realization of product development projects

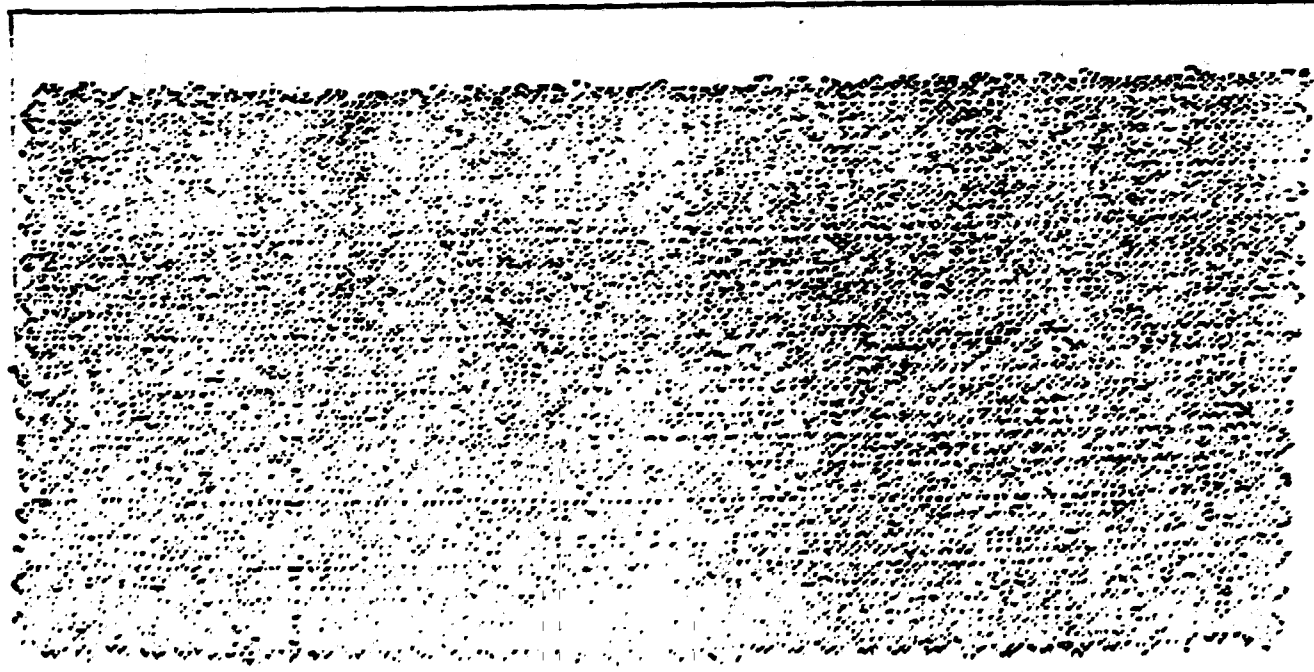


SAMPLES - 1

Jeans fabric 250 g/m², 50% Jute, 20% PE, 50% C

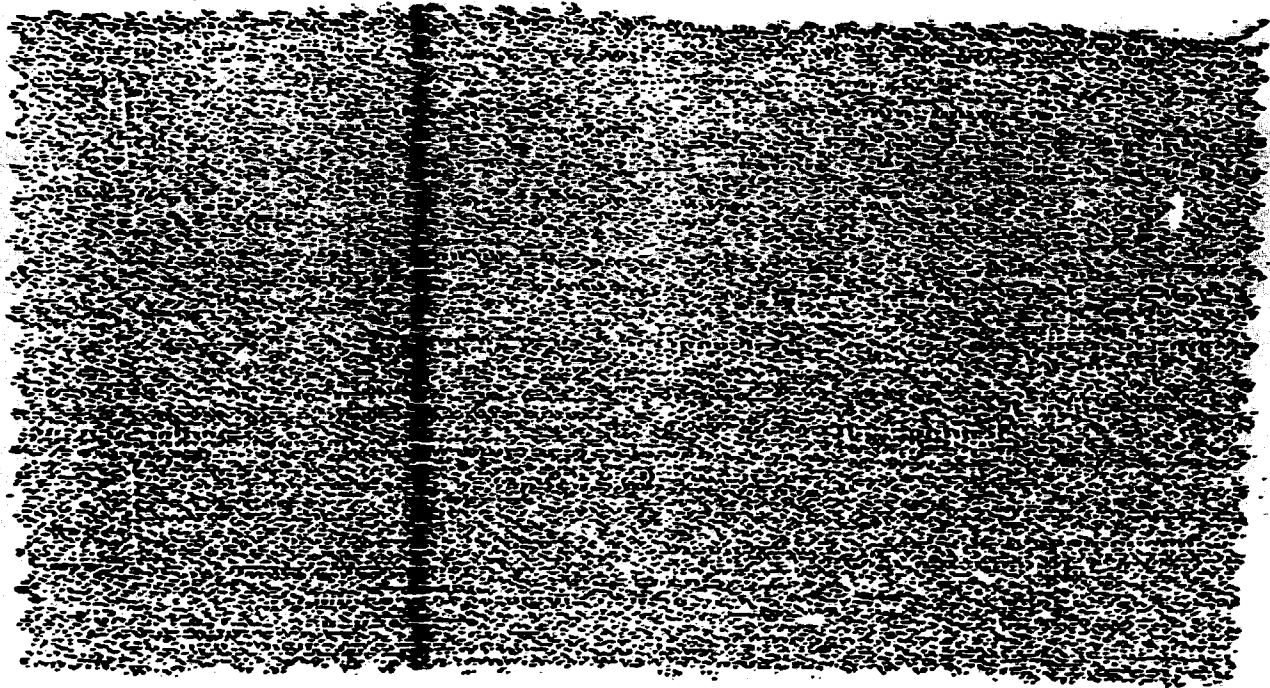


Jeans fabric 225 g/m², 40% Jute, 20% PE, 40% C



SAMPLES - 2

Red fabric 190 g/m², 40% Jute, 60% PE



Etched fabric 190 g/m², 40% Jute, 60% PE

