



**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)

RESTRICTED

21281

DP/ID/SER.A/1742  
9 November 1995  
ORIGINAL: ENGLISH

**HIGH-LEVEL ADVICE ON THE ESTABLISHMENT OF AN R AND D FACILITY  
FOR IMPROVEMENT OF PROCESS TECHNOLOGIES OF HERBAL  
MEDICINES INCLUDING A TRAINING CENTRE**

SI/INS/94/802/11-51

INDONESIA

**Technical report: Findings, work performed and recommendations\***

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

*Based on the work of K. M. Parikh,  
chemical technologist*

Backstopping Officer: T. De Silva  
Chemical Industries Branch

United Nations Industrial Development Organization  
Vienna

---

\* This document has not been edited.

V.95 59218

## CONTENTS

	Page No.
Abstract	
I. Introduction	1
II. Activities	2
III. Requirements for a viable industry	5
IV. Conclusions and recommendations	8
V. General structure for the implementation of the proposed centre	9
VI. Estimates of expenditure and income	11
List of Annexures	
1 Job Description.	13
2 List of major plants used.	15
3 List of plants approved by FDA as Jamu.	19
4 Registration formalities for Jamu and Labelling requirements as per FDA.	26
5 List of Places visited.	27
6 List of persons visited.	32
7 List of selected plants of importance.	40
8 Government spending on medicine, modern and herbal.	41
9 Case study of pepper longum/refractum.	42
10 Estimates of costs	44

## ABSTRACT

**Project No. SI/INS/94/802 - High Level Advice on the Establishment of an R&D Facility for Improvement of Process Technologies of Herbal Medicines.**

The consultant was briefed at UNIDO Head Quarters in Vienna, on 26-27 June 1995 and was on mission in Indonesia from 3 July to 28 August 1995. The duties assigned are given in the Job Description in Annex I.

The mission was a joint one with a marketing expert assisted by a national consultant. Unfortunately, the market analyst expert had to leave the field after a week due to unforeseen personal reasons. Hence the consultant carried out the duties expected with the assistance of the national expert and the other counterparts. In fact, some of the duties assigned to the market expert had to be done by the consultant in order to submit a complete report to the Government. The consultant visited institutions, factories and cultivations dealing with medicinal plants in Jakarta as well as in other parts of the country. The consultant also discussed the findings with the Government authorities at different stages of the mission activities. The findings and recommendations were finally discussed with the UNIDO Technical Adviser who was in Jakarta to finalize and present the concept to the Government authorities. The recommendations were presented by the consultant at a meeting specially called for this purpose. These were accepted by the Government authorities for further discussions and follow-up action.

The requirements and cost-estimates for the setting up of a fully operational centre and the possible income generating activities to make it a viable centre have been included in the report.

## I. INTRODUCTION

While modern medicine is a recent development in last five decades, from centuries traditional medicine has taken care of the health of mankind. Even today a large fraction of the world population depends on traditional medicine. Traditional medicine with improved validity will always remain in the life of people. Traditional medicine is getting internationally used. The future for good validated traditional product is excellent in local as well as in international market.

Traditional JAMU herbal medicine is a part of life of Indonesian people and tradition from centuries. It has served the humanities in all their health problems. Modern medical science is comparatively recent. World over due to high toxicity ratio of synthetic medicines, people want to turn back to nature, even if it is slow. Even cost wise the traditional medicine is economical and well within the reach of less fortunate people. Thus Jamu is complimentary health care to modern medicine. People as such do not recognize the identity of system, what they need is cure and relief.

The Indonesian government has rightly decided to invest and investigate deeply in to this system and to afford more credibility, by working more scientifically in the field of Jamu herbal medicine and assisting persons occupied in the field with knowledge and training to update their production, productivity, quality and efficacy. It will also help them in marketing.

The importance of this project is that it will serve a wide range of the population. 48% of Indonesian families are using Jamu more than three times a month. A list of plants used in large quantities is given in Annexure 2. There are 326 registered companies and numerous other small companies and individuals involved in manufacture. Equally large numbers are in selling and distribution. The basic raw material is collected from farms and forests, so farmers and rural collectors and vendors are involved and earn their livelihood from this occupation. A rough estimate could be that more than 1% of the population is wholly or partly dependent on income from this source.

It is the government's intention to assist farmers by providing new non-traditional crops. This can involve the introduction of planned forestry of medicinal trees, to provide easy access and benefits to poor rural collectors to improve their earnings. As a result, biodiversity will be conserved and better scientific Jamu products (economical and safe), will be available as alternatives to people for their health care and it will also assist in export promotion of these products to the world market and in particular to clients in developed countries, who are actively searching for such products. This will increase the country's export, based on their own technology.

Thus the Indonesian Government, National Planning and Development Board (Bappenas), Ministries of Health and Industries have rightly decided to train personnel and validate and update JAMU products. Already the Food and Drug Administration has approved a list of 157 plants for use in Jamu products (Annexure 3). Registration formalities and labelling requirements have been established by the FDA (Annexure 4).

## II. ACTIVITIES

The consultant and the national consultant visited Java and parts of Sumatra islands extensively to acquaint themselves with the actual work being done in the field (Annexure 5). The list of persons contacted during the mission is given in Annexure 6.

They also visited farms in Bogor, Solo and Madura mainly cultivating *Kampferia galanga*, Zingiber and *Piper longum*. It was observed that major plants, such as Zingiber, Curcuma, *Kampferia* etc. are cultivated in various parts of the country. The organizations like Balitro at Bogor and Directorate General of Estate Crops are providing agricultural inputs. The government has a good system of transferring the technology at grass root level through the Family Welfare Movement (Pembinaan Kesejahteraan Keluarga "PKK").

There are two major systems of cultivating plants in Indonesia.

1. Regular farming.
2. Kitchen Garden farming.

In kitchen garden farming, people owning small lands of even less than an acre are informed and trained through the PKK and other centers to cultivate medicinal plants. They cultivate and sell through collectors and the collectors supply to industrial and other consumers. This has an advantage that all the available lands are put to commercial use and provide extra income to the owners. This may sometimes affect quality as procedures followed will vary from person to person.

In view of this prevailing system, it is important that quality planting material and important procedural steps be explained to these cultivators to obtain uniform quality of raw material. They also need to be advised on status of their land and treatment it requires.

The small owners should be encouraged to take up cultivation of medicinal plants used in small quantities locally so that a good collaboration could be built up with local industrial processors. This will benefit financially both the cultivator and the processor, as well provide a regular supply/demand situation.

It is also essential to recommend that an association or societies of small cultivators and industrial consumer be promoted for more co-operation. Even PKK can play a considerable role in this field.

In forest farming at Jimber Merubetiri it was observed that wild plants are cultivated and grown in forests and domesticated and grown at other places, thus conserving the bioiversity.

Our visits to small and medium as well home production of Jamu were very fruitful. The small and medium industries are progressing satisfactorily within the available means and facilities. They are unable to meet the entire demand because of production constraints. Most of the work is carried out by hand. Some machines are introduced in manufacturing and packing but yet much more need to be done. The finance and space problems also exist. Technological awareness and knowledge will assist them to achieve further progress.

The consultants gathered that stocking of regular quality raw material was needed, because of the seasonal character of plants. Alternatively, one has to pay higher prices to obtain the raw material during the lean season. This alternative is not preferred as it will introduce large variations in quality and cost. Thus the preferred option is to buy and stock during the season. This will provide uniform good quality raw material at an economical price. For this block up of capital, industry should be favoured with low interest working capital against stocks. This preference will help farmers-cultivators as they will not have to depend on traders-middlemen, who will pay them less and inflate the price for the consumer. Middlemen may not do proper storing which may cause deterioration in quality. Thus it is in the larger interest of government and farmers that the industry be financed.

Other point observed was that each and every manufacturer was interested in it's own way of production. They maybe encouraged to have their own quality control system (laboratory) and for costly and complicated testing they should depend on an outside laboratory.

In processing a more hygienic approach, use of minimum required temperature and untouched processing from raw material to packing are important and proper guidance need to be given in this respect to these manufacturers.

The manufacturers were good sales people and few have tried in a small way export marketing successfully. More information and knowledge on product quality, efficacy and export can boost their export considerably. Information on international regulations, registration requirements and proper scientific literature and training can be given by the centre on continuing basis to producers, technicians, marketing and other specified personnel.

A centre should establish quality and processing standards for generic and branded products and train them in processing. We observed that there is a lack of such knowledge, information and facilities for many small and medium scale manufacturers.

Almost all are interested in clinical evaluation of their products and are confident about the product quality and performance. The lack of testing facilities, high cost of testing and reluctance of modern medical professionals to assist are some of the problems to be solved.

Here, the proposed centre could assist the industry through their clinical laboratory in various types of clinical evaluation of efficacy and safety. As thousands of product units are manufactured and sold to consumers daily, simplitia and branded and in order to have complete independent and unbiased evaluation on efficacy and safety, centre can take up clinical audit on the request of a manufacturer.

A proper clinical evaluation questionnaire with regards to product use, dosage, period of use, indications and patient's evaluation should be enclosed with each pack with a reply envelop addressed to the centre. The received reply will be clinically and statistically evaluated by competent persons on the predetermined parameters and a report can be given to the manufacturer for his use. Even repeated surveys like this will address the batch to batch conformity. This will help the manufacturers to carry out improvements, clinical trials and marketing and also in the registration processes with other countries as such independent reports are considered by many authorities

world over.

Availability of raw materials at present is satisfactory, but with the increase in volume it may pose some problems. Price fluctuation of raw materials is a major problem as industry is working on a very low margin of profit. With the cultivation and post harvest technology development and quality standardization these problem will ease.

Visit to machine manufacturing industry, inspired confidence that they can meet the demand and requirements of Jamu industries, if proper guidance is given on types and demand of equipments. There is ample scope of introducing better equipment for quality and economic production.

The research institutions at Yogyakarta, Surabaya and Bandung have the capacity and desire to work on the jamu products. Finance and proper guidance and co-operation from medical profession are some of their problems. The visits revealed that the facilities are established and some work has started. There is great enthusiasm to develop and work on this aspect. The advantage of such a situation should be fully exploited. More R & D units at universities, hospitals and in industry should be created. The work is enormous. At Surabaya, Airlangga University we met a researcher who has obtained training in the assessment of immune modulation in human beings. This is the most important property of medicinal plants identified by various workers in Europe, USA and Japan. This way, the plants act in the promotion of health and in relieving many immune related diseases. The most advanced and research minded medical professionals are now desirous of actively working on our own ancient knowledge to study and understand it's action.

Agricultural and forest institutions are also working on major plants like curcuma and zingiber as well on other plants. They would like to know more about plants used in jamu, demands and quality needs to direct their efforts on that line.

The consultants visited some social and training institutes. There is a good network of PKK, women's organizations and institutions to deliver the message and knowledge at the grass root level in the villages.

The Jamu industry and its use are very well developed in the country with satisfactory results. It is getting more popular. The private practitioners, industry and selected scientific persons with support from government are successful in keeping the tradition alive and provide safe, economic alternative remedies to less fortunate people in the country. Even today more than 40% of the modern drugs are derived from plant and natural resources.

There are 326 registered manufacturers in the country. It is difficult to get exact figures of production and sales of Jamu products, but various figures and estimates suggest the sales are about half of the modern medicine. Comparing the price structure of the modern and Jamu products it appears that production in terms of quantity may be higher than modern medicines. Thus with scientific validity the use of Jamu medicine is expected to be very large, not only serving the health of the nation but also providing livelihood to a large part of the population in addition to being an important export earner through the sale of effective safe alternative health care products to the global population.



The whole picture is very conducive and emphasizes the need of a special centre for the development of the whole industry as envisaged by the government. The huge initial input from the government for few decades will prove the importance of this industry in health care, employment of farmers and village workers and an export earner for the country. It will be one of the most beneficial industries to environment and national health.

### III. REQUIREMENTS FOR A VIABLE INDUSTRY

Availability of raw material is the basic requirement for the development of the industry. There are more than 100 plant materials commonly used in practice. 10 most common plants frequently used in large quantities were identified (Annexure 7).

Agronomy department has to study the variations in the same plants grown at different places and try to bring uniformity to the extent possible. The cultivation technique and good planting material have to be provided for farm cultivation. The plants for the forestry have to be developed on the same line and regular growing be encouraged to the extent of its use. The personnel has to be trained in identifying the species and using the same species for every batch.

Analytical chemistry department has to identify and develop the assaying of known active constituents and/or identify marker substances. It also should develop finger printing techniques using chromatographic methods and methods of estimating the same in blood and other body fluids.

Pharmacy department has to work out laboratory processes, and develop the analytical methods for standardization. The current processes have to be studied and on the basis of available standards, the cost effective, scientific processes are to be developed. The same be further developed on pilot plant basis. Various formulations such as powders, extracts, tablets, capsules, liquids, syrups etc. have to be improved using the modern manufacturing equipments and processes specially for small and medium industries.

Training in good manufacturing and laboratory practices have to be given. Quality assurance of products and their indications, dosages etc. have to be provided for consumer guidance.

The clinical evaluation of such standardized plants and products should be carry out by clinical department on few patients as may require to meet statistical validation on the basis of generally accepted requirements for such studies.

Thus the joint and simultaneous work on selected plants and products will provide useful leads for standard and efficacious production and marketing.

Idea of generic and branded, as well as over the counter and prescription products has to be created in the minds of industry. The ways and needs of patenting the product has to be developed and explained.

The patent authority has to be convinced of the need and practice of patenting herbal drugs in other countries to ensure availability of patents

in that country. This is very important for international marketing. Patents can be obtained in other countries only after obtaining it in the parent country.

### **Training**

Farmers are producing the medicinal plants in demand as per their existing knowledge. They need to be informed and trained in, requirements of the plants by industry, purpose of the plant, physical and chemical qualities, methods and institutions who can check the quality, type of planting material necessary, time and methods of cultivation, time and method of collection, post harvesting treatment, name and addresses of end users, prevailing market prices, methods and material for packaging, forwarding and methods of approaching banks and institutions for financing.

Farmers should be trained in identifying problems and need for constant improvement so as to be more cost effective. This will help them in global competition and better profitability in the home market.

Cooperation between farmers and manufacturers should be encouraged and arranged for the benefit of both. Even co-operative farming between the two will be more beneficial to each of them.

Manufacturers' standards be trained to understand their product in modern concept of health and assist them in preparing literature-information on that basis and marketing on those lines.

They must be told the importance of uniformity in quality and efficacy from batch to batch.

They are to be informed and educated on simple methods of testing from the raw materials to product and control the processes to assure quality of every batch.

Clinicians and Pharmacologist have to be specifically trained in methods of evaluation and testing of plants and products. The products which are already permitted for marketing can be evaluated clinically with patient consent without going through costly and time consuming process of preclinical evaluation.

Modern scientific knowledge has to be applied to eastern traditional practices at affordable cost to develop local technology and know-how.

It is necessary to identify and develop books on Jamu medicine for educating the scientific community and general public about the basic resources and the practice of Jamu. This will enable to stress the importance and new developments on Jamu medicine.

### **Efficacy and toxicological studies**

Standardized plants and products have to be submitted for preliminary clinical studies for evaluation. Once the product is in the market and consumed by the population, there is no harm in conducting clinical evaluation on the same by modern medical practitioners in dispensaries and hospitals or clinics. What is required is to follow appropriate procedure as internationally recommended. Patient information on studies and consent with

a right to withdraw any time is one of the most important aspect.

Insistence on toxicological studies is irrelevant when product is on the market with FDA permission and widely used by the people. At the most few persons using since a long time may be listed and studied.

Such an evaluation study will provide enough data and basis for further study and development of good standard and safe economical products and contribution of the country to international medicine.

One must realize that use of natural products since centuries is based on research methodology available at that time. What we need to do is to confirm and improve the efficacy on the basis of modern technological development.

Clinical evaluation is the most important requirement for validating the use of local plants and formulations, used since centuries on the basis of keen observation. Work is enormous as a large number of plants and products are used and available for study. A quick evaluation focused on selected plants and products would be helpful. Combination of modern science and eastern thinking within the low available means does not allow the scientific luxuries and hence scientific personnel has to take calculated responsibility and screen on statistically required numbers of patients. The experience and long use suggest, they are effective.

Toxicological studies can be done on the basis of surveys of people using these drugs regularly for long periods. These are also like food material. Acute toxicity will give a good idea as normally the lethal dose of such products are not determinable even after administration of high doses.

In view of the very high cost of other toxicological testing, insisting on these tests first before clinical evaluation means denying the development of Jamu products though they are found beneficial in practice.

Pharmacokinetic studies in healthy volunteers can be done with marker substances. This also can be postponed and be done after the clinical evaluation. All the following three tests have to be conducted after clinical evaluation.

1. Toxicology studies, Chronic, Teratogenic & Mutagenic.
2. Pharmacokinetics and
3. Clinical trials.

In view of this we have to develop our own methodology, i.e. acute toxicity, survey method and clinical evaluation on statically required number of patients as per the modern system of medicine. These results should decide the future course of action.

#### IV. CONCLUSIONS AND RECOMMENDATIONS

Modern medicines are a result of the development of various basic sciences in last few decades such as Chemistry, Analytical, Physics, Electronics etc. These scientific developments have to be applied to traditional medicine without any reservation.

On the above concept my recommendation is to establish a Training and Research centre for the improvement and validation of JAMU products as suggested in the next chapter.

The modest beginning with a capital cost of about five million US dollars and recurring cost of about one million dollars will open up huge possibilities for manufacturers and entrepreneurs to develop the local and export markets. Current market of Jamu is hardly anything compared to future opportunities in next five to ten years. Current natural product market of developed countries alone is of the order of \$7000 million as reported by a British firm, McAlpine Thorpe & Warriar Ltd.

This development will lead to the following benefits:

- a. Rural population with employment and higher earnings.
- b. Farmers with new crops and better profits.
- c. Conserve biodiversity and protect the environment.
- d. Development of the industry and employment at higher technical levels.
- e. Increase export of products.
- f. Provide economic health care on the basis of local technology.
- g. Government will get better revenues.

Only one case study of Piper longum/refractum given in Annexure 8 shows that one Jamu medicinal plant earnings will increase from \$3.6 million to \$6.0 million in one year with additional revenue/profit of \$ 2.4 million yearly to one area of MADURA. This is the immense benefit of R & D, which can never be compared to spending.

With regard to the successful implementation of the Training and Research centre, Kimia Farma will be the ideal authority for the Government for it's implementation. The same can be fast put to work with assistance from an expert agency like UNIDO.

There are 6000 health centres and 525 government hospitals with 66000 beds and 20000 physicians. If Ministry of Health requests the physicians to do one clinical evaluation on one jamu plant or product in three years then yearly we will have about 5000 studies.

152 jamu plants have been approved by FDA for production and free sales, alone or in combination. These are the store house of nature's chemistry and a pandora's box. They served millions of people for centuries for their health care. They need a thorough investigation. The clinicians should not hesitate to use these for assaying on selected human beings for the benefit of humanity and national considerations. As an example take the case of liver disease where the death rate is about 3.7%. Modern medicine has nothing specific to offer. Many plants have proved to be efficacious and are being used. Jamu has some of these plants and products like Andrographis, Curcuma (xanthoria & domestica), Tinospora etc. They should be given fair trials for

the benefit of patients.

Government spends 2% of GDP on health and 90% is used for modern medicine (Annexure 9). The spending on jamu should be increased to 30% at least.

Country needs more such centres. To assist industry and others to develop their own centres following suggestions are made.

1. All capital cost for R & D be allowed as 100 % deductions in first year of purchase.
2. Spending on R & D be allowed at 200 % as expenses.
3. Banks may be directed and government financial institutions be asked to provide 70% loan on modernization or new set up of jamu production or research facilities at lower interest rate and seven years payback period with two years moratorium.
4. Government should offer land at concessional terms for medicinal plant cultivation to farmers, industry and entrepreneur.

The research centre and above suggested steps will bring very beneficiary changes in the Jamu industry in the next decade. Setting up of research centres, quality production and huge local and export market development will thus take place. The industry will enter in to O.T.C. (over the counter) and prescription market in line with modern medicine.

#### V. GENERAL STRUCTURE FOR THE IMPLEMENTATION OF THE PROPOSED CENTRE

A Centre for Research and Development in Jamu Medicine and Health Care Products and training to be established should have a qualified scientific person as the Director.

It is recommended that a group of selected experts in each concerned field be appointed to form a scientific committee to advise the Director of the Centre for Research and Development in Jamu Medicine and Health Care products, to select the most promising plants and product for specific R & D activity. The suggested committee members are as follows:

1. Three members from the industry.
2. One members from modern medicine faculty.
3. One members from Jamu medicine practice.
4. One Pharmacologist.
5. One Agronomist (for medicinal plants)
6. One Pharmacist (One each from modern and Jamu)
7. One Pharmacognosist.
8. One Botanist.
9. One from each of the ministries or of concerned Government departments:  
 Ministry of Health  
 Ministry of Agriculture  
 Ministry of Industry  
 Ministry of Commerce  
 Ministry of Finance  
 Ministry of Science.
10. Director of the Institute (Ex officio)
11. Department Heads of the Institute (Ex officio)

The Institute shall have following departments to meet the requirements.

1. Pharmacognosy:  
To determine the botanical identity of plants, it's macroscopy and microscopy, cultivation, collection etc.  
To train personnel in the field.
2. Analytical chemical standardization:  
To study the possible active chemical constituents of the plants, to select the marker and finger printing of chemical constituents to maintain uniformity of batch production.  
To study residual pesticides and heavy metals in plants and products.  
To develop standards and methods for products and mixtures.  
To train personnel in this field.
3. Pharmacy/processing:  
To develop production processes to achieve uniformity from batch to batch to ensure quality.  
To develop concept of OTC and Prescription products.  
To develop cost effective production processes for small and medium industries on pilot scale.  
To train people from industry, in processing, good manufacturing and laboratory practices.
4. Agronomy and agricultural practices:  
To develop cultivation and collection of standardized plants.  
To develop cultivation of organically grown plants, and procedure of it's certification.  
To improve the quality and yield of production of Jamu plants.  
To train farmers and collectors in the art.  
To provide right type of planting material.
5. Clinical evaluation and trials:  
To develop procedures and protocols for clinical evaluation and trials of individual standardized jamu plants and products.  
To confirm the claim indications and mode of action.  
To train personnel in this field.
6. Pharmacology and Toxicology:  
To develop suitable models and procedures to confirm the indications mentioned for standardized Jamu plants and products.  
To develop pharmacokinetic profiles for Jamu plants and products.  
To train personnel in this field.  
To study the various dose related toxic effects of plants and products. Acute, Chronic, Mutagenic and Teratogenic, effects if any.  
To train personnel in the field.
7. Microbiology:  
To standardize and achieve microbiologically acceptable raw materials and products.  
Process standardization on this basis. Study effects of extracts, volatile oils etc. on microbes.

To train personnel in this field.

8. Training Centre (Library, Database, Information, Education and Patenting):

To provide facilities and arrange training to required personnel in all the above fields as regular ongoing activities.

To provide library and database services to various departments of the centre and to outsiders in the field.

To inform industry, users and scientific community of the progress and prospects in the field.

To collect available data on Jamu medicine and its practice and to develop educational material on the same.

Thus with the selection of plants and products, individual departments in collaboration and as a team start their respective work in their own departments and also guide and assist other university, research institutes, hospitals and clinical centres in the subsector.

#### VI. ESTIMATES OF EXPENDITURE AND INCOME

Cost data on the centre and research laboratories are given in Annexure 10. The one time capital cost for establishing the research centre is estimated at about \$5.0 million. The benefit and generation of national income out of the same can be huge in terms of money as well indirect in terms of health depending upon the seriousness with which the work is undertaken.

The amount required is very modest and should not find any difficulty with the government, considering its benefits. Even these finances can be created through international funding.

Important aspect is to find human resources for the project. During the visit and discussions with various people it is felt that enough technical manpower and young scientific workers are available. What is required is the development of the total project and in the initial stage some foreign expert to guide for five years.

Summary of cost:

Project cost in million \$:

Building (area 2900 sq. meter).....	\$ 1.45
Equipment.....	\$ 1.19
Furniture & Fixtures.....	\$ 0.50
Utilities.....	\$ 0.50
Installation.....	\$ 0.10
Consultations, experts & training.....	\$ 0.76
Contingency.....	\$ 0.50
Total.....	\$ 5.00

**Note:** The present Kimia Farma factory is likely to be shifted to new premises at Bekashi and if so, the present premises at Pulogadung will be ideal for the centre. This will save building cost of about \$ 1.45 million and time and reduce costs on furniture and utilities upto \$ .55 million bringing the cost down to \$ 3.0 m.

This is more a research and training institute and not a commercial project and hence direct benefit to user industry, consumer and national development is more stressed.

Possible source of income:

Training:

Two different courses a week -  
about 25 persons in each 50 @ \$250.00 per person.  
(Yearly 2000 people can be trained in different aspects).

40 weeks - annual income - \$ 500,000.00

Refresher courses for technologists -  
3 per year for 25 persons in each

@ \$ 600.00 per person - annual income \$ 45,000.00

Sub total ..... \$ 545,000.00

Testing charges for samples:

Analytical:  
600 samples per year @ \$50.00 per sample \$ 30,000.00  
Pharmacology:  
50 samples per year @ \$500.00 per sample \$ 25,000.00  
Toxicology:  
5 samples per year @ \$10000.00 per sample \$ 50,000.00

Technical service fees to industry:

40 firms @ \$10000.00 \$400,000.00

Sub total..... \$ 505,000.00

Total ..... \$ 1,050,000.00

Lumpsum and Royalty fees as and when new products are developed \$

Sale of products made at pilot plant \$





## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

SI/INS/94/802/11-51

**Post Title:** Chemical Technologist

**Duration:** 2.0 m/m

**Date Required:** ASAP

**Duty Station:** Java and travel within the country

**Purpose of Project:** To facilitate the decision of the government on the setting up of a R & D facility for the improvement of process technologies and a training centre for training of personnel in a small scale industries producing herbal medicines.

**Duties:** The Chemical Technologist will function as a Team Leader of a UNIDO field mission together with Market Analyst, and will work in collaboration with the national consultant and the counterparts to carry out the following:

- i) Assess the size and structure of the herbal-based pharmaceutical industry the level of its performance and the quality of its products.
- ii) Recommend the potential indigenous medicinal herbs and preparations for industrial processing.
- iii) Examine the feasibility of cropwise cultivation of selected species in Indonesia and recommend optimum scale of plantations.
- iv) Examine mechanisms for local development of technology including R & D and measures for design and fabrication of equipment locally.
- v) Determine and outline methodologies for having central facilities for analytical instrumentation, and quality assurance of both raw materials and finished products.
- vi) Determine the requirements for a training unit to serve the small scale industries of plant based products.
- vii) Determine the inter-institutional linkages required for operation of such a central facility and a training unit.
- viii) Prepare cost-estimates for a central facility for process technology development, including pilot plant facilities, quality assessment instrumentation, expertise and training.
- xi) In consultation with the market analyst, evaluate the financial and techno-economic situation for sustaining a national industry based on medicinal herbs and prepare a comprehensive report based on all the above parameters and including inter-alia the following:-
  - capital requirements
  - operational modalities and costs estimates
  - estimated revenues from domestic and export markets
  - likely investment returns
- x) Review the Government's plans for the development of the herbal medicines sector and for the R & D facility and training centre.

The report, prepared jointly by the experts in consultation with the Technical Adviser and for which the main responsible person will be the team leader, should be ready and available in draft form at the conclusion of the mission for discussion with the Government authorities and the UNDP.

---

Applications and communications regarding this Job Description should be sent to

Project Personnel Recruitment Section, Industrial Operations Division  
UNIDO, VIENNA INTERNATIONAL CENTRE, P.O. Box 300, Vienna, Austria

**Qualifications:** Chemist/Pharmacist/Technologist or chemical engineer with over 10 years of experience in the production and quality control of plant-based pharmaceutical products.

**Language:** English

**Background:**

Indonesia already possesses an ongoing industry that produces factory made herbal pharmaceuticals. These are widely dispensed and used. At the other end of the spectrum, there is a cottage-scale industry that possesses to varying degrees of acceptability therapeutic preparations of plant origin.

The Directorate-General of Basic Chemical Industry, of the Ministry of Industry in collaboration with the Ministries of Agriculture and Health have expressed their desire to put the national industry on a sound basis and have accordingly proposed that UNIDO as a first measure carry out a diagnostic survey. The government feels that an assessment of the industry, the potential markets both internal and external, the prospects of cropwise cultivation and the mechanisms should precede the development of plans for upgrading the industry in the country.

## ANNEXURE NO: 2. LIST OF MAJOR PLANTS USED

NO	LOCAL NAME	LATIN NAME	INDICATION
1	Temulawak	<i>Curcuma xanthorrhiza</i>	Hepatitis chronic, arthritis
2	Kunyit	<i>Curcuma domestica</i>	Hepatitis chronic, arthritis, antiseptic
3	Bawang Putih	<i>Allium sativum</i>	Candidiasis, hyperlipidemia
4	Jati Blanda	<i>Guazuma ulmifolia</i>	Hiperlipidemia
5	Handeuleum, Daun Ungu	<i>Graptophyllum pictum</i>	Haemorrhoid
6	Tempuyung	<i>Sonchus arvensis</i>	Nefrolitiasis, diuretic
7	Kejibeling	<i>Strobilanthes crispus</i>	Nefrolitiasis, diuretic
8	Labu Merah	<i>Cucurbita moschata</i>	Teniasis
9	Katuk	<i>Sauropus androgynus</i>	Increased of ASI
10	Kumis Kucing	<i>Orthosiphonis aristatus</i>	Diuretic
11	Seledri	<i>Apium graveolens</i>	Hypertension
12	Pare	<i>Momordica charantia</i>	Diabetes mellitus
13	Jambu Biji, Klutuk	<i>Psidium guajava</i>	Diarrhoea
14	Ceguk, Wudani	<i>Quisqualis indica</i>	Ascariasis, oksikuariasis
15	Jambu Mede	<i>Anacardium occidentale</i>	Analgesic

## ANNEXURE NO: 2. LIST OF MAJOR PLANTS USED

NO	LOCAL NAME	LATIN NAME	INDICATION
16	Sirih	<i>Piper betle</i>	Expectorans, antiseptic
17	Saga Telik	<i>Abrus precatorius</i>	Stomatitis aftosa
18	Sembung	<i>Blumea balsamifera</i>	Analgesic, antipyretic
19	Benalu Teh	<i>Loranthus spec.</i>	Anti cancer
20	Pepaya	<i>Carica papaya</i>	Anthelmintic
21	Brotowali	<i>Tinospora rumphii</i>	Tonikum, tetanus, antipyretic
22	Pegagan, Kaki Kuda	<i>Centella asiatica</i>	Antipyretic, diuretic, hypertention
23	Legundi	<i>Vitex trifolia</i>	Antiseptic
24	Inggu	<i>Ruta graveolens</i>	Analgesic
25	Sidowayah	<i>Woodfordia floribunda</i>	Antiseptic, diuretic
26	Pala	<i>Myristica fragrans</i>	Sedative
27	Sambiloto	<i>Andrographis paniculata</i>	Diabetes mellitus, antiseptic
28	Jahe, Halia	<i>Zingiber officinale</i>	Analgesic, antipyretic, antiimplamation
29	Delima Putih	<i>Punica granatum</i>	Diarrhoea, antiseptic
30	Dringo	<i>Acorus calamus</i>	Sedative

## ANNEXURE NO: 2. LIST OF MAJOR PLANTS USED

NO	LOCAL NAME	LATIN NAME	INDICATION
31	Jeruk Nipis	<i>Citrus aurantifolia</i>	Cough
32	Ketepeng Kebo	<i>Cassia alata</i>	Skin infection
33	Temugiring	<i>Curcuma heyneana</i>	Anthelmintic
34	Salak	<i>Eugenia polyantha</i>	Stomachache.
35	Adas	<i>Foeniculum vulgare</i>	Expectorans
36	Kencur	<i>Kaempferia galanga</i>	Cough, analgesic
37	Cabe Jamu	<i>Piper retrofractum</i>	Carminative, stimulants, diaforetic
38	Bawang Merah	<i>Allium cepa</i>	Antipyretic
39	Temu Ireng	<i>Curcuma aeruginosa</i>	Anthelmintic
40	Teki	<i>Cyperus rotundus</i>	Diuretic
41	Tengguli	<i>Cassia fistula</i>	Purgative
42	Kemukus	<i>Piper cubeba</i>	Asthmaticus
43	Kedawung	<i>Parkia biglobosa</i>	Meteorisms
44	Daun Wungu	<i>Gratophyllum pictum</i>	Haemorhoid

ANNEXURE NO: 2. LIST OF MAJOR PLANTS USED

NO	LOCAL NAME	LATIN NAME	INDICATION
45	Kayu Putih	<i>Melaleuca leucodendra</i>	Asthmatic, expectorans, headache, stomachache
46	Pasak Bumi	<i>Eurycoma longifolia</i>	Diuretic, antipyretic
47	Lengkuas, Laos	<i>Langkas galanga</i>	Malaria, stomachache, carminative
48	Pule Pandak	<i>Rauwolfia serpentina</i>	Hypertension
49	Kayu Rapat	<i>Parameria laevigata</i>	Adstringentia, diaforetic, antipyretic, itching

## ANNEXURE NO: 3. LIST OF PLANTS APPROVED BY FDA AS JAMU

NO	NAME OF PLANTS	PART USED	ANNUAL USE (TON)
1	<i>Kaempferia galanga</i> L.	Rhizome	490.000
2	<i>Languas galanga</i> Stunz.	Rhizome	481.000
3	<i>Curcuma xanthorrhiza</i> Roxb.	Rhizome	472.000
4	<i>Zingiber officinale</i> Roxb.	Rhizome	357.000
5	<i>Curcuma aeruginosa</i> Roxb.	Rhizome	356.000
6	<i>Foeniculum vulgare</i> Mill.	Fructus	321.000
7	<i>Alyxia reinwardtii</i> BI.	Cortex	283.000
8	<i>Piper retrofractum</i> Vahl.	Fructus	269.000
9	<i>Parkia roxburghii</i> G.Don.	Semen	175.000
10	<i>Zingiber zerumbet</i> Smith.	Rhizome	155.000
11	<i>Curcuma domestica</i> Vahl.	Rhizome	151.000
12	<i>Syzygium aromaticum</i> Merr. & P.	Flos	131.000
13	<i>Centella asiatica</i> Urb.	Herba	126.000
14	<i>Carum copticum</i> Benth.	Fructus	124.000
15	<i>Orthosiphon aristatus</i> Mrq.	Folium	98.000
16	<i>Zingiber americans</i> BI.	Rhizome	93.000
17	<i>Eurycoma longifolia</i> Jacq.	Radix	84.000
18	<i>Boesenbergia pandurata</i> (Roxb) Schlet.	Rhizome	83.000
19	<i>Zingiber purpureum</i> Roxb.	Rhizome	73.000
20	<i>Glycyrrhiza glabra</i> L.	Radix	72.000
21	<i>Piper nigrum</i> L.	Fructus	71.000
22	<i>Zingiber aromaticum</i> Vahl.	Rhizome	65.000
23	<i>Alstonia scholaris</i> R.Br.	Cortex	63.000
24	<i>Cola nitida</i> Cher.	Semen	60.000
25	<i>Cassia alata</i> L.	Folium	59.000

## ANNEXURE NO: 3. LIST OF PLANTS APPROVED BY FDA AS JAMU

NO	NAME OF PLANTS	PART USED	ANNUAL USE (TON)
26	<i>Cinnamomum zeylanicum</i> BL.	Cortex	54.000
27	<i>Elephantopus scaber</i> L.	folium	54.000
28	<i>Baëckeae frutescens</i> L.	Fructus	50.000
29	<i>Myristicae fragans</i> Houtt	Semen	50.000
30	<i>Curcuma heyneanae</i> Val & Zyp	Rhizome	48.000
31	<i>Phyllanthus niruri</i> L.	Herba	48.000
32	<i>Imperata cylindrica</i> Beauv.	Rhizome	48.000
33	<i>Parameria barbata</i> K.Schum	Cortex	47.000
34	<i>Oryza sativa</i> L.	Amylum	46.000
35	<i>Amomum cardamomum</i> Auct.	Fructus	44.000
36	<i>Coriandrum sativum</i> L.	Fructus	43.000
37	<i>Carica papaya</i> L.	Folium	43.000
38	<i>Momordica charantia</i> L.	Fructus	41.000
39	<i>Litsea odorifera</i> Val.	Folium	40.000
40	<i>Melalouca leucadendron</i> L.	Folium	39.000
41	<i>Sindora parvifolia</i> Backer.	Fructus	30.000
42	<i>Litsea cubeba</i> Pers.	Cortex	29.000
43	<i>Piper cubeba</i> L.F.	Fructus	28.000
44	<i>Paederia foetida</i> Auct.	Folium	27.000
45	<i>Piper alba</i> L.	Fructus	27.000
46	<i>Equisetum debile</i>	Herba	27.000
47	<i>Woodfordia fruticosa</i>	Flos	27.000
48	<i>Apium graveolens</i> L.	Fructus	26.000
49	<i>Guazuma ulmifolia</i> Lmk.	Folium	24.000
50	<i>Uonea barbata</i> Fries	Thallus	22.000



## ANNEXURE NO: 3 . LIST OF PLANTS APPROVED BY FDA AS JAMU

NO	NAME OF PLANTS	PART USED	ANNUAL USE (TON)
51	<i>Foeniculum vulgare</i> Mill.	Semen	20.000
52	<i>Caesalpinia sappan</i> L.	Lignum	19.000
53	<i>Strychnos ligustrina</i> BL.	Semen	18.000
54	<i>Gallae</i>		17.000
55	<i>Kaempferia galanga</i> L.	Rhizome	16.000
56	<i>Nigella damascena</i> L.	Semen	16.000
57	<i>Cocos nucifera</i> L.	Oleum	16.000
58	<i>Blumea balsamifera</i> DC.	Folium	15.000
59	<i>Cinnamomum burmani</i> BL.	Cortex	15.000
60	<i>Nigella damascena</i> L.	Semen	14.000
61	<i>Ficus deltoidea</i> Jack.	Flos	14.000
62	<i>Tamarindus indica</i> L.	Crudum	14.000
63	<i>Santalum album</i> L.	Lignum	13.000
64	<i>Psidium guajava</i> L.	Folium	13.000
65	<i>Datura metel</i> L.	Folium	12.000
66	<i>Helicterus ibora</i> L.	Fructus	12.000
67	<i>Piper betle</i> L.	Folium	12.000
68	<i>Andropogon amboinicus</i> Merr.	Folium	12.000
69	<i>Symplocos odoratissima</i> Choisy	Cortex	11.000
70	<i>Mentha arvensis</i> L.	Herba	11.000
71	<i>Areca catechu</i> L.	Semen	11.000
72	<i>Nyctanthes arbortristis</i> L.	Flos	11.000
73	<i>Areca catechu</i> L.	Semen	10.000
74	<i>Murraya paniculata</i> Jack.	Folium	10.000
75	<i>Andrographis paniculata</i> Ness	Herba	10.000

## ANNEXURE NO: 3. LIST OF PLANTS APPROVED BY FDA AS JAMU

NO	NAME OF PLANTS	PART USED	ANNUAL USE (TON)
76	<i>Rheum officinale</i> Bil.	Radix	10.000
77	<i>Belericacae</i>	Fructus	9.000
78	<i>Cinchona calysaya</i> Wedd.	Cortex	9.000
79	<i>Massoia aromatica</i> L.	Cortex	9.000
80	<i>Allium sativum</i> L.	Bulbus	9.000
81	<i>Cinnamomum sintok</i> BL.	Cortex	9.000
82	<i>Andropogon amboincus</i> Merr.	Radix	8.000
83	<i>Anisum vulgare</i> L.	Fructus	7.000
84	<i>Ocimum sanctum</i> L.	Folium	7.000
85	<i>Noschonia polystachyum</i> Benth.	Folium	7.000
86	<i>Punica granatum</i> L.	Cortex	7.000
87	<i>Plantago major</i> L.	Folium	7.000
88	<i>Plushea indica</i>	Folium	7.000
89	<i>Sericocalyc crispus</i>	Folium	7.000
90	<i>Sesbania grandiflora</i>	Cortex	7.000
91	<i>Acorus calamus</i> L.	Rhizome	6.000
92	<i>Elaeocarpus grandiflorus</i> Smith	Fructus	6.000
93	<i>Rauwolfia serpentina</i> Benth	Radix	6.000
94	<i>Dioscorea hispida</i> Denastedt	Rhizome	6.000
95	<i>Cyperus rotundus</i> L.	Rhizome	5.000
96	<i>Tinospora tuberculata</i> Beume		5.000
97	<i>Messuae ferrea</i> L.	Flos	5.000
98	<i>Phaseolus vulgaris</i> L.	Semen	5.000
99	<i>Eugenia cumini</i> Merr.	Fructus	4.000
100	<i>Surenii</i> Sp.	Cortex	4.000

## ANNEXURE NO: 3. LIST OF PLANTS APPROVED BY FDA AS JAMU

NO	NAME OF PLANTS	PART USED	ANNUAL USE (TON)
101	<i>Sonchus arvensis</i> L.	Folium	4.000
102	<i>Jasminum sambac</i> Ait.	Flos	3.000
103	<i>Pogostemon cablin</i> Bth.	Folium	3.000
104	<i>Anona Muricata</i> L.	Folium	2.000
105	<i>Sterculia foetida</i> L.	Folium	2.000
106	<i>Aegle Marmelos</i> Cotr.	Folium	2.000
107	<i>Meremia mammosa</i> Hall.f	Tubera	2.000
108	<i>Morinda citrifolia</i> L.	Folium	2.000
109	<i>Vitex trifolia</i> L.	Folium	1.000
110	<i>Hibiscus rosasinensis</i> L.	Folium	1.000
111	<i>Carthamus tinctorius</i> L.	Flos	1.000
112	<i>Cymbopogon citratus</i> Stapf	Folium	1.000
113	<i>Gunnera macrophylla</i> BL.	Fructus	1.000
114	<i>Saccharum officinarum</i> L.	Stem	1.000
115	<i>Aloe vera</i> L.	Stem	1.000
116	<i>Rafflesia Patma</i> BL.	Flos	1.000
117	<i>Abrus precatorius</i> L.	Folium	1.000
118	<i>Aglaia Odorata</i> BL.	Folium	1.000
119	<i>Capsicum dunuum</i> L.	Fructus	1.000
120	<i>Sauropus androgynus</i> Wigth	Folium	0.500
121	<i>Ligustica acutiloba</i> L.	Radix	0.400
122	<i>Achillea millefolium</i> L.	Folium	0.400
123	<i>Sesamum orientale</i> L.	Folium	0.400
124	<i>Brassica alba</i> L.	Semen	0.400
125	<i>Desmodium triquetrum</i> DC.	Folium	0.400

## ANNEXURE NO: 3 LIST OF PLANTS APPROVED BY FDA AS JAMU

NO	NAME OF PLANTS	PART USED	ANNUAL USE (TON)
126	<i>Coleus Atropurpureus</i> Benth.	Folium	0.400
127	<i>Citrus hystrix</i> DC.	Fructus	0.400
128	<i>Gaultheria fragrantissima</i> Wall.	Oleum	0.300
129	<i>Raphanus sativus</i> L.	Radix	0.300
130	<i>Senna angustifolia</i> L.	Folium	0.200
131	<i>Alevrites moluccana</i> Willd.	Semen	0.200
132	<i>Thea sinensis</i> L.	Folium	0.200
133	<i>Euchresta horsfieldii</i> Benn.	Semen	0.200
134	<i>Graptophyllum fictum</i> Griff.	Folium	0.100
135	<i>Persea gratissima</i>	Folium	0.100
136	<i>Averrhoa carambola</i> L.	Flos	0.100
137	<i>Entada phaseoloides</i> Mess.	Semen	0.100
138	<i>Abelmoschus moschantus</i> Medik	Radix	0.090
139	<i>Averrhoa bilimbi</i> L.	Folium	0.090
140	<i>Erythina subumbrans</i> Merr.	Folium	0.080
141	<i>Plectranthus scubellarioides</i> L.	Folium	0.050
142	<i>Allium Ceps</i> L.	Bulbus	0.040
143	<i>Euphorbia hirta</i> L.	Herba	0.040
144	<i>Staclusarpheta jamaicensis</i> Vahl.	Folium	0.030
145	<i>Physalis angurata</i> L.	Folium	0.040
146	<i>Smilax zeylanica</i> BL.	Rhizome	0.030
147	<i>Calvatius</i> Sp.	Flos	0.020
148	<i>Nicolaia solaris</i> Horan	Floc	0.020
149	<i>Anacardium occidentale</i> L.	Folium	0.020
150	<i>Melaotoma candidum</i> D.Don	Folium	0.010

## ANNEXURE NO: 3 LIST OF PLANTS APPROVED BY FDA AS JAMU

NO	NAME OF PLANTS	PART USED	ANNUAL USE (TON)
151	<i>Arcangelisia flava</i> Merr.	Cortex	0.005
152	<i>Citrus aurantifolia</i> Swingle	Fructus	0.002
	T O T A L		6,223.667

Registration for Jamu is regulated by regulation of Ministry of Health number : 246/Menkes/Per/V/1990 dated : 28 May 1990.

Which contain a.o.:

Obligation of applicant to submit to the Department of Health data of manufacturing facilities, the product, method of production and quality control, stability, indication, contra indication, method of use of product, Certificate of GMP for Traditional Drug, samples of the product, design of packing material. (per attachment)

#### LABELLING REQUIREMENTS AS PER FDA

The labelling requirements are mention on paragraf VI regulation of Ministry of Health No.: 246/Menkes/Per/V/1990 dated : 28 May 1990.

Stating that :

On the package, container, label and leaflet of Indonesia Traditi-onal Medicine, should bear the word JAMU inside a circle, printed on the upper left hand side of the package, container, label.  
Leaflet should contain information of :

- a. Name of the Traditional Medicine and brand name
- b. Composition
- c. Weight of content or quantity in each package
- d. Dosage
- e. Indication
- f. Contra Indication (if any)
- g. Expiry Date
- h. Registration Number
- i. Batch Number
- j. Name of Industry and City
- k. For traditional medicine under license should mention the name and address of the licensor
- l. All wording should be in Bahasa Indonesia and Latin character
- m. Name of the material in the composition should be written in Latin according to Indonesian Pharmacopoea, Extra Phramacopoea of Indonesia or other books determine by the Ministry of Health.

ANNEXURE NO: 5 . LIST OF PLACES VISITED

- \* Jakarta (West Java)
- \* Semarang (Central Java)
- \* Yogyakarta (Central Java)
- \* Solo (Central Java)
- \* Surabaya (East Java)
- \* Jember (East Java)
- \* Kediri (East Java)
- \* Batu, Malang (East Java)
- \* Madura (East Java)
- \* Bandung (West Java)
- \* Sukabumi (West Java)
- \* Bogor (West Java)
- \* Bengkulu (South Sumatera)

ANNEXURE NO: 5 LIST OF RESEARCH INSTITUTIONS VISITED

- \* Fitochemical Laboratory LIPI-LBN in Bogor
- \* Research Instituted for Medicinal Plant and Spices (BALITRO) in Bogor
- \* Gajah Mada University, in Yogyakarta :
  - Research Centre on Indonesian Traditional Medicine
  - Clinical Pharmacology Facility
- \* Airlangga University in Surabaya :
  - Research Centre on Indonesian Traditional Medicine
- \* Ministry of Health, Surabaya :
  - Health Services Research and Development Centre
  - Food & Drug Control Office
- \* I.T.B. (Institute Technology Bandung) :
  - Department of Pharmacy
- \* Pajajaran University (UNPAD-Bandung) :
  - Clinical Assay Facility
- \* Research & Development of PT. Kimia Farma Bandung



ANNEXURE NO: 5 LIST OF FARMS VISITED

- \* Centre of *Orthosiphon stamineus*, in Sukabumi, West Java
- \* Centre of *Kaempferia galanga* (kencur) in Boyolali Central Java
- \* Centre of *Foeniculum vulgare* (Adas) in Cepogo Central Java
- \* Centre of Zingiberacea or Ginger in Wonogiri Central Java
- \* Centre of Pepper longum (Cabe Jamu) in Madura East Java
- \* Conservation Forest Merubetiri, East Java

ANNEXURE NO: 5. LIST OF CLINICAL FACILITIES VISITED

- \* Gajah Mada University in Yogyakarta
- \* Airlangga University in Surabaya
- \* Pajajaran University in Bandung

ANNEXURE NO: 5. LIST OF INDUSTRIES VISITED

1. Jamu Industry PT. Borobudur in Semarang
2. Jamu Industry PT. Ny. Meneer in Semarang
3. Jamu Industry PT. Sido Muncul in Semarang
4. Jamu Industry PT. Air Mancur in Solo
5. Jamu Industry PT. Mustika Ratu in Jakarta
6. Jamu Industry PT. Sari Ayu in Jakarta
7. Jamu Industry Payung Pusaka in Kediri
8. Jamu Home Industry in Wonogiri
9. Essential Oil Distillation, PT JASULAWANGI in Sukabumi, West Java
10. Machine Factory of PT. Pratindo Canggih Mulya in Jakarta
11. Machine Factory of PT. Meco in Surabaya
12. Machine Factory of PT. Rotar in Surabaya
13. PT. Kimia Farma Jakarta, Production Unit Pulo-gadung

ANNEXURE NO: 6 LIST OF PERSONS VISITED

## GOVERNMENT

A. INSTITUTIONS :I. Directorate Jenderal Drug and Food Control of  
Ministry of Health (P.O.M.)

1. - Name : *Drs. Wisnu Katim*  
- Position : Director Jenderal of PCM
2. - Name : *DR. Johnny Ria Hutapea*  
- Position : Director of Traditional Medicine

II. National Planning and Development Board  
(Bappenas)

1. - Name : *DR. Fasli Jaial, Ph.D.*  
- Position : Head, Social Welfare, Health & Nutrient Bureau
2. - Name : *Ir. Sri Irawati Susalit*  
- Position : Staff

## III. PT. Kimia Farma (Government Pharmaceutical Company)

1. - Name : *Drs. H. Iman Hidayat*  
- Position : President Director
2. - Name : *Drs. Syarif Bastaman*  
- Position : Director of Production

IV. Health Services Research and Development Center (P4K), NIHRD, Ministry of Health, Surabaya

1. - Name : *Prof. DR. Haryadi Suparto*  
- Position : Head of Clinic P4K

PRIVATE

A. JAMU INDUSTRIES

I. Jamu Industry PT. Borobudur, Semarang

1. Name : *Drs. Rasyid, Apt.*  
Position : Head of Production

II. Jamu Industry PT. Ny. Meneer, Semarang

1. Name : *Ir. Endah Permata*  
Position : Head Cultivation

III. Jamu Industry PT. Sido Muncul, Semarang

1. Name : *Drs.D.Sugiarto Sindoro, Apt*  
Position : Director of Production

IV. Jamu Industry PT. Air Mancur, Solo

1. Name : *Ir. Hadi Handaru*  
Position : Technical Manager

2. Name : *Drs. A.S. Poerwono*  
Position : Head of R & D

V. Jamu Industry PT. Mustika Ratu, Jakarta

1. Name : *F. Hendrik Susanto*  
Position : Export Manager

## VI. Jamu Industry PT. Sari Ayu, Jakarta

1. Name : *Dra. Widyastuti*  
Position : Manager of Q.C.
2. Name : *DR. Sinambella*  
Position : Production Manager

## VII. Jamu Industry Payung Pusaka, Kediri

1. Name : *H. Budhi Djatmika, HBA*
2. Position : Director

## VIII. Jamu Home Industry in Wonogiri

1. Name : *Sumirah*  
Position : Owner

## IX. Essential Oil Distillation, PT. Jasua wangi, West Java, Sukabumi

1. Name : *Ir. Hari*  
Position : Factory Manager

## X. Machine Factory of PT. Pralindo Canggih Mulya in Jakarta

1. Name : *Ir. Liman Kurniawan*  
Position : Head of Factory

## XI. Machine Factory of PT. Mecn, Surabaya

1. Name : *Setiawan Kumala*  
Position : Head Office & Factory

## XI. Machine Factory of PT. Rotar, Surabaya

1. Name : *Benny Hurtlehardjana*  
Position : Head of Factory

**B. UNIVERSITY****I. University of Gajah Mada Research Centre on Indonesian Traditional Medicine (PPOJ-UGM), Yogyakarta**

1. Name : *DR. Sudarsono*  
Position : Head
2. Name : *Dr. Ngatidjan*  
Position : Secretary
3. Name : *DR. Imono Argo*  
Position : Pre-clinic Researcher
4. Name : *Dr. Samekto W.*  
Position : Clinicient
5. Name : *Drs. Agus*  
Position : Biologist-Plant Researcher

**II. University of Airlangga Research and Development Centre on Indonesian Traditional Medicine (P3OT-UNAIR), Surabaya**

1. Name : *Prof. DR. Noor Cholís*  
Position : Chairman of Univ. Airlangga Research Institute
2. Name : *DR. Wahyu Djatmiko*  
Position : Head of P3OT
3. Name : *Dr. Paat*  
Position : Secretary

C. REGIONAL OFFICE - POM

I. Regional Office of Drug and Food Control of Ministry of Health (BPFM-Kanwil POM), Semarang

1. Name : *Dra. Ny. M. Soenaryono*  
Position : Vice Chairman

2. Name : *Drs. Agus*  
Position : Staff

II. Regional Office of Drug and Food Control of Ministry Health (Kanwil-POM), Surabaya

1. Name : *Drs. Warjo*  
Position : Head of Regional Office

2. Name : *Drs. Didik*  
Position : Sub Section of Traditional Drug

III. Institute of Technology (ITB), Bandung

1. Name : *Dr. H. Asep Gana Sugandi*  
Position : Head of Pharmacy Department

2. Name : *Dr. Sudiro Sutarno*  
Position : Biologist and Ethnologist

3. Name : *Dr. Sudana Atma Widjaja*  
Position : Microbiologist

IV. Working Group on Research and Clinical Trial of Fitofarmaka, Pajajaran University (UNPAD), Bandung

1. Name : *Prof. Dr. Iman*  
Position : Chairman

2. Name : *Prof. Dr. Sidik*  
Position : Vice chairman



#### D. RESEARCH- INSTITUTIONS

##### I. Research Institute for Spice and Medicinal Crops. (Balitro) - Bogor

1. Name : *Dr. Ir. Djiman Sitepu; APU*  
Position : Head of Plants Disease Department

##### II. Research And Development Center for Biology (Puslitbang Biologi) The Indonesian Institute of Sciences (LIPI), Bogor.

1. Name : *Chairul, Dr.Sc.*  
Position : Senior Research Scientist

##### III. Institute for Research of Medicinal Plants, Tawangmangu, Solo

1. Name : *Drs. Djumidi*  
Position : Head of Institute

2. Name : *Ir. July*  
Position : Staff

##### IV. Institute of Materi Medica Batu, Malang

1. Name : *Ir. Wahyu Suprpto*  
Position : Head of Institute

E. I. Directorate Jenderal of Estate Crops, Jakarta

1. Name : *Ir. Rajab Djamani*  
Position : Chief sub Directorate of Estate Program  
Development

II. Directorate Jenderal of Estate Crops, Sumenep, Madura

1. Name : *Doni Herry*  
Position : Staff

III. Directorate Jenderal of Estate Crops, Bengkulu

1. Name : *Ir. Eddy T.*  
Position : Vice chairman

F. EXPORTERS AND IMPORTERS OF JAMU

I. PT. Trans-Pacific Tradings Inc, Semarang and Singapore

1. Name : *Mr. Lie Ay Yen*  
Position : President

II. CV. Kurnia Abadi

1. Name : *Gunawan L.*  
Position : Director

III. CV. Sumber Kencana and CV. Bumi Makmur, Semarang

1. Name : *Bambang Hartono Terta*  
Position : Director

IV. CV. Mukti and Benzar Trading & Co, Semarang

1. Name : *Mr. Syaiful Bahri*  
Position : Director

V. PT. Ny. Meneer, Semarang

1. Name : *Widya*  
Position : Manager of Production

VI. ABC Group, Semarang

1. Name : *Iskandar*  
Position : Director

## ANNEXURE NO: 7. LIST OF SELECTED PLANTS OF IMPORTANCE

NO	LOCAL NAME	LATIN NAME	INDICATION
1	Temulawak	<i>Curcuma xanthorrhiza</i> Roxb.	Liver tonic, chronic hepatitis
2	Kunyit	<i>Curcuma domestica</i> Val.	Liver tonic, chronic hepatitis
3	Labu Merah	<i>Cucurbita moschata</i> Duch.	Anthelmintic
4	Jati Blanda	<i>Guazuma ulmifolia</i> Lamk.	Hiperlipidemy
5	Brotowali	<i>Tinospora rumphii</i> Boerl.	Anti malaria, diabetes melitus, hepatitis
6	Sambilata	<i>Andrographis paniculata</i> Nees.	Antiseptic, diabetes melitus, hepatitis
7	Tempuyung	<i>Sonchus arvensis</i> Linn.	Kidneystone, diuretic
8	Kejibeling	<i>Strobilanthes crispus</i>	Kidneystone, diuretic
9	Legundi	<i>Vitex trifolia</i> Linn.	Antiseptic for respiratory tract
10	Kumis Kucing	<i>Orthosiphonis stamineus</i> Benth.	Diuretic
11	Pegagan	<i>Centella asiatica</i> Urban.	Diuretic, antiseptic, hypertension, skin Regeneration
12	Jahe	<i>Zingiberis officinalis</i>	Analgesic, antipyretic, anti inflammatory
13	Cabe Jawa	<i>Piper retrofractum</i>	Carminative, diaforetic, stimulan

ANNEXURE NO: 8 GOVERNMENT SPENDING ON MEDICINE, MODERN & HERBAL

- For Modern Drugs Consumption per capita

1994	:	4.81 USD
1993	:	4.16 USD
1992	:	3.58 USD
1991	:	3.26 USD
1990	:	3.00 USD

\* Source : I.P.A

- For Herbal Medicine Consumption per capita

1994	:	0.65 USD
1993	:	0.57 USD
1992	:	0.33 USD
1991	:	0.26 USD
1990	:	0.21 USD

\* Source : Directorate of Traditional Drug Control  
FDA Ministry of Health

### Case study Piper longum (refrectum)

Visited a village near the town of Sumenep at Madura with the officers from the department of agriculture and saw the fields of cultivated Piper longum. This is a major earner for the farmer.

In a nearby village we met a farmer called Mr. K.Moh. Takib, of Kec. Bluto, Kab. Sumenep 69466.

The harvesting season is from February to August. The plant gives full yield after two years. The major problem is scarcity of water in the area. Farmer has to bring in water from distant places and feed it using a special tin bucket. One bucket per plant per week is the requirement. If plant is watered properly and enough, then fruiting yield is better. According to the farmer if enough water is given, the yield may increase by about 50% i.e. 1.5 kg. per plant. Also because of the scarcity of water, death rate is about 30% of the plants grown. When the death rate is reduced to 10%, the yield will be 20% more per plant. Thus the water is the main constraint.

About 485 hectares of land are cultivated in this area. 2500 plants per hectare are grown. Each plant gives 3 kg. of fresh fruit, i.e. about 1 kg. of dry fruit. These are marketed at present at 7000 Rups. per kg. i.e. about \$3.00 per kg. (dry weight) in the local market. Yield per hectare is 2500 kg. i.e. \$7500.00 per hectare. Therefore 485 hectares under cultivation will give earnings of about \$ 3.6 million annually.

The cost of cultivation, harvesting etc. per hectare:

Seeds.....	\$ 45.00
Fertilizer @ 2 kg. per hole, i.e. per plant	\$ 45.00
Plantation.....	\$ 55.00
Collection.....	\$ 45.00
Cleaning and drying, bagging etc.....	\$ 10.00
Total cost.....	\$200.00
(Capital cost is not included)	

Even taking the higher cost of \$500.00, the margin comes to about \$ 7,000.00 per hectare. Such an important commodity needs to be given special attention as a considerable quantity can be exported after the local use of plant as medicine.

The immediate requirement is improved irrigation. As water resources are being created, drip irrigation system should be immediately introduced and farmers should be trained in the use of the system.

The cost for establishment of drip system may be little high and farmers may not be ready to spend for it. Hence total financing from a bank or a government institution should be arranged at a low interest rate of about 5%. The loan may be repayable after two years in five equal instalments. This will enable the farmer to provide much needed water to the plants regularly, resulting in higher yields and saving of scarce commodity, water for other plants and uses. The higher yield in one year will off-set the cost of

establishment of the drip irrigation system.

Per hectare return will be higher by about \$ 5,000.00 annually. The cost of drip system per hectare as calculated by Kantor Disbun Sumenep is about \$ 1,400.00 (given below). Thus for 485 acres total one time cost will be about \$ 0.7 million. The total earnings from same acreage of 485 acres will go up from \$ 3.6 million to \$ 6.0 million per year, i.e. increase of \$ 2.4 million (about 66%).

**USULAN PERCOBAAN PEMBERIAN AIR (PENYIRAMAN) PADA  
TANAMAN CABE JAMU DENGAN CARA DRIPPING (PENETESAN)**

Lokasi:

Desa	:	Pekandangan sangra
Kecamatan	:	Bluto
Kabupaten	:	Sumenep
Propinsi	:	Jawa Timur
Nama Petani	:	Moh. Takip
Alamat	:	Desa Pakandangan Sangra Kec. Bluto
Luasan Lahan Percobaan	:	200 m <sup>2</sup>
Jumlah Tanaman Cabe Jamu	:	
Diatas Lahan Tersebut	:	100 pohon

Bahan-bahan

1. Selang plastik diameter 1/4 mm sepanjang	:	150 meter
harga per meter	:	Rp. 225.-
jumlah	:	Rp. 33,750.-
2. Selang plastik diameter 1 mm sepanjang	:	10 meter
harga per meter	:	Rp. 600.-
jumlah	:	Rp. 6,000.-
3. Sambungan selang untuk setiap pohon	:	100 buah
harga per buah	:	Rp. 150.-
jumlah	:	Rp. 15,000.-
4. Jarum suntik besar sebanyak	:	100 buah
harga per buah	:	Rp. 250.-
jumlah	:	Rp. 25,000.-
5. Penampung air (drum minyak) 1 buah	:	Rp. 20,000.-
6. Kayu penyangga tempat air	:	Rp. 25,000.-
	Jumlah	:
		Rp. 124,750.-

Details on equipment, manpower, space, capital cost  
and recurrent cost requirements for  
individual departments (laboratories) within the centre

**(a) Botany & Pharmacognosy Laboratory:**

Area: 200 m<sup>2</sup> @\$500.00 per m<sup>2</sup> \$ 100,000.00

**Manpower:**

Chief research scientist (one) @ \$ 1,500.00 per month	\$ 18,000.00
Research scientists (two) @ \$ 1,000.00 per month	\$ 24,000.00
Scientists/technicians (two) @ \$ 500.00 per month	\$ 12,000.00

**Sub total** (\$ 54,000.00)

**Equipment:**

Research microscope with photographic attachment & demonstration screen	\$ 10,000.00
Plant growth chamber	\$ 8,000.00
Glass apparatus: Sohlot extractors, vacuum concentrator & distillation equipment, driers, TLC, steam heaters, vacuum pumps, section cutters etc.	\$ 20,000.00

**Sub total** (\$ 38,000.00)

**(b) Analytical Chemistry Laboratory:**

Area: 300 m<sup>2</sup> @ \$ 500.00 per m<sup>2</sup> \$ 150,000.00

**Manpower:**

Chief Research Scientist (one) @ \$ 1,500.00 per month	\$ 13,000.00
Research scientists (four) @ \$ 1,000.00 per month	\$ 48,000.00
Scientists/technicians (six) @ \$ 500.00 per month	\$ 36,000.00

**Sub total** (\$ 102,000.00)

**Equipment:**

HPLC with FDA detector	\$ 50,000.00
HPLC semipreparative	\$ 40,000.00
AAS with UV detector & furnace attachment	\$ 80,000.00
HPTLC Camag	\$ 50,000.00
Gas chromatography	\$ 30,000.00
UV Spectrometer	\$ 15,000.00
IR Spectrometer PU 9712 type	\$ 25,000.00
Amino acid analyzer	\$ 10,000.00
Electrophoresis	\$ 10,000.00



Glass apparatus	\$ 10,000.00
Other small instruments	\$ 30,000.00
<b>Sub total</b>	<b>(\$ 350,000.00)</b>

**(c) Pharmacy and pilot plant Laboratories**

Area: 500 m<sup>2</sup> @ \$ 500.00 per m<sup>2</sup> \$ 250,000.00

**Manpower:**

Chief Research Scientist (one) @ \$ 1,500.00 per month	\$ 18,000.00
Research scientists (four) @ \$ 1,000.00 per month	\$ 60,000.00
Scientists/technicians (five) @ \$ 500.00 per month	\$ 30,000.00
<b>Sub total</b>	<b>(\$ 96,000.00)</b>

**Equipment:**

Eureka set of equipment with main drive, universal gearing unit, agitator, coating, kneader, wet granulator, sieve shaker, cone mixture, counting & filling equipment, planetary mixer with jacket, semi automatic- liquid dosing filler and homogenizer type HMG	\$ 30,000.00
Digital balances	\$ 2,000.00
Driers, Tableting, Dehumidifier, Pulveriser, multi mill, Filtration, Incubators, etc.	\$ 20,000.00
Pilot extractors	\$ 25,000.00
Pilot Vacuum concentrators	\$ 25,000.00
Spray and Vacuum drier & Freez drier	\$ 80,000.00
Other equipments & instruments	\$ 50,000.00
<b>Sub total</b>	<b>(\$ 232,000.00)</b>

**(d) Agronomy and Forestry Laboratory:**

Area: 400 m<sup>2</sup> @ \$ 500.00 per m<sup>2</sup> \$ 200,000.00  
25 hectare land in two locations  
(not valued)

**Manpower:**

Chief research scientist one \$ 1,500.00 per month	\$ 18,000.00
Research scientists (four) @ \$ 1,000.00 per month	\$ 48,000.00
Scientists/technicians (six) @ \$ 500.00 per month	\$ 36,000.00
<b>Sub total</b>	<b>(\$ 96,000.00)</b>

**Equipment:**

Tissue culture equipment	\$ 100,000.00
Agricultural instruments	\$ 20,000.00
Tractors, Trucks & attachments	\$ 50,000.00
Laboratory instruments	\$ 10,000.00
<b>Sub total</b>	<b>(\$ 180,000.00)</b>

**(e) Clinical Research Laboratory:**

Area: 100 m<sup>2</sup> @ \$ 500.00 per m<sup>2</sup> \$ 50,000.00

**Manpower:**

Chief research scientist (one) @ \$ 1,500.00 per month	\$ 18,000.00
Research scientists (two) @ \$ 1,000.00 per month	\$ 24,000.00
Scientists/technicians @ \$ 500.00 per month	\$ 12,000.00
<b>Sub total</b>	<b>(\$ 54,000.00)</b>

**Equipment:**

Computers and few others (many other) equipment will be shared by Pharmacology and Toxicology labs. All equipment is listed under Pharmacology.) \$ 20,000.00

**(f) Pharmacology & Toxicology Laboratories**

Area: 400 m<sup>2</sup> @ \$ 500.00 per m<sup>2</sup> \$ 200,000.00

**Manpower:**

Chief research scientists (two) @ \$ 1,500.00 p/month	\$ 36,000.00
Research scientist (two) @ \$ 1,000.00 per month	\$ 24,000.00
Scientists/technicians (three) @ \$ 500.00 per month	\$ 18,000.00
<b>Sub total</b>	<b>(\$ 78,000.00)</b>

**Equipment:**

Common list for clinical, toxicology and Pharmacology.	
Auto-track computer controlled ( Columbus)	\$ 12,000.00
Shuttle box	\$ 10,000.00
ISO Thermax tele thermometer	\$ 10,000.00
Spirometer	\$ 5,000.00
Laser doppler flow meter	\$ 5,000.00
BP, temperature & ECG monitor	\$ 3,000.00
Water prodigy and micro pipette	\$ 1,000.00
Luminometer	\$ 5,000.00
Steam washer, microtome & metabolic cage	\$ 5,000.00
Pressure and flow recorder	\$ 2,000.00

1.2.3 Biochemistry analyzer	\$ 5,000.00
Haematology analyzer	\$ 5,000.00
Microscope with photographic attachments	\$ 10,000.00
Polygraph	\$ 20,000.00
Microtome, balances, tissue processors and Other instruments	\$ 50,000.00
Animal House	\$ 20,000.00
<b>Sub total</b>	<b>(\$ 166,000.00)</b>

**(g) Microbiology laboratory**

Area: 100 m<sup>2</sup> @ \$ 500.00 per m<sup>2</sup> \$ 50,000.00

**Manpower:**

Chief research scientist (one) @ \$ 1,500.00 per month \$ 18,000.00  
 Research scientist (one) @ \$ 1,000.00 per month \$ 12,000.00  
 Scientists/technicians (one) @ \$ 500.00 per month \$ 6,000.00

**Sub total** (\$ 36,000.00)

**Equipment:**

Laminar flow \$ 5,000.00  
 Autoclave, Ph. meter, Balances, Ovens,  
 Water baths, microscope, centrifuge etc. \$ 25,000.00

**Sub total** (\$ 30,000.00)

**(h) Training centre, Library, Information Facility**

Area: 600 m<sup>2</sup> @ \$ 500.00 per m<sup>2</sup> \$ 300,000.00

**Manpower:**

Librarian (one) @ \$ 1,000.00 per month \$ 12,000.00  
 Assistant (one) @ \$ 500.00 per month \$ 6,000.00  
 Training Scientist @ \$ 1,500.00 per month \$ 18,000.00  
 Assistant Scientist (one) @ \$ 1,000 per month \$ 12,000.00  
 Assistant clerks (two) @ \$ 500.00 per month \$ 12,000.00  
 Assistant scientist (one) \$ 1,000.00 per month \$ 12,000.00  
 Clerk (one) @ \$ 500.00 per month \$ 6,000.00  
 Other recurring:  
 Books, journals & subscriptions \$ 100,000.00  
 Printing, publishing etc. \$ 10,000.00

**Sub total** (\$ 188,000.00)

**Equipment:**

Xerox machine \$ 30,000.00  
 Micro filming \$ 5,000.00  
 Computers, Books etc. \$ 100,000.00

Miscellaneous	\$ 15,000.00
<b>Sub total</b>	<b>(\$ 150,000.00)</b>

**(i) Director's office and administration**

<b>Area:</b> 300 m <sup>2</sup> @ \$ 500.00 per m <sup>2</sup>	\$ 150,000.00
--	---------------

**Manpower:**

Director (one) @ \$ 2,000.00 per month	\$ 24,000.00
Assistant Director (one) @ \$ 1,500.00 per month	\$ 18,000.00
Financial Controller (one) @ \$ 1,500.00 per month	\$ 18,000.00
Chief accountant (one) @ \$ 1,000.00 per month	\$ 12,000.00
Secretaries (three) @ \$ 600.00 per month	\$ 18,000.00
Account clerks (two) @ \$ 600.00 per month	\$ 12,000.00
Clerks (four) @ \$ 600.00 per month	\$ 24,000.00

<b>Sub total</b>	<b>(\$ 126,000.00)</b>
------------------	------------------------

**Equipment:**

Computers, office equipment etc.	\$ 20,000.00
----------------------------------	--------------

## Summary:

	Department	Equipment costs	Recurring costs
a	Botany & Pharmacognosy	\$ 38,000.00	\$ 54,000.00
b	Analytical chemistry & standardization	\$ 350,000.00	\$ 102,000.00
c	Pharmacy & Pilot production	\$ 232,000.00	\$ 96,000.00
d	Agronomy & Forestry	\$ 180,000.00	\$ 96,000.00
e	Clinical lab.	\$ 20,000.00	\$ 54,000.00
f	Pharmacology & Toxicology lab.	\$ 166,000.00	\$ 78,000.00
g	Microbiology lab.	\$ 30,000.00	\$ 36,000.00
h	Training, Library, Information Education & Patenting	\$ 150,000.00	\$ 188,000.00
i	Director's office, Administration & Accounts	\$ 20,000.00	\$ 126,000.00
	<b>Total</b>	<b>\$1,186,000.00</b>	<b>\$ 830,000.00</b>

## Building costs:

a	200	-	100,000.00
b	300	-	150,000.00
c	500	-	250,000.00
d	400	-	200,000.00
e	100	-	50,000.00
f	400	-	200,000.00
g	100	-	50,000.00
h	600	-	300,000.00
i	300	-	150,000.00
<b>Total</b>	<b>2900</b>		<b><u>1,450,000.00</u></b>