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**FACT FINDING AND PREPARATIVE ASSISTANCE MISSION TO ASSESS THE
POTENTIAL OF PROCESSING TRADITIONAL MEDICINAL PLANTS
FOR CONVERTING THEM INTO MODERN DOSAGE FORMS**

MOZAMBIQUE

Technical report: Preparatory assistance mission*

**Prepared for the Government of Mozambique
by the United Nations Industrial Development Organization**

Based on the work of C. K. Atal, chemical technologist

**Backstopping officer: T. De Silva
Chemical Industries Branch**

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ABSTRACT

The expert deputed by UNIDO for preparatory assistance to Mozambique gathered facts, figures, statistics and knowledge about the traditional system of medicine, more particularly about the extent to which medicinal plants are utilized as healing agents, and whether or not it will be feasible to initiate experimental production of medicines based on herbal raw materials available in the country.

Meetings were held with Government officials, traditional medicine practitioners; Senior executives of National Institute of Health and National Directorate of Health; Chiefs of National Drug Quality Control Laboratory and Pharmaceutical Department of Ministry of Health; Heads of Faculty of Medicine, Faculty of Chemistry, Faculty of Agriculture; General Directors of Pharmacia Company and MEDIMOC State Enterprise for import and export of Medical materials (Annex 7). The following conclusions were derived by the expert.

1. Traditional system of medicine and traditional herbal medicines. The system is deeply entrenched in the general population of Mozambique. It is in harmony with tradition, culture, socio-economic and medical needs of majority of population.
2. The plant based medicines administered by traditional healers are cheap and 85% of rural population can afford only to go to a traditional healer due to absolute poverty.
3. Modern medicines are scarce, costly, available only in big cities, 97% of modern medicines are imported and only 3% manufactured in the country. Based on import statistics per capita consumption of modern medicines in Mozambique is less than one dollar per year- lowest figure for an African country.
4. There is no organized manufacture of plant based medicines in Mozambique. On the contrary brand name herbal medicines are being imported in the country.
5. Traditional healers source of herbals for day to day use is from a limited radius around the village, limiting the choice of healing plants to only a few. There is also no cultivation of essential oils containing plants in any part of Mozambique.
6. It is the Government policy to encourage steps for study of traditional medicines and to improve availability of crude drug raw materials. It is also the policy of the Government to encourage production of plant based medicines in modern dosage-forms in order to improve the reliability and safety of this class of medicines.

7. It is the Government policy to integrate the traditional system of medicine within the overall health delivery system of the country.
8. The Government has taken some positive steps indicating its seriousness on this subject, by creating GEMT and publishing for the first time a book in 4 volumes on Medicinal Plants.
9. The request for preparatory assistance by UNIDO had originated by the Hon. Minister of Health himself.
10. There is no single centre of research or development of medicinal and aromatic plants and no other institute has a multidisciplinary team activity under one roof and therefore it was difficult to name a single host institute where the project could be located. However there are separate centres of excellence located in Maputo where experience exists in the field of chemistry and biology of medicinal plants and experience of cultivation of economic plants at the Agriculture faculty. Besides the Ministry of Health has departments dealing with Drug Quality Control, malaria testing, traditional medicine survey and also large modern hospitals where manufacturing activity can be started in the Hospital Pharmacy Galenical section. Thus a scattered infrastructure and trained personnel are available to be formed into a team under an experienced coordinator.
11. The expert has come to the conclusion that there is a strong compelling need to support a project on Production of medicines from indigenous botanical raw materials in Mozambique.
12. The expert has prepared a project document whose immediate objectives are:
 - A. Experimental production of herbal medicines from botanical raw materials in modern dosage form with quality control and safety considerations.
 - B. Direct training needs.
 - C. Institution building

INTRODUCTION

The consultant was briefed by the Backstopping Officer in Vienna. The duties to be carried out were explained and are given in Annex 1. The duration of the mission was from 17 November to 16 December 1993.

On arrival at Maputo the office of Unido Country Director was contacted. The J.P.O at the Unido Office accompanied the consultant to Ministry Of Health and introduced him to Mrs. Laurinda Dias Diogo, Chief of the Quality Control Laboratory of Drugs, who was to act as government counterpart.

The expert was provided an office space at the Department of Studies on Traditional Medicals System (G.E.M.T.) and an Ethnobotanist Mr. Mulhovo was assigned to assist the expert, making programme of visits and arranging meetings and fixing appointments during the successive 3 weeks.

POSITION AND AVAILABILITY OF BOTANICAL HERBS WITH MEDICINAL
PROPERTIES USED IN TRADITIONAL SYSTEM OF MEDICINE

Traditional healers are the only practitioners available to the sick people in most rural areas of Mozambique (Annex 2,3). In recent years Mozambican Government encouraged the traditional medical healers to form association of traditional healers at the district, provincial and national level. The number of registered traditional healers in the country is about 25,000. Their association is called AMETRAMO. According to the Xai-Xai District President in Gaza province, there are 4.000 traditional healers in Xai-Xai district alone.

During interviews with 3 Ametramo district presidents and 3 other famous traditional healers in and around Maputo, in all cases the traditional healers collect their requirement of crude drugs from the bush in and around their village or district. There is no organised channel for collection, supply or sale of such crude drugs except Xipamanine market in Maputo where the urban dwellers can buy crude drugs in freshly collected or dried form for use of healers or as home remedies. The number of such market available herbs was approximately about 100.

Besides this a large business house Casa Ada' in Maputo had on display for sale more than 200 botanical materials originating from Europe, central and South America. About 50 brand name medicines were also available in fancy packings and were of imported origin. A list of these crude drugs is annexed herewith. (Annex 4)

Description of the subsector

It has been estimated that over 100 pure phytochemicals extracted from medicinal plants are included in modern western pharmacopoeias and are widely used in modern medical practice. At least 2000 other medicinal plants are used in developed and developing countries in crude form as home remedies, as

prescribed medicines in the indigenous Unani Ayurvedic and Chinese systems of medicine in South, South-East & East Asia. Medicinal plants find a similar use in traditional medical system in non-urban areas of Central and South America and African Countries.

It is also a fact that in most developing countries 70 to 85% of the population is still at an economic level where they cannot afford to buy modern medicines because of their high cost and therefore for economic and cultural reasons only go to a traditional doctor/healer. In Mozambique because of absolute poverty 60% population cannot even afford traditional medicine cost.

It is also now the official policy of W.H.O. and other U.N. agencies to encourage research, development and production of indigenous herbal medicines so that they are available to all segments of society.

While it is true that many traditional herbals are used in medicine on empirical basis but it is also true that a number of plant remedies cure diseases, particularly chronic diseases for which there are no sure modern medicines. Toxicity and side reaction risks are inherent in both modern and traditional medicines.

The promotion and integration of traditional medicine involve people of various disciplines, working as a team; the botanists, pharmacists, organic chemists, pharmacologists, and traditional healers, if we want to make traditional remedies safe and more reliable.

Government Policy Towards Traditional Medicine

In Mozambique there is practically no local production of modern medicines so that all requirements of modern medicine are met from imports costing the country US\$ two million in foreign exchange. Even then the medicines are scarce in modern Government Hospitals.

There is also no factory scale manufacture of traditional medicines or herbal home remedies.

The per capita consumption of modern medicine in Mozambique is less than one US dollar per year, lowest figure on the African Continent. More than 85% of the population uses either home remedies or treatment from traditional medical herbalists or healers.

The Government of Mozambique has therefore officially adopted a policy of encouraging and promoting use of traditional medicines. A number of steps have been taken in this direction (Annex 5). Ministry of Health (Annex 6) has published for the first time a comprehensive list of medicinal plants, published in 4 volumes. A department has been exclusively created for systematic study of traditional system of medicine (G.E.M.T.). Govt has made a request to UNIDO to prepare a report on this subject and provide project preparatory assistance to upgrade the production of medicines from traditional medicinal plants and prepare a project document.

Traditional practitioners are also being associated to treat patients in modern hospitals in collaboration with modern doctors.

There is no other UN agency funded ongoing or prior programme on medicines from plants or on traditional medicines. There are small micro bilateral programmes between the Eduardo Mondlane University Maputo and Swedish SAREC agency, confined to study of a single antimalarial plant but this work is at a more academic level.

There is another programme on phytochemistry of cashew shell liquid oil whose objectives are very different. Some research on anti malarial drugs has been done at parasitology laboratory of Ministry of Health.

Institutional Framework for the subsector

The import of modern medicines, medical and surgical supplies, and brand name herbal remedies are handled by a government company MEDIMOC. this company exported about 100,000 \$ worth of crude botanical drugs to European Countries during 1992-93.

The internal supply and distribution of medicines is handled by Pharmac Company which is also a government agency.

There is a private manufacturing company making modern medicines from imported bulk materials. This company under the name SWAMO has a limited production.

There is another Govt Sector Company manufacturing oral rehydration salt for diarrhea. There is no R & D Institute for drugs, modern or traditional. Manufacture of modern medicines is monitored by the Quality Control Laboratories of Ministry of Health. There is no school of pharmacy in the Country to train professional pharmacists.

WHO'S PROGRAMME IN TRADITIONAL MEDICINE *¹

Traditional and indigenous systems of medicine have persisted in many countries, even in many parts of the world where modern health care is usually available. In the last two decades, the idea of mobilising the manpower component of traditional medicine for purpose of primary health care, particularly in rural areas, has gained strength in many developing countries.

The steps leading to WHO'S Programme in Traditional Medicine may be summed up as follows:

¹ * WHO chronicle 31; 427-428, (1977)

In 1974 UNICEF/WHO carried out a joint study for meeting the basic health needs of developing countries and recommended that practitioners of traditional health and traditional medicine should be trained for the primary health care services. This recommendation was endorsed by the executive board in 1975 and by the world assembly in 1977, when a decision on promotion and development of training and research on traditional medicines was passed by acclamation.

In 1976 WHO'S regional committee for Africa had "Traditional Medicine and its role in development of health services in Africa" as the topic for technical discussion. In the same year the regional committee for South East Asia adopted a resolution calling for the promotion of traditional and indigenous systems of Medicine in Asian countries.

In June 1976 WHO established a working group in Geneva for the promotion and development of traditional medicine. The programme prepared by the working group had the following objective.

- To foster a realistic approach to traditional medicine in order to improve health care.
- To evaluate traditional medicine in the light of modern science so as to maximise useful and effective and discourage harmful areas.
- To promote the integration of proven valuable knowledge and skills in traditional and modern medicine.

The suggested approaches include the formulation of national health policies for better utilisation of traditional medicines in the countries health care system. The approach included setting up administrative machinery needed to ensure

planning effective planning, utilisation and supervision of practitioners of traditional medicine within the health care system of the countries.

Multidisciplinary investigations into systems of traditional medicine have been officially encouraged by WHO. Special attention has been given to Laboratory and clinical investigation for identifying effective remedies besides investigation of psychological and anthropological aspects of traditional medicine.

Where possible priority is given to the promotion and development of useful local resources, such as herbs, for production of medicines. It is believed that such action will reduce the medical cost and bill of many developing countries.

WHO believes that efforts in the above direction should achieve "total health care for all by the year 2000". There are already indications of future break throughs in this endeavour.

The WHO'S Drug Action Programme (DAP.) 91.5. "Access to drugs and Finance", the following extract should be generally valid:

The absolute level of expenditure per inhabitant varies from country to country between 1 and 300 US\$ per annum, which is an enormous range. This absolute level gives an indication of the level of drug supply to the population and the kind of policy being pursued. Satisfaction of needs is another matter, which depends on how fairly the drugs purchased are distributed, and how much of the expenditure is wasted. Consider a set of five categories.

- expenditure of less than \$5 per capita per annum is unlikely to give the entire population of the country a regular supply of drugs. The figure of 5\$ is a national average. Part of the population therefore has less than 5\$.

- With expenditure of 5-10\$/capita it is possible to supply a large part of the population with essential drugs. Average drug expenditure in developing countries in 1985 was \$ 5,4.
- With expenditure of 10-50 US\$ per inhabitant, there is ample scope for satisfying the drug needs for the entire population.
- In excess of \$50 per capita per annum, consumption may be regarded as partly wasted.- - - - -".
- In excess of \$ 100 or \$ 150, which is the case in certain developed countries, we are probably dealing with massive over-consumption. This does not mean that no part of the population has very restricted access to drugs. In 1985, average consumption of drugs was \$ 62 per capita in developed countries.

**UNIDO'S PROGRAMME IN TRADITIONAL MEDICINE *²
AND INDUSTRIAL UTILISATION OF MEDICINAL
AND AROMATIC PLANTS**

Plant based traditional medicines play a vital role in the health care of the majority of the people in developing countries. These medicines are still prepared using the age old traditional methods. There has not been any significant research and development work on these medicines despite the advances in science and technology in other areas. Furthermore, traditional practitioners have resisted any such attempts as being detrimental to their practice. The difficulties associated with continuing the practice of having the practitioner prepare the drugs himself have resulted in some centralized production, thus paving the way for the introduction of modern technology. The demand for standardized quality herbal preparations has also

² * Development Programmes of Unido
Chemical Industries Branch D.1.0, Unido, Vienna 1993

increased as a result of the resurgence of interest in natural medicines among people in the industrialized countries. Hence research and development activities in this area is on the increase.

The lack of access to modern therapy is still a factor of crucial importance in maintaining primary health care for major segments of the population in developing countries. The need to provide less expensive standardised quality preparations based on medicinal plants induced UNIDO to launch a programme of development assistance in this important and environment friendly area of activity.

Apart from the traditional ways of using these plants, many are exported to industrialized countries as raw materials for drugs, fragrances and flavours. The value-added products are then imported, costing the countries several times more than the original revenue gained from exporting the raw materials. With a few exceptions, harvesting medicinal and aromatic plants in developing countries for both local use and export has been from natural wild resources.

As a result many plant species have been lost and some are in danger of extinction. It has also caused biodiversity conservation problems

It is necessary that systematic cultivation of medicinal and aromatic plants be introduced in order to conserve biodiversity and protect endangered species. Systematic cultivation of this type of plants could only be initiated if there is a continuous demand. Hence only if the farmer is assured of the sale of raw material. Thus cultivation and processing should be started simultaneously in rural areas.

Many rural areas have an agriculture based economy where people depend on sustenance agriculture. Hence cash and food crops are produced in quantities just sufficient to earn a living. The potential of processing the indigenous flora to

obtain value added products has not been fully exploited due to lack of know how, financial resources and entrepreneurial capabilities. In order to achieve sustainable rural development, small scale rural industries based on renewable plant resources have to be introduced. These should be planned in taking into account the traditional agricultural practices so that a bottom up approach to rural development can be initiated. Aromatic plants are good candidates for such small scale industrial processing as one can obtain low volume, high value essential oils using fairly simple distillation stills. The technology is easy and can be absorbed by the people. Besides the products have a large shelf life thus ensuring income even after months of production.

During the last 2 decades, UNIDO has provided funds and implemented technical assistance programmes in as many as 37 developing countries.

Process Technology for Medicinal Plants

The medicines for internal use prepared in the traditional manner involve simple methods such as hot or cold water extraction, expression of juice after crushing, powdering of dried material, formulation of powder into pastes via such a vehicle as water, oil or honey, and even fermentation after adding a sugar source.

One major concern in introducing modern technology is whether the final preparation will be acceptable to the practitioner who has sole faith in extemporaneous preparations. This problem has to be overcome by a process of education, whereby the disadvantages of the old methods and the advantages of the new methods can be imparted.

Disadvantages of traditional methods:

- Authenticity and purity of raw material not known
- Variability of raw material quality
- Post-harvest deterioration of raw material

- Non-availability of raw material for extemporaneous preparation (seasonal nature of plants)
- Non uniformity of dosage
- Poor stability of the preparation
- User difficulties owing to bulkiness and transport.

Advantages of introducing modern technology:

- Verification of authenticity and purity
- Control of quality of raw material
- Proper post-harvest treatment
- Controlled and efficient processing methods which are reproducible.
- Standardized product and therefore the uniformity of dosage
- Conversion into conveniently handled dosage forms
- Significant increase in stability (monitoring of stability possible).

MACOL Report Recommendations on exploitation of land and sea plant resources of Mozambique

MACOL (Manana Consultores Lda) prepared a detailed report on "Comprehensive study of the Chemical Industries subsector" under the project DP/MOZ/88/014. In volume 4 of this report recommendations have been made on potential of exploiting land and sea plant resources as raw materials for manufacture of pharmaceuticals, phytochemicals, vegetable, colourants and hydro-colloids. It is suggested in the report that pharmaceuticals made from Mozambican plant sources might offer a low cost alternative for that part of Mozambican population who cannot afford to pay the cost of standard modern medicines.

The use of selected agricultural by-products like (CNSL) Cashew nut and Shell liquid has been proposed to form the basis of surface coating materials and high priced products like Cardol and Dardanol can be made from CNSL for export marketing. The report also discusses the possible production of traditional medicines to augment the scarce availability of medicines in

Mozambique.

Specific mention is made of following plants by Dr. P. Castro-Boisier who was a Brazilian Expert on the MACOL Project.

Cymbopogon species	Essential Oils such as Java, Citroneila, Lemongrass and Palmarosa oils.
Eucalyptus species	Source of essential oil of Eucalyptus for pharmaceutical use and as source of Cineole
Vetiver species	Source of Khus oil used as fixative in high class perfumes.
Opuntia species	Insect parasite Dactilopius coccus (Cochineal) is the source of red colour Carmine
Tagetes species	Marigold petal meal is the source of Xanthophyllin
Bixa orellana seeds	Source of Carotenoid colour annato and bixin
Eucneuma cotinii Eucneuma spinosum	These red algae are source of Pentin like material Carageenin

It may be relevant to point out here that serious effort was made 10 years ago to start essential oil plantation of Lemongrass, Mentha and Citronella in 1984. About 30 hectares were planted in Muaguide, Cabodelegado province, later shifted to village Munona on periphery of lake Tegue-Tegue in Zambesia province. This project was abandoned in 1987 due to lack of steam distillation equipment and technology.

G.E.M.T.

This is a department of study of a traditional medicine created under the ministry of health to carry out socio-anthropological studies and survey of medicinal plant flora for species used by traditional healers.

A 4 Volume book "Medicinal Plants and their use in traditional medicine" has been published by this department G.E.M.T. is placed directly under General Director of Institute of National Health.

Another monograph entitled Glossary of traditional medicinal Plants is almost ready for publication.

Government of Mozambique has ambitions plant to further expand the activities of GEMT which will play an important role under the UNIDO project, if and when the project implementation starts.

MEDIMOC

MEDIMOC is a government enterprise for import and export of all medical supplies and medicines. It is a dynamic profit making unit and has demonstrated success also in export of plant derived crude drugs, the export 1992 was of the order of US\$100,000 expected to double during the years 1993 and 1994.

MEDIMOC also imports herbal brand name medicines from Portugal, other European countries, South Africa and South America. The internal sale of such medicines is handled by another state enterprise Pharmak Company.

There is importation in Mozambique also of essential oils. The import is sizeable but figures could not be procured.

Some export statistics of crude drugs exported by MEDIMOC is appended in this report.

EXPORT STATISTICS OF MEDIMOC

Year	Products	Quantity	Value
1979	Lemongrass	2,770 kg	DM 4,155.00
1980	Terminalia sericea	500 kg	USD1,500.00
1981	Gloriosa superba	101 kg	USD1,747
	Taburnamontana elegans	600 kg	USD4,050
	Hypogophyton procumbens	9,950 kg	USD27,010
	Brackenridgea Zambuebaruca	104 kg	USD 624
1982	Ricinus communis (Castor seeds)	50,000 kg	USD16,450
	Capsicum frutescens	3,500 kg	USD4,725
	Hypogophytons procumbers	945 kg	USD2,612.96
	Jateorhiza palmata (colombo roots)	8,520 kg	USD3,408.50
1983	Ricinus communis (castor seeds)	200,000 kg	USD56,700
1984	NO EXPORT		
1985	Jateorhiza palmata (colombo)	710 kg	USD319.50
1986	Jateorhiza palmata (colombo)	5,600 kg	USD3,080
1987	Jateorhiza palmata (colombo)	20,000 kg	USD10,800
1988	Jateorhiza palmata	5,000 kg	USD 2,800
1989	Jateorhiza palmata	500 kg	USD255
1990	Ricinus communis (castor seeds)	10,000 kg	USD3,950
1991	Jateorhiza palmata	5,000 kg	USD2,650
1992	Terminalia sericea	45,000 kg	USD90,000
1993	Terminalia sericea	52,000 kg up to 30 Nov.	
		24,000 kg	USD40,652
		28,000 kg	DM87,360
Expected export in Dec. 1993	Jateorhiza palmata	24,000 kg	USD19,200

There is steady increase in the value of export after the war, and for next year export estimate more than USD 200,000. As there are several new plants to be collected and MEDIMOC is finding new market for the products.

RECOMMENDATIONS

Herbal Crude drug market of Maputo and need for formal local manufacture of medicines

This market caters to the need of those urban people who use herbal home remedies, medicines of traditional system or medicines of plant origin which are still used in, many countries outside Africa. About 200 crude herbal medicines available in "Casa Ada", a Portuguese company, are crude drugs which were once officially used in modern medicines and were included in Pharmacopoeias of European countries. Many of these are imported from Portugal, South Africa, Brazil and Bolivia.

In Maputo there is availability of 100 orso locally available medicinal plant parts in dozens of shops in fresh or dried condition in the Xipamanine market in the less affluent section of Maputo city. There is also no manufacturing activity in case of herbal medicines and even the production of modern medicines meets only 3 % of the total import of modern medicines. It is estimated that 60% of the population which is below the poverty line has no access to medicine of any kind.

The Government of Mozambique is trying to mobilize traditional system of medicine to play an increasing role in the total health care system of the country. An association of traditional medical practitioners (AMETRAMO) has been formed and a department of study of traditional system of medicine has been set up under Ministry of Health.

A project for manufacture of herbal medicines, therefore, seems justifiable for a variety of reasons discussed in this report. A project document has been prepared in which it is proposed to manufacture 5 selected medicines based on plant raw materials and production by distillation of some selected essential oils from plants which will be cultivated for this purpose. The project has an equipment and machinery component, a training component and a manufacturing component. The project being multidisciplinary, it is proposed that personnel and talent existing in the University Chemistry and Agriculture faculty on the one hand and G.E.M.T., drug quality control laboratories under Ministry of Health be involved to work as a team under coordination by a senior staff of Ministry of Health. This team will provide scientific back up to the manufacturing activity which will be set up in the galenical pharmacy section of one of the central hospitals in Maputo.

Mozambique has only one single University with departments of chemistry, biology, agronomy, physics and geology and a Medical School under faculty of Medicine. There is no school of pharmacy in the country. There is a good faculty of Agriculture at the University in Maputo.

However knowledge, experience and infrastructure necessary for study of Medicinal plants exists scattered at different centres in and around Maputo city. One of the lecturers at faculty of chemistry is a phytochemist with experience of participation in a Swedish programme of investigation of medicinal plants.

INIA under Ministry of Agriculture has the largest National Herbarium of Flora of Mozambique. There is also a very well organised Quality Control Laboratory for Drug testing which has adequate man power and facilities for all raw material testing of drugs for enforcement of the drug control legislation. The botanical Herbarium of the University Eduardo Mondlane is accessible to (GEMT) Traditional Medicine Department of Ministry of Health for reference purposes.

The Agriculture department of the University is chaired by a senior experienced agricultural engineer who is willing to participate in the project and provide supervision and land for Medicinal Plant Garden to also conduct agrotrials on medicinal plants. Pharmacology and toxicology testing can be organised by the Ministry of Health in Maputo or such testing can be done on payment abroad. Medimoc is a govt. trading company for import - export of medicines and has experience of large scale collection of herbs from the wild for export purposes. Fortunately all this scattered talent is concentrated in Maputo.

As there is no single point Institute having all the required multidisciplinary talent under one roof, it will be quite in order to let the Ministry of Health be the implementing agency for the project through designation of Chief of Medimoc or GEMT (Traditional Medicine Department) as National Project Director. The most important final goal output of the project i.e experimental production of Capsules, Tablets & Herbal-tea-bags will be directly supervised by the NPD at their own premises and other support activities for the goal objective will be carried out at other centres with NPD as the monitor/coordinator.

**SELECTED LIST OF ESSENTIAL OIL BEARING
PLANTS FOR CULTIVATION AT AGRONOMY FARM**

<u>Plant</u>	<u>Medical Product</u>
* Mentha arvensis	Menthol
* Mentha piperita	Peppermint oil
Mentha spicata	Spearmint oil
* Eucalyptus speces	Eucalyptus oil and
** Anethum graveolens	Dill oil
** Anethum sowa	Anethole
Cymbopogon citratus	Lemongrass oil
C. pendulous	Citral vitamin A
C. winterianus	Citral
Ocimum gratissimum	Java citronella
O. basilicum	Anti-mosquito
	Wild basil oil
	Sweet basil oil
* Important raw material for Balm industry besides many other uses.	
** Important raw material for antifatulence & anti colic properties for infants/children.	

TENTATIVE LIST MEDICINES TO BE EXPERIMENTALLY PRODUCED

	MEDICINAL PLANT RAW MATERIALS	PRODUCT	USES
I.	Centella asiatica Aloe sps	Cream	Wound healing Scar clearing
II.	Holarrhoena pubescens H. floribunda Jateorhiza palmata	Tablets sugar coated	Amoebic dysentery
III.	Chenopodium Ambrosoides Artemesia maritima	Vermifuge Tablets	Worms in Children Ascariasis Threadworm
IV.	Thevetia nerifolia Scilla maritima	Tablets	Cardiac insufficiency Arrhythmia
V.	Ocimum gratissimum Clove oil Cinnamom oil Mint oil Eucalytus oil	Balm 1. Liquid balm 2. In Paraffin	Headache Muscular pain
VI.	Gloriosa superba Seeds & rhizomes	Tablets or Capsules	Gout
VII.	Momordica balsamina Carica papaya	Tablets	Digestive
VIII.	Trichelia emetica Aloe sps	Cream	Skin Diseases
IX.	Herpagophyton Procumbers	Capsules	Arthritis & backache
X.	Milletia sps Derris sps Azadirach indica	Powder	Household isecticide

TENTATIVE LIST OF MEDICINAL PLANTS TO BE
INCLUDED FOR SURVEY AND EXPERIMENTAL
CULTIVATION TRIALS

	USE
Jateorrhiza palmata	Dysentery
Terminalia sericea	Diarrhoea
Momordica balsamina	Digestive
Trichelia emetica & T.Rendelotii	Diarrhoea
Gloriosa superba	Gout Uric acid disorder
Hypogophytor procumbers	Arthritis backache
Eupatoruim odoratum	Malaria
Carica papaya	p a p a i n - digestive
Uraria genus	Malaria
Thiiaacuim africanum	Asthma
Aloe species	F e m a l e diseases
Milletia sps	Insecticide
Commiphora serrata	Arthritis, D e n t a l problems
Holarrhoena bubescers	A m o e b i c dysentery
Chenopoduim ambrosioides	Intestinal Worms
Melia azadirac	Skin diseases
Centella asiatica	Wound healing
Urginea maritima	C a r d i a c troubles
Theretia nerifolia	"
Strophanthus sas	"
Catharanthus roseus	Exportable
Rau wolfia vonitoria	
Physostigma venenosum	Antihypertension
Ammi Visnaga	Glaucoma
	C o r o n a r y
	Vasodilator
Cymbopogon Validus	Exploratory
Datura sps	Colic pain

Need to mobilize expertise, experience and skills of multidisciplinary nature existing at different centres in Maputo

ACTIVITY CENTRES

**NATURE OF ACTIVITIES
AND PARTICIPATION**

1. G.E.M.T.
Ministry of Health in
cooperation with INIA

1. Collection and survey of traditional medicinal plants.
2. Responsibility of certifying botanical identity of those crude drugs which will form raw material for manufacture of tablets, capsules etc.
3. To cooperate with other project activity centres for supply and authentication of botanical living specimens of dried raw materials.
4. To maintain reference herbarium sheets, specimens of all project related plants.

2. Quality control laboratory
of ministry of health

1. To carry out quality control of herbal raw materials and extracts and dosage forms of herbal medicines within the limitations of available methods and knowledge of active principles.
2. To carry out essential oil standard methods of analysis, and cooperate with University Chemistry and Agronomy Centres under the project.

3. University Chemistry
Department (Dr. Pagule
Lecturer)

1. To carry out detailed phytochemical investigation on few selected plants chosen for manufacturing activity.
2. To carry out routine analysis of selected aromatic oils desired from agronomy activity under the project.
3. To develop laboratory scale technology for isolation of colchicine from *Gloriosa*.

4. Agricultural Faculty (Mr. Perreira, Engineer)

1. To develop a nucleus of agronomy activity centre at Bilene or Maputo.
2. To grow aromatic plants and develop agrotechnology and steam distillation technology at the farm.
3. To develop medicinal plant garden of about 200 species suited to South Mozambique.
4. To supply samples of essential oils and medicinal plants for analysis and for the manufacturing activities.

5. Manufacturing Centre, the place to be decided by Ministry of Health

1. To prepare aqueous and solvent extracts from herbs.
2. To manufacture medicines in modern dosage form from plant extracts.
3. Manufacture of tablets capsules and teabags.

PROJECT IN MOZAMBIQUE

JOB DESCRIPTION

Post Title: Chemical Technologist

Duration: 1.0 m/m

Date Required: May 1993

Duty Station: Mozambique

Purpose of Project: Fact-finding and preparatory assistance mission to assess the potential for the industrial utilization of medicinal and aromatic plants.

Duties: The expert will work in collaboration with counterparts to accomplish the following:

- 1) To assess the potential of medicinal and aromatic plants indigenous to Mozambique for industrial utilization.
- 2) To assess the progress in cultivation and post harvest treatment of medicinal and aromatic plants.
- 3) To assess the progress in the current production of herbal pharmaceuticals and essential oils and the specific needs for improvement of these.
- 4) To assess industrial and institutional infrastructure related to Medicinal and Aromatic Plants in the country, and the development of pharmaceuticals based on traditional preparations and essential oils.
- 5) To assess the current research capabilities and status of equipment, for natural product based drug development.
- 6) To assess the market potential and economic viability of industrial production of plant based products.
- 7) To prepare a priority list of plants for industrial utilization based on raw material availability, market potential and economic viability of their industrial use.
- 8) To prepare a comprehensive report containing the findings, conclusions and recommendations on the basis of the above, and to recommend therein the mechanisms and modalities of a technical assistance project including a draft project document containing the inputs in terms of equipment, training, expertise and other infrastructural requirements for the establishment of a processing plant and a R&D laboratory.

Qualifications: Industrial Chemist/Chemical Technologist with at least 10 years experience in industrial utilization of medicinal and aromatic plants and with experience in developing countries

Language: English

BRIEF DESCRIPTION OF MOZAMBIQUE**THE REPUBLIC OF MOÇAMBIQUE - FACTS:**

POPULATION: 16,3 MILLION, ANNUAL GROWTH 2,8%

RURAL AREAS: 80%, A MAJOR PART STILL WARFFECTED

ETHIC GROUPS: ca. 30 - MORE THAN 15 LANGUAGES

CAPITAL: MAPUTO (1 MILLION)

COASTLINE: 3000 KM

LAND AREA: 800000 SQ.KMS - 10 PROVINCES

SOME HEALTH SECTOR FACTS:

1. LEVEL: ABOUT 400 HEALTH CENTERS/POSTS

2. LEVEL: 25 GENERAL/RURAL HOSPITALS

3. LEVEL: 9 PROVINCIAL AND 3 PSYCH. HOSPITALS

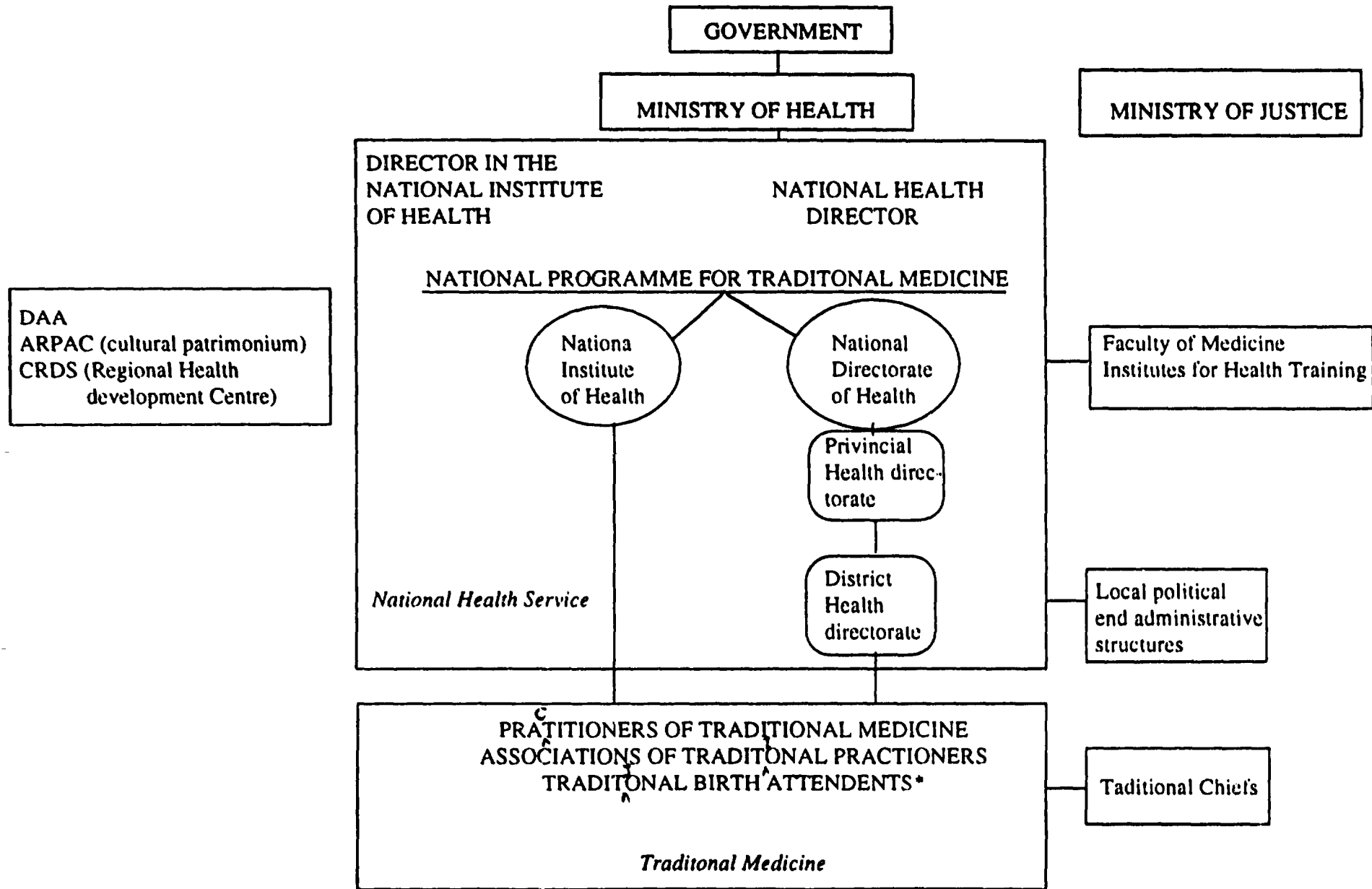
4. LEVEL: 3 CENTRAL HOSPITALS
(CENTRAL HOSP./MAPUTO - 2000 BEDS)

40% OF THE POPULATION HAVE ACCESS TO HEALTH SERVICES
CHILD MORTALITY (0-5 YEARS): 30 PER 1000 BIRTHS.

LEVEL OF ABSOLUTE POVERTY: 65%

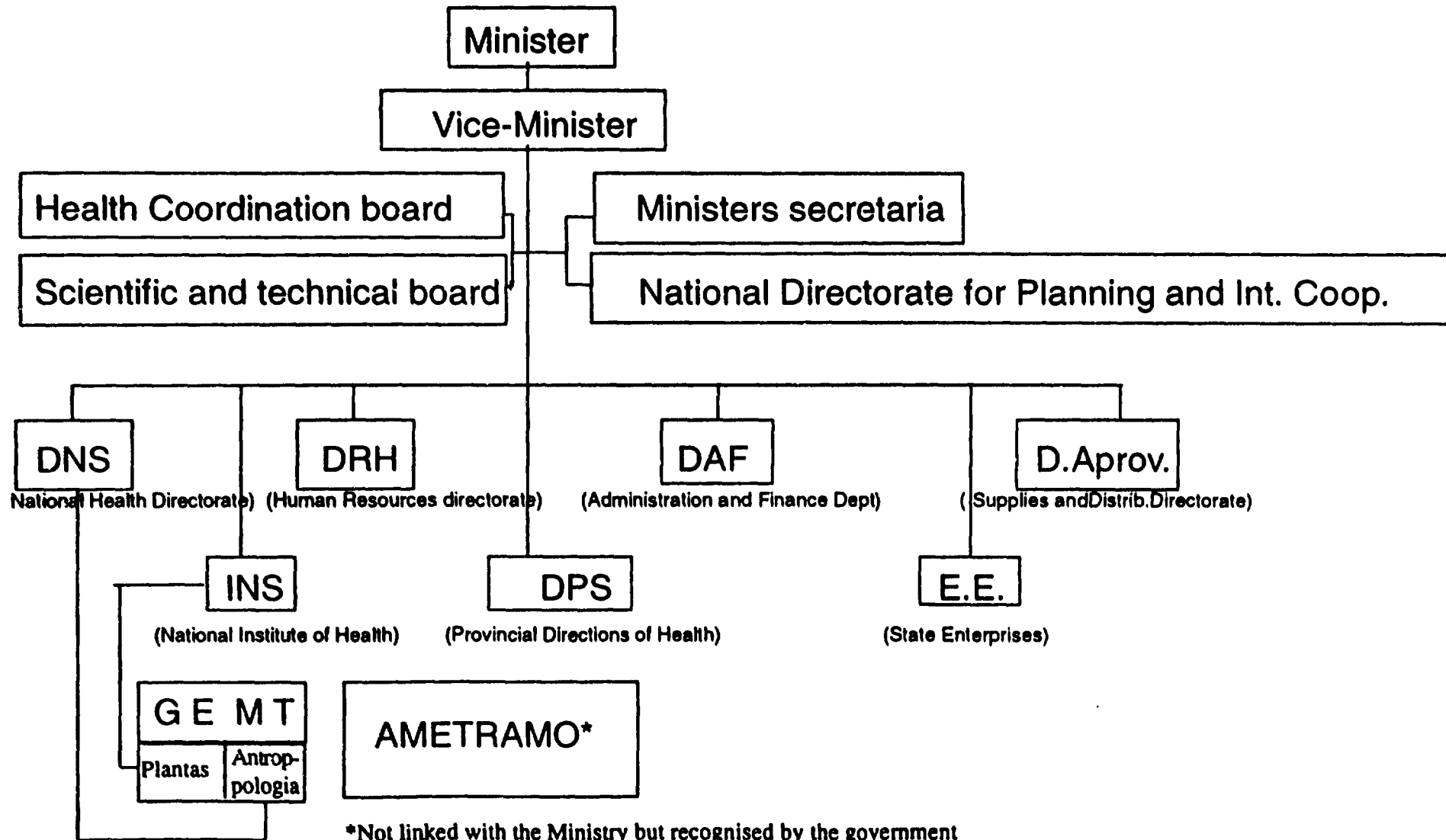
MOZAMBIQUE'S PHARMACEUTICAL SECTOR: (Government Initiatives)

1. C.T.T.F. - (The national drug committee), - 1975.
A consultative organ for the MOH..
2. The National Drug Policy was formed:
 - Generic prescribing of drugs 1977
 - Standardization of the drug market
 - Release of the national drug formulary
 - Establishing the Essential drug profile.
 - Reduced Number of Drugs: from 13000 to 300.
3. A Enterprise for drug imports, E.E. Medimoc (M.) started in 1977, departments in 3 regions. Via tendering, MEDIMOC obtained good prices compared to the rest of the 30 companies importing drugs. For this reason - MEDIMOC received the exclusive rights to import drugs in 1979.
4. A major part of the pharmacies were abandoned in 1975. A parastatal body, "FARMAC", took over in 1977. 12 private pharmacies continued it's function. Currently 58 pharmacies:
 - 19 private (15 in Maputo and Beira)
 - 39 "Farmac" (26 in Maputo and Beira)
 - The 8 other provinces has 1 - 3 pharmacies each.
5. The National Quality Control Lab. for Drugs: (1982)
 - Randomized analysis/control for Medicines
 - Cooperation with the WHO-Lab. at Harare
 - Quality assurance for "Medimoc drugs" - all over Mozambique.
6. The National Pharmaceutical Industry serves only - 3-4% of the market.
 - EMOFAR (parastatal), producing ORS-Salts
 - SWAMO (private), products for pharmacies and some for exports.
7. The pharmacy sector is small and limited. Less than 10 pharmacists and 100 pharmacy technicians serve 16,5 million people.



* Capacity strengthening programme for traditional birth attendents of the MHC dept Ministry of Health

ORGANIZATION DIAGRAM OF THE MINISTRY OF HEALTH



*Not linked with the Ministry but recognised by the government as a legal association that defines its own membership rules

PERSONS VISITED

1. UNIDO OFFICE

Mr. Italo D.C. Fraquelli
 Unido Country Director
 Mrs. Gabriell Ott JPO

2. MINISTRY OF HEALTH

- Ms. Laurinda Dias Diogo
 Pharmacist & Chief of Quality Control
- Mr. Geraldo Kirschner
 Former Consultant to GEMT
- Mr. Mulhovo, Botanist
 Department of Studies on Traditional Medicine
- Elizabeth Banqueiro
 Chief of Pharmaceutical Department
- Mr. Lucas Chomera Jeremias
 Joint Director National Health

3. TRADITIONAL MEDICAL PRACTITIONERS

- Tr. Dr. Aurélio Langa
 Outskirts of Maputo

4. ASSOCIATION OF PRACTITIONERS OF TRADITIONAL SYSTEM OF MEDICINE (AMETRAMO)

- Xai-Xai Province President
 Tr. Mrs. Sabina Nhaca
- Chokwé District President
 Mr. Mapulango Ernesto Maluleke
- Moamba District President & Practitioner at
 Moamba Government Hospital
 Mrs. Cecilia Cossa

5. GOVERNMENT MEDICAL IMPORT - EXPORT COMPANY (MEDIMOC)

- General Director
 Mr. Renato Ronda
 Mr. Mário José Sidónio

6. CENTRAL HOSPITAL MAPUTO, MEDICINE DEPARTMENT

- Dr. W. Wustling
- Dr. Manuel Raivoso
- Dr. Massingarella

7. DIRECTOR GENERAL

- FARMAC - Company for Distribution of Medical
 Supplies
 Mr. Joaquim Durão

8. NATIONAL DRUG QUALITY CONTROL LABORATORIES
- Chief Ms. Laurinda Dias Diogo
9. UNIVERSITY EDUARDO MONDLANE, MAPUTO
 - Chemistry Department
Head of the Department
dr. Felisimus Tocoli
dr. Felisberto Pagula, lecturer
 - Botany Department & Herbarium
Mr. Salomão O. Bandeira
Ms. Maria Celeste Mondego
 - Faculty of Agriculture
Mr. José Rodrigues Pereira Engineer
10. NATIONAL INSTITUTE OF AGRICULTURE RESEARCH (INIA)
 - Head of Botany Department & Museum
dr. Mário Calane da Silva
11. MAPUTO HERBAL DRUG MARKET
 - Casa Ada Company
&
Xipamanine Market
12. Dr. Rui Gama Vaz M.D.

Director National Institute of Health
Ministry of Health
13. Dr. Leonardo Simão

Hon. Minister of Health
Peoples Republic of Mozambique

**Backstopping Officer's Technical Comments
based on the work of C.K. Atal**

The consultant has assessed the current status of research and development on medicinal and aromatic plants in Mozambique in making his recommendations for development. The potential and the need to develop plant based medicines and essential oils has been stressed in his report.

The fact that there is no single institute for multidisciplinary work has to be taken into account in long term planning to set up a medicinal and aromatic plants product and process development centre. Any project at this stage requires effective coordination of activities to be carried out at different locations.

The draft project document has included all the necessary elements for a well planned project and funds for such a project should be considered on a priority basis as it will enhance the health care delivery system of the country.