OCCASION

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

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

RESTRICTED

19694

DP/ID/SER.B/702
27 May 1992
ORIGINAL: ENGLISH

STRENGTHENING OF THE TECHNOLOGICAL CAPABILITY OF THE THAI PACKAGING CENTRE

DP/THA/87/019

THAILAND

Terminal report*

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

Based on the work of Ms. Amornrat Swatditat,
National Project Director

Backstopping officer: Joao de M. R. Belo,
Engineering Industries Branch

United Nations Industrial Development Organization
Vienna

---

* Mention of company names and commercial products does not imply the endorsement of UNIDO. This document has not been edited.

V.92 54700

TABLE OF CONTENTS

1 INTRODUCTION

Packaging is an area where small and medium scale industries in Thailand suffer from a number of inadequacies since they do not pass the standards set by importing countries. A large amount of goods are damaged during storage, handling and transport due to inadequate packaging. In addition, the design often lacks in attractiveness thus reducing potential sales.

The importance of packaging has been recognized by the Government of Thailand as noted in the Fifth (1982-1986) and the Sixth Development Plan (1987-1991) by the National Economic and Social Development Board, Office of the Prime Minister, Bangkok, Thailand.

The policies concerning packaging in the Fifth Development Plan (1982-1986) are specified in the Science and Technology Development Section and also in the Accelerated Export Policies. It aims to develop packaging of agricultural and industrial products to minimize losses, to create added value which will increase the farmers' income in rural areas. The Thai Packaging Centre (TPC) then was established by the Thai Government in 1984 to be responsible for upgrading the packaging standard level of the country. The main responsibility of the Centre is to provide testing services, research and development activities, promotional, as well as advisory and consultancy services in the field of packaging to both private and government institutions. The emphasis is to reduce economic loss resulting from improper packaging and to promote export of agricultural and industrial products.

Additionally, the Sixth Five-year Economic and Social Development Plan (1987-1991) has stated the need to expand industry in order to absorb the increasing labour force. Particular emphasis is given to improvement of services to small and medium-scale industries, a large number of which are located in rural areas.

The Sixth Development Plan has also continued to emphasize the importance of packaging development on agricultural products which are specified in the Production - Marketing - Employment Development System Plan.

The major packaging problems in Thailand are based upon the fact that manufacturers, customers, exporters, and transporters, etc., have not paid attention to the importance of proper packaging. Most of them concentrate their efforts only in low-cost production without paying attention to loss and damage due to improper packaging. There is also a lack of well classified information on packaging which causes serious obstacles in marketing, particularly in the foreign market. In an attempt to solve trade deficit problem, the government of Thailand has put strong effort in export promotion of agricultural produce. However, success in this trade is dependent on many factors including adoption of proper packaging. Therefore, the Centre has to strengthen its capabilities to cope with all the packaging problems concerned and also to fulfill the national policy in packaging.

In March 1990, the UNIDO project supported by UNDP started with the title: Strengthening of the Technological Capability of the Thai Packaging Centre DP/THA/87/019.

2 OBJECTIVES AND LOGIC OF THE PROJECT

2.1 DEVELOPMENT OBJECTIVES

To upgrade the national packaging standard level in order to reduce economic loss and to promote the export of agricultural and industrial products.

2.2 IMMEDIATE OBJECTIVES

(1) To strengthen the capability of TPC technical staff on the planning and implementation of applied research and development programmes relevant to the needs of the Thai exporting community, as well as on correct interpretation of related laboratory testing results and subsequent elaboration of advice to the concerned parties.

(2) To strengthen the capability of TPC technical staff in developing packaging for fresh fruits and vegetables made from indigenous material both for local distribution and export to nearby countries.

(3) To strengthen the capability of TPC within the fields of packaging information and training services for supporting the packaging manufacturers and entrepreneurs.

2.3 PROJECT LOGIC

On completion of this project, the Centre was expected to have sufficient capabilities to help small and medium industries

reduce loss and damage of export goods. Therefore, the Centre should be supported in the following areas.

(1) Structural and graphic design of consumer and transport packages.

(2) Well-trained and qualified personnel and well-equipped laboratory to efficiently undertake all its activities.

(3) The research results as well as all services should be very beneficial for all parties concerned.

3 ACTIVITIES CARRIED OUT AND OUTPUTS PRODUCED

3.1 PLAN OF WORK

In general, the project was well kept as having been programmed at the beginning. There was only some delay because (1) experts could not come as schedule, (2) lack of qualified staff for the fellowship, and (3) insufficiency of budget for equipment as discussed in the Project Performance Evaluation Report of February 1991.

There were two revised budgets approved in December 1990 and July 1991 (ANNEX I)

3.2 EQUIPMENT

Finally there were only 4 items of the equipment ordered as presented in ANNEX II.

The installation of these equipments had so significant contribution to TPC that TPC is able to serve industrial sectors.

However, the consultants emphasized the importance of purchasing a gas chromatograph, a melt flow indexer, a melting temperature apparatus and a sample cutter.

3.3 TRAINING OF COUNTERPART STAFF ON THE JOB

The training activities for the TPC staff were organized as follows :

- Internal seminars presented by the expert in the area concerned
- Round table discussions of the problems
- Visits to industries with the consultant and counterpart staff
- Seminars and courses given to the industries
- Technical advise for testing of packaging materials and containers
- Guidance for the research project and method.

3.4 TRAINING OF COUNTERPART PERSONNEL ABROAD

(1) Miss Amornrat Swatditat, the Director of Thai Packaging Centre, completed two study tours visiting different institutions and exhibitions related to packaging in 1990 and 1991. They are Fraunhofer-Institute for Food Technology and Packaging (ILV), TNO Packaging Research Institute, The Danish Packaging and Transportation Research Institute

(ETI), PIRA International, The Institute of Packaging, Campden Food and Drink Research Association (CFDRA), The International Trade Centre (ITC), Interpack' 90 and PaPro' 91. The benefit obtained is not only the information concerning those institutions but also to learn trends in development of packaging in Europe which is one of the target export market.

(2) Miss Kanchana Dummanamda who works in the area of flexible packaging and laminate package, and Miss Pattra Maneesin who works in packaging for processed food received a training at the National Food Packaging Centre (CETEA) of Brasil for two months. They attended a seminar on "Latas Eletrossoldados : Aspectos Technologicos e Avaliação da Qualidade" on 5-6 November 1991 at CETEA. They also participated in Brasil International Trade Fair and Agro Fair held from 11-17 November 1991 in Sao Paulo, Brasil.

3.5 CONSULTANTS

Following is the final list of the consultants in this project.

Name	Country	Arrival	Departure	Expertise
Ernesto Pichler	Brasil	7 May 90	6 Jun. 90	Woooden transport nakaging
		11 Dec. 91	3 Feb. 92	
John Salisbury	England	10 Sep. 90	24 Oct. 90	Paperboard
Ivan Varsanyi	Hungary	20 June 91	14 Oct. 91	Shelf-life
Joseph Miltz	Israel	3 July 91	27 Aug. 91	Plastic film
		30 Jan. 92	Feb. 92	
Guy Chevallier	France	11 Oct. 91	5 Feb. 92	Graphic design

3.6 INTERNAL SEMINARS

The most important activity of this project was the training of TPC staff which could be best achieved through the organization of internal seminars using the wide experiences of each expert.

All the experts presented in the seminars in the following areas:

(1) E. PICHLER : Transport Packaging

The topic is a sharing of experience between packaging laboratories of TPC and Technological Research Institute, Brazil concerning performance test standards :

- Drop test and Shock test
- Vibration test

- Compression test
- Tests of materials and correlation with package performance
- The importance in testing of packaging for dangerous products

(2) J. SALISBURY : Paper and board

Lecture on testing of paper and board, supplemented by video training films of the following tests :

- Burst (paper)
- Burst (board)
- PIRA creaser
- Taber stiffness tester
- Cobb test
- Ink rub test
- Elmendorf tear test
- Beach puncture test
- Bentsen smoothness and porosity tests
- Oil absorption tester
- Heat sealing techniques

(3) I. VARSANYI : Shelf-life estimation of food and food stuff

The topic is an explanation of the basic theory of food deterioration and shelf-life estimation:

- Characterization of food
- Relatively stable and changing attribute of food
- Factors influence the food quality changing

- Possibilities to inhibit or reduce the rate of reactions
- Shelf-life estimation of food
- Shelf-life and packaging
- Possibilities of shelf-life extension

The consultant has also prepared several good reference documents on shelf-life estimation of foods and foodstuffs.

(4) J. MILTZ : Structure, property-application relationship of polymeric packaging materials.

The topic covers :

- Mechanical properties
- Thermal properties
- Flow (rheological) properties
- Mass transfer (permeation and migration)
- Optical properties
- Chemical properties
- Methods for laminates manufacturing : advantages and disadvantages of the different methods.
- Structure, properties and applications of condensation polymers
- Molecular structure of ploymers, including molecular weight averages and molecular weight distribution and methods for their determination
- The relationship between structure and properties of polymers
- Processing of polymers and package manufacturing.

(5) G. CHEVALLIER : Export Packaging Design Workshop

TPC personnel and outside designers were trained in this workshop. Eight participants worked on different target products. Only 4 promotional logos and final designs were accepted by the consultant.

The programmes of the workshop were :

- 8 technical information sessions on
  - packaging & terminology
  - metal containers
  - glass containers
  - plastic containers
  - paper and board
  - labels
  - corrugated fiber board
  - testing of packaging
- 3 factory visits
  - metal containers
  - glass containers
  - plastic containers
- 4 critic and creative sessions

3.7 SEMINARS AND COURSES FOR THE THAI INDUSTRY

There were two seminars and one workshop conducted by two consultants during the project.

(1) Seminar on "New Trends in Plastic Packaging for Food"

22 August 1991 conducted by Prof. Joseph Miltz, 67 participants

(2) Export Packaging Design Workshop

This workshop was composed of 15 sessions (3 hrs per session) during 18 November to 20 December and conducted by Mr.Guy Chevallier. There were 8 participants and 14 observers, 2 participants and 6 observers are TPC staff. Each participant had to develop a new packaging for a product selected for its export potential.

(3) Seminar on "Packaging : A Tool for Marketing Consumers Goods for Export"

22 January 1992, with three other guest speakers and Mr. Guy Chevallier, 40 participants.

Annex III presents the name of the attendances in these seminars and workshops, with the total of 129 persons.

3.8 BOOKS

Books in the field of polymer are very limited at TPC. A preliminary list of books to be acquired was prepared by J. Miltz as shown in ANNEX IV.

4 ACHIEVEMENT OF IMMEDIATE OBJECTIVES

All the activities mentioned already in the section of "activities carried out and outputs produced" were also part of achievements of this project. Achievement of immediate objectives can be summerized as follows.

4.1 The prototypes of transport packaging for fruits and vegetable were designed using Para rubber wood and bamboo. Three designs of wooden boxes without lid of 100, 50 and 40 litres were rather heavy and expensive. There were two designs of bamboo basket of 30 litres with closed and opened mesh. The performance of the prototypes was tested; the wooden boxes passed all tests, but none of the bamboo baskets. The procedure for performance testing of the prototype can be used for future work in developing transport packaging.

4.2 The structural designs for retail packaging of target products especially for fresh fruits and spices were made. The pre-test programme for fresh rambutan was also carried out as a model for shelf-life determination. The reports on complete test programme of packaging materials and of packed products, including sampling plan, shelf-life estimation of packed foods and determination of effects of packaging on quality changing of packed products, will be good references for TPC's future work.

4.3 TPC staff were trained on the use and applications of the test equipments for paper and board which have been already installed at TPC. The detailed test procedures of the equipments were interpreted. Videos, shown demonstrations of how to test,will be very helpful for TPC staff and industries.

4.4 Concerning plastic films and laminate packages, TPC staff were advised and trained in testing of plastic films and laminates and especially in the interpretation of results and also in research

methods. The consultant's lecture has provided TPC staff a sound background in the area of polymers and plastic packaging.

4.5 TPC and private graphic designers gained general design practices and improved of the quality of the designs. The design project on "packaging for fresh fruits" given to one of the TPC designers flourished him with knowledge of how to work on graphic design as well as how to design retail unit to correspond with standard size of shipping carton. It is very important that packaging designers are be able to work on both structural and graphic design. Graphic design of packaging of target products, cut-flowers, fresh fruits and spices, which had been already produced, were also improved under the guidance of the consultant.

4.6 ITC decided to select TPC as a main field station in Thailand for "Packdata" which is a computerized packaging information system. Packdata database has been already installed at TPC. ITC also provided a complete set of hard copy materials relevant to Packdata. This information system comprising basic technical and commercial information on packaging will serve the need of packaging users and manufacturers as well.

5. UTILIZATION OF PROJECT RESULTS

The benefits of the project have accrued to TPC staff and through them to the industries in following aspects:

5.1 RESEARCH AND DEVELOPMENT

The research project will fulfill the Sixth Five-year Development Plan (1987-1991). Methodology in development of package prototype, performance testing and shelf-life determination are applied to other produces such as litchi and some products. The box making machine will help save time in making a number of corrugated fibre board boxes for shelf-life study and performance evaluation in different simulated storage and transport conditions. The graphic design for packaging will provide marketing information and act as a silent salesman so that Thai products can compete in the international market. The results of all research projects will be of great advantages to the exporters.

In order to be acquainted with the research method, the consultant in plastic film designed two research projects to be carried out by TPC personnel after his departure and he agreed to review and assist in analyzing the results after the completion of the experimental work.

5.2 TESTING OF PACKAGING MATERIALS AND CONTAINERS

The knowledge obtained during training expecially in paper and plastic areas will help TPC staff capable to cope with requests from industrial sector. The steady growth of testing services from year to year lends support to the Centre's acceptability by the industry. Awareness of industrial sector on the quality of packa -

ging will not only reduce economic loss but also raise the packaging level of the country up to the standards.

5.3 STANDARDIZATION

TPC shares the national committee for packaging standards working in the following sectors :

- paper and board
- plastic
- metals
- transport
- packaging ancillaries.

TPC will be in a position to contribute more constructively to the development of packaging standards and specifications of the country.

5.4 TRAINING AND PROMOTION

Training is one of the most important activities of this project. There are two training areas : training TPC personnel and training of the industries and other institutional personnel.

The training of TPC personnel, as a major consequence, increases the technical knowledge and provides assistance to the industrial sector.

Through the courses organized by TPC, a number of technicians from the industrial sector and other institutions have been trained

in different topics of packaging. The knowledge gain will be used to upgrade their products and reduce their production cost.

Another important utilization of the results of the project was the participation of the TPC personnel as lecturers in seminars, training courses, conferences, organized by other institutions in the packaging area.

TPC always participates in the packaging exhibition, conducts the seminars and the packaging prototype contest. These programmes will create packaging awareness in the wide spectrum.

As the newsletter is also one promotional tool, TPC now is publishing a 12-page Newsletter every two months. Starting from October 1992, TPC Newsletter will be improved and transformed into a magazine entitled "Packaging Thailand". This publication will certainly contribute to the development of a national packaging consciousness.

5.5 INFORMATION COLLECTION AND DISSEMINATION

Since there has been a considerably increasing demand from both the government institutions and the industrial sector for packaging information either local or foreign sources, as a national body, TPC has to promptly provide relevant, and up-to-date information to various sections of industry, government and international bodies. Utilization of computerized system will facilitate the collection and dissemination of packaging information at a certain extent. PACKDATA, a computerized system of packaging information provided

by the International Trade Centre is one of the important sources of that can be searched at present.

Concerning books recommended by the cousultants, TPC has ordered and received some already.

6 CONCLUSIONS

The project succeeded in completing its main task. The equipments were installed and used for various activities of TPC. The staff was trained to operate these equipments. Various trainings were carried out in order to upgrade the general packaging knowledge of the staff.

However, some minor problems were encountered, for instance, the water vapor testing system could not be purchased because of the imbalance between the price and budget; the consultants could not come as scheduled and lack of qualified staff for fellowship.

7 RECOMMENDATION

7.1 CONSULTANCY

It is highly recommended that the foreign consultants to the project should know in advance their job description so that they could bring as much material related to their expertise.

The duration for each mission should be only one or two months. If more time is required, the missions should be split. The first part of the mission should be introduction period,

introducing one another and summarizing the project situation, etc. Then a specific programme should be carried out until the end of period. The third step should be a follow up of what has been done by the group, a reorganization of the programme and the work.

7.2 EQUIPMENT

Because of limited budget and increased cost of the new model of the equipment, TPC still does not have MOCON water vapour permeability test system and a car. MOCON water vapour permeability test system will be used in research project as well as testing service to industry for quality evaluation related to barrier properties of flexible packaging material. A car will be necessarily used for TPC in conducting training course and visiting factory outside Bangkok.

According to the consultants' suggestions, a few important testing instruments namely a gas chromatograph, a melt flow indexer, a melting temperature apparatus and a sample cutter are needed in TPC's laboratory. However, during the preparation of this report, Belgian Government has already confirmed to provide TPC a set of gas chromatograph. Other equipments have not been ordered yet because the prices are rather high and TISTR can not provide budget for these equipments.

7.3 TRAINING

The actual system for training of TPC personnel by the experts or other institutions should be continued. At present, not even one officer of TPC graduates in packaging major. Therefore, it is necessary to promote an education programme for TPC personnel in studying abroad to receive complete training in Master Degree or Ph.D.

The quality of TPC highly depends on the quality of its technical manpower. Packaging being dynamic in nature, requires constant touch with developments that are taking place especially in developed countries. Consequently, TPC personnel should be supported regularly to engage in study tours and training abroad.

Since graphic design is as important as structural design, TPC designers also acquire competence in design of shapes of containers, mainly made of glass and plastic.

7.4 PACKAGING AND ENVIRONMENT

In most industrialized countries actions have been taken in view of protecting the environment. Several environmental issues are demanding urgent attention. One of the most important subject all over the world is the relation between "Packaging and Environment"

Packaging for dangerous goods need certification before being exported to EC and the USA. There are also other aspects of packaging used for export to industrialized countries that the

packaging have to be recycled ; the product should not be off flavor or off-taste because of unsound packaging, etc.

As a national packaging centre, TPC should be able to cope with any problem related to packaging and environment. This idea was strongly supported by UNIDO consultant-Prof. Joseph Miltz. His general views on the subject of "Packaging and the Environment in Thailand" is shown in ANNEX 5.

7.5 REQUEST FOR FURTHER ASSISTANCE FROM UNDP/UNIDO

TPC would request for further assistance from UNDP/UNIDO as follows :

1. To support the purchase the equipments recommended by the consultant
2. To support study tour, fellowship and study towards Master Degree and Ph.D. in packaging regularly.
3. To sponsor the project "Packaging and Environment" (including packaging of dangerous goods)

ANNEX I

5 March 1990

UNITED NATIONS DEVELOPMENT PROGRAMME

Project of the Government of

THAILAND

PROJECT DOCUMENT

Number and title: DP/THA/87/019/B/01/37 - Strengthening of the Technological Capability of the Thai Packaging Centre

Duration: One and a half year

Project site: Bangkok

ACC/UNDP sector & subsector: (0510) Industrial development support services
(0520) Manufacturing industries

Government sector & subsector:	UNDP and cost sharing financing:	
Science and Technology Export Promotion	UNDP IPF	$ 260,100
	Other (specify)	$
Government implementing agency:	Govt. or third party cost sharing (specify)	$
Thailand Institute of Scientific and Technological Research (TISTR), Ministry of Science, Technology and Energy (MOSTE)	UNDP & cost sharing T o t a l:	$ 260,100

Executing agency: U N I D O

Estimated starting date: May 1990

Government inputs: Baht 35,334,000 (in kind)

The primary function of the project is to build up the institutional capacity of the Thai Packaging Centre (TPC) to transfer modern packaging technology into the national production and marketing enterprises concerned. To meet effectively this goal, the project will induct TPC into applied research, training, information and consultancy services in support to the packaging manufacturer and user enterprises.

On behalf of:	Signature	Date	Name/title
The Government implementing agency	Smith Kampempool	7 March 1990	Prof. Dr. Smith Kampempool Governor, TISTR
The Government		22 MAR 1990	(b) Mr. Wanchai Sirirattana Director-General Department of Technical and Economic Cooperation
Executing Agency		11.4.90	Nils Ramm-Ericson UNIDO Country Director
UNDP		30 3 90	Fabrizio Ossella Regional Representative, a.i.

United Nations official exchange rate at date of last signature of project document: $1.00

UNITED NATIONS DEVELOPMENT PROGRAMME

SECOND MANDATORY PROJECT REVISION 1990

COUNTRY: THAILAND

PROJECT NUMBER: DP/THA/87/019/D/01/37

TITLE: STRENGTHENING OF THE TECHNOLOGICAL CAPABILITY OF THE THAI PACKAGING CENTRE

The attached budget of the above project is hereby rephased to reflect estimates of expenditure for 1990 and the consequential effect on future years budgets.

Total budget increase is due to the application of proforma cost in the expert component.

The change to the project budget - UNDP input is as follows:

Previous UNDP input - Project budget code	"C"	$263,800 (line 99 total)
Revised UNDP input - Project budget code	"D"	$291,665 (line 99 total)
UNDP input -	INCREASE	$27,865

L.N. Soumarokov, Deputy Director-General
Agreed on behalf of UNIDO

Date

Alan Doss, Regional Representative
Approved on behalf of the UNDP

10 DEC 1990
Date

UNITED NATIONS DEVELOPMENT PROGRAMME
PROJECT REVISION

Country: Thailand

Project Title: Strengthening the Technological Capability of the Thai Packaging Centre

Project No.: DP/THA/87/019/E/01/37

The above project is amended as indicated, and for purposes as specified in this document.

The change to the UNDP project budget is as follows:

Previous UNDP input - Project budget code "D"	$	291,665
Revised UNDP input - Project budget code "E"	$	385,931
UNDP input - increase	$	94,266

Mr. Wanchai Sirirattna
Director-General
Department of Technical and Economic Cooperation

8 JUL 1991

Agreed on behalf of the Government — Date

Nils Ramm-Ericson
UNIDO Country Director

Agreed on behalf of the Executing Agency — Date

Alan Doss, Regional Representative

11 JUL 1991

Approved on behalf of the United Nations Development Programme — Date

Proposed amendments and justification

The attached budget of the above project has been rephased to reflect actual expenditures for the year 1990 and the consequential effect on the budget for future years.

Total proposed budget increase, amounting $34,266, results from changes in BLs as specified and justified below:

BL 11-01: Increase of $8,670 due to higher actual costs of the international expert

BL 11-02: Decrease of $475 due to lower actual costs of the international expert.

BL 11-03, 11-04, 11-05:

Increase of $8,800 due to application of 1991 proforma cost

BL 42-00: Increase of $82,143 in order to make appropriate allotment for purchase of the water vapour transmission rate tester and oxygen transmission rate tester which are contemplated on the project document concerned. Thai Packaging Centre's letter dated 28 December 1990 and DTEC's letter No. 1703/9788 dated 3 April 1991 refer in this connection.

BL 51-00: Decrease of $4,872 due to lower estimated costs.

COUNTRY	THAILAND	DATE PRINTED 03/06/91	PAGE
PROJECT NUMBER	THA/87/019/B/01/37	SHADOW BUDGET	LAST REV 03/06/91
PROJECT TITLE	Strengthening of the Technological Capability of the Thai Packaging Centre		

PROJECT BUDGET COVERING UNDP CONTRIBUTION (in U.S. dollars)

PROJECT COMPONENTS		TOTAL AMT M/M	1989 AMT M/M	1990 AMT M/M	1991 AMT M/M
1010 PROJECT PERSONNEL					
111 Experts:					
011-001 Expert in Transport Packaging		41,629		31,629	10,000
		3.0		1.0	2.0
011-002 Exp.in Paper/Board Cons. Pack.		25,981		25,981	
		2.0		2.0	
011-003 Exp.in Film & Laminate Pack.		30,450			30,450
		3.0			3.0
011-004 Exp. in Processed Food Pack.		40,600			40,600
		4.0			4.0
011-005 Exp. in Packaing Graphic Des.		40,600			40,600
		4.0			4.0
11-99 Subtotal	(1)	179,260		57,610	121,650
		16.0		3.0	13.0
115 Official travel:					
015-000 Travel		600			600
15-99 Subtotal	(1)	600			600
019 COMPONENT TOTAL	(11)	179,860		57,610	122,250
		16.0		3.0	13.0
1030 TRAINING					
031 000 Fellowships		40,000			40,000
032 000 Study Tours		18,000		10,820	7,180
039 COMPONENT TOTAL	(11)	58,000		10,820	47,180
1040 EQUIPMENT					
042 000 Non-Expendable Equipment		143,943		56,325	87,618
049 COMPONENT TOTAL	(11)	143,943		56,325	87,618

COUNTRY : THAILAND DATE PRINTED 03/06/91 : PAGE 2

PROJECT NUMBER : THA/87/019/B/01/37 : SHADOW BUDGET : LAST REV 03/06/91
PROJECT TITLE : Strengthening of the Technological Capability of the Thai Packaging Centre

PROJECT BUDGET COVERING UNDP CONTRIBUTION (in U.S. dollars)

PROJECT COMPONENTS		TOTAL AMT M/M	1989 AMT M/M	1990 AMT M/M	1991 AMT M/M
1050 MISCELLANEOUS					
053 000 Sundries		4,128		1,128	3,000
059 COMPONENT TOTAL	(**)	4,128		1,128	3,000
999 BUDGET TYPE TOTAL	(***)	385,931		125,883	260,048
		16.0		3.0	13.0
999 UNDP TOTAL	(***)	385,931		125,883	260,048
		16.0		3.0	13.0

Project Number	UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION NON-EXPENDABLE PROPERTY CONTROL RECORD	Page No. : 1
DP/THA/87/019		Period Ending : CECEMBER-91

Country : THAILAND

Project Title : STRENGTHENING OF THE TECHNOLOGICAL CAPABILITY OF THE THAI PACKAGING CENTRE

Purchase Order Number	Item No.	Description	Qty. Ord.	US Dollar Equivalent	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-0-00834	1	IBM PS/2 MODEL 55 SX-61, S/N 23 1153689.	1	4,210.00	1	09	90	G	1	
15-0-00834	2	IBM PS/2 COLOR MONITOR 12", S/M 55LP855.	1	840.00	1	09	90	G	1	
15-0-00834	3	HP LASERPRINTER III, S/N 3018S26290.	1	2,700.00	1	09	90	G	1	
15-0-00834	4	VOLTAGE REGULATOR MICRO 1000 FOR 90 MINUTES, S/N 98020/178.	1	4,345.00	1	09	90	G	1	
15-0-00834	5	COMPUTER DESK WITH PRINTER SUPPORT.	1	870.00	1	09	90	G	1	
15-0-00834	6	CHAIR.	1	460.00	1	09	90	G	1	
15-0-00834	7	CANON COPYING MACHINE NP 4335.	1	6,810.00	1	09	90	G	1	
15-0-00834	8	TABLE FOR CANON NP 4335.	1	310.00	1	09	90	G	1	
15-0-00834	9	SORTER 20-FOLD.	1	1,810.00	1	09	90	G	1	
15-0-00835	1	MODEL 810A BOXMAKER SERIAL NO. AL.90450.	1	18,602.00	1	04	91	G	1	
15-0-00835	2	MODEL 110 SLITTER SERIAL NO. AL.90451.	1	5,893.00	1	04	91	G	1	
15-0-00835	3	P.50 B/C STAPLER C/W FRL, AIRLINE AND FITTINGS.	1	1,025.00	1	04	91	G	1	
15-1-01170	1	OX-TRAN SERIES 2/20 MASTER MODULE 001-904.	1	53,120.00	1	12	91	G	1	Condition when received is good. Mocon engineer will come to install on 4 February 1992
15-1-01170	2	OX-TRAN SERIES 2/20 SATELLITE MODULE.	1	20,380.00	1	12	91	G	1	
15-1-01170	3	AUTOMATIC DIGITAL BAROMETRIC PRESSURE COMPENSATOR.	1	1,840.00	1	12	91	G	1	

Project Number : DP/THA/87/019	Page No. : 2
Country : THAILAND	

Purchase Order Number	Item No.	Description	Qty. Ord.	US Dollar Equivalent	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-1-01170	4	REGULATOR ASSEMBLY 2/20.	1	1,670.00	1	12	91	G	1	
15-1-01170	5	PACKAGE ENVIRONMENTAL CHAMBER OPT..	1	9,010.00	1	12	91	G	1	

Project Number	UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION	Page No. : 3
DP/THA/87/019	NON-EXPENDABLE PROPERTY CONTROL RECORD	Period Ending : DECEMBER-91

Country : THAILAND

Project Title : STRENGTHENING OF THE TECHNOLOGICAL CAPABILITY OF THE THAI PACKAGING CENTRE

We certify that the quantities of non-expendable equipment received, less the quantities of non-expendable equipment written-off, reflect the physical count of the items on hand.

Unido project manager or Resident representative — Nils Ramm-Ericson, UNIDO Country Director (signature) — Date 6.2.92

Government counterpart — A. Suvatdilat (signature) — Date 20 Jan '92

ANNEX III

LIST OF PARTICIPANTS ATTENDING IN THE UNIDO-TPC COURSES AND SEMINARS

1. SEMINAR ON NEW TRENDS IN PLASTIC PACKAGING FOR FOOD

1. Best Pack Co., Ltd.
2. Thai Modern Plastic Industry Co., Ltd.
3. Union Carbide (Thailand) Co., Ltd.
4. East Asiatic (Thailand) Co., Ltd.
5. Lam Thong Food Industry Co., Ltd.
6. S.C. Johnson & Son Co., Ltd.
7. Thai Polyethylene Co., Ltd.
8. Nestle (Thailand) Co., Ltd.
9. Premier Marketing Co., Ltd.
10. Kasetsart University
11. Palco Industry Co., Ltd.
12. Bangkok Novel Co., Ltd.
13. East Asiatic Co., Ltd.
14. Custom Pack Co., Ltd.
15. Viwat Industry Co., Ltd.
16. South East Paper Industry Co., Ltd.
17. MMP Packaging Group Co., Ltd.
18. Unique Pack Co., Ltd.
19. MCTI Co., Ltd.
20. Thai Offset Co., Ltd.
21. Food Processing Co., Ltd.

22. Lever Brother (Thailand) Co., Ltd.
23. Morakot Industries Co., Ltd.
24. Warner-Lambert (Thailand) Co., Ltd.
25. Thai-Nam Plastic Co., Ltd.
26. Toyo Ink (Thailand) Co., Ltd.
27. CP. Food Product Co., Ltd.
28. Siam Food Co., Ltd.
29. Wales and Co Universe Co., Ltd.
30. The Union Frozen Products Co., Ltd.
31. Strong Pack Co., Ltd.
32. Thai packaging Centre

2. EXPORT PACKAGING DESIGN WORKSHOP

PARTICIPANTS

	Name	Company	Project
1.	Mr. Bamrung Isarakul	J. Walter Thompson	Coconut powder/cream
2.	Ms. Aree Suthiwongkul	SPA Advertising	Tea
3.	Ms. Nuchanard Kerechote	Lion Containers	Jam
4.	Mr. Wison Singhares	Plan Grafik	Canned food
5.	Mr. Panodvan Chuensuwan	Creative Pring	Dry fruits
6.	Mr. Naray Korchimeta	Industrial Service Institute	Snack
7.	Mr. Chaiwoot Gethlim	Thai Packaging Centre	Fresh Fruit
8.	Mr. Suthep Lohacharoon	Thai Packaging Centre	Frozen prepared food

OBSERVERS

1. Chulalongkorn University
2. King Mongkut's Institute of Technology Ladkrabang
3. Bangkok University
4. Rangsit University
5. Department of Export Promotion
6. Strong Pack Co., Ltd.
7. Lion Containers Co., Ltd.
8. C.P. Food Products Co., Ltd.
9. Thai Packaging Centre

3. SEMINAR ON PACKAGING : A TOOL FOR MARKETING CONSUMER GOODS FOR EXPORT

1. Rung-Silp Printing Co., Ltd.
2. Colgate-Palmolive (Thailand) Co., Ltd.
3. Morakot Industries Co., Ltd.
4. Arti-Flora Co., Ltd.
5. Lion Container Co., Ltd.
6. Plan Motif Co., Ltd.
7. Thai Container Co., Ltd.
8. Coolman Corp.
9. PSG Intertrade Co., Ltd.
10. Kasetsart University
11. Chakrapong Phuwanart Campus
12. King Mongkut's Institute of Technology Ladkrabang
13. Thailand Institute of Scientific and Technological Research
14. Thai Packaging Centre, TISTR

ANNEX IV

Preliminary list of books on polymers and packaging to be acquired.

1. Billmeyer, W.Jr.
   Textbook of Polymer Science
   2nd (or later) edition, Wiley - Interscience

2. Nielsen E.
   Mechanical Properties of Polymers and Composites
   Vol 1 & 2 Marcell Dekker (1974)

3. Compton, T.R.
   The Analysis of Plastics
   Pergamon Press, Oxford (1987)

4. Bakker, M. & Eckroth, D.
   The Wiley Eneyclopedia of Packaging
   Wiley Publ. Co. (1986)

5. Cairns, J.A., Oswin, C.R. and Paine. F.A.
   Packaging for the Climatic Protection
   Newnes - Butterworths, London (1974)

6. Gray, J.I., Harte, B.R. and Miltz, J.
   Food Product - Package Compatibility
   Technomic Publ. Co. (1987)

7. Hotchkiss, J.H.
   Chemical Interactios Between Food and Food Packaging
   ACS Symposium Series No. 365

8. Koros, W.J.
   Barrier Materials and Structures
   ASC Symposium Series. (1989)

9. ASTM Vol. 15.09 - Packaging

10. Heldman, D. and Lund, D.
    To appear at the end of 1991

ANNEX V

General views on the subject of
"Packaging and the Environment"
in Thailand

Prepared by:
Prof. Joseph Miltz, Head
Packaging Laboratory
Technion - Israel Institute of
Technology
Haifa, Israel

In recent years the relation between "Packaging" and the "Environment" has become one of the most important subjects all over the world and many industrialized countries devote much effort and resources in order to find ways how to deal with this subject.

The main reason for the widespread attention to this issue stems from the growing attention and concern by the public as well as by regulatory governmental agencies to the safe and well being of the people, nature and atmosphere.

Thus, packaging, storage and transport of "Dangerous Goods" are being more and more regulated in order to prevent accidents from occurring. Special materials, test methods for packages and handling procedures are being imposed primarily by the European Economic Community (EEC), and the USA. Countries that will not be able to properly test their packages and comply with the regulations will not be able to export their goods to these countries.

Another subject of widespread attention is the share of packaging in the solid waste streams and methods how to diminish this share. The subject is catching up momentum

because of the diminishing space for landfilling and the harmful results some processes (like incineration of some plastics) may have.

Different approaches how to deal with the subject of packages in the solid waste have been proposed. These include, among others: recycling, incineration, pyrolysis, bio- and photo-degradation etc. In Thailand, where these subjects are very acute, they are not covered or dealt with to any extent. There is no single laboratory in the country that is familiar with the testing procedures of packages for dangerous goods. The technical presonnel at the Thai Packaging Centre (TPC) which is the only Packaging Laboratory in Thailand is also not familiar with the problem of packaging in the solid waste stream and how to deal or study this subject. On the other hand, today there are countries in Europe which will not allow import of goods unless the packages could be recycled. The number of such countries is growing.

Thus, it is imperative in the author's mind to train the TPC personnel and to equip these people with the knowledge and equipment in order to enable them to carry out R & D and testing work in the area of "Packaging and the Environment" and to enable Thailand to make one step further in the direction of integration within the developed countries.

It is the opinion of the author that UNIDO or UNDP should support such a project, including the preparation of the proposal as the technical personnel at TPC is not familiar enough with the subject in order to prepare an appropriate project proposal.

Backstopping Officer's Comments

According to its title the project was aimed at strengthening the technological capability of the Thai Packaging Centre, with a view to contributing towards long-term achievement of the development objective: to upgrade the national packaging standard level in order to reduce economic loss and to promote the export of agricultural and industrial products.

The outputs produced may not have always been exactly as foreseen in the project document. However, they were quite in line with the objectives concerned, which were actually achieved through the implemented activities.

Each one of the five experts, who carried out the project technical assistance missions, proposed slight readjustments in the duties to be performed, in agreement with the National Project Director and with the concurrence of the UNDP and UNIDO responsible officers. It must be recognized that the outputs actually produced through the re-arranged activities contributed to the actual achievement of the objective concerned at a level not below, or even above the contribution which would have come from the scheduled outputs only.

The immediate objectives of the project were fully achieved, at a level which is really remarkable in comparison with the scale of the project.

The capability of the Thai Packaging Centre (TPC) technical staff on the planning and implementation of applied research and development programmes relevant to the needs of the Thai exporting community, as well as on correct interpretation of related laboratory testing results and subsequent elaboration of advice to the concerned parties (first immediate objective), was actually strengthened. For that purpose industries were visited by TPC specialists accompanied by experts. Seminars and workshops open to participants from the industry were carried out. Training of the mission counterparts took place on the project premises, abroad and in direct contact with the national industries which the TPC will be expected to assist in the future.

The capability of TPC technical staff in developing packaging for fresh fruits and vegetables made from indigenous material, both for local distribution and export to nearby countries (second immediate objective), was also strengthened. The national counterparts co-operated in the development and laboratory appraisal of packaging models, having actually participated in packaging development approach as it has to be continued to satisfy the national needs concerned.

The capability of TPC within the fields of packaging information and training services for supporting the packaging manufacturers and entrepreneurs (third immediate objective) was also strengthened through the establishment of a computerized packaging information data bank and actual organization and implementation of training programmes for participants from the industry.

The recommendations of this project terminal report are very pertinent. Particularly important and worthy full consideration and follow-up is the recommendation to further technical assistance to the Thai Packaging Centre under the title of "Packaging and the Environment", namely aimed at the establishment of specific capability in the fields of packaging of dangerous goods, environment suited packaging development and applied research on re-cycling of used packages from the municipal garbage.