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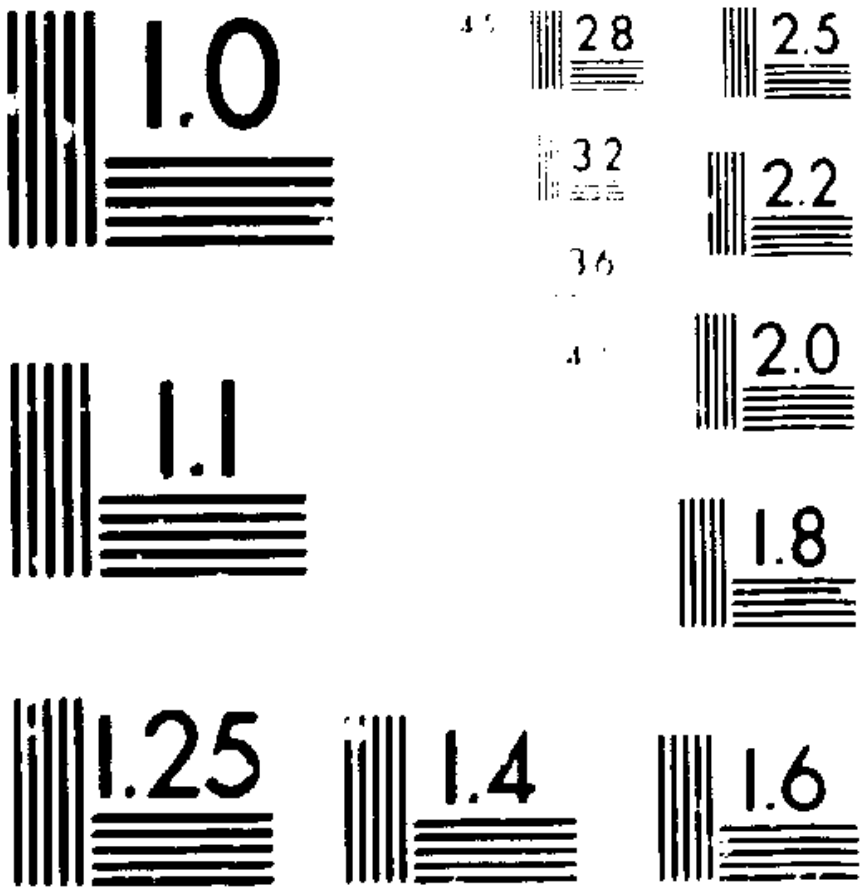

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TEXTILE DYEING AND FINISHING INDUSTRY SERVICE CENTRE

DP/ROK/82/027

REPUBLIC OF KOREA

Technical report: Textile Dyeing and Finishing Industry*

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

Based on the work of Gert Bremhorst
Consultant in Textile Dyeing and Finishing

United Nations Industrial Development Organization
Vienna

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PART I.

INTRODUCTION

The Government of the Republic of Korea has set high priority on modernizing the country's textile industry in order to improve the quality of textiles to meet the requirements of higher price sections of the textile world market.

A Dyeing and Finishing Research Center should therfor be established to assist the Korean textile industry to improve the quality level of their export products. As the specific problems of the Dyeing and Finishing (D/F) sector were not enough identified by the counterparts, a Preparatory Assistance was necessary to clarify a number of fundamental issues:

- survey of the D/F industry to find out the specific problems throughout the sector
- what measures is the Government taking to support the textile industry ?
- what budgetary provisions have been made for the establishment of a D/F service center ?
- how could the existing but evidently underutilized facilities of existing textile testing institutes be effectively employed in the proposed scheme ?
- what is the most appropriate location for the contemplated center ?
- what total resources - physical and human - would be required to establish an effective D/F center?
- what would constitute optimum utilization of the limited UNDP resources available to support the planned center?
- transformation of the survey's findings into an active programme for the proposed center

The duration of the survey in Korea was from 26th January to 16th March 1984.

I am very obliged to all persons at the Korea Research Institute of Chemical Technology (KRICT) and at UNDP and all other institutes and companies, who have facilitate the work of my mission. (see ANNEX II)

PART II.

1. Background

Based on the latest report from Korea Federation of Dyeing Industry Cooperatives in which 303 firms throughout the country were included.

The total number of D/F-firms is approximately 600. 320 firms are members of the Korea Federation of Dyeing Industry Coop. Even, when the statistics does not include the total number of D/F-firms, it gives an representative average about the present situation of the D/F - sector.

1.1 Regional diversification of D/F-firms

Kind of treatment on fabric	Area Seoul	Taegu	Pusan
Woven fabrics			
- Synthetics	22	65	3
- Cotton-cotton blends	13	16	11
- Silk	4	2	4
- Wool	1	1	2
Knitted fabrics	20	11	5
Others	5	5	3
Yarn			
- Synthetics	21	6	27
- Cotton-cotton blends	5	9	4
Printing			
- Table-printing	19	3	1
- Machinery printing	11	3	1
Total number of firms	121	121	61
diversification in %	40	40	20
Employees	13,200	19,500	15,700

Comments to table 1.1.

The D/F-industries are practically concentrated in 3 main areas. Few very big vertical textile firms are not members of the Federation of Dyeing Cooperatives and so far not included in the report. Their location is sometimes outside of the main areas.

The objectives of the Government try to concentrate the D/F-industries into D/F-estates , as it is already realized in the

- Bisan -dyeing industry estate in Taegu
- Banwol-dyeing industry estate in Seoul.

In the Bisan estate e.g. are about 70 firms involved from 121 firms in the whole Taegu area. Such specialized industry estates facilitate the installation of central waste water treatments or central energy power plants.

1.2. D/F-industries regional diversification of production
(% of total production in each field)

Kind of treatment on fabrics	Area Seoul	Taegu	Pusan	Summerized percentage of total production
Woven fabrics				
Synthetics	15	84	1	51
Cotton+cotton-blends	45	37	18	20
Silk	63	-	37	3
Wool	17	18	65	0.5
Knitted fabrics	89	4	7	20.5
Others	17	44	39	5
				100%
Yarn				
Synthetics	58	11	31	94
Cotton+cotton blends	15	61	24	6
				100%
Printing				
Table-printing	82	17	1	24
Machinery printing	82	16	2	76
				100%

1.3. D/F sectors Structure of production concerning Quantity and average price/unit (for the complete D/F or printing treatment)

(Quantity in % of production in each field)
(average price/unit for piece goods in Won/yd)
(" " " for yarns in Won/kg including winding)

Kind of fabric	Domestic sales (%)	Average price/u (Won)	Export sales %	Price/ unit (Won)	Summerized percentage of total production
Woven fabrics					
Synthetics	30	125	70	125	51
Cotton + Cotton blends	40	154	60	184	20
Silk	60	170	40	186	3
Wool	95	415	5	910	0.5
Velvet	1	548	99	351	0.8
Knitted fabrics	32	70	68	62	20.7
Others	57	121	43	242	4
					100%
Yarns					
Synthetics	39	487	61	537	94
Cotton + Cotton blends	33	1,440	67	974	6
					100%
Printed fabrics					
Table-printed	30	560	70	438	24
Machinery -printed	30	240	70	276	76
					100%

Comments on table 1.3.

This table shows very clearly that low-price fabrics and yarns are still dominating the production amount. Especially in the field of pure synthetic fabrics and yarns there is a growing competition from other East Asian textile producers, such as China, Taiwan and Malaysia.

The present, average price comparison as published by the "Korea Herald" in February 1984 for synthetic woven fabrics:

Korean textiles	US$ 1.4/yds^2
Taiwan "	US$ 1.31/yds^2
Rep. of China "	US$ 0.98/yds^2

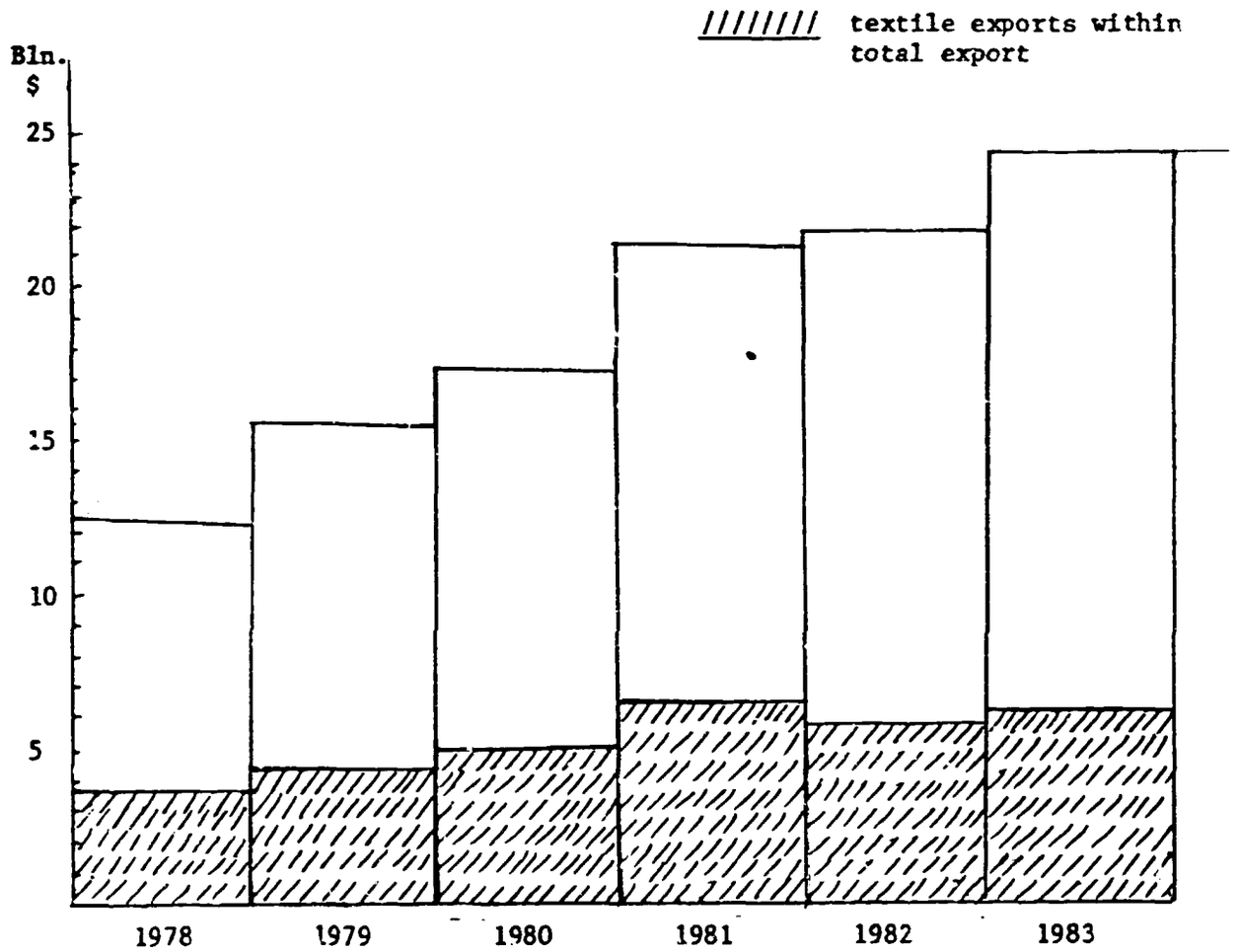
The possibilities to increase the value of pure synthetic fabrics and yarns through dyeing, finishing and printing are limited. Facing the growing competition in this field, the benefits continue to diminish.

1.4. D/F sector's development of domestic sales and export sales since 1976

(based on quantity, in % of total production in each field)

	Woven fabrics		Yarn		Printed fabrics	
	D	E	D	E	D	E
1976	58	42	40	60	70	30
1977	45	55	44	56	66	34
1978	40	60	24	76	57	43
1979	33	67	24	76	42	58
1980	44	56	20	80	43	57
1981	35	65	41	59	31	69
1982	34	66	39	61	30	70
Absolute Quantity 1982	2,230 bln. yds		123,000 tons		125 bln. yds.	

1.5. Development of R.O.K. total exports and textile exports since 1978



1.6. Number and age of machinery equipments within the D/F-sector

	Age (years) 1-5	5-9	9-12	10	Σ	%
Piece dyeing						
Jiggers	415	312	290	169	1,186	46
Winches	133	183	89	107	512	20
Beam	84	48	28	39	199	8
Rotary-washer	100	80	24	12	216	8.5
Jets	211	84	6	3	304	12
Continue	2	3	3	5	13	0.5
Others	71	30	16	10	127	5
Σ	1,016	740	456	345	2,557	100%
%	40	79	18	13		
Yarndyeing						
Hank spray	103	135	45	24	307	35.5
Hank box	19	49	22	40	130	15.5
Cones	75	101	51	58	285	34
Tow	19	10	12	12	53	7.5
Others	10	6	3	41	60	7.5
Σ	226	301	133	175	835	100%
%	27	36	17	20		
Printing						
Table printing	45	109	80	10	244	72
Machinery "	23	18	3	6	50	15
Roller "	10	12	3	5	30	9
Transfer "	1	-	1	3	5	1.5
Others	3	3	1	1	8	2.5
Σ	82	142	88	25	337	100%
%	24	42	26	8		
Stenter Machine	100	90	61	55	312	
%						

Comments on table 1.6.

The condition and maintenance vary greatly from firm to firm. Most of the machines have only manually controlled heating and cooling valves. The control instruments are often insufficiently maintained. Sometimes expensive control instruments are not used because of lack of knowledge and understanding their importance or because of wrong or missing maintenance.

The majority of the machines is built by the local machinery industry. They are often copies of Japanese, European and American textile machines. The quality of these locally built machines is lower than that of the originals.

2. Statement of main shortcomings and problems of the D/F industry

The main attention during the survey was given to the small and medium scale industry, as these companies need assistance most.

Not all companies are plagued by the shortcomings described below. Some of them are already well organized and equipped and developing in the right direction.

2.1. Infrastructure/legislation/financing - problems

- financial weakness of many companies precludes the necessary investment in improved machinery and equipment;
- companies which are not exporting cannot obtain better foreign dyestuffs and auxiliaries at reasonable prices because of the import restrictions of the Government;
- small scale industries are not able to pay for the available services of existing textile testing institutes.

2.2. Commercial problems

- only few companies have direct contacts to their consumer markets. Most of them are commission dyers and finishers, completely depanding on the orders of dealers and trade houses;
- the low price level, imposed by the dealers and trade houses does not allow the use of better dyestuffs and auxiliaries;
- high competition among the companies within the D/F industry.

2.3. Management/staff - problems

- the management of many small and medium scale companies does not appreciate the need for continuing training of their technical staff through seminars or technical courses;
- highly qualified, well educated textile chemists or technicians prefer more attractive and better-paid jobs in larger companies or jobs in different sectors;

- in many companies, the management is still aiming at higher output instead of higher quality of their products;
- in many companies, the management skills are deficient.

2.4. Technical problems

- recommendations about application of dyestuffs, chemicals and auxiliaries from cheap producers are insufficient or missing;
- technical information through technicians of the dyestuff and auxiliary industry, machinery industry or fiber industry is especially for small companies very rare;
- technical knowledge and skills of the technical staff is limited to the current production and not able to adjust to different kinds of treatment and demands (e.g. D/F of natural fibers+blends);
- raw materials vary a great deal with respect to yarn preparation, sizing application and pretreatment;
- laboratories in small companies often inadequately equipped;
- raw water treatment insufficient or missing;
- lack of knowledge of future trends and demands in the D/F-sector;
- technical assistance needed in pretreatment procedures, finishing, such as wash and wear, soil release, durable press, hydrophobic treatment, anti-shrinkage, anti-static, anti-crease.

3. Existing textile institutes and their main activities

The country has already several textile testing institutes with branch offices or branch laboratories in the main textile areas. At the moment, their services and activities focus on testing the physical properties of fabrics and yarns. For the D/F industry these tests are mainly concerned with the fastness of dyeing and printing.

The following institutes exist:

- Korea Yarn + Fabric Testing Inspection Institute, Seoul
- Korea Textile Inspection + Testing Institute, Seoul
- Korea Apparel Testing + Inspection Institute, Seoul
- Kyungbuk Textile Technology Promotion Center, Taegu (K.T.T.P.C.)

During my survey I visited the K.T.T.P.C. only at Taegu. This institute was built in 1978 for the textile industry in the Taegu area. The testing instruments and the pilot plant equipment are numerous and of excellent quality. The total number of staff is about 50 persons. 6 of them are specialized in dyeing, finishing and printing.

The centre's main activities for the D/F-industry are

- fastness tests (light, weather, rubbing, sublimation, migration, washing, water, flammability);
- seminars for D/F chemists and technicians. (3-5 days).

All services have fixed prices. Research and development activities are not carried out at the moment. The opinion of the D/F-industry at Taegu regarding feasibility of R+D-activities of this institute was not very optimistic.

When I visited the laboratories and pilot plant, the instruments and machines were not used. Especially the dyeing and finishing pilot plant looked unused. The use of the existing equipment depends on orders from the D/F-industry. The institute made new investments in 1984 for about US$ 220.000,-, financed by the city of Taegu (color matching computer, rotary washer, etc.).

4. Measures by the Government to support the D/F-Industries

- consultancy services through international experts (e.g. 1983 a total of approx. 300 days consultancy);
- financial aid to small + medium size companies through available loans;
- financial subsidy for textile institutes (e.g. 1983 for K.T.T.P.C., Taegu, US$ 220.000,-);
- coordination between small + medium size companies and big companies to share the activities and to avoid inefficient competition;
- import liberalization for foreign products to increase the export quotas;
- lower import duties on dyestuffs and textile auxiliaries.

5. Budgetary provisions of the Government for the D/F service center

For the year 1984 KRICT allocated for the activities of the D/F-center 1 textile chemist (university level), 1 researcher (chemistry degree),1 technician (chemistry) plus funds to pay for the services to be performed on behalf of the center by other sections of KRICT. With regard to 1985 it appeared that KRICT awaited the recommendations of the mission prior to finalizing its budgetary requirements.

6. Justification

In view of the variety of problems affecting the performance of the D/F industry, it is clear that, to bring about improvements and changes, support is required from a number of sources: financing, management training, trend analyses etc. in addition to the chemical field as may be provided initially by KRICT.

In future the new KRICT-D/F-Center (D.F.C.) should also coordinate the activities of the various testing institutes. Through frequent contacts to sales organizations, trade houses, foreign textile institutions, the new KRICT-DFC should act as a window to current trends within the textile D/F industry.

The location at Daejeon would be appropriate as it is situated in the most important D/F areas (Dae-Seoul). (see Annex III). The laboratories at KRICT are already equipped with expensive instruments for chemical analysis. For specific textile analysis, new instruments must be ordered. (see Annex IV/1/2). Special tests, which would require expensive textile testing instruments, can be carried out at one of the existing textile institutes. Pilot-plant-trials, if necessary, should be carried out in Taegu, using their under-utilized facilities.

6.1. General activities

The new D/F-center should concentrate on textile chemistry and deal with:

- chemical analyses of insufficient described dyestuffs and textile chemicals in order to analyze their properties and chemical constitution;
- development and determination of textile chemical treatments in order to avoid environmental pollution through waste water and exhause air.
- improvements for existing textile chemical procedures in order to reduce energy + water consumption;

- development of short test-methods to analyze different pre-treatments of raw materials (e.g. sizing products + their amounts, spinning preparations);
- worldwide trends in textile chemical treatments and introduction of those new methods within Korean D/F-companies considering the local production facilities;
- technical courses on special developments of new treatments or improved treatments;
- introduction of improved or new textile chemical procedures in the factories.

In order to ensure that the activities are focussed on the priority requirements of the D/F-industry the KRICT-DFC will need frequent and close linkages not only with the D/F-industry itself but also with:

- existing textile testing + service centers;
- Korean Federation of Dyeing Industries Cooperatives;
- Ministry of Commerce and Industry;
- Ministry of Science and Technology;
- textile highschools;
- textile universities;
- dyestuff producers)
- chemical producers) domestic and abroad
- fiber producers)
- textile machinery producers)
- textile institutes abroad (Japan, USA, Europe)

6.2. Recommended, immediate R+D activities

In view of the existing capabilities at KRICT-DFC, the initial activities should be focused on the following:

a. Recycling TPA

Waste water treatment after caustic soda treatments on PE-fabrics, in order to reduce costs for this treatment and for recycling PES-oligomeres to retain TPA (Terephtacic Acid).

b. Yarn Treatments

Determination and chemical analyses of yarn treatments to screen those products, which could be produced by the local chemistry industry.

c. Antistatic Auxiliaries

Determination of antistatic auxiliaries for PE and PA-fabrics, test series of their properties and effects, to find out the most appropriate products and application procedures.

d. Dyestuffs + Textile Chemicals

Determination of textile dyestuffs and textile auxiliaries, which are insufficiently described to find out their chemical constitution, their properties and the most appropriate application procedures.

e. PE-Wet on Wet Printing

Determination of most appropriate application for wet-on-wet printing methods for PE-fabrics.

f. Fabric Pretreatment

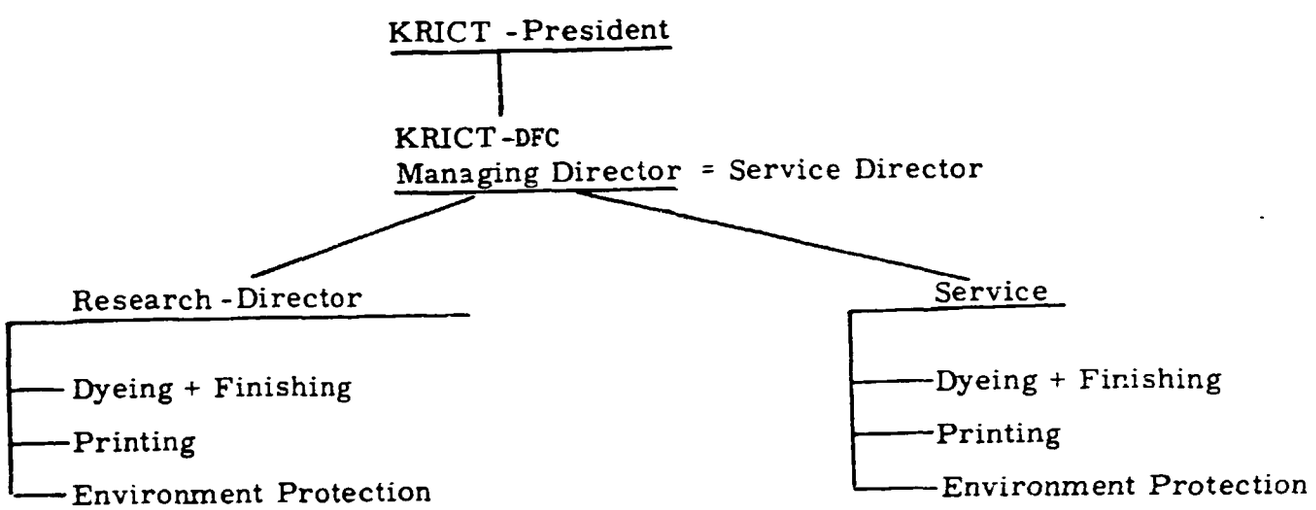
Analyses of grey fabrics to find out the most appropriate pretreatment procedures.

7. Outputs

In the first phase the new D/F center serves as a specific research and development center for textile chemistry including in-plant services. In the second or later phase the new D/F center should also provide market analyses for actual or future D/F methods and trends and their introduction into the local D/F industry.

8. Institutional Framework

8.1. Recommended organization chart:



8.2. To deal with the main technical shortcomings of the D/F sector, the center activities should include:

Research + development work and in-plant service in the following fields of textile chemistry;

- pretreatment
- dyeing + finishing
- printing
- environmental pollution

8.3. Necessary staff

The present staff consists of 3 people with the following qualifications:

- 1 textile chemist -Research Director (university level)
- 1 textile chemist (university level) - researcher
- 1 organic chemist

During the period of the project, the following staff should be added:

service division

-*1 textile chemist (university level) with at least 10 years practice in production management in dyeing + finishing
- 1 textile chemist (university level) with at least 10 years practice in production management in printing
- 1 textile chemist (university level) with at least 10 years practice in production management in pre-treatment finishing
- 1 chemical engineer for environmental pollution

research division

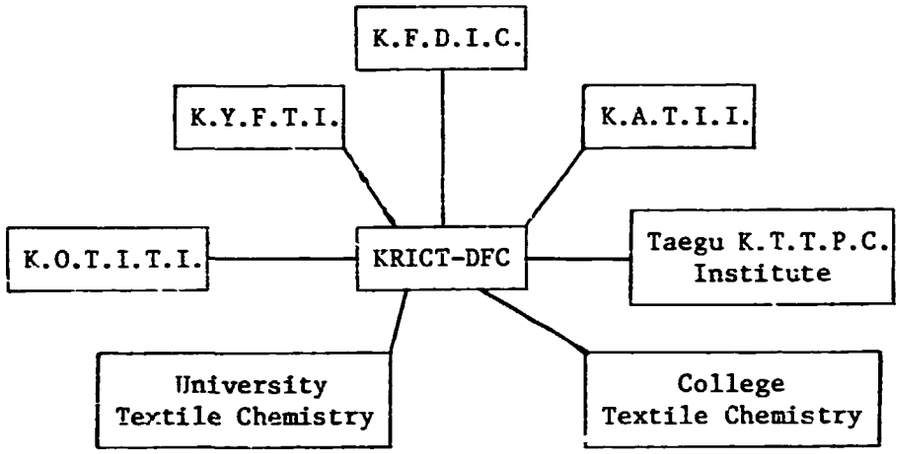
- 1 organic chemist (university level) for dyeing + finishing
- 1 organic chemist (university level) for printing
- 1 organic chemist (university level) for pre-treatment + environmental pollution
- 1 organic chemist (university level) for analytics

laboratory assistance

- 4 chemists

*(Qualification, see Annex VI)

8.4. Besides of the contacts to the D/F industry, close cooperation should be maintained with:



K.F.D.I.C. - Korea Federation of Dyeing Industry Cooperatives
K.Y.F.T.I. - Korea Yarn + Fabric Testing Inspection Institute, Seoul
K.A.T.I.I. - Korea Apparel Testing + Inspection Institute, Seoul
K.O.T.I.T.I. - Korea Textile Inspection + Testing Institute, Seoul
K.T.T.P.C. - Kyungbuk Textile Technology Promotion Center, Taegu

This cooperation with the existing textile testing institutes is important to avoid undue competition. The existing textile testing institutes, as they are not active in research and development works, should use the textile chemical research-facilities at KRICT-DFC. KRICT-DFC itself should use the textile routine testing facilities and the pilot plant facilities of the existing institutes against a fee. In this manner all institutes can enlarge their activities and service capabilities.

KRICT-DFC should coordinate all textile chemistry research and development activities.

Federation of D/F Cooperatives would be necessary to discuss current problems and issues affecting the D/F-industry. The agenda of these meetings should include:

- Statement of current research work at KRICT-DFC;
- Final reports on completed research work;
- Selection of new research activities and determination of their timing.

A steering committee should be established with the following membership

- heads of textile institutes in Korea;
- heads of textile trade associations.

The director of the KRICT-DFC should convene and chair these meetings.

9. Inputs

9.1. Government Inputs

a) Assignment of national staff		Proposed starting date
project director	(1)	Jan. 1985
supervising manager	(2)	Jan. 1985
senior staff r + s.	(2)	Feb. 1985
	(2)	Jan. 1986
junior staff r + s	(1)	Jan. 1985
	(2)	Sept. 1985
	(1)	Jan. 1986
technicians	(2)	Mar. 1985
	(2)	Nov. 1985

b) Equipment	Estimatet costs (Won)
Expendable equipment	10,000.000,-
non expendable equipment	125,000.000,-
R+D funding for 85/86	100,000.000,-

c) Miscellaneous	
operation and maintenance	15,000.000,-

9.2. UNDP-Inputs

a) Assignment of international staff	Proposed duration and date
(1) Expert in Dyeing and Finishing	4 m/m 1985
with knowledge and at least 5 years	2 m/m 1986
experience in D/F woven and/or knitted	
fabrics of synthetics with blends natural	
fibers.	

(2) Expert in Printing woven and/or knitted fabrics with at least 5 years experience in synthetic and blended fabrics and pure natural fibers	2 m/m	1986
(3) Expert in testing dyestuffs and auxiliaries with at least 5 years experience in a textile D/F institute for testing dyestuffs and auxiliaries	2 m/m	1986
(4) Expert in testing yarn preparations and spinning oils with at least 5 years experience either in a textile testing institute for such analyses or in the chemical industry for this kind of textile chemicals.	1 m/m	1985
(5) Expert for Environment protection for D/F industry with at least 5 years experience in solving water and energy-saving problems in the textile industry	2 m/m	1986

b) Training

(1) Fellowships

The research and service staff of the RDC should get the opportunity for abroad training in following fields:

- dyeing and finishing methods
- printing
- environment protection for textile industry

c) Study Tours

For the research staff are study tours to textile research institutes abroad envisaged.

For the service staff study tours to industries of the D/F sector in developed countries

d) Equipment

see ANNEX IV/2

10. Workplan

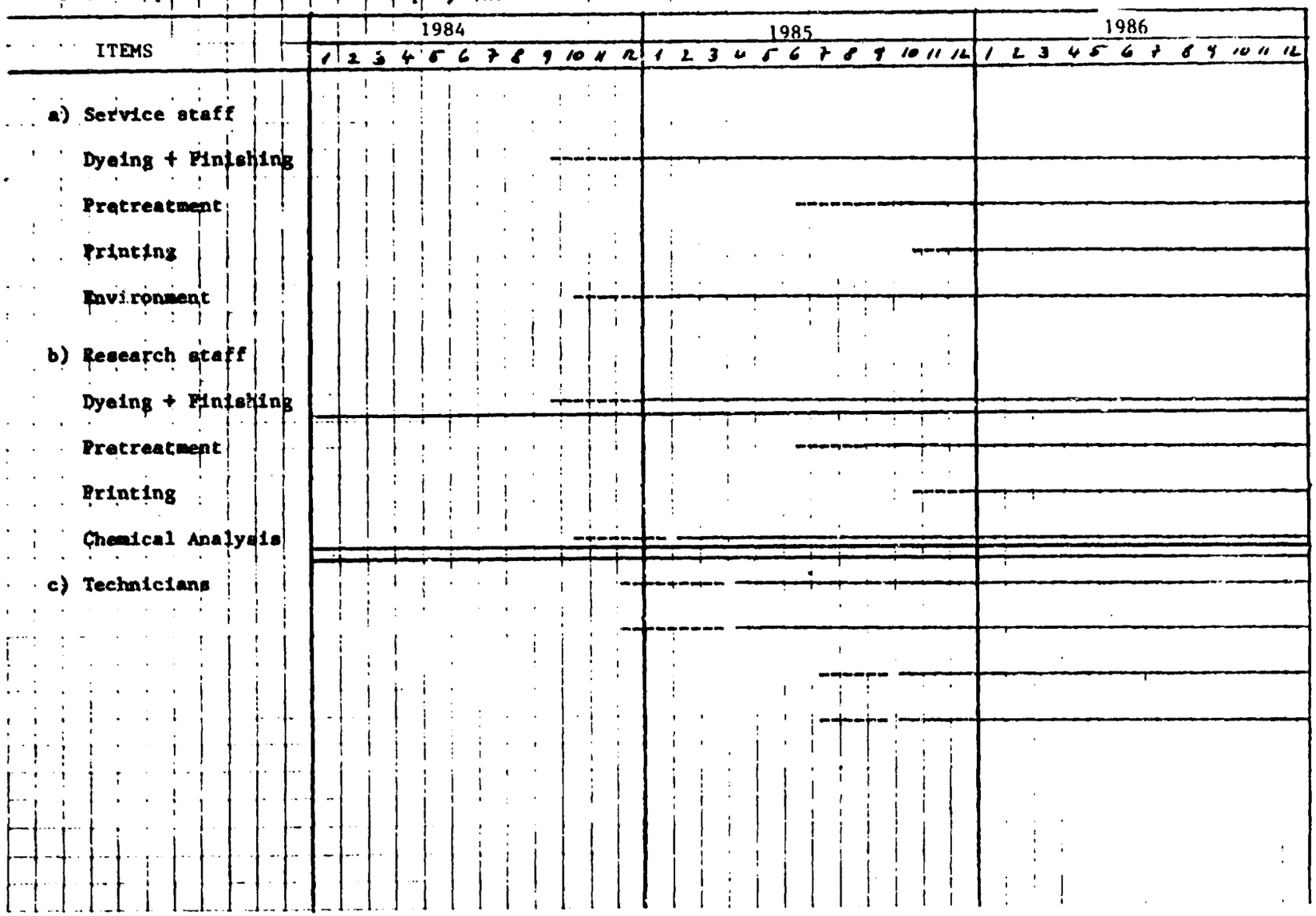
A proposed workplan for manpower recruitment, experts and training, Equipment and immidiate research activities is attached under ANNEX I/1 - I/ 4.

In addition it would be essential, that the proposed outside linkages can be started as soon as possible to create the first "steering committee" in order to determine the most appropriate scope of the future activities of the RDC.

WORK PLAN

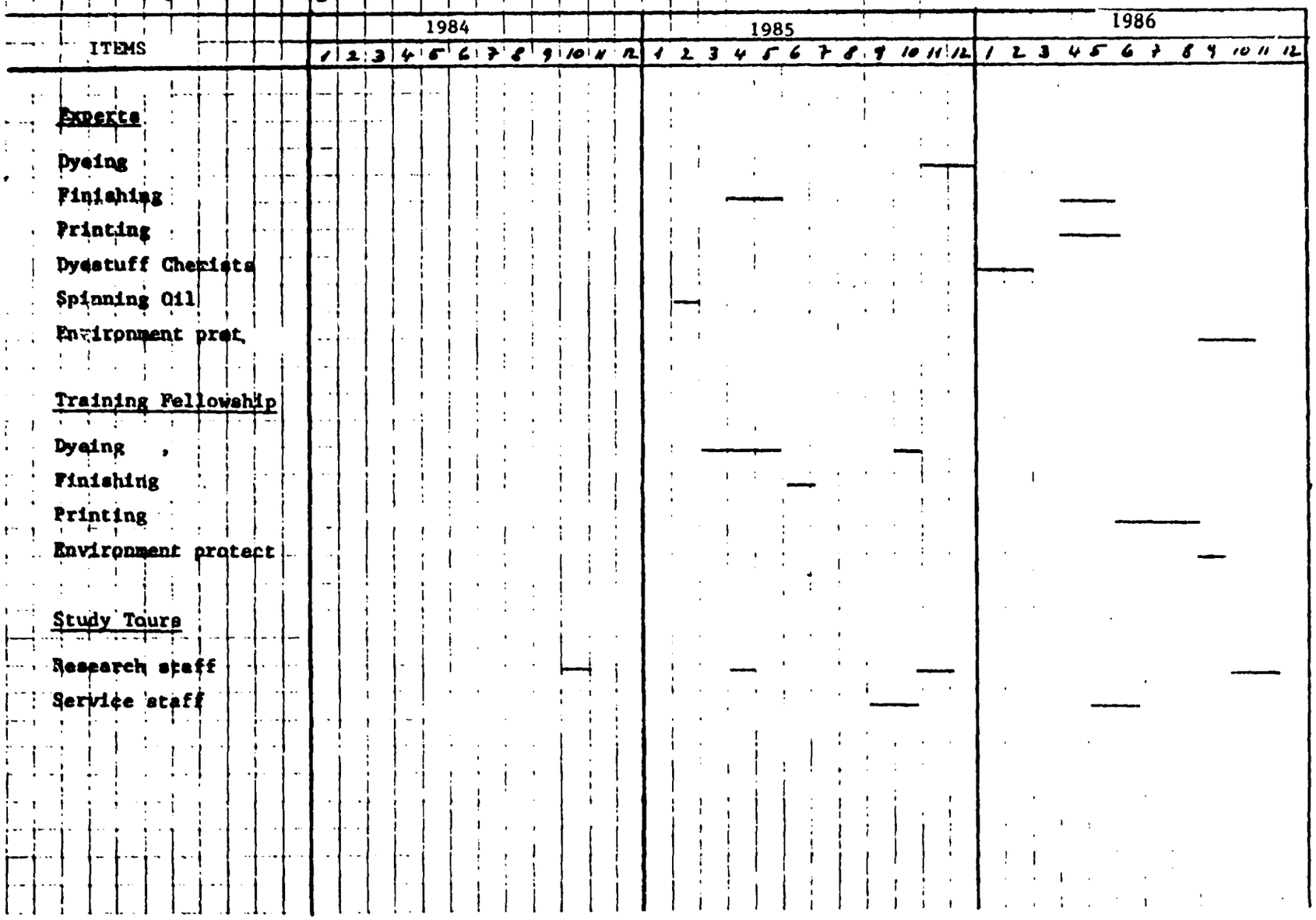
------- Recruitment
_____ Employment

I/1. Manpower Recruitment & Employment



WORK PLAN

I/2. Experts/Training



WORK PLAN

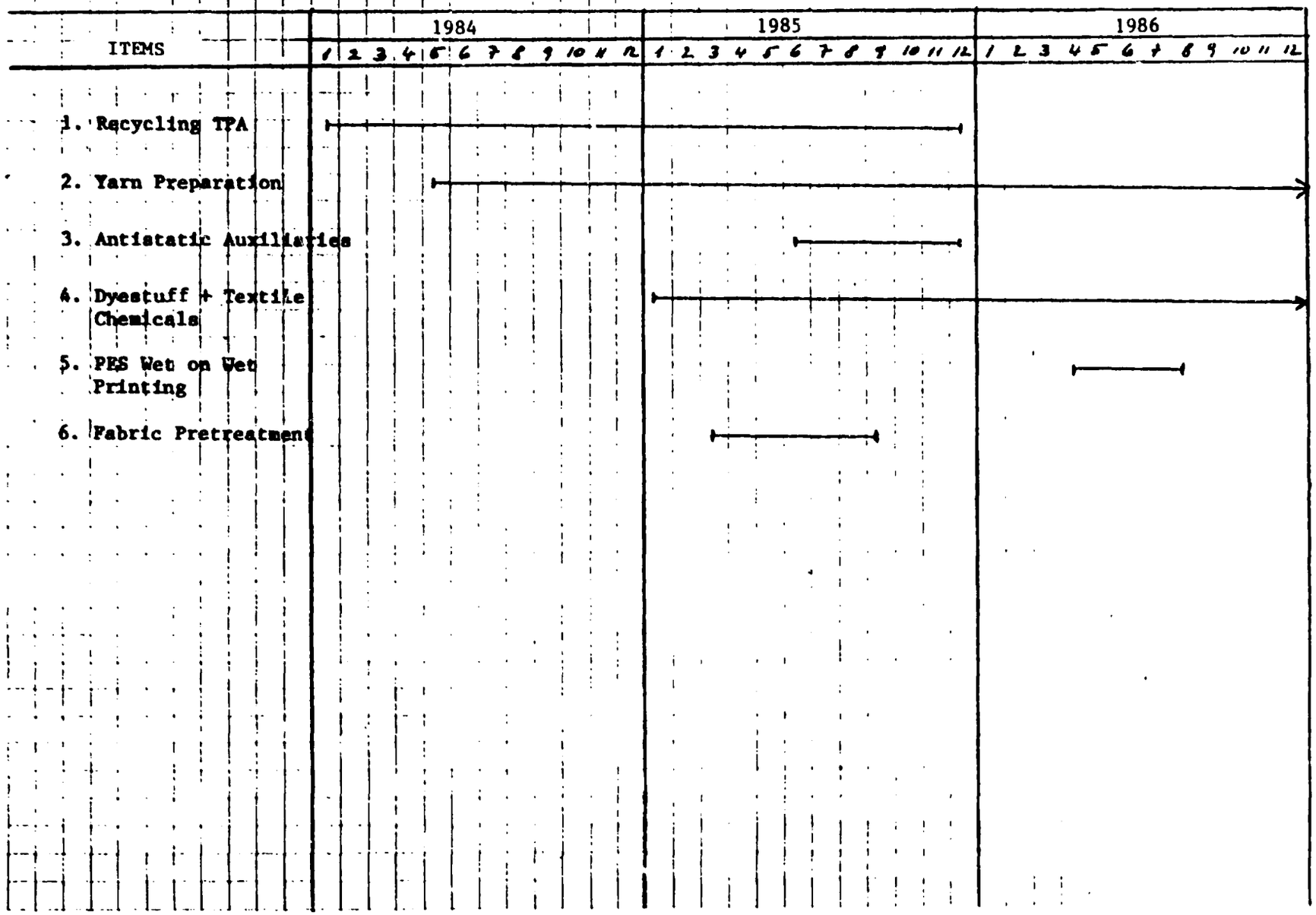
I/3. Equipment (see list in Annex IV)

-------- Aquisition
——— Installation

ITEMS	1984												1985												1986											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
A.																																				
B.																																				

WORK PLAN

I/4. Research Activities



ANNEX II

List of Companies + Industries Contacted

A) Institutions

UNDP

Mr. B. Vunibobo	Resident Representative
Mr. F. Ossella	Deputy Resident Representative
Mr. K. Jenkner	Co-ordinating Industrial Adviser
Mr. F. Saarloos	Junior Professional Officer

KRICT

(Korea Research Institute of Chemical Technology, Daejeon)

Dr. Young Bok CHAE	President
Mr. Jae Hyun Lee	Director
Dr. Kyeong-Yeol YUN	Project Director

K.T.T.P.C.

(Kyeong-Buk Textile Technology Promotion Center, Daegu)

Mr. Yum	Director

K.F.D.I.C.

(Korea Federation of Dyeing Industries Cooperatives

Mr. Yoon	Director

Daegu Dyeing Industry Complex Corporation

Mr. Baek	President
Mr. Heo	Director

K.T.A.

(Korea Traders' Association)

Mr. Lee, Sang Seol	Managing Director

B) Companies

Bisan-Complex, Taegu

Kuk Jae Dyeing-Weaving Co., Ltd.

Mr. Oh	Managing Director
Mr. Kim	Head of Laboraty

Dae Won Dyeing + Finishing

Mr. Jung	Managing Director

Ehwa Dyeing-Weaving Ind.

Mr. Sin	Director
Mr. Byun	Production Manager
Mr. Yea	Technical Manager

Sambo, Dyeing + Weaving Co.

Mr. Park	Technical Director

Samic Textile Dyeing Ind.

Mr. Song	Technical Director

Dae Sung Co. Ltd.

Mr. Shin	President
Mr. Moon	Vice President

Seong An Textile Co.

Mr. Choi	Technical Director
Mr. Park	Managing Director

Kyung Dong Dyeing + Printing

Mr. Cho	Production Manager
Mr. Jung	Printing Production Manager

Ansung Dyeing + Weaving Co.

Mr. Won	Managing Director

Dong San Textile Dyeing

Mr. Lee	Dyeing Production Manager

Dai Dong Textile

Mr. Park	Production Manager

Jai Il Synthetic Dyeing

Mr. Yoo	Technical Director

Tong Kook Synthetic Fibre Ind. Co. Ltd.

Mr. Shin	Technical Director
Mr. Kim	Production Manager

Nam Sun Trading Co.

Mr. Choi	Production Manager

Daejon

Choongnam Spinning

Mr. Kim	Technical Director
Mr. Ro	Production Manager

Panwol-Industry Complex

Hae Sung Textile

Mr. Park	Production Manager

Saewha Textile Co. Ltd

Mr. Kwak	President
Mr. Lee	Production Manager

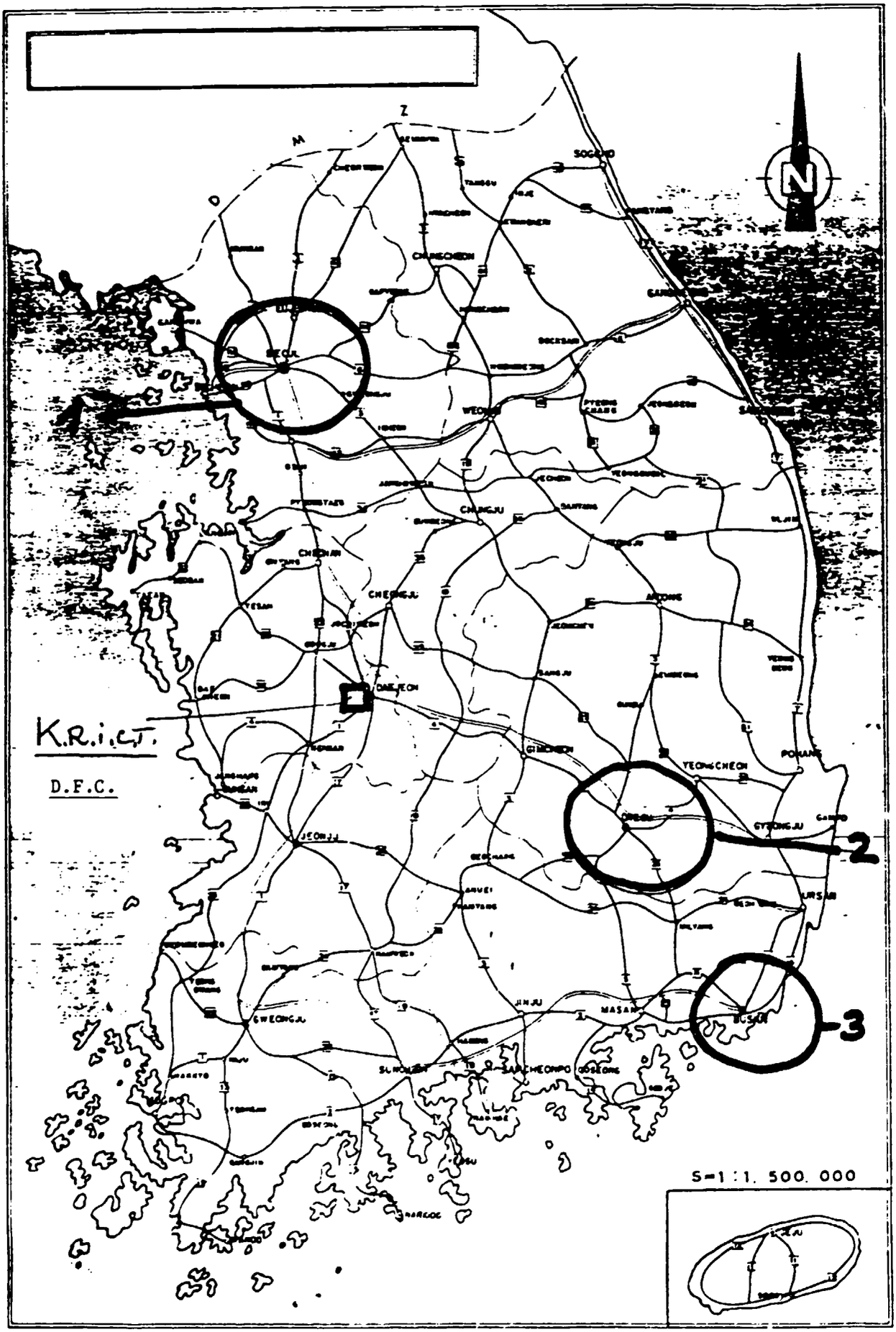
Sungmin Corp.

(=9 Different Printing Companies)

Mr. Hwang	President
Mr. Sim	Technical Director
Mr. Park	Production Manager

Tong Il Dyeing Co.	
Mr. Kim	Production Manager
Pusan Area	
Gae Lim Textile Co.	
Mr. Park	President
Sung Chang Textile Ltd.	
Mr. Kim	Technical Director
Seoul	
Bayer AG	
(Dyestuff Division)	
Mr. Sagner	Sales Manager
Hoechst AG	
(Dyestuff Division)	
Mr. Müller	Sales Manager

ANNEX III



1,2,3 = Main dyeing + finishing areas

ANNEX IV/1

List of existing Equipment at KRICT, which is to use for KRICT- DFC

1.	Elemental Analyzer	50,000
2.	Infrared Spectrophotometer	57,000
3.	UV-Vis. Spectrophotometer	30,000
4.	Nuclear Magnetic Resonance Spectrophotometer	175,000
5.	Thermal Analyzer	100,500
6.	Atomic Absorption Spectrophotometer	90,000
7.	Instron Strength Tester	300,000
8.	Weather-O-meter	30,000
9.	Fade-O-meter	30,000
10.	Gloss meter	4,500
11.	Rockwell Hardness Tester	5,000
12.	Dilato meter	1,500
13.	Deflection Temperature Tester	15,000
14.	Drying Oven	1,000
15.	Centrifuge	700
16.	PH-meter	1,500
17.	Rotary evaporator	2,000
18.	Water bath	600
19.	Hot plate	400
20.	Magnetic stirrer	300
21.	Vacumm pump	400
22.	Fume hood	2,500
23.	Hydrometer	200
24.	Heating Mantle	100

ANNEX IV/2

List of Necessary Equipment for KRICT-DFC

		Estimated Price US$
A)	Viscosimeter	1,000
	Thickness Gauge	100
	Microscope	2,600
	Hot Stage Microscope	1,200
	Camera	1,000
	Microtome	2,700
	Refractometer with Temp. Bath	3,900
	Hand Refractometer	200
	Perspiration Meter	350
	Crock Meter	500
	Standard Light Source	1,300
	Shaking Bath	850
	Analytical Balance	2,500
	Flammability Tester Vertical	1,300
	Vacuum Oven	600
	Crease Recovery Tester	350
	Elmendorf Tearing Tester	1,500
	Laundery O-meter	1,500
	Tele-thermometer	600
	Tensio Meter	1,000
	High Speed Homogenizer	1,000
	Recorder	1,500
	Mackey Tester	2,500
	Electric Furnace	500
	Micro Kjeldahl App.	1,000
	Hygrometer	100
	Karl Fischer Titorator	250
	Refrigerator	500

	Water Repellency Tester	250
	Air Permeability Tester	1,500
	Water Resistance Tester	800
	Static Electricity Tester	2,500
	Friction Coefficient Tester	5,000
	TLC Set	600
	Automatic Burets	800
	Gas Chromatograph	15,000
	Measuring Cutter + Bqlance	500
	Spectrophotometer	5,000
	Thermo Tester	4,500
	Wrinkle Recovery Tester	350
B)	Lab. Dyeing Test Machine	6,000
	Lab. Dyeing Test Machine HT	7,000
	Lab. Mangle	1,500
	Lab. Printing Table	4,000
	Lab. Steamer	3,000
		91,700.-

PROJECT BUDGET COVERING GOVERNMENT COUNTERPART CONTRIBUTION IN KIND DP/ROK/82/027
(in thousands of Korean Won)

COUNTRY : Republic of Korea
PROJECT TITLE : Textile Dyeing and Finishing Industry Service Center
PROJECT NUMBER: DP/ROK/82/027

		Total		1985		1986	
		m/m	Won	m/m	Won	m/m	Won
10.	PROJECT PERSONNEL						
11.	Counterpart Personnel						
11-01.	Project Director	24	60.000	12	30.000	12	30.000
11-02.	Supervising Manager	48	96.000	24	48.000	24	48.000
03.	Senior staff research + service	72	114.000	24	38.000	48	76.000
04.	Junior staff research + service	84	84.000	36	36.000	48	48.000
05.	Technicians	96	57.000	24	19.000	48	38.000
19.	Component Total		411.000		171.000		240.000
40.	EQUIPMENT						
41.	Expendable equipment		10,000		4,000		6,000
42.	Non-expendable equipment		125,000		80,000		45,000
49.	Component Total		135,000		84,000		51,000
50.	MISCELLANEOUS						
51.	Operations and Maintenance		15.000		5.000		10.000
53.	R & D Budget for D/F		100,000		40,000		60,000
59.	Component Total		115.000		45.000		70.000
99.	GRAND TOTAL		661.000		300.000		361.000

15/3/84

16/3/84

PROJECT BUDGET COVERING UNDP CONTRIBUTION
(in US Dollars)

COUNTRY : Republic of Korea
PROJECT TITLE : Textile Dyeing and Finishing Research Center
PROJECT NUMBER: DP/ROK/82/027/A/01/37

		Total		1984		1985		1986	
		m/m	$	m/m	$	m/m	$	m/m	$
10.	PROJECT PERSONNEL								
11.	Consultants	15	100,000			6	40,000	9	60,000
19.	Component Total		100,000				40,000		60,000
30.	TRAINING								
31.	Fellowships	9	46,000			5	26,000	4	20,000
32.	Study Tours	9,5	48,000	1	6,000	4,5	22,000	4	20,000
39.	Component Total		94,000		6,000		48,000		40,000
49.	EQUIPMENT		90,000		60,000		30,000		
59.	MISCELLANEOUS		30,000				20,000		10,000
99.	GRAND TOTAL		314,000		66,000		138,000		110,000

ANNEX VI

Qualification for Head of Service Group - Head of Steering Committee

= Managing Director of KRICT - DFC

Education:	Textile chemist or textile engineer
Experience:	At least 10-15 years production management in a D/F-company in combination with sales activities, contacts to D/F-associations, dyestuff + chemical producers, fiber producers, machinery producers, desirable.
Personal Skills:	Optimistic, initiative success character, able to contact persons, willing to travel 50-60% of work time, at least 1 foreign language (English) fluently to speak and write, organization-properties, team spritit, readiness to bear responsibility.

A. Development Objectives

The Government of the Republic of Korea has set high priority on modernizing the country's textile industry in order to improve the quality of textiles to grow into higher price sections of the textile world market.

Within the textile industry, the Dyeing and Finishing (D/F) sector is one of the most important sectors to determine the quality level of textiles.

A special D/F research center should be established to assist the Korean textile industry to improve the quality level of their export products.

B. Immediate Objectives

1. Establishment of a D/F research + development service center with textile chemical R + D facilities as well as in-plant services for the D/F industry for the following fields:

- pretreatment
- dyeing + finishing
- printing
- environment protection

2. Extension of service activities to deal with the broader scope of the textile industry problems, such as:

- trend analyses for improved or new textile chemical treatments
- trend analyses of textile product developments
- coordination between existing textile institutes, textile associations, sales associations
- contacts to similar institutions abroad