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15 August 1985
ENGLISH

ASSISTANCE IN THE PRODUCTION OF PHARMACEUTICALS FROM THE THAI TRADITIONAL PHARMACOPOEIA

DP/THA/82/006

THAILAND

Technical report: Marketing of pharmaceuticals derived from plants and essential oils*

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 John G. Meredith,
Expert in marketing of pharmaceuticals derived from plants

United Nations Industrial Development Organization
Vienna

* This document has been reproduced without formal editing

V.85-29862

Abbreviations used where relevant

EEG	:	Economic Evaluation Group - Techno-Economics Division.
GO	:	Government Organisations
GPO	:	Governmental Pharmaceutical Organisation
MDF	:	Military Drug Factory
MSTE	:	Ministry of Science, Technology and Energy
NGO	:	Non-Government Organisations (i.e. Private enterprise)
NPI	:	Natural Products Industry Co. Ltd.
PNPRD	:	Pharmaceutical and Natural Products Research Development
TISTR	:	Thailand Institute of Scientific and Technological Research

Surface measures : 1 Rai (1600 sq.metres) = 400 sq. Wah
1 sq. Wah = 4 sq. metres

There are approximately :

2½ rai to 1 acre
6¼ rai to 1 hectare

CONTENTS

I. INTRODUCTION

Project DP/THA/82/006, under the title "Assistance in the production of Pharmaceuticals from the Thai Traditional Pharmacopoeia" stated that the development objective was :

"To promote the utilisation of Thailands resources of medicinal plants thereby enhancing self-reliance in the field of pharmaceuticals while providing income to agricultural producers of the plant material".

The immediate objectives numbered six in all, headings 1 to 4 and heading No.6 were specifically aimed at the development of production technology at pilot scale level and the recommendations concerning economic processes, the optimisation of quality and its strict control to meet the rigid specifications applicable to products sold on the international markets. Of equal importance was the scaling up of laboratory processes and the preparation of suitable formulations using drugs obtained from indigenous plants, as well as remedies mentioned in the Thai traditional pharmacopoeia. The package was also directed at assisting the Primary Health Care Programme.

Heading No. 4 was :

"To inform the local pharmaceutical industry, to generate interest in undertaking production of the products developed and, to provide assistance in production technology and marketing".

It is in conformity with this objective that, at the request of the Thai Government, the United Nations Industrial Development Organisation (UNIDO), fielded Mr. John G. Meredith as "Expert in Marketing of Pharmaceuticals derived from plants", for one month during June/July 1985.

The Expert's duties include :

1. Assistance in the identification and establishment of suitable contacts with potential overseas users/buyers of products developed by the Thailand Institute of Scientific and Technological Research.
2. Aid in the identification of a priority list of products, and specification thereof, based on realistic market assessments.

In submitting this proposal, the expert hopes to contribute in some measure to the broader aspects of the project, whilst bearing in mind that there may be some unavoidable constraints in the rapid development of any relevant commercial supporting operation.

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II. SUMMARY

Within the framework of the Thailand Institute of Scientific and Technological Research (TISTR), the Pharmaceutical and Natural Products Research Department (PNPRD) can mobilise not only the skills and professionalism of well trained and capable staff but the resources offered by the Economic Evaluation Group of the Institute.

The combined efforts of PNPRD and EEG enable TISTR to examine all available natural raw materials, to provide up-to-date scientific data backed by economic investigation. The data collated are presented in commercially acceptable form, backed whenever possible by the findings of modern methods of instrumental analysis and organoleptic assay.

This technical and scientific strength does not appear to be supported at the present time by a Market Research operation of equal know-how and the contacts with the commercial world of international markets are tenuous and depend principally on the maintenance of a few personal links, chiefly within the Scientific world.

A new look at the whole structure is necessary to ascertain if any commercial development can take place within the terms of reference of the TISTR and if not, to determine under what conditions an organisation can be set up to persuade the three partners, namely TISTR, the Government Organisations (GO) and the non- Government Organisations (NGO) to work on a concerted basis towards the marketing of Thai produced medicinal plant extracts, essential oils and other drugs.

The present weakness can be assisted by the direct submission of Thai products to the buying centres, either by personal presentation during a study tour by a TISTR Member or other agreed appointee or by means of a promotional visit to the centres by a UNIDO appointed Delegate.

Whichever approach is eventually selected, the efforts must be supported by well proven and documented samples and quotations.

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III. FINDINGS AND CONCLUSIONS

During initial discussions at the Thailand Institute of Scientific and Technological Research, it was clearly apparent to the expert that the Pharmaceutical and Natural Products Research Department of the TISTR, led by its Director Mrs. Sasithorn WASUWAT, is well aware of the efforts needed to establish any form of use or sale of specialised products obtained from indigenous medicinal plants or aromatic raw materials.

The problem of developing marketing connections applies both to the Domestic market and the Foreign markets (Exports), but whereas certain direct approaches can be undertaken by the TISTR with respect to the Home Market, the field of Export remains difficult and requires special consideration.

On the one hand, an increased use in Thailand of medicines or pharmaceutical preparations of local manufacture will eventually help to decrease the heavy burden imposed by the expenditure of hard currency for imported products (import substitution); on the other hand, those same locally made products and specialities can, if specifically developed and if necessary reformulated for Export become major contributers to the foreign currency earning capability of the Country.

The efforts already undertaken by the TISTR on the domestic market, with the preparation and presentation of GARLIC NATURA, a 100% pure Garlic, water soluble extract of Allium sativum Linn (Annexe iv) manufactured by the Natural Products Industry Co. Ltd. (NPI), at Chiang Rai and the elaboration and presentation of FLYGESAL (Annexe v.) an anti-inflammatory cream containing Zingiber cassumunar Roxb., manufactured by one of the Government Organisations, are a good indication of the results so far obtained, these being not only promising but proof that the criteria of International Quality standards are being applied.

These achievements and those in the research programmes on SENNA extract (Annexe viii.) and sennosides obtained from Senna augustifolia and

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on PAPAIN (Annexe vi.) obtained from the latex of Papaya carica, as well as on the medicinal value of Phakbung-Thale, Ipomoea pes-caprae (L.) Roth. clearly demonstrate the nature and potential of the research work undertaken at the TISTR. The work on Ocimum basilicum (Annexe vii.) is of great interest and further products are referred to in Annexes ix and x.

The guidelines of the marketing brief indicate a predominance of naturally derived medicines or extracts obtained from medicinal plants but it is clear that some importance must also be given to the production of essential oils or extracts from aromatic plants, especially as it is possible to consider some of the raw materials not only as saleable products in the dry state or as distilled oils, but as component parts of blends or as raw materials for further processing.

In simpler terms, the plants, herbs and roots being investigated can have their use in the major world-wide industries of Pharmaceuticals, Perfumery and Cosmetics, as well as in Flavours and the Food Industry.

The over-view taken by the TISTR, and more specifically by the PNPRD is that the products which are being studied will in due time show their importance and validity. This can quite logically be so in terms of scientific achievement but the TISTR is ready to concede that to achieve the main objective of wide use and distribution, adequate consideration must be given to the commercial viability of any project.

In accepting the complexities of modern marketing methods and trends, the TISTR has, wherever possible, dealt with the problems by means of an Integrated Programme applicable to its research work.

The Integrated Programme in in effect a cycle which involves Research and Development (R+D), Engineering/or Equipment and Industrialisation (EI) as well as seeking advice from the Economic Evaluation Group (EEG). The cycle is the activity and the responsibility of the TISTR in developing the original product concept and carrying it through to the prototype stage.

The interdependence of these activities in commented on as follows :

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a) Research and Development

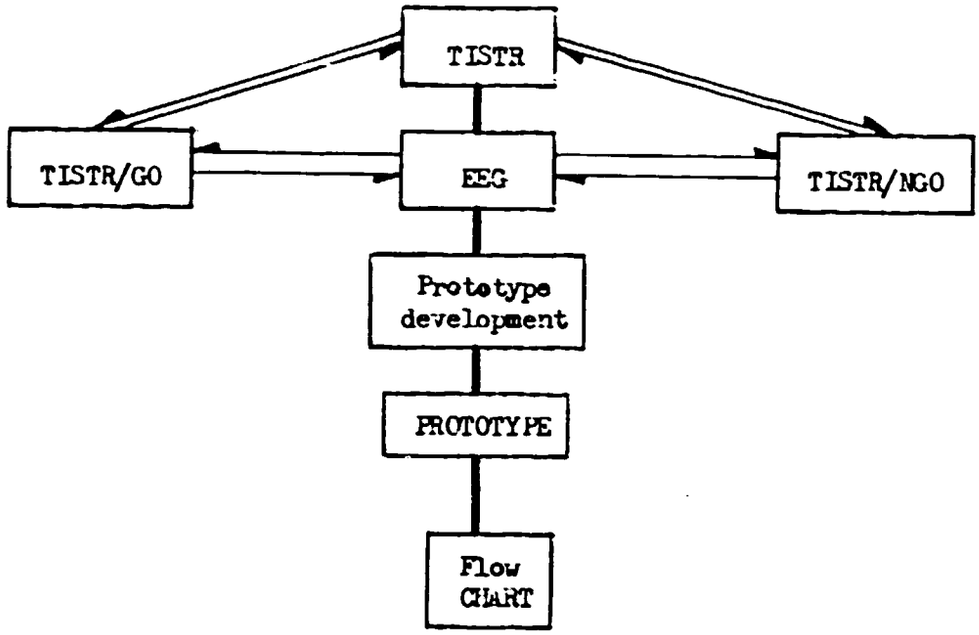
The Research and Development programme makes allowance for an arrangement by which the TISTR can call on the services of any specialised organisation, whether Government (GO) or Non-Government (NGO), the latter referring to Private Enterprise.

In practice, the implementation of the Integrated Programme has two phases, each phase incorporating its own economic study based on the premise that only those products which have a sales future are to be developed in the short-term; the remainder are to be kept under study for future reference. The two phases are broadly defined as involving Manufacture (Phase 1) and Promotion (Phase 2).

Manufacture : On the basis of satisfactory results obtained in the laboratories, the scale-up to pilot plant production is undertaken either by the TISTR on its own, or by the TISTR using its link with the Government in order to benefit from the facilities offered by the GO's which have equipment for trial runs, including the Military and the Government Pharmaceutical Organisation which run fully equipped factories. The TISTR will also use its link with the NGO's, the factories in the private sector often employing specialists with knowledge applicable to the project being considered.

Following the process through, it has been possible to draw up the following Organisation Chart, which it is agreed seems best able to indicate the relationships.

Pilot Scale Production Organisation



The flow-chart is prepared by the TISTR and submitted to the manufacturing agencies, which might be part of the GO's (Military / GPO factories and other National enterprises) or belong to the independent NGO's in the Private Sector.

Any modifications to the flow-chart which might be called for are made by the TISTR and communicated to the manufacturer after further consultation with the partners concerned.

Promotion : This is the preliminary to Industrial Production and necessitates a clear definition of the approach to be used.

The Integrated Programme and the Pilot-Scale Organisation point the way to the two possibilities at present envisaged, one being the direct involvment of the TISTR, the other being the direct involvment of Private enterprise.

TISTR Promotion : In this case, the TISTR is not only the adviser but the promoter of the whole programme and it makes use of the facilities obtainable either through the GO or the NGO. The Private Enterprise organisations are sometimes limited to specific lines of production and these may or may not be available. The Government Organisations however, such as the Pharmaceutical or Military supply factories have available a much more flexible line structure made available to the TISTR. This is extremely relevant in the development

of any new product.

Private enterprise Promotion : In this case the expertise and services of the TISTR are used for production start-up and are readily on-call, sometimes on a contract basis, for batch or overall quality control.

At this stage, it must be stressed that within the Marketing concept and strategy, the sales-viability of any product remains a pre-requisite of the Integrated Development Programme.

The selling mechanism starts at the R+D stage, quite simply because the R+D programme calls for sales potential as justification for any investment.

An initial screening of potential growth products is undertaken by the TISTR in conjunction with the EEG and, on selection, the product, or product group is subjected to a thorough feasibility study by the EEG.

The stimulus to the research programme comes from two possible sources :

In-house research (prompted by PNPRD)
or
Contract research (at the request of NGO - Private Enterprise)

Whatever the source, the programme is subject to the findings of the EEG and, it is at this stage that, subject to further investigation, the recommendation can be either to cancel or to proceed.

Cancellation is understood to mean that the particular project is temporarily shelved.

To proceed means that the "Go-ahead" is given for investigation into the EI component (Engineering/Equipment and Industrialisation) and the presentation of the findings is made in a well documented form which can then become the platform from which approaches can be made either to the GO or the NGO, depending on the outlet recommended.

For its own promotions, the TISTR benefits from a special CHARTER which authorises the Institute to appeal directly to the consumer through a Public Relations Organisation, backed by the Minister for Science, Technology and Energy, with product claims supported by certified documents.

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At present, the TISTR acts as Technical Adviser and quality controller to the Natural Products Industry Co. Ltd., operating at Chiang Rai, which organisation can enter into sales contracts with exporters, or overseas agents, as the situation demands. At the moment the NPI is actively promoting Garlic Natura.

b) Commercialisation

The Economic Evaluation Group undertakes the work of cost estimations required before any discussion can take place with the manufacturers, dealers or exporters.

Wherever possible, current market prices of the commodities are obtained from Trade Publications such as the Chemical Marketing Reporter, published weekly in the U.S.A. and other International Trade Papers and Reviews. Although trends are followed carefully, the market prices tend to be indicative only and comparison with actual contract prices is therefore not possible at the present time.

The present efforts made on the Export Markets by the NPI may produce some feed-back from the important centres of trade, like New-York in the U.S.A., Hamburg in the Federal Republic of Germany and, Osaka in Japan; it is still too early to assess the results.

Large quantities of medicinal plants are used in the preparation of medicinal and herbal teas and the interest in such "natural" preparations is steadily increasing,however, some distinction must be made between the markets for herbal plant material likely to be used as food constituents (i.e. spices and natural colours) and those which might be used either in formulated herbal remedies or as raw materials for the extraction of the alkaloids or active principles.

The choice of raw materials, whether they are synthetic or natural, used by the pharmaceutical manufacturers is often influenced by economic factors and nowhere is this more important than in these markets where plant-derived substances are a vital tool in traditional or modern medicine and are essential for the advancement of forward-looking health care programmes in developing countries. Where it is necessary for one such country to become

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involved with the markets in the industrialised countries, as in the case of earning foreign currency, it is essential that all operations be subject to contracts, especially if they are likely to be out of the traditional Export/ Import circuits.

The ITC/UNCTAD/GATT publication on "Markets for selected Medicinal Plants and their derivatives"(Geneva 1982) made the point that :

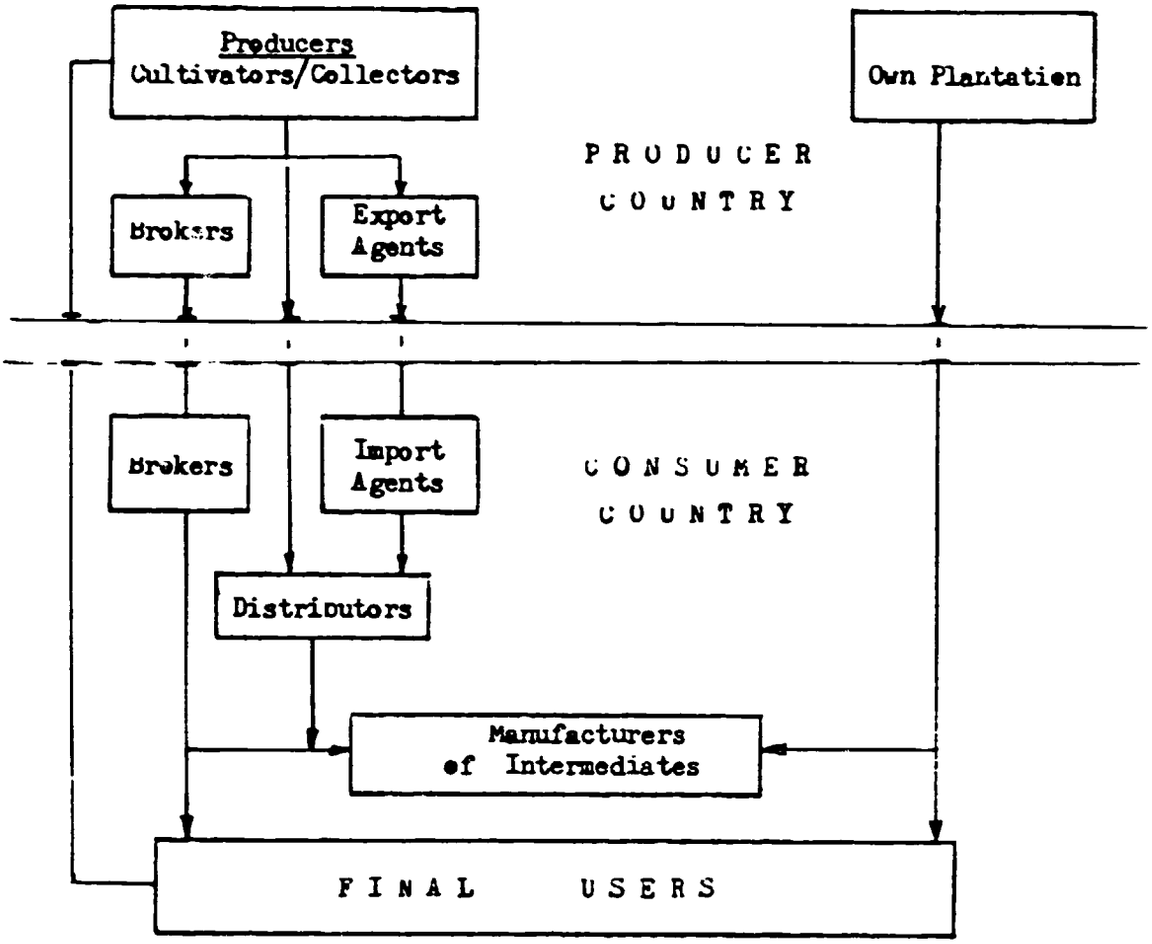
> "The growth potential for some of the botanicals used in products sold over the counter, particularly in the herbal and health-food shops, is expected to be good and the markets studied are all expected to show steady increases in the 1980's; increased demand should be particularly noticeable for laxatives, cough and cold remedies, ginseng and other medicinal herbs."

With the high cost of world-wide promotion, selling and transportation, it may well be that for developing countries, the major growth markets for medicinal plants and for their extracts will turn out to be in the geographical region in which the producing countries are located, which in the case of Thailand would point to South-East Asia, the Indian sub-Continent, Australasia and Japan, rather than Europe and America.

The Trade and Distribution channels are largely respected both by producers and buyers, although some companies, requiring large volumes of plant material have been known to by-pass the trade and to import direct or set up joint ventures in the countries growing the plants so as to ensure regular supplies of plant material. In many ways and this is all too often overlooked, joint ventures can be of great assistance to developing countries in that they guarantee purchase of the raw material and contribute in most cases to further technological development.

Although there can be slight operational differences due to a variance in local conditions, the more common trade and distribution channels are summarised in the following chart :

NATURAL PRODUCTS



It is important to note that companies requiring small volumes usually purchase from Traders, Brokers or Agents. The majority of buyers do not require a sufficient volume to justify direct imports and unless they have known a particular supplier for a long time, they will not be prepared to take the risk. This is why quality control and regularity of supply are so important.

One very clear advantage of a close relationship with the channels of distribution is the fact that through them it is possible to obtain feed-back concerning the commercial and technical acceptability of the raw material or processed product. They often also constitute a reliable source of information for the development of new raw materials. It is this last function which proves invaluable to the sales operation, so important in the Marketing Cycle; once attention has been paid to the functions of Capital (or Finance), R+D (Research & Development), MR (Market Research), MFG (Manufacturing), or in the case of the TISTR, EI (Equipment & Industrialisation).

Although there is no sales activity, per se, within the TISTR, there is sufficient development work to provide full-time involvement for a Co-ordinator capable of bringing together the interests of the TISTR and those of the GO or the NGO whilst at the same time researching, establishing and following-up the commercial leads available.

This does not necessarily mean that the TISTR is to impede its Scientific and Technological role by introducing "commercialism" but rather that it would increase its strength and authority by demonstrating its knowledge of world conditions and its capability of dealing with the challenge.

A most important phase in the development of any export oriented enterprise is the initial contact on the selected market because good, or bad, reputations are often attached to the commercial or trading houses.

Most Trade Directories of international standing have editions which cover the activities of particular markets and these are worth consulting because they usually list the Importer/Agent, or the Manufacturer, by its principal activity. However, this is not always the case, so it is advisable, when possible, to approach those importers or manufacturers with well known and declared interest in the import of specific products (see Annex xi).

It is obvious that the better the relationship is with a specific market, the more valuable and accurate will be the information available. This is especially so when related to raw-material prices, which on the user market are sometimes calculated in terms of what the client is prepared to pay rather than on the amount the exporter in the producing Country should be getting.

The prices the end-users are prepared to pay for botanical raw materials are generally determined by the value of the botanical in the finished product. Once the sales (trade) price of the finished product is determined, the value of the raw material component can be estimated and, as this is usually the price to be paid to the importer, the actual raw material cost in the Country of production is arrived at by subtracting the various handling charges such as trade margins, export taxes, handling and port charges, freight etc. The incidence of freight charges in relation to bulk often means that bulky botanicals are compressed and baled whenever possible.

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The saving by compression techniques can be as much as 60%, sometimes more, illustrating the fact that packaging can be a serious matter.

It must also be remembered that raw material prices are also determined by market forces and pressures, since the final product must be commercially viable. To ensure this, stability of price and continuity of supply must be maintained. The effort is well worth making and, if sustained, the results are rewarding especially in terms of the potential for agro-industrial development.

c) Selected products.

At present the activity of the TISTR is primarily the development of pharmaceuticals and, after standardisation, the promotion of the local use of certain indigenous drugs or medication.

At this point it is necessary to make quite clear that quality specifications for medicinal plants and their derivatives are well defined in the various pharmacopoeiae and national formulary standards established in most countries.

In Europe alone, there are at least 14 different Pharmacopoeia Indices used, so world-wide, the examining bodies of importance may well be in excess of thirty.

At the moment, although efforts are being made towards unification, a general standard simply does not exist so it is advisable to consult the different Pharmacopoeia Indices and National Formularies before samples are prepared and submitted and, to remember that in many cases the pharmaceutical companies that use plants and plant extracts lay down their own specifications. This can also apply to the issue of phytosanitary certificates because most industrialised countries, through their official sanitation standards requirements, insist that a product be cleared of micro-organism contamination before it is allowed into the country. Standardisation, therefore, should be the subject of cross-checking before being established.

The need for standardisation also applies to any of the medicinal and aromatic plants and the products which might be produced therefrom. It follows

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that where applicable, standards must be based on satisfactory results obtained in terms of animal toxicology, biological assay and relevant clinical trials.

Gas Liquid Chromatography (GLC) and Infra-Red Spectrometry (IR) are in common use for quality assay on most of the world markets. Where the research primarily concerns drugs requiring pharmacological development, it is necessary to confirm the biological activity. For certain industrial products of known pharmacological activity and already established as drugs, instrumentation helps in the development of technology.

In terms of the TISTR and world-wide markets, it is important to establish controllable standards for Garlic Natura, Flygesal, Senna and Senna extracts as well as for Lime oil or any other essential oil under examination.

Within the framework of the present development programme, further attention should be paid to the cultivation and treatment of Turmeric, Curcuma longa (L.) which has a ready market as a component in most curries but is also of special interest as a natural colouring material. The presentation, after curing, either as the traditional "finger" or as the essential oil or resinoid, is usually influenced by the requirements of the buyer. The Technology is well known and the market has been well surveyed by the Tropical Development Research Institute (TDRI) of London (U.K.), formerly known as the Tropical Products Institute (TPI).

Among the Essential oils discussed were those under investigation at the Chantuk Farm (about 15 to 20 rai), namely Cananga odorata, Rosa damascena and Brucea amarissima and those worthy of further examination, chiefly due to favourable market conditions. These are: Lime oil (Citrus aurantifolia), Patchouli oil (Pogostemon cablin) and Vetiver (Vetiverria zizanioides). In terms of definition and quality, the standards put out by the British Standards Institution and the Essential Oil Association (EOA) of the U.S.A. cover the normal requirements.

The discussions that have taken place at the TISTR have been wide-ranging and have included the cultivations in Chantuk and Chiang Rai as well as the development of more extensive trial farms. The TISTR is actively pursuing a policy of agro-industrial development which could certainly benefit further from follow-up procedures instituted, if requested, by UNIDO.

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IV. RECOMMENDATIONS

The itemised recommendations that follow are the result of discussions held primarily at the TISTR, with Mrs. Sasithorn WASUWAT, Director of the Pharmaceuticals and Natural Products Research Department, in consultation with Mr. Visha TUNVIRACHAISAKUL, Acting Head of the Analytical Techno-Economics section of the Economic Evaluation Group. Included in the discussions at a later stage was Mr. Anuwat WONGWAN, Managing Director of the Natural Products Industry Co. Ltd.

1. The establishment of a MARKET RESEARCH Operation within the framework of the existing Economic Evaluation Group.

2. The MR Operation to be headed by Mr. Visha Tunvirachaisakul and having access to all the professionalism and services (Economists, Technicians as well as Typists) available to the EEG.

3. All product information, fact sheets and promotional material, including press releases, to be collated by the MR Operation and suitably indexed for ready reference.

4. Setting up of the mechanism for the wide dissemination of information, including technical bulletins, fact sheets and general market surveys, as well as indicative price levels.

5. Setting up of all correspondence and communications with Agents or Brokers, Exporters or Importers, either in Thailand or overseas.

6. Establishing links with the larger and better-known International Organisations dealing in or buying raw materials.

7. Setting up the record-keeping and filing systems related thereto.

8. The Heads of Departments, or their Appointees to be in regular informal contact for the conduct of day-to-day business.

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9. INTER-DEPARTMENTAL MEETINGS

A Formal Meeting should take place once a month (more often if circumstances reauire it) to carry out a "post-mortem" on past activity and to plan ahead for any promotional programme.

10. The MR Operation to stimulate technical investigation when necessary, based on the "feed-back" obtained from the domestic and foreign markets.

11. To advise the PNPRD of any changes in packaging and/or presentation prompted by changes in legislation or required by changing market conditions.

12. To assist the Director of the PNPRD in up-dating Quality Control by passing on immediately any information obtained from time-to-time on the matter.

13. UNDP/UNIDO to examine the possible use of the Study Tour Component to facilitate contacts between the Head of the MR Operation and the main Centres of purchase.

14. UNDP/UNIDO/TISTR to envisage a Budget Component to assist in setting up the required development programme.

Annex 1.

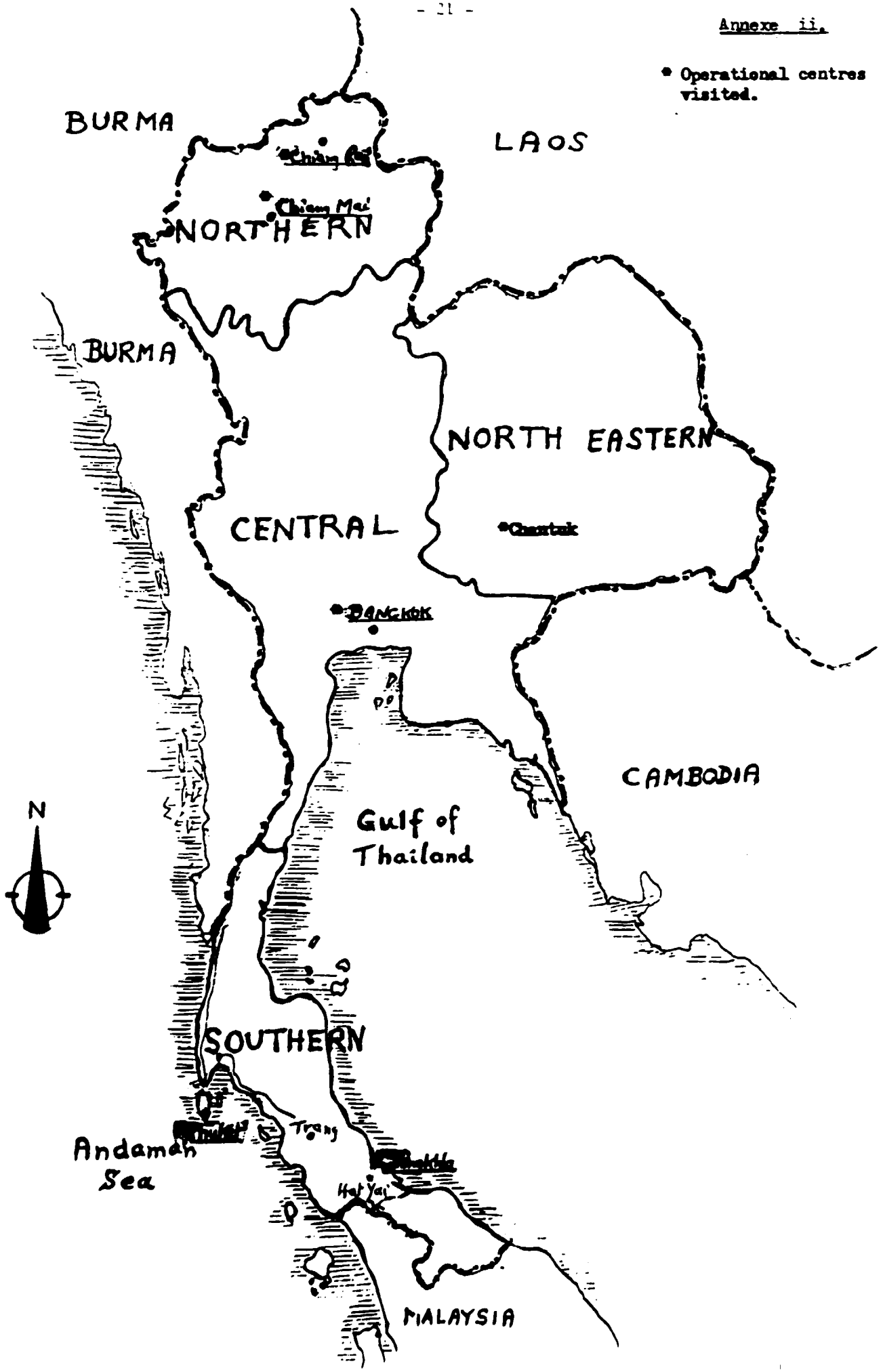
MISSION PROGRAMME

JUNE 13, 1985. :	10.00 hrs	Arrive Bangkok. Met at Airport by Mrs. Sasithorn WASUWAT. Introduction to TISTR, preliminary discussions, settling in.
JUNE 14 -	A.M.	UNDP and report to SIDFA (UNIDO). TISTR - meet Dr. Subthorn TANDHANAND.
	P.M.	TISTR - begin detailed work on programme.
JUNE 17 -	A.M.	TISTR - visit to Medicinal Plant Market and Drug Stores. Wholesale and Retail.
	P.M.	Plan visit to Chantuk.
JUNE 18 -		All day visit to Chantuk, in Parkchong, Nakornrajasima, N.E. to examine Senna, Cananga odorata, Chrysenthemum morefolium.
JUNE 19 -	07.30	Fly to Chiang Mai : Visit development farm during A.M. Visit Tea packing factory for discussions and collaboration with TISTR. Raming Tea Co. Ltd. Overnight stay in Chiang Mai
JUNE 20 -	08.30	Fly to Chiang Rai : visit to production factory of Garlic natura.
	P.M.	Fly back to Chiang Mai, then back to Bangkok.
JUNE 21 -		TISTR - All day discussions with EEC on product costing and marketing.
JUNE 22/23	(Sat.-Sunday)	Overnight train to Haat Yai, then by road to Songkla to assess possibilities of Ipomoea pes-caprae (L.) on sea-shore. P.M. on by road to PHUKET.(Ta late P.M.)
JUNE 24/25	2 days	Explore different bays to locate Ipomoea. Visit to Marine Biology Research Centre. Collect large sample of Ipomoea. Visit to Agricultural Research Centre. Fly back to Bangkok, late P.M. on 25th.

JUNE 26 - 28		TISTR. Summing-up of information gained during the visits, discussing marketing component and eventual commercialisation. Visits to interested parties and NGO's. Preparation of report. P.M. on 28th : Draft report submitted to PNPRD and to EEG and agreed after further discussion.
JULY 1 to 5	TISTR	Typing of Report and preparation of the relevant Annexes. Further discussions with NGO's and final visits.
JULY 6, 1985. :	21.20 hrs.	Scheduled departure by BA 032 for London H-R. End of Mission.

Annexe ii.

* Operational centres visited.



Annexe iii.

LIST OF PARTICIPANTS

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Dr.	Smith KAMPEMPOOL	: Governor
Dr.	Yenchai LAOHAVANICH	: Deputy Governor II
Mrs.	Sasithorn WASUWAT, MSc., MSc.	: Director, Pharmaceuticals and Natural Products Research Dpt.
Dr.	Jit SRIWANAWIT	: Director, Chemical Industry Department.
Mrs.	Sachee PIYAPONGSE	: Acting Director, Techno-Economics Division.
Mr.	Visha TUNVIRACHAISAKUL	: Acting Head, Analytical Techno-Economics.
Dr.	Sunthorn TANDHANAND	: Director (Retired), Siviraj Hospital. Adviser on Clinical Evaluation.

OFFICE OF THE NARCOTICS CONTROL BOARD (ONCB).

Police Maj.-Gen.	Chavalit YODMANI	: Secretary-General, NCB.

THAI RESEARCH INSTITUTE OF PHARMACOGNOSY UNDER THE ROYAL SCHEME (TRIPURS).

Mr.	Adul SRITHEP	: Director.

KU TECHNICAL SERVICES

Dr.	Kamol JANLEKHA (World Bank)	: Senior Adviser, Ministry of Agriculture.

INTER-COUNTRY CENTRE FOR ORAL HEALTH
(in collaboration with WHO)

Ms.	Yupin SONGPAISAN, DDS., MPH., MSc.	: Senior Dental Officer.

RAMING TEA CO. LTD., Chiang Mai.

Mr.	Nit WANGIWAT, MSEE Univ. of Texas.	: Managing Director, President Tea Producer Association.

ASPHALT and CONCRETE WORKS CO. LTD.

Dr.	Pornprom HONGLADAROM	: Managing Director.

NATURAL PRODUCTS INDUSTRY CO. LTD.

Mr. Amnuat WONGWAN : Managing Director.

UNITED NATIONS DEVELOPMENT PROGRAMME /
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Mr. Mohammad A. SIDDIQUI : Senior Industrial Development Field Adviser.

Other Organisations (NGO)

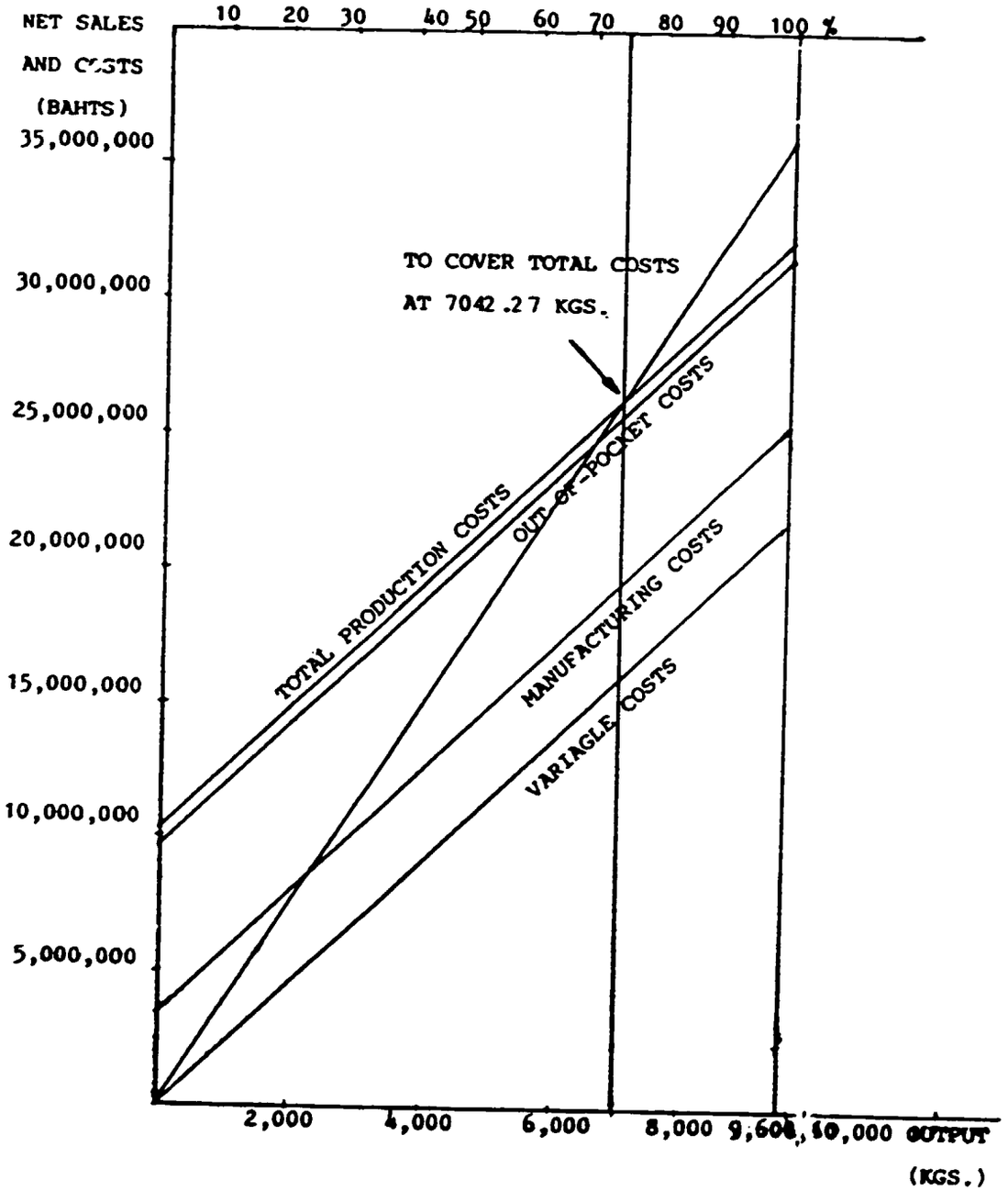
NGUAN HENG CHAN TRADING : Mr. Prasit ARKKAPRACHA, Manager.

ASAHEE TRADING : Mr. Vitool SIRASUITTIRAT, Manager.

Annexe iv.

COST PROFILE

Garlic natura



BRAKE-EVEN CHART FOR A GARLIC NATURA PLANT, BASED ON ANNUAL PRODUCTION OF 9,600 KILOGRAMMES OF GARLIC NATURA.

Comment :

Cost of garlic average for all reason ฿55 per kg.

Yield of garlic Natura 1 kg. from 12.5 kgs. of garlic

Cost per unit (capsule) with foil-pack 1.34 Baht

Weight of garlic natura in one unit (capsule) 0.4 gm.

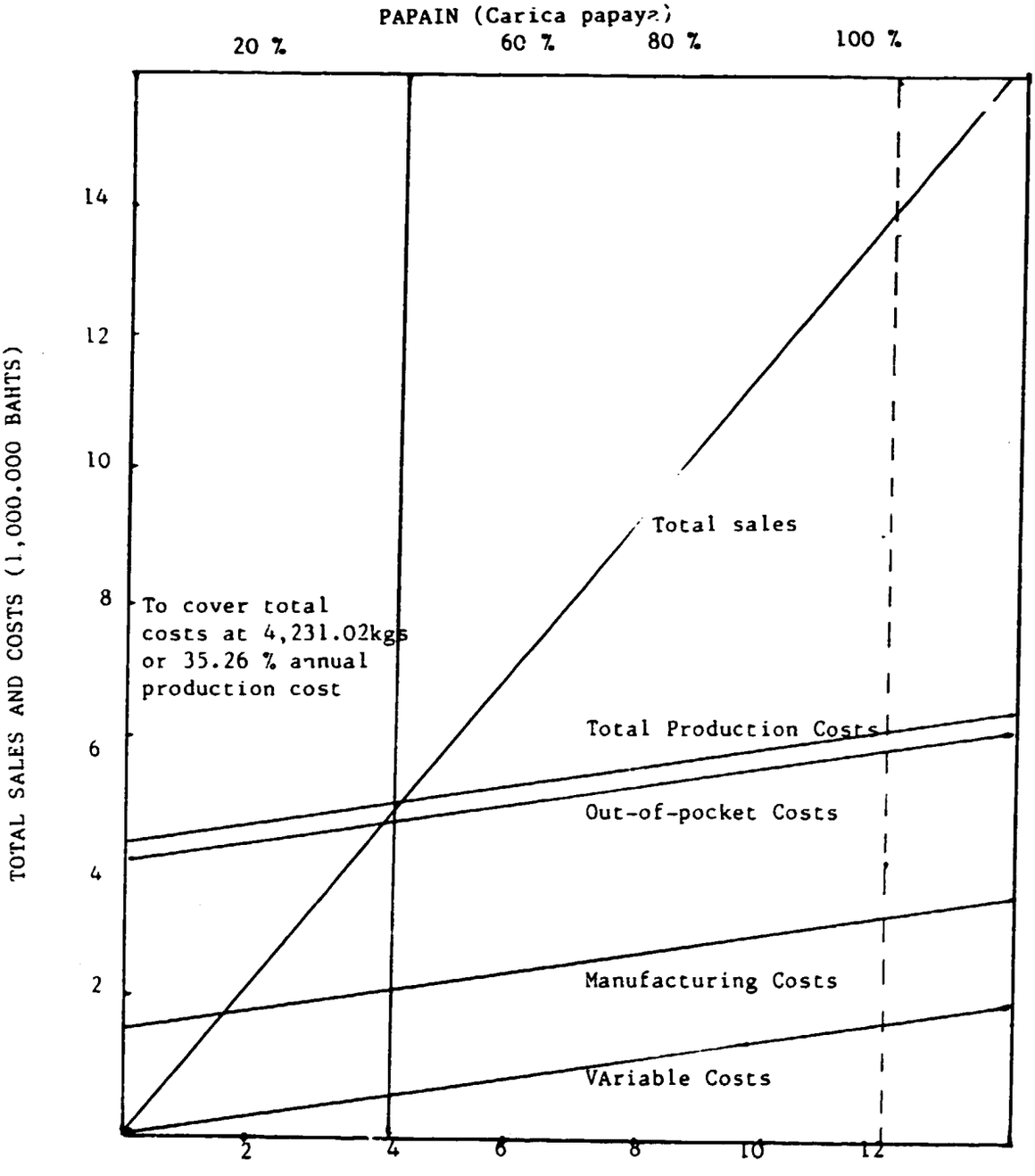
COST PROFILE

Plygesal

1.	Cost of raw material :	7 Baht/kg. at seasonal price
2.	Yield of plai oil :	1 kg. from Zingiber Cassumunar 118.75 kgs.
3.	Wages :	269.66 Baht/liter of plai-oil
4.	Utilities :	95.34 Baht/liter of plai-oil
5.	Cost of plai-oil :	1,109.5 Baht/liter
6.	Plygesal :	1 unit of plygesal contains 14 grams of plai-oil
7.	Cost of plygesal :	1 unit (30 gm.) ⟶ 9.9304 Baht

COST PROFILE

PAPAIN (Carica papaya)



Break-even chart for a papain plant based on annual production of 12,000 kilograms of papain.

Comment:

Cost of fruit on open market from ฿ 0.50-3.50 per kg

Yield in latex on fruit weight of 1.5 kg - 5 gm
1 kg latex requires 200fruits (300 kg)

Tapping cost (5kg per man-day (8 hrs, costs ฿ 66 per day) ฿ 13.2 kg

Annexe vii.

COST PROFILE

Basil oil

(Ocimum basilicum)

1. Cost of raw material (basil leaves) 2-4 Baht/kg.
2. Yield of basil oil 1 kg. per 333.33 kgs. of Basil
3. Wages 84 Baht per kg.
4. Utilities 66.67 Baht/kg.
5. Cost of Basil oil depend on cost of raw material,
   (1) cost of Basil at 2 Baht ⟶ 1,134 Baht/kg.
   (2) cost of Basil at 3 Baht ⟶ 1,467.33 Baht/kg.
   (3) cost of Basil at 4 Baht ⟶ 1,800.66 Baht/kg.

Annexe viii.

COST PROFILE

Senna Tea Bag

Comment :

1.	Cost of Senna pod (dry)	⟶ 30 Baht/kg.
2.	Labor Cost	0.00016 ฿/bag
3.	Utilities	0.0029 "
4.	Depreciation	0.00002 "
5.	Packaging	0.198 "
6.	Cost of Senna tea bag	0.21086 "

Annexe ix.

LIST OF PRODUCTS UNDER DEVELOPMENT

1. Garlic Natura Capsule, water-soluble garlic extract in powder form.
2. Plygesal, anti-inflammatory cream from Phlai, Zingiber cassumunar Roxb.
3. Antibacterial cream from Alpinia galanga Swartz.
4. Antifungal cream from Alpinia galanga Swartz.
5. Laxative drug from Senna, Cassia angustifolia Vah..
6. Protincture of Ginger from Zingiber officinale Rosc.
7. Papain from Papaya, Carica papaya Linn.
8. Vitamin E, and oryzanol from rice bran waste.
9. Basil oil from Ocimum basilicum Linn.
10. Extract from Rauwolfia serpentina Benth., concentrated biological
11. Stevioside from Stevia rebaudiana Bertoni.

Annexe x.

LIST OF PRODUCTS SUPPORTED BY PUBLICATIONS

A PRELIMINARY STUDY OF PAPAIN PRODUCTION IN THAILAND

PILL CAPSULES PRODUCT FROM LOCAL MATERIAL, FROM GELATIN

NEW ANTIDYSENTERIC FROM AN OLD THAI DRUG PLANT, BRUCEA AMARISSIMA

CAFFEINE FROM TEA WASTE

RAUWOLFIA SERPENTINA

UTILIZATION OF SENNA LEAVES - AN AGRICULTURAL WASTE IN THE PRODUCTION OF LAXATIVE DRUG

THE MEDICINAL VALUE OF PHAKBUNGTHA-LE (IPOMOCA PES-CAPRAE)

MASMINUM SUMBAC OIL FOR PERFUME

CONCENTRATED GARLIC EXTRACT DEVELOPMENT

GARLIC NATURA (CLINICAL STUDY ON EFFICACY)

THE USE OF IPOMOEA PES-CAPRAE CREAM IN THE TREATMENT OF SKIN INFLAMMATION CAUSED BY THE JELLY-FISH

THE STUDY ON THE SPERMICIDAL EFFECT OF NAM MAN PHLAI, ZINGIBER CASSUMUNAR ROXB

PRELIMINARY STUDY ON THE USE OF 'PLI' CREAM

Annexe xi.

List of recommended contacts

SWITZERLAND :	DIXA AG., Stationsstrasse 39a, 9000 St. Gallen	Importer/Processor
	CIBA-GEIGY AG., Klybeckstrasse 141, 4000 Basel	Processor/ Manufacturer
	MIGROS, Genossenschaftsbund 141, Limmatstrasse 152, 8031 Zürich	Chainstore/own importing/Processing
	SIEGFRIED AG., Untere Brühlstrasse, 4800 Zofingen	Importer/Processor
	SOPLECO SA., 19 rue du Rhône, 1204 Geneva	Importer
	ZYMA SA., 1260 Nyon	Manufacturer
GERMANY :	Dr. MADAUS & CO., Osterheimer Strasse 198, 5000 Cologne 91	Processor
	INTERDROGAS GmbH, Aachenerstrasse 197, 5000 Cologne 41	Importer/Agent
	Joh. Gottfr. SCHUTTE &CO., Bornstrasse 16/17, 2800 Bremen 1	Importer/Agent
	BOEHRINGER MANNHEIM GmbH, Sandhoferstrasse 112-132, 6800 Mannheim	Processor/ (papain)
	GALENUS MANNHEIM GmbH, Sandhoferstrasse 176, 6800 Mannheim 31	Processor
	KALI-CHEMIE AG., Hans Boekler Allee 20, 3000 Hannover	
UNITED KINGDOM:	WILLIAM RANSOM & SON LTD., Hitchin/ Herts SG5 1LY	Processor
	GLAXO Laboratories Ltd., Greenford Road, Greenford Middlesex UB6 OHE	Processor
	The BOOTS COMPANY, Thames Road, Nottingham NG2 3AA	Processor
	ANDARD-MOUNT (International) LTD., 24/28 London Road, Wembley, Middlesex HA9 7HD	Processor
FRANCE :	Ets.MARSEILLAISE D'IMPORTATION, 17 rue Mires, 13003 Marseilles	Importer/Agent
	INDUSTRIE BIOLOGIQUE FRANÇAISE, 35 Quai du Moulin-de-Cage, 92 Gennevilliers	Processor/papain
	LABORATOIRE INDUSTRIEL DE BIOLOGIE, 4 bis Ave Alexandre Dumas, 95 Soisy-sous-Montmorency	Processor (papain)
	SOCIETE RAPIDASE, 14 rue des Comtesses, 59113 Seclin	Processor/papain
	ROUSSEL UCLAF, 35 Bd. des Invalides, 75007 Paris	Processor

UNITED STATES :	S.B. PENICK & CO., 1050 Wall Street West, Lyndhurst, NJ 07071	Broker/Importer (senna, papain)
	HATHAWAY ALLIED PRODUCTS, 24002 Frampton Ave., Harbor City, CA 90710	Broker/Importer (papain)
	LEDERLE Laboratories, Division of American Cyanamid Co., Wayne, NJ 07470	Processor
	MERR CORPORATION, 9500 Railroad Ave., North Bergen, NJ 07047	Processor
	WYETH Laboratories, P.O.Box 8299, Philadelphia, PA 19101	Processor
CANADA :	DRUG TRADING CO. LTD., 15 Ontario Street, Toronto ON M5W 1E4	Importer Botanicals
	ANCA LABORATORIES, 111 Consumers Drive, Whitby ON, L1N 5Z5	Processor (senna)
	The PURDUE FREDERICK CO. (Canada) Ltd., 123 Sunrise Ave., Toronto ON M4A AG	Senna products
JAPAN :	HINO PHARMACEUTICAL CO. Ltd., 33 Doshocho 2-Chome, Higashi-ku, Osaka 541	Importer
	YAMAMOTO YAKUHIN KOGYO CO. LTD., 3 Nihonbashi Honcho 4-Chome, Chuo-ku, Tokyo 103	Importer
	TAISEO PHARMACEUTICAL CO. LTD., 24-1 Takada, 3-Chome, Toshima-ku, Tokyo	Processor
	TAKEDA CHEMICAL INDUSTRIES LTD., 27 Doshomachi 2-Chome, Higashi-ku, Osaka 541	Processor
	THE GREEN CROSS CORPORATION, 1/3 Gamon-cho, Joto-ku, Osaka.	Processor (papain)

For Perfumery, Flavour and Cosmetic products, especially essential oils, essences, concrètes, absolues and waxes.

GERMANY :	GERBERDING UND CO. - DRAGOCO, Dragocostrasse, 3450 Holzminden	Processor/User
	HAARMANN UND REIMER GmbH, An den Teichen 2, 3450 Holzminden	Processor/User
FRANCE :	Ets. CHAPABOT & CIE, 10 route Napoléon, 06 Grasse	Processor/User
	ROURE BERTRAND Fils & JUSTIN DUPONT, 27, Avenue Pierre Sémard, 06 Grasse	Processor/User
SWITZERLAND :	L. GIVAUDAN & Cie. S.A., Vernier- Genève	Processor/User
	FIRMENICH & Cie., La Jonction. Genève	Processor/User
UNITED STATES :	INTERNATIONAL FLAVORS and FRAGRANCES INC., 521 West 61st Street, New York, N.Y.10019	Processor/User