



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)

18700

Distr.  
RESTRICTED

IO/R.177  
16 November 1990

UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

ORIGINAL: ENGLISH

STRENGTHENING OF THE CHINA RAMIE TECHNOLOGY DEVELOPMENT CENTRE

DG/CPR/85/057/11-01

PEOPLE'S REPUBLIC OF CHINA

Technical report: Fifth mission\*

Prepared for the Government  
of the People's Republic of China  
by the United Nations Industrial Development Organization

Based on the work of Mortimer O'Shea, senior technical adviser

Backstopping officer: J. P. Moll,  
Agro-based Industries Branch

\* Mention of firm names and commercial products does not imply the endorsement of the United Nations Industrial Development Organization (UNIDO). This document has not been edited.

## ABSTRACT

### Objectives

The objectives of this report are to record:

- the discussions at Changsha between the representatives of the tripartite organizations with responsibility for the execution of the aims of the Project Document for the strengthening of the China Ramie Technology Development Centre and the representatives of the University of Leeds.
- revision of the Terms of Reference for subcontracting by the University of Leeds in the technological areas of: Degumming, Weaving and Dyeing/Finishing
- arrangements for the training of nine RTDC senior technicians
- arrangements for visits to the RTDC and one nominated ramie mill by experts from the University of Leeds
- agreement of the Terms of Reference
- Visits to ramie mills

### Major recommendations

- that the University of Leeds Industrial Services Division should now be awarded a formal contract to undertake the work in accordance with the agreed Terms of Reference in the subjects of:
  - Degumming
  - Weaving
  - Dyeing/Finishing
- work to commence early January 1991 and scheduled for completion end December 1992
- determination of cut-off points
- progress monitoring arrangements

**CONTENTS**

<b>Index</b>	<b>Subject</b>	<b>Page</b>
1.00-06	Background to discussions	05
2.00-09	Salient points from discussions	06-07

**ANNEXES**

I	Revised & Amended Terms of Reference	08-18
II	Itinerary & Work Schedule	19
III	Persons Met	20
IV	Explanation of Abbreviations Used	21

**SUMMARY**

The report deals with the discussions at Changsha between the CTA, UNIDO, UNDP, RTDC, CICETE, MTI and representatives of the University of Leeds, one of whom had authorization from the University Industrial Services Division to sign their agreement to the thus revised Terms of Reference for the subcontracting of Degumming, Weaving and Dyeing/Finishing. The report also deals with the tentative arrangements for the training of nine senior technologists from both the RTDC and the Zhuzhou Ramie Textile Printing & Dyeing Mill.

**RATE OF EXCHANGE:** One US Dollar equals 4.710 Yuan

- 1.00 Background to tripartite plus University of Leeds discussions at RTDC.
- 1.01 In June 1990 the CTA had discussions at RTDC and CICETE/MTI and UNDP concerning the response to tender invitations for subcontracting of:
  - degumming
  - spinning
  - weaving
  - knitting
  - dyeing/finishing
- 1.02 It was decided then to recommend to UNIDO the award of contracts as follows:
  - degumming to Novo Nordisk
  - spinning to a PRC undertaking
  - weaving to University of Leeds
  - knitting to a PRC undertaking
  - dyeing/finishing to University of Leeds
- 1.03 A letter from Mr. Xu Kui, the NPD, to Ms. Zhang, UNDP, dated 29 August 1990 explained that the University of Leeds should be awarded contracts for:
  - degumming
  - spinning
  - weaving
  - dyeing/finishing
- 1.04 This was the CTA's understanding of the current status at the commencement of discussions at RTDC on 17 Oct 1990.
- 1.05 The change to the position as at 1.02 was made at a meeting in Beijing in September 1990 between CICETE, MTI and UNDP. This change was not reported to the CTA before his departure for PRC nor indeed has any such communication been received to date.
- 1.06 At the commencement of discussions at RTDC on 17 October 1990 the NPD informed the meeting that Novo Nordisk had requested to be excused from submitting a formal tender for degumming. It was, therefore, decided to request the University of Leeds to undertake this work and it would be a matter for them to decide upon whether to cooperate with Novo or any other supplier of enzymatic auxiliaries.

- 2.00 Salient points from discussions at RTDC.
- 2.01 The Backstopping Officer representing UNIDO clarified a number of points including that although this was a 'Government-executed' project financed on a 50/50% basis by the PRC government/UNIDO, most of UNIDO's funding was now to be dedicated to subcontracts. The remaining funds would be re-allocated to this.
- 2.01.1 The currently available total for subcontracting is \$183k following earmarking of \$163k as follows:
- \$95k for Leeds personnel travel and DSA; CTA's travel to PRC/Vienna and DSA
  - \$5k for CTA's visits to Leeds
  - \$60k for RTDC/Zhuzhou personnel travel and DSA to Leeds
  - \$3k for miscellaneous expenses
- 2.01.2 Leeds reported a shortfall in the total available money to cover their subcontracts and it is hoped that UNDP can - in consultation with CICETE/MTI - make up this relatively small amount.
- 2.02 Leeds to approach subcontracts in a spirit of co-operative research with the RTDC/Zhuzhou ramie mill. This is the only mill specifically nominated for the immediate implementation of experimental results during the course of the subcontracts.
- 2.02 Subcontract results will not be dependent on any new machinery/equipment purchases by the client.
- 2.03 the NPD specifically requested that no 'old ground' should be covered by Leeds and promised to furnish them with details of old research work. However, Leeds insist on reserving their right to check the correctness of procedures lest any profitable line of enquiry should be thus overlooked.
- 2.04 Leeds could not give unqualified guarantees on all the stated requirements of the client but promised to make every effort to achieve the targeted objectives.
- 2.05 Work to be staged so that any unpromising lines of investigation can be abandoned and fresh approaches begun.

- 2.06 Progress to be monitored by the CTA as follows:
- 2.06.1 Visit University of Leeds immediately following the return of experts from each PRC mission, i.e., twice a year,
  - 2.06.2 Visit RTDC as soon as possible after Leeds visit,
  - 2.06.3 Visit UNIDO, Vienna for debriefing,
  - 2.06.4 Submit a progress report with recommendations for any changes/modifications as deemed necessary.
- 2.07 It was agreed that a schedule of review/cut-off points should be included in the Terms of Reference.
- 2.08 It was agreed that a 'common language' (scientific parameters) should be established between the client and the subcontractor to enable correct comparisons to be made.
- 2.08 The work plan to be based upon 'substance' rather than on 'time'. The objective must be to develop some basic knowledge on how to improve the industry whilst considering the limitations of the existing machinery and processes.
- 2.09 The original Terms of Reference dated 17 August 1989 were discussed line by line and revised and amended in accordance with the perceived needs of the project from the viewpoints of both client and subcontractor. The revised document is given as Annex I.



TERMS OF REFERENCE

DC/CPR/85/051 - Strengthening the National Ramie Technology  
Development Centre, Changsha, Hunan Province

For undertaking a sub-contract to assist a project on the Strengthening of the National Ramie Technology Development Centre in Changsha, Hunan Province in the People's Republic of China.

**1. Background**

Ramie has been a fibre crop for thousands of years in China. The fibre is distinguished for its durability and comfort for summer wear. China produces around 75%-80% of the world's ramie fibre output, which is estimated to be close to 70,000 tons yearly. Other significant ramie producing countries are Brazil and the Philippines. The Hunan province is China's largest ramie producer, accounting for over 25% of the national production.

Ramie is a perennial crop. In Hunan three crops are annually harvested at intervals of 60-80 days from May to November. At present most of China's ramie is exported (close to 90%). A rough estimate shows the following breakdown:

tops	25%
varn	15%
grey fabric	50% of the total production
domestic	10%

The target is to increase the export of products with a high value added (finished fabrics and even clothing) and to reduce the exports of tops and varn. By further increasing the fibre production more ramie products should become available for the domestic market in particular in blends with other fibres.

The ramie textile industry still uses the traditional long and expensive technological process cycle, with outdated machinery, low production efficiency, poor working conditions and considerable amounts of effluent wastes. Finishing techniques are outdated, resulting in frequent quality deficiencies of fabrics. To date no ramie processing technology institutes exist to support the industry in overcoming its fundamental problems on a national basis. In view of the importance of ramie for several of its provinces and for its contribution to the balance of payment the Government of China, through its Scientific and Technological Committee decided by Decree of 21 December 1984, to create a national "Ramie Technological Development Centre" in order to provide a professional organ for applied research for modernizing the processing technology of the national ramie textile industry. The decision to establish this Centre, initially using the premises and facilities of the provincial "Hunan Ramie Textile Research Institute" and later moving into its own buildings in 1987, is the first attempt for a concerted action to modernise the national industry and to improve diversification and quality of ramie textile products.

\* This is the original and agreed document now incorporated in this report with pages renumbered 8-18.

The Centre's new building to be located in the town of Changsha, the capital of the Hunan Province, will have an area of 3,000 sq.m. for pilot equipment and another 3,000 sq.m. for research and offices.

At present the Centre has a staff of 120, of which 40 are qualified technicians. Once established in the new premises in Changsha, the Centre will have a staff of 270, including 130 technicians for which graduates from the textile college will be recruited.

The Centre's activities will cover all steps of the ramie trade, from plantation to consumer products. Although important for the fibre quality, the project will not include the agronomical part of the process. The project's scope of activities will be concentrating on industrial processing, to begin with degumming of the ramie fibre, developing modern processing methods and demonstrating these to the enterprises and train their staff.

As a consequence of the development of objective of this project a National ramie Research and Development Centre will be established to support the ramie industry in the People's Republic of China. This institution will become the national Centre for applied research and development of modern processing technology, experimental work on conventional and modern processing equipment, training and extension services to industry.

The Government will provide buildings, local staff, locally manufactured equipment, public utilities and raw material for test-runs. UNDP will provide specialized expertise, training and modern machinery which are not available in China. The expenditure for machinery will be financed by the Government of China under a cost sharing arrangement. The Centre will be equipped with a processing plant for carrying out applied research on degumming, spinning, weaving, knitting, and dyeing/finishing complete with a physical and chemical testing laboratory, and an automation research group.

#### Scope of services to be rendered

Sub-contracts are required in the areas of:

- Degumming
- Dyeing and Finishing
- Weaving

Due to the required homogeneity of the output offers from sub-contractors capable of covering all areas are preferred. Sub-contracting specific parts of the programme will be permitted. Nevertheless, provisions are made to consider offers from potential sub-contractors which are prepared to render their services in only one area (e.g. degumming) provided they are prepared to collaborate with other selected sub-contractors.

Detailed descriptions of the required services for each area are explained in Attachment 1

## 11. Duties of the contractor

The contractor shall take the primary responsibility for all research work. The contractor will be required to provide assistance over a period of at least 2 (two) years involving a series of short-term, co-ordinated and intensive inputs by individual specialists whose particular skills are relevant to the project's objective.

Since the major objective of the project is to develop and subsequently to promote advanced remote processing technologies and to achieve this with the active participation of the local staff rather than by the sole efforts of the contractor's specialists, the individual specialists assignments will preferably be brief and intensive, designed to guide, stimulate and teach by example, but avoiding undue dependence on the part of the local staff. This will require repeat visits by individuals according to their speciality, working to a schedule that can be established just a few months in advance, throughout the project life.

Special emphasis has to be given to the fellowship programmes. The contractor is expected to develop tailor-made programmes for the fellows and provide the outlined programme either at his premises or to arrange for the outlined fellowship programme at suitable institutes or companies. Tuition and supervision fee for the fellowships should be included in the offer but as a separate item.

DG/CPR/85/057 - Strengthening the National Ramie Technology  
Development Centre, Changsha, Hunan Province

The immediate objective is to develop and apply modern processing technologies in the manufacture of quality textile fabrics from ramie fibre. In so doing the contractor will focus on the following areas:

1. Degumming

- experiment with the use of various chemical and biological agents in removing non fibre matter from raw, green ramie dried ribbons (stalks);
- experiment with softening and scouring agents and any other auxiliaries as necessary in the subsequent processing stages in order to produce the optimum results of fibre purity without any significant resultant degradation of fibre length, strength and colour;
- provide the client with a representative sample of fibre from each stage with reference number and full details to allow evaluation and so that the client's results can be compared and reconciled with those of the contractor.

The major objective is to achieve industrial-scale reproducibility of the laboratory-scale results in both fibre quality parameters and significantly reduced processing time and with cost-effective processing.

Particular attention must be given to the latter and appropriate technology applied to such items as fibre cages, vessels and machines and all the requisite industrial installations.

The contractor shall submit specifications for the effective industrial implementation of the optimum process including equipment specifications for both laboratory and industry and assist with equipment selection, evaluation and eventual commissioning of a pilot industrial-scale processing line at the client's premises which will be the model for industrial installations throughout the PRC. It is expected that certain existing machines and processes such as scutching and softening will become unnecessary or at least greatly improved and modified.

The present degumming process leaves a level of 2 1/2-3% residual gum on average but about 10% of the fibre has a higher level (say about 4%) and has to be separated out by hand and reprocessed. The target for the new process is 2% residual gum on average with 5% requiring reprocessing. The fibre strength should be improved from the present level of 4.2-4.5 g/den to 4.5-4.8 g/den. The total cost of the improved process should not be greater than the present.

a) At the end of the project:

- The contractor shall have assisted in the training of 3 (three) of the client's senior textile chemists and other relevant staff so that they will have become fully conversant and competent in the implementation of the improved chemistry and technology and will further have become capable of continuously carrying out R & D work in degumming, in advising the Agronomists of the Centre on research results, in co-operating with the Spinning Department in developing improved fibre qualities and in advising the industry in applying modern degumming processing technology as will have been developed through the co-operative efforts of the contractor and the client.

b) During the course of the contract:

- The contractor shall produce research reports on:
  - specifications for crude ramie fibre required for efficient modernised degumming processes;
  - noise and waste reduction by applying new degumming technology;
  - grading systems for ramie fibre aiming at the production of fine pure ramie tops;
  - new additives/oils for accelerated degumming;
  - bio-assisted degumming;
  - test results of pilot industrial application in the client's development unit.

The research results should contain laboratory as well as demonstration scale data and should enable development of the technology package.

- the contractor shall facilitate the implementation of the improved technology by inviting 3 (three) senior experts from the client's staff to receive instruction and training at the contractor's premises and the client will allow the contractor's experts full access to and the use of his own facilities and co-operate with the contractor in the procurement, installation and commissioning of any special machinery, equipment and facilities as deemed necessary following tripartite consultation with UNIDO experts, the contractor and the client's staff;
- the client is agreeable to the contractor sub-contracting any part of this assignment but will deal only with the contractor who will be responsible for the confidentiality of all information;
- the contractor is expected to give a time-phased and staged breakdown of proposed work and to apply a price to each stage and a discount for the full package.

## II. Dyeing, printing and finishing

- experiment with the use of various chemical and biological agents in the removal of size and any other contaminants from earlier processes in order to arrive at the optimum process from both cost-effectiveness and fabric quality;
- experiment with the use of various bleaching agents with similar objectives to the foregoing;
- develop cost-effective and reproducible dye recipes for ramie and ramie-blended yarns and fabrics, having due consideration for the makes and types of dyeing equipment available to the client and within the PRC industry. The requisite internationally accepted fastness levels must be attained. Particular attention should be paid to increasing the dye uptake and obtaining brighter colours.
- experiment with various chemical finishes to improve the crease recovery of ramie fabrics. The present level for 36x36 Nm pure ramie fabric is fast recovery 95° and slow recovery 120°. The target for a new process is 120° and 150° respectively. The crease recovery should be better than at present.
- develop fabric finishes including the best singeing technology and softening technology in order to attain enhanced fabric handle and the elimination of hairiness and itchiness. The target is that a fabric should be capable of being worn next to the skin and to be acceptable to about 90% of people.

The major objective is to achieve industrial-scale reproducibility of laboratory-scale results whilst retaining the integrity of the textile, enhancing handle and reduction of process time.

The contractor shall submit specifications for the effective industrial implementation of the optimum processes including, where necessary, equipment specifications for both laboratory and industry and assist with equipment selection, evaluation and eventual commissioning of a pilot industrial-scale processing line at the client's premises which will be the model for industrial installations throughout the PRC.

The client shall provide the contractor with a listing of the machines and equipment, both laboratory- and industrial-scale available at the Centre or within the industry. The contractor will advise the client where there appear to be any inadequacies of a significant nature and duly make recommendations concerning new equipment.

a) At the end of the project:

- the contractor shall have assisted in the training of three of the client's senior textile chemists and other relevant staff so that they will have become fully conversant and competent in the implementation of the improved chemistry and technology and will further have become capable of continuously carrying out the preparation of recipes and of advising the dyehouse and finishing departments' personnel of the mills;
- the contractor shall provide the client with a technology package with basic know-how describing the technology developed for desizing, fabric preparation, dyeing and finishing and covering all other aspects of importance to the client in fulfilling his services to the China ramie industry;

b) During the course of the contract

- the contractor shall provide research reports on reproducible dye recipes for ramie concentrating on improved dye uptake and brighter dyeings; also fabric finishes with an improved handle for ramie fabrics;
- the client shall provide the contractor with all requisite material samples (yarns and fabrics) all of which shall be labelled and have reference numbers which the contractor must adhere to throughout the project - by air freight.

The research results should contain laboratory as well as demonstration scale data and should enable development of the technology package.

- the contractor shall facilitate the implementation of the improved technology by inviting three senior experts from the client's staff to receive instruction and training at the contractor's premises and the client will allow the contractor's experts full access to and the use of his own facilities and co-operate with the contractor in the procurement, installation and commissioning of any special machinery, equipment and facilities as may be deemed necessary following tripartite consultation with UNIDO experts, the contractor and the client's staff.
- the client is agreeable to the contractor sub-contracting part of this assignment but will deal only with the contractor who will be responsible for the confidentiality of all information.
- in the event that the contractor wishes to make commercial use of any novel information or product/process development arising from this contract by passing on any information to a third party, such divulgence of information specifically arising from the contractor's work for the client may be made only with the prior consent of UNIDO in consultation with the PRC authorities and the client.
- the contractor is expected to give a time phased and staged breakdown of the work, a price for each stage and a discounted price for the package.

### III. Weaving

- using plain yarns (to be provided by the client by air freight) of pure ramie in 36<sup>S</sup>Nm count experiment to establish sets of optimum parameters for all the relevant stages of manufacture under the headings of "Preparation and Weaving".
- it is proposed to gradually replace the existing shuttle-changing looms by modern Rapier-type machines. The contractor should, therefore, initially study ways of upgrading the existing looms, for instance by the use of a retrofit Rapier package.
- the contractor is advised that a Somet loom will be installed by the client. Other Rapier looms may also be experimented with.

Among the areas to be explored are:

- improved winding - recommendations on the most suitable machines and a study of the feasibility of using some method of splicing.
- improved sizing with recommendations about size recipes and machine variables.
- improved warping and the use of larger knotless packages.
- the introduction of modern preventive maintenance.
- review testing and QC procedures.
- improved fabric inspection equipment and practices.
- atmospheric control including cleaning, temperature and humidity control.

The targets to be achieved are a reduction by 25% of the faults caused by variations in pick spacings; a reduction by 25% in the faults caused by tight warp ends; a reduction by 50% in the faults caused by warp or weft floats (warp and weft stitching).



a) During the course of the project:

The contractor shall produce research reports on the following:

- development of ramie apparel fabrics, including test reports;
- advisory reports on setting parameters for the principal yarn counts and cloth constructions;
- suggestions for the introduction of Rapier machines to the industry;
- quality control in ramie weaving mills.

The research results should contain laboratory as well as demonstration-scale data and should enable development of the technology package.

- the contractor shall co-operate with the client in the procurement, installation and commissioning of any special machinery, equipment and facilities as may be deemed necessary following tripartite consultation with UNIDO experts, the contractor and the client's staff.
- in the event that the contractor wishes to make commercial use of any of the R+D findings arising from this contract by passing of any information onto a third party, such divulgence of information or product development specifically arising from the contractor's work for the client may be made only with the prior consent of UNIDO in consultation with the PRC authorities and the client.

IV. PROGRAMME OF VISITS

a) University of Leeds experts to PRC

1991

Four experts for two weeks plus travel time during March/April  
Three experts for four weeks plus travel time during August/Sept

1992

Three experts for two weeks plus travel time during March/April  
Three experts for four weeks plus travel time during August/Sept

b) RTDC visiting fellows to the University of Leeds

1991 and 1992

Nine persons for a total of six months each at periods to be arranged and agreed

Cut-off points

This agreement can be terminated after consultation between the CTA and RTDC duly reported to the other concerned parties through UNIDO. The first cut-off point can be June 1991. Further cut-off points can be December 1991 or June 1992. The contractor to be paid respectively as follows:

June 1991 - one quarter of total subcontract money  
Dec 1991 - one half of total subcontract money  
June 1992 - three quarters of total subcontract money

Alternatively

The terms of the agreement can be modified on the three above cut-off points by agreement between the contractor and the client through UNIDO.

Monitoring

The CTA to be responsible for the monitoring of progress during the course of the project through:

Discussions at Leeds with the contractor following each visit to PRC by the contractor's experts; subsequently visiting RTDC and debriefing by UNIDO in Vienna followed by a formal report.

Work plan

A detailed work plan will be prepared by the CTA in consultation with the contractor as soon as concrete information can be provided by the NPD on which fellows are to be sent to the University of Leeds bearing in mind the vital need that they have an excellent command of English both spoken and written.

AGREEMENT TO TERMS OF REFERENCE AS REVISED AND AMENDED ON 29 OCTOBER 1990

I hereby agree to the Terms of Reference as attached.



Signed 徐 煜 Date 1990.10.31 Title NPD

On behalf of the RTDC

Signed PQ Smith Date 31<sup>st</sup> Oct 1990 Title Senior Lecturer

On behalf of The University of Leeds  
Industrial Services.

ANNEX II

Itinerary and work schedule

Date	Activity
20.10.90	Travel Kilkenny-Dublin-Copenhagen-Beijing
21.10.90	Arrive Beijing
22.10.90	Report to UNDP
23.10.90	" " "
24.10.90	Travel to Changsha
25.10.90	Visit Zhuzhou Ramie Textile Printing & Dyeing mill
26.10.90	Discussions and inspection of premises at RTDC
27.10.90	Discussions at RTDC
28.10.90	Preparation of draft Terms of Reference
29.10.90	Discussion of draft TOR at RTDC
30.10.90	Visit Liuyang Ramie Textile mill; finalize draft TOR at RTDC; Fax agreed TOR to UNDP
31.10.90	Discussions on implementation of subcontracts including interviewing by University of Leeds representatives of prospective visiting Fellows
01.11.90	Return Beijing
02.11.90	Debriefing with Barry Crowston at UNDP
03.11.90	In Beijing
04.11.90	Return via Copenhagen to Dublin; overnight Dublin
05.11.90	Return Kilkenny

ANNEX III

Persons met

Name	Organization & Title
Ms. Wang Jing	CICETE Programme Officer
Mr. Chen Rong	MTI Programme Officer
Ms. Wang Wei Li	CICETE Programme Officer
Mr. Bei Yulong	MTI Director
Mr. Xu Kui	RTDC Director and NPD
Mr. Zhang Jian Wu	RTDC Vice Chief Economist and Assistant NPD
Ms. Tan Al Li	RTDC Vice Chief Engineer
Mr. He Zhi Yong	RTDC Dyeing and Finishing Research Director
Mr. Kung Lei	RTDC Dyeing and Finishing department
Mr. Wang Ning Ya	RTDC Degumming Chemist/Technologist
Mr. Li Gui Zhen	RTDC Engineer
Mr. Mao De He	RTDC Senior Engineer
Mr. Huang Shao Shi	RTDC Knitting Technologist/Interpreter
Ms. Li Mei	RTDC Interpreter/Designer
Mr. Chou Xianghuai	Zhuzhou Ramie Textile Printing & Dyeing Mill - Vice Director
Mr. Guan Dehua	Ditto - Deputy Chief Engineer/Senior Engineer
Mr. Cai Pei-Wei	China Dyeing & Finishing Development Centre-Senior Engineer/Vice Director of Planning Dept.
Dr. Geo. W. Madras	CTA of UNIDO Project for China Dyeing & Finishing Development Centre
Mr. Barry Crowston	UNIDO Country Director - PRC
Ms. Zhang Xi Wei	UNDP Programme Officer/Senior Engineer
Mr. Cao Jianhai	UNDP Programme Officer
Backstopping officer	UNIDO, Agro-based Industries Branch
Dr. Philip A. Smith	University of Leeds Senior Lecturer - Dept. of Textile Industries
Mr. Douglas Bland	Senior Lecturer - Weaving - Huddersfield Polytechnic

ANNEX IV

Explanation of abbreviations used

RTDC	Ramie Technology Development Centre
CTA	Chief Technical Adviser
NPD	National Project Director
PRC	People's Republic of China
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
CICE'TE	China International Centre for Economic and Technical Exchanges
MTI	Ministry of Textile Industry
TOR	Terms of Reference
k	Thousand
Nm	Metric Yarn Counts system
QC	Quality Control
R&D	Research & Development