



**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)

105

REVITALIZATION OF NATIONAL SILK INDUSTRY

SI/PHI/86/884

REPUBLIC OF THE PHILIPPINES

Technical report: Dyeing, printing and finishing of natural silk\*

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

Based on the work of Walter Brunner, expert in silk dyeing,  
printing and finishing

Backstopping officer: A. Eraneva, Agro-based Industries Branch

United Nations Industrial Development Organization  
Vienna

---

\* This document has been reproduced without formal editing.

I. EXPLANATORY NOTES

Value of local currency:

1 US\$ = 20.39 Pesos

Local capital letter abbreviation:

PTRI = Philippine Textile Research Institute

## II. ABSTRACT

The purpose of the project is to revitalize the natural silk industry.

The objective of the activity being reported is to assess the possibilities to develop internationally acceptable dyed, printed and finished silk fabrics with typical national characteristics.

The silk dyeing, printing and finishing expert would work to the following terms of reference:

- duration of the activity to be five weeks;
- location of the activity to be in Manila, with some travel within the country;
- work in close cooperation with UNDP/Manila and PTRI;
- prepare an outline for the technologies to be applied in achieving the foregoing goals;
- estimate cost for a pilot silk printing, dyeing and finishing unit.

III. TABLE OF CONTENTS

	<u>Page</u>
I. EXPLANATORY NOTES	2
II. ABSTRACT	3
III. TABLE OF CONTENTS	4
INTRODUCTION	5
RECOMMENDATIONS	6
IV. DYEING, PRINTING, FINISHING OF NATURAL SILK	7
A. Assessment of current dyeing, printing and finishing of silk	7
B. PTRI's role in the improvement of dyeing, printing and finishing of silk	8
C. Conclusions	9
D. Consequences	10
V. ANNEXES	12
A. Acknowledgments	12
B. Recommendations given on dyeing of silk	14
C. Dyestuff producers with technical service in Asia	15
D. Machinery for the pilot plant	16
E. Meetings, conferences, discussions, visits out of PTRI Manila	17

## INTRODUCTION

The visit to the Philippines was undertaken during the period 8. October-9. November 1987. The purpose of the project was to assess the possibilities to develop internationally acceptable dyed, printed and finished silk fabrics with typical national characteristics.

The assignment included the preparation of an outline for the dyeing, printing and finishing applied in achieving the foregoing goals and the estimation of cost for a pilot silk printing, dyeing and finishing unit.

These original objectives of the activity had to be broadened. The testing is insufficient to guarantee the high quality of raw silk for the internationally acceptable standard, and the raw silk filament as it was used intended for dyeing is not fitted for wet treatments especially for degumming.

Therefore, additional consultation was made in the field of yarn processing such as reeling, testing, twisting and throwing.

## RECOMMENDATIONS

1. The regular testing of raw silk must be strictly improved. Testing equipment must be completed especially with an instrument for measuring the tenacity and elongation.
2. The twisting of silk filament must be developed to produce trame or organzine on skeins which are suited for degumming and dyeing.
3. Rigid technical training and specialization on dyeing must be made available to the staff of PTRI, hence, training abroad especially in Europe is advantageous.
4. Slight improvement of existing dyeing equipment of PTRI and fabrication of some laboratory tools need proper attention. Infrastructure in pilot plant of PTRI also needs improvement. Later on, the installation of different dyeing machines with total cost of US\$ 100,000 must be taken into consideration.
5. To guarantee the successful development of the project and to give more new information and recommendations for further measurements, an expert in dyeing and finishing of natural silk should be sent annually for 3 - 4 weeks in the succeeding years.

#### IV. DYEING, PRINTING, FINISHING OF NATURAL SILK

The silk industry has gained a foothold in the Philippine setting. The takeoff from the pilot demonstration farm to industrial production with the coming in of the private sectors and the farmer cooperators, has more or less stabilized the cocoon production in the country. PTRJ, with its attempts to promote the silk industry, has established a reeling plant in order to utilize the local cocoon to produce its own raw silk. Serious attempts and exploration therefore must be considered to utilize the yarns to produce Philippine silk products rather than completely relying on foreign market.

##### A. Assessment of current dyeing, printing and finishing of silk

The current market areas of the locally produced silk yarns are the handweavers of Iloilo and Aklan wherein the yarns are woven into exotic silk fabrics which are also indirectly exported by the foreign buyers. Some of the yarns utilized by these handweavers are dyed woven into fabrics with typical Filipino design.

A private company in Benguet, the Narda's Handwoven Arts and Crafts, is engaged in manufacturing tourist items with typical national characteristics. This company is very much enthusiastic to utilize silk other than cotton and other synthetic fibers as raw materials for their products, most of which are exported to other countries. The company is equipped with 500 handlooms, 300 of which are located at the respective homes of the handweavers. The dyeing equipment used is very traditional. Famous for the classic designs, the company reaps success in the domestic and foreign market.

The sole powerloom weaver for silk in the country is the Fil-Fibers Manufacturing Corporation, which is also willing to utilize the locally produced silk yarns once the production of raw silk is stabilized and has comparably good quality and price. This company is equipped with 26 powerlooms, and with estimate production of 10 yards per machine



per eight-hour operation. They produce different kinds of silk fabrics, from "Barong" material (the national costume of Filipino men) to douppion silk, jacquard, pongee, and others which are dyed in the traditional process. No finishing treatment is applied to the fabrics.

B. PTRI's role in the improvement of dyeing, printing, and finishing of silk

The Silk Research and Technology Division of the PTRI conducts product development activities to enable production of silk products that will meet consumer requirements and develop a viable non-traditional export products. One of the major activities of the project is the utilization of waste cocoons by degumming the wastes and hand-spinning them to produce hand-spin silk yarns with a typical distinctive character for handweaving purposes. The degumming and hand-spinning technology is aimed to be transferred and developed as a rural-based industry for the country side.

Dyeing of silk yarns such as tie-dyeing has been conducted to produce classic designs such as the "Ikat," which is of typical national character. Several recommendations were proposed for the improvement of the dyeing of silk, (Annex 2). Equipped with a very traditional equipment for dyeing, the project aims to acquire modern equipment and establish a pilot plant for dyeing and finishing silk in order to facilitate extension and technical services to silk weavers/manufacturers in the country. With the establishment of this pilot plant and more technical expertise on dyeing and finishing of silk, PTRI could be established as a center for information and technical services for dyeing, printing, and finishing of silk.

### C. Conclusions

Quality testing of raw silk is incomplete and not being done regularly.

Raw silk which is untwisted is not suited for wet treatment especially for degumming.

The technology of silk dyeing used in the Philippines is very traditional in nature. There is insufficient knowledge on dyeing and there is a need to upgrade the technical services.

Companies engaged in the production of traditional and indigenous commodities/fabrics are very much enthusiastic in utilizing natural silk especially for handweaving purposes. Raw silk filaments, dyed or undyed, are utilized by the handweavers for the production of novelty items. Dyeing is done by the companies themselves in an old-fashioned way.

Hand spin silk produced from waste cocoons has a good potential in the domestic market as a good material for handwoven or knitted apparels or other novelty items.

One private powerloom silk weaver which imports raw silk from China is very much interested to obtain further information on dyeing of natural silk and its blends especially the silk polyester blend.

#### D. Consequences

- The testing equipment for raw silk must be completed by providing an instrument to measure tenacity and elongation. The instrument need not be expensive, yet, traditional type is acceptable.
- Twisting and throwing must be developed to produce trame and organzine which are suited for degumming and dyeing purposes.

Trame: a loosely twisted silk yarn made by doubling or twisting two or more filaments together and usually used for the weft of a fabric.

Organzine: a raw silk yarn formed from two or more twisted strands doubled and twisted in the reverse direction when plied, that is, used for warp threads in fine fabrics.

- Rigid technical training and specialization on dyeing must be made available to the staff of PTRI. Training can be done in the Philippines in connection with the dyestuff producers through their technical information services, (Annex 3) but it would be advantageous if the staff could be trained abroad especially in Europe.
- Special finishing treatment for silk fabric is not absolutely necessary since the natural beauty and charm of silk are such that it requires relatively little finish. Only after treatment with acid or a little softener is required which needs no special equipment.
- Printing of silk is not yet used and should not be used in the near future. Printing is very complicated and requires high technical expertise and there exists a very stiff competition in the world market.
- Slight improvement of the existing dyeing equipment of PTRI and fabrication of some laboratory tools need proper attention.

- Improvement of infrastructure of the pilot plant of PTRI, especially water system, must be done.
- On a longer period, installation of sample dyeing equipment in pilot plant of PTRI must be studied. The cost for this equipment is estimated at US\$ 100,000 (Annex 4).

V. ANNEXES

A. Acknowledgments

UNIDO Philippines

Mr. Santi Narashima - Senior Industrial Development  
Field Adviser

Ms. Meriaty Subroto - Jr. Professional Officer  
Assistant to the Senior  
Industrial Development  
Field Adviser

UNDP Philippines

Mr. Turnhan K. Mangun - Resident Representative

Mr. Nicholas Brown - Assistant Resident Representative

Department of Science and Technology, Manila

Dr. Antonio Arizabal - Department Secretary

PTRI Manila

Mr. Eduardo P. Villanueva - Director

Ms. Virmila B. Alvarez - Science Research Specialist II

Ms. Paraluman Gonzales - Science Research Specialist I

Ms. Daisy Chua - Science Research Specialist I

PTRI La Trinidad, Benguet

Silk Industry Development Project

Mr. Paul M. Bacuso - Science Research Specialist I

I should also wish to express my thanks to several individuals, companies and associations, who assisted me during my visit, and to the people of the Republic of the Philippines, for their warmth, help, kindness and courtesy so readily given during my time in their country.

B. Recommendations given on dyeing of silk

- Advices to prevent the silk from being degummed during dyeing of undegummed silk.
  
- Recipes on:
  - . Degumming of silk fabrics
  - . Aftertreatment of dyed silk
  
- Detailed information on dyeing of silk with:
  - . Acid and metal complex dyes
  - . Reactive dyes
  
- Method on testing the degree of degumming of natural silk.

C. Dyestuff producers with technical service in Asia

Bayer Philippines, Inc.  
Dyestuff Division  
Ortigas Avenue corner Roosevelt Street  
Greenhills, San Juan, Metro Manila

Mr. Werner Baelz - Division Manager

Zuellig Marketing Corporation  
Ciba-Geigy Division  
Dyes and Chemical Department  
Sen. Gil J. Puyat Avenue Extension  
Makati, Metro Manila

Ms. Remy S. Valencia - Technical Manager

Mr. Tony Sy - Technical Sales Representative



(Annex 4)

D. Machinery for the pilot plant

Laboratory Equipment for Exhaust Dyeing	US\$ 14,000
Laboratory Winch Beck	25,000
Laboratory Pressure Dyeing Equipment for Cones	40,000
Transport and Installation	<u>21,000</u>
	<u>US\$ 100,000</u>

E. Meetings, conferences, discussions, visits out of PTRI Manila

14.10.87 The 6th Gifts, Toys, Housewares and  
Fashion Accessories Market Show  
Center for International Trade Expositions and Missions  
Philippines International Convention Center  
Roxas Boulevard, Manila

16.10.87 Fil-Fibers Manufacturing, Inc.  
Silk-Fabrics Manufacturer  
Marikina, Metro Manila  
Mr. Percy A. Silvala  
Mr. Chau - Technical Manager

20.10 - 23.10.87 Stay in La Trinidad, Benguet

21.10 PTRI - Silk Industry Development Project  
- La Trinidad, Benguet  
Breeding Station  
Mr. Paul M. Bacuso - Officer-in-Charge  
Science Research Specialist I  
- Kapangan Benguet Farmers Association  
Cocoon Producing Farmers

22.10 Narda's Handwoven Arts and Crafts  
La Trinidad, Benguet  
Ms. Leonarda Capuyan - Proprietress

26.10.87 Zuellig Marketing Corporation  
Ciba-Geigy Division  
Dyes and Chemicals Department  
Sen. Gil J. Puyat Avenue Extension  
Makati, Metro Manila  
Ms. Remy S. Valencia - Technical Manager  
Mr. Tony Sy - Technical Sales Representative

- 27.10.87 Bayer Philippines, Inc.  
Dyestuff Division  
Ortigas Avenue corner Roosevelt Avenue  
Greenhills, San Juan, Metro Manila  
Mr. Werner Baelz - Division Manager
- 30.10.87 Edward Keller (Philippines) Inc.  
Textile Machinery Department  
Pasong Tamo, Makati, Metro Manila  
Mr. Enrique Ma. Llamas - Manager  
Mr. Ramon M. Lachica, Jr. - Senior Sales Engineer
- 03.11.87 Zuellig Marketing Corporation  
Ciba-Geigy Division  
Dyes and Chemicals Department  
Sen. Gil J. Puyat Avenue Extension  
Makati, Metro Manila  
Mr. Johnny Khong Hun - Manager
- 04.11 - 05.11.87 Stay in Iloilo City  
04.11 Gizon's Iloilo Handicrafts  
Arevalo, Iloilo City  
Ms. Leonor Hortinela - Proprietress