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FACT FINDING AND PREPARATORY ASSISTANCE TO ASSESS
THE POTENTIAL AND PREPARE A PLAN OF ACTION
FOR THE INDUSTRIAL UTILIZATION OF MEDICINAL
AND AROMATIC PLANTS

UGANDA

Technical report: preparatory assistance mission *

Prepared for the Government of Uganda
by the United Nations Industrial Development Organization

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* This document has not been edited.

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ABSTRACT

The objective of this fact-finding and preparatory assistance mission from 16 August to 22 September 1996, was to assess the potential of medicinal and aromatic plants of Uganda for industrial utilization. The main areas to be assessed were: progress in cultivation and post harvest treatment; current production of herbal pharmaceuticals and essential oils; industrial and institutional infrastructure; market potential and economic viability and feasibility of establishing small scale production units in rural areas. Based on this mission, appropriate recommendations of technical assistance for the establishment of a processing plant and an R&D laboratory have been given.

Most of the 18 million population of Uganda depend on use of traditional medicines for their primary health care since the modern medicines do not reach the 90% of population especially in rural areas. There are over 100,000 traditional doctors and herbalists practicing traditional medicines based on the use of medicinal plants growing wild in the country. There have been no efforts made to cultivate any of these plants thus many species have already become extinct. Some steps have now been taken by individual traditional doctors for the cultivation of selected medicinal plants for their own use.

After visiting various institutes and holding discussions with various persons (Annex 9) connected with the use of medicinal and aromatic plants, the mission has recommended the need for organized cultivation of selected medicinal plants for use of traditional doctors and eventually for industrialization.

The Natural Chemotherapeutic Research Laboratory (NCRL) established by the Ministry of Health in 1965 has the requisite infrastructure and scientific expertise to evaluate medicinal plants being used by traditional doctors. However, they need to be provided expertise on modern methods of processing with an appropriate pilot plant facility.

A formulation development laboratory for processing of extracts into unit dosage forms is necessary for industrialization of these herbal medicines. Sufficient training in standardization and quality control methodology will also be required in order to make the products of international standards.

1. INTRODUCTION

Uganda is situated in a lofty plateau in the heart of Africa and shares common borders with Sudan to the north, Zaire to the west, Rwanda and Tanzania to the south and Kenya to the east. Lying under the tropical sun, the country has snow capped peaks, strangely shaped green hills, rich and fertile valleys, gurgling rivers and powerful rapids. It is a land of dramatic contrasts where one finds magnificent lakes, endless grass plains, humid and impenetrable gingles, treacherous swamps and dormant volcanoes.

Uganda covers an area of 241,460 sq.kms. of which about 43,942 sq.km. are open water and swamps. The country lies at an average altitude of 1200 m above sea level. The western limb of the Great East African Rift Valley runs along the greater portion of Uganda's Western Border Region. Associated with it are the Rift Valley lakes of the West, and the highlands culminating in the fabled Mountains of the Moon, the Rwenzori Mountains. Veiled in mist and occasionally revealing glistening glaciers and perpetual snows, the Rwenzori range rises to over 5200 m to become the third highest mountain in Africa (Annex 7).

In the north-east are the vast wide open spaces of Karamoja where rocky mountains interrupt the defiant plains. Mount Elgon is a vast extinct volcano rising over 4700 m in the east. In the south-west are the virunga volcanoes where rare mountain gorillas are found.

Looking over undulating emerald green hills in the south in Lake Victoria, basking in perpetual summer to claim second place among the largest fresh water lakes of the world. It is in Uganda that the immortal River Nile begins its 6,400 km long journey to the Mediterranean Sea. In this "Cradle of the Nile" are many breath-taking water falls and rapids, the most magnificent of which are the mighty Murchison Falls. It is here that the waters of the Nile force their way through a gap less than 7 m wide, thundering to the rocks 45 m below.

Despite the country's equatorial latitudes, the tropical climate is tempered by an average altitude of over 1500 m and much of the country enjoys a mean temperature of 25°C. The total average rainfall amounts to 125 cm, evenly distributed throughout the year, although there are heavier rains in March-May and August-November. Humidity in Uganda is generally low and except in the areas adjacent to the Sudan border and along the Nile Valley, the weather is rarely trying.

The population of Uganda is estimated at 17.8 million growing at 3% annually. The economy of the country is predominantly agricultural which accounts for 67% of exports. Almost 85-90% of the population is dependant on traditional medicines for their health care as modern medicines do not reach the rural population. The practice of traditional medicine was hindered at the beginning of the Protectorate era by the introduction of western medical practices which depend mostly on imported synthetic drugs. However the traditional medicines continued to be used because of strong cultural beliefs in the population and because of scarcity of the health care facilities. One tragic consequence of this change was that traditional medicine has been surrounded by secrecy and that the practitioners of the traditional medicine went undercover and assumed a low profile. The Natural Chemotherapeutic Research Laboratory (NCRL) of Uganda is currently trying to salvage this traditional knowledge for posterity. Such knowledge, not only can save lives and improve human productivity and well being, by supplementing the benefits of western medicine but can by so doing save valuable foreign exchange for the country.

The Ministry of Health of Uganda has adopted a policy in which the main emphasis is given to primary health care, with a view to make available to all people in the country effective and affordable drugs, including traditional medicines. Therefore, the Ministry is working closely with traditional practitioners in order to achieve the objective of the WHO programme "Health for all by the year 2000" by encouraging them to be members of the health teams at the local community level to participate in primary health care. The Ministry has also encouraged the traditional healers to form a National Association which should be

the nucleus through which the Government will regulate and supervise their practice. The Ministry will also arrange appropriate training programmes for traditional practitioners, such as birth attendants and bone-setters. The referral of patients between medical practitioners and traditional healers will also be open and acceptable. The Ministry has also decided to strengthen the NCRL to carry out applied research on such aspects as packaging and bottling of traditional medicines and to make land and funds available to grow and conserve medicinal plants being used by traditional healers.

There have been few systematic studies on the medicinal plants of Uganda mainly done by scientists of Faculty of Medicine of Makerere University. The NCRL has collected over 1130 species of medicinal plants spread over 336 genera from all over the country and preserved them in the Laboratory Herbarium, compiled all information on their usage from traditional healers and carried out ethnobotanical surveys in 26 districts, out of total 39 districts of Uganda. During the survey the researchers identified and registered the traditional healers, had dialogue with them concerning their practices, collected their views on the need for the formation of a National Association of Traditional Healers of Uganda and gathered data on the occurrence of these medicinal plants in their districts.

The office bears and active members of Herbalist Association meet at NCRL on every Wednesday and hold discussions with the Director on specific projects pertaining to the identity of plant species, their uses or any other matter relevant to the traditional system of medicine.

As a part of the Health Service Rehabilitation Project, the Ministry of Health of Uganda has already ordered procurement of necessary scientific equipments, analytical instruments, chemicals etc. for the Natural Chemotherapeutic Research Laboratory so that systematic evaluation of selected medicinal plants used by traditional healers are taken up at the earliest. With these in-puts, the laboratory will be operational within the next 2-3 months.

A lot of data on the use of medicinal plants by traditional healers have been collected and their identity confirmed by the NCRL. A list of 25 most commonly used herbs by these traditional doctors has been compiled and systematic scientific evaluation is under way. An important step to be taken is to organize cultivation trials of these plants so that farmers are given agro-techniques for systematic cultivation of plants for use by traditional healers in the first place. Only after sufficient commercial quantities of these plants are available, the industrial processing into extracts and formulation into modern dosage forms can be taken up.

2. INSTITUTIONS VISITED

Natural Chemotherapeutic Research Laboratory, Kampala

Soon after my arrival in Kampala on 16th August 1996, I had a meeting with the Director, Mr. N.K. Mubiru and discussed about the plan of the activities to be undertaken in order to accomplish the various objectives listed in the job description (Annex 1). Mr. Mubiru appraised me of the various studies which have been done in the laboratory since its inception in 1965 and the various factors which hampered the growth of this laboratory.

After attaining independence in 1962, the Ministry of Health in Uganda started functioning and practice of the traditional medicine in the country was recognized officially by the Government. In 1963, the Ministry of Health initiated collection of data on medicinal plants being used by various traditional doctors and herbalists spread all over the country. The Ministry felt a need for the creation of a Laboratory where the traditional medicines would be systematically evaluated in order that the population of Uganda are able to get good medicines duly studied for their safety and efficacy at the Laboratory. The Natural

Chemotherapeutics Research Laboratory was thus established in 1965 under the direct control of Ministry of Health and continues till to-date under the same Ministry. Dr. Moody was the first Director of the Laboratory and various sections of the Laboratories like Botany, Chemistry, Pharmacology and Animal house started functioning. Initially, there was a great resistance from traditional doctors in undertaking systematic scientific studies and did not co-operate with the Laboratory staff. The present Director, Mr. Mubiru joined the Laboratory in 1967 as Scientific Officer. In 1968, Dr. Moody left and the laboratory was headed by Dr. George Davidson who was there till 1972. During these years the laboratory had taken a concrete shape of working on various aspects of traditional medicines like their proper identification, systematic chemical analysis, their toxicity studies in laboratory animals and also pharmacological evaluation on animal models. The expert staff in each discipline had joined by then like Mr. A.B. Kakooko (taxonomist) Mr. C.A. Amai (Chemist) both of them still continue to be in the staff at present. Subsequently Ms. S.K. Apio (Botanist) and Dr. Grace Nambatya (Chemist) joined the laboratory and are currently working.

During 1971, after the change of Government, the Laboratory could not get any financial support and the scientific approach to systematic evaluation of traditional medicines suffered a great set-back. The present Director Mr. Mubiru has been in-charge of the Laboratory since 1972 and has been trying to mobilize funds for conducting the research work started earlier but because of non-availability of financial resources, the laboratories, could not pursue the work.

The various compounds isolated from medicinal plants at that time were further analyzed and characterized through the courtesy of scientist friends abroad.

During 1970's and 1980's, due to political instability, the NCRL thus suffered heavily in scientific pursuit and no research work was possible due to non-availability of solvents, equipments, and other consumables. They could not even collaborate with other departments like Chemistry and Botany of Makerere University since they were also in a similar situation.

The NCRL has well laid areas for different laboratories including an inflammable solvent store, a pilot plant area, an extraction laboratory facility, a chemistry lab with separate instruments area, a pharmacology lab with separate animal house facility, a plant taxonomy lab with herbarium, workshop area and an administrative block comprising of four rooms. However due to lack of resources and funds, the research staff, technicians and other administrative support could not be built up. This is now planned in view of renewed activities of organizing systematic studies on various plants.

It is since last few years after the present Government took charge that the NCRL has started getting rehabilitation in the form of some funds for resuming activities. The laboratories were in bad shape and needed repairs which have been done. Some funds were provided for procurement of few essential instruments and equipments, various solvents, consumables, and these are expected to be received within a month or so. Thereafter the research work on various priority areas will be taken up.

During the last couple of years, the NCRL has established close links and liaison with various traditional healers and herbalists to understand their problems and identify methods to solve these especially with regards to proper identity of various herbs, their availability, etc. A number of surveys in different districts of Uganda have been undertaken with financial support from African Development Fund and Nigeria Trust Fund and large number of traditional healers and herbalists contacted for ascertaining their list of herbs commonly used, help them in their proper identification and preservation in the departmental herbarium. They have identified the endangered and rare medicinal plants and are trying to organize cultivation of these through traditional healers themselves. Out of 39 district of Uganda 26 have already been covered and reports of 20 are published in the form of documents. Based on these surveys, about 2300 herbarium specimens have been prepared. A list of 15 most endangered species identified are given in Annex 2. A project on preserving these rare and endangered species has already started functioning last year through financial support of IDRC-Canada. List of 25 most commonly used medicinal plants by various traditional healers is given in Annex 3.

During 1991, a multi-disciplinary field mission and ethanobotanical and floristic research was undertaken by scientific staff of NCRL in association with other scientific staff members of the Organization of African Unity, Scientific, Technical and Research Commission based in Nigeria, which resulted in a useful publication entitled "Traditional Medicine and Pharmacopoeia-contribution to Ethanobotanical and Floristic studies in Uganda". This publication will serve as a useful tool to systematically cultivate medicinal plants being used regularly by traditional healers and herbalists.

A Project on Medicinal Plants and Bio-diversity has been approved by IDRC-Canada under Mr. Amai in November, 1994, with an overall objective to identify ways and means to improve the availability of some of Uganda's rarest and most endangered medicinal plants. This project has started functioning in association with Entebbe Botanical Gardens in June 1995 with the following specific objectives:

- (i) to identify local perception of these medicinal plants and their usage.
- (ii) to identify conservation problems associated with selected medicinal plants.
- (iii) to stimulate public awareness and to encourage local participation in conservation, propagation and sustainable utilization of these plants and
- (iv) to propose policy recommendations and implementation guidelines to maximize bio-diversity conservation in Uganda.

In this project, 11 field assistants work with 4 traditional healers and the project is targeted only towards the needs of traditional healers and involve opinion leaders in particular areas as well as teachers and students. 4 pilot areas have been identified in each region and it is proposed to organize a medicinal plant garden in each area. Specific training would be imparted to traditional healers for conservation and propagation of these medicinal plants. The Government of Uganda is supporting this by donating approximately 15 hectares land in Tororo Region for cultivation trails which used to be a forest reserve. Another 2 acres have been provided at Kabale and 7 acres in Lira region. The traditional healers have also provided small land areas of 0.5 acre to 1 acre in Luwero region for this purpose.

Makerere University, Kampala

The Makerere University Campus is the major Educational Centre in Uganda imparting training in all disciplines of Science, Arts, Medicine, Engineering and Agriculture/Forestry. The campus is very well developed with separate buildings to house different departments. I visited the departments of Chemistry, Botany, Pharmacy, Agriculture and Forestry and Pharmacology to ascertain whether any systematic research work is being pursued in the field of medicinal and aromatic plants.

Department of Chemistry

I had a meeting with Dr. S. Mukasa, Head of the Department who informed that due to lack of facilities especially in terms of instruments, no work is being done on any medicinal plant though many of the staff members especially Dr. Mpago, Dr. Kiremire and himself were very much interested in medicinal plant research. A number of undergraduate students are given small projects of research on medicinal plants, which do not involve any major instrumental analysis. Few of these project reports were available in his department. This department has also suffered due to political instability in the past and are now trying to re-build the research base with the support of some international organizations and funds provided by the University. They have an active collaboration of working with University of Norway.

Department of Botany

The Head of the Department Dr. R. Bukonya Ziraba informed me that some of the faculty members were undertaking research project on medicinal plants, but no work has been done on systematic cultivation aspects of any medicinal plant. He himself had undertaken some ethanobotanical surveys of Rwenzori

Mountain Forests in Bundibugyo, in 1991. Out of the 77 useful plant species recorded, 22 plants were used by traditional healers of the region for various medicinal purposes.

The Herbarium of the department has incorporated over 50,000 plant specimen and another 100,000 specimens have to be added and transferred to the new Herbarium building in a few months. Most of these 100,000 plants have been properly identified. Ms. Olivia Wanyana-Maganyi showed us round the Herbarium and how they preserve the plant specimens. Many of these are of medicinal value but they have not been segregated. The plants are categorized as per their Family. The Botanical Garden attached to the Department has many plants of medicinal value.

Department of Pharmacy

This Department was started in 1988 and for B. Pharm course, admit 15 students every year which involves 4 years of teaching course and one year training in Hospital (5-6 months) regulatory affairs (2 months), community pharmacy (2 months) and industry (2 months). After this the candidate has to sit for an examination for the award of membership of Pharmaceutical Society of Uganda. This is a legal requirement in order to practice any field of pharmacy in Uganda. The Pharmacy and Drugs act was established in 1970 and National Drugs Authority was set up in 1993. Dr. Richard Odoi Adona is the Head of the Department, who himself is a Pharmacologist. He appraised me of the various projects being pursued in the Department on medicinal and aromatic plants by his colleagues.

I also had a meeting with Dr. Olwa Odyek, Associate Prof. of Pharmacy who has been working on some of the selected medicinal and aromatic plants of Uganda. He is currently working on Khaya grandiflora (Meliaceae) as an anti-malarial agent being used by traditional healers. Other plants of interest are Vernonia amygdalina and Solanum acculeastrum. The essential oil bearing plants on which he is currently working are lemongrass, eucalyptus, ocimum spp, lemon peel and mentha sps. At present he has two PhD students and two M. Pharm students working on various medicinal plants. Two antibacterial plants Microglossia pyrifolia and Aspilia sps are under investigation.

Dr. O. Onegi, In-charge of Pharmacognosy unit has identified the following plants for systematic cultivation and propagation. Matricaria, camomilla, Lavendula angustifolia Digitalis, lanata, Cassia angustifolia, Linum sps, Podophyllum hexandrum, Ephedra sinica, Mentha arvensis. These plants have demand both in Uganda and export markets. Due to limited facilities, they have not been able to undertake systematic cultivation trials. The Department is in the process of acquiring 5 acres land for establishing a medicinal plant garden where cultivation trials would be undertaken.

Department of Pharmacology, Makerere Medical School- Kampala

I held discussion with Prof. W.W. Anokbonggo, Head of the Department regarding various studies being conducted in his laboratories on medicinal plant extracts and phytochemicals. In the past certain chemical constituents isolated from medicinal plants in the Chemistry Department were systematically evaluated for pharmacological activity. All these extracts and phytochemicals are first screened for their acute-toxicity studies in mice/rats. The Department is maintaining an animal house for their routine work comprising of mice, rats, rabbits and guinea pigs. They have a large capacity to house these, but because of lack of sufficient funds only limited number of animals are maintained. Their laboratories are poorly maintained because of lack of resources; all old equipments are either out of order or not in proper condition for use. The Department is trying to seek assistance from the University or other donor agencies for a specialized laboratory where general screening of medicinal plants could be undertaken systematically.

Dr. Ogwal-Okeng of this department has found two plant species viz. Secamone africana and Sckuhria pinnata as most potent antimalarial plants out of 10 plants species recommended and used extensively by traditional doctors of Uganda. A systematic study of the hydro-alcoholic extract against

Plasmodium falciparum was done after undertaking acute toxicity studies. Further clinical application in humans is being planned especially for extract of Secamone africana, since the plant extract kills the plasmodium directly. Similarly extract of Zanthoxylum zanthoxyloides has been found to be very effective as an anthelmintic on Ascaris lumbricoides using piperazine as standard drug for comparison. The current studies are now being focussed on anti-diabetic plants used by various traditional doctors.

The selection of plants for systematic study are taken up after survey of various districts and interaction with traditional doctors and herbalists of the region who prescribe these to the patients.

Uganda Herbalist's Association, Kampala

Discussions were held with Dr. Haji Lutakome Sentamu, Chairman of the Association. This was established in 1962, has 4640 members and there are 10 more associations of traditional healers and herbalists. The total number of herbalists in Uganda are estimated to be over 1,00,000 in number. In addition there are traditional practitioners who use spiritualism in addition to the use of various medicinal plants. All these associations are registered with the Government. While the various herbalists's association and traditional birth attendants get registered with Ministry of Health, the traditional practitioners get registered with Ministry of Culture. The membership is open to individuals on the recommendations of local chiefs or local councils of the district and subsequent interviews. The Uganda Herbalists Association is collaborating with THETA (traditional healers and therapies against AIDS) for systematic treatment of patients with Aids to relieve them of the secondary infections like diarrhoea, ulcers and other skin disorders, pneumonia etc. This Association has regular interaction with the Natural Chemotherapeutic Research Laboratory as well as the Ministry of Health Officials on various issues and problems faced by them in obtaining medicinal plants for treatment of the people. In view of several medicinal plants in getting extinct this Association is keen to undertake systematic cultivation of some of these medicinal plants and many of these have been grown in their home gardens for their use. As per the present Chairman (since 1983) the following diseases are commonly attended by these herbalists: diarrhoea, blood pressure, STD's, diabetes, skin disease, herpes, AIDS, infertility in women and impotence. The Association is keen to seek help in procuring various medicinal plants of their requirements from farmers who could grow these. They are also open to the idea of modern dosage forms of these plants/extracts. They are aware of the cases of adverse reactions in some patients who have been given medicines by unauthorized people who pretend to be herbalists and try to bring such cases to the notice of the Ministry of Health. They are also concerned about the poor hygiene maintained by some herbalists. The Association members collaborate with modern doctors in hospitals on specific diseases, now that the modern doctors are not averse to their treatment as was in the past.

The Chairman of the Association runs a clinic named Bwakedde Mpulira Traditional Clinic at Kampala, where he dispenses various crude herbs in powder form in 10 g plastic containers with coded labels. Some preparations are in liquid form in plastic bottles. The main problem faced by them is appropriate grading and packing, their preservation and training facilities.

At this clinic an average of 40-50 patients seek appointment per day and a regular card is maintained for each patient (specimen Annex 4). There are about 10 AIDS patients in their clinic who are getting regular treatment and are kept busy with some handcraft work. They use about 200 plants in different combinations for various diseases. The most commonly used 10 plants are as follows:

- Zimya
- Bukumvu
- Musilihame
- Embaluka
- Omukyusa
- Akaluaza

- Ekifluula
- Bwanda
- Ekifabakazi
- Egirikiti

Gwowonya Eggere Herbal Services Ltd., Masajja

I visited this centre which is about 10 km away from Kampala where I held discussions with the Director, Dr. Sheik Muhamood Kayira. He has a small factory attached to the centre where herbal products are processed for dispensing to the patients. This company is attached to NACOTHA (National Council of Traditional Healers's and Herbalists Association). The registration of this factory was done by Chief Factories Inspector, Uganda. In this Clinic also, proper records of each patient is maintained (Annex 5). The clinic maintains an inventory of several medicinal plants and many of these are grown in their garden in clinic premises and also in a 5 hectare plot in Rakai District. Trial cultivation of 97 medicinal plants have been initiated here. At this Clinic not only patients from Uganda seek treatment but several patients come from Kenya, Zaire and Tanzania. The average number of patients attending the Clinic are 25-35 and during winter season can go up to 50-70 per day. The common diseases for which they treat patients are malaria, stomach problems, diarrhoea, headache, AIDS symptoms, STDs, ulcers etc. The medicines are given as crude powders duly labelled with coded numbers, and a few in liquid form. The facilities for production are very primitive and lot of efforts for proper hygiene are needed.

Bulls General Agencies Ltd. (SALONPAS) Kampala

This is a leading manufacturer of herbal medicines in Uganda. They are running a clinic at Kampala where eight traditional doctors attend to the patients. Some of these are specialists e.g in dental problems, ladies problems etc. They also maintain records of each patient and medicines given to them in a proper format (specimen Annex 6). There is a separate dispensary for retail and wholesale medicines. They employ about 70-75 people in their organization, including the factory workers in the industrial area of Kampala. The Managing Director, Haji Twaha Lubowa took me round the factory and also showed me the new factory under construction at Bwaise Industrial Area about 6 kms away. They are trying to organize production on scientific lines and have recruited people specially for R&D and phytochemists and pharmacists and nurses. The company was started in 1930 although the factory could be registered only in 1972. They have a lot of demand for their products but are unable to meet the requirements because of lack of resources for expansion. They also feel lot of problems in obtaining medicinal plants in sufficient quantities and they have to advertise through local radio for their requirements of plants. They have also initiated cultivation of some of these plants. For this they have acquired 69 acres in one district and 41 acres in another district. Their present turn over is 200 million Uganda Shillings per year. They are popularly known as SALONPAS which is the trade name of a Japanese Co. - Hisamiton Pharmaceutical Co. Ltd., for which they are the sole distributors in Uganda.

The factory producing crude herbal powders/liquids is not in a very hygienic condition and they hope to overcome these problems in their new factory. Due to lack of resources they could not procure any machinery etc, although they have a grinder and aluminum vessels for the manufacture of liquid preparations (7 products). They use sodium benzoate preservative in liquid preparations. The crude herbs are stacked in gunny bags which need improvements for proper storage and handling.

Entebbe Botanic Gardens-Entebbe

This is one of the earliest research centres established in 1898 in Uganda to maintain and introduce various plants of economic importance. The gardens are spread on 35 hectares. The Officer in charge Mrs. Florence Ochola took me round the garden where a small nursery is also maintained for medicinal plants. The garden has mostly trees of economic importance including ornamental and fruits. Their thrust

has not been for medicinal plants as such but many of these are of medicinal importance being regularly used by various herbalists. About 200 plants species are growing in the garden. An IDRC project in collaboration with Natural Chemotherapeutic Research Laboratory on Biodiversity of medicinal plants is currently in progress in which 15 rare medicinal plants are being preserved.

Department of Forestry-Kampala

In order to find whether any policy has been framed for the utilization of minor forests produce of Uganda like medicinal plants, gums, resins etc., I held discussions with Mr. Frederick William Kigenyi, Deputy Commissioner for Forestry. This Department functions under Ministry of Natural Resources. In the Forestry Act of 1964, the local population in the vicinity of forests were permitted to collect minor forest produce for their own local consumption. It has now been stopped since many materials were taken out for commercial purposes. A large quantity of Prunus africana bark was taken out of the country and exported to France.

The Forest Reserves of Uganda are spread in 1.4 million hectares including National Parks. 3% of these are tropical high forests. Rest is woodland and mountains. From these woodland areas, the traditional healers and herbalist collect their requirement of medicinal plants. Now the Forestry Department is in the process of regulating the movement of minor forest produce as the indiscriminate collection has depleted the country of vast resources. Many species have become extinct and the department is concerned for this.

In the past few years Pine Resin tapping was permitted to a private enterprises viz Rosin Uganda Ltd., in Katugo Forests. But this tapping is not on a major scale. Gum arabic is being collected from Karamoja Forest Reserves by private entrepreneurs for export.

Uganda National Bureau of Standards-Kampala

This organization was started in 1989 under the Ministry of Trade and Industry. They have well laid laboratories and I held discussions with Ms. Hope Kamusiime. She has worked in the field of natural products both at master's level and undergraduate level in the Chemistry Department, Makerere University. Due to lack of resources, the Bureau could not function fully. They have laboratories for various sections like food, chemicals and environment, engineering, meteorology and have a Documentation Centre. They have a complete collection of British Standards and Indian Standards for various consumers goods. They sell standards to various manufacturers and have so far prepared 51 standards and have given Quality mark to 5 products. They have not undertaken any work on the development of standards for medicinal plant products since they feel that this would come under the purview of the National Drug Authority.

The laboratories are yet to be fully equipped with instruments/equipments though it has a gas chromatograph and a spectrophotometer in the chemistry laboratory. The microbiological testing for some food products is routinely done. They have a meager staff of 15 scientific personnel and 3-4 technicians. They have a collaborative research programme with the Agricultural Research Board for the analysis of dairy products. They are keen to collaborate with the Natural Chemotherapeutic Research Laboratory for the development of standards for various medicinal and aromatic plants and extracts/essential oils.

National Council of Traditional Healers and Herbalists Association (NACOTHA)-Kampala

This organization has been conceived as a wilful non-profit, non-government concern to alleviate jointly the native healers identities in Uganda under one forum, yet it combines the professionals and individuals activities for healthy national development. Started in 1992, NACOTHA aims at harnessing all available effort and know-how of native healers within or outside Uganda towards making all people healthy.

The major objective of this organization is to initiate, participate in and support efforts and activities already in practice, aimed at improving the levels of standards of health in Uganda.

The council's activities include, among others:

- Scientific meetings by the natural spiritual groups relevant to similar herbs differing in names and methods of cure in practice.
- Meetings of native healers without spiritual powers but talented in cure through inherited methods by practical know-how and adoption of experiences.
- Annual General Meetings embracing all types of native healers duly registered under the umbrella of NACOTHA and abide by its prospective.
- Assist in promoting training in high standard in health practices in Uganda.
- To produce and disseminate health information materials especially in support of Primary Health Care.
- Contribute to the development of national health policies relevant to Uganda's needs and resources.

I visited NACOTHA Cultural and Health Centre and held discussions with its Chairman, Dr. J.B.K. Musaasizi and other office bearers. About 160 Associations of natural healers and herbalists are members of this Association and about 200 shops practicing and dispensing herbal medicines and treatment are located at this centre. Some of the shops had their products duly labelled while most of these had no labels or uniform packing. Crude herbal materials are sold/dispensed in the form of whole plant material or powdered ones or as decoctions. The grinding of the herbs is done manually. All these doctors collect the herbs for their use themselves or through their trained personnel. Many of these doctors claim to have medicines for cure of secondary infections associated with AIDS. They try to document these through coloured photographs of patients with improvements made after using of their herbal medicines. They are keen to have plants and machinery to facilitate their work of powdering the herbs and process them into standard products.

This Centre receives and treats an average of 80-10 patients per day. The common symptoms dealt with are herpes zoster, diarrhoea, persistent fever, cough, skin rash, lost of appetite and STD's. It is observed that most patients who come there have already been to hospitals and other clinics and thus start treatment at a late stage. They also find lot of problems in getting medicinal plants which are depleting in their region and hence are looking forward to cultivate these.

The Council is expanding its treatment centres at Nakulabye, Katwe Jubilee Park, Mpigi, Masaka, Jinja, Mukono, Iganga, Rakai, Tororo, Masindi etc. The council has prepared a detailed research proposal for pursuing HIV/AIDS Research amounting to approx. 75000 US dollars and are looking forward to donor agencies for help in systematic research work on the subject. They require expert guidance in processing and packing of the herbal preparations as well as in proper hygiene and cleanliness aspects.

Kawanda Agricultural Research Institute (KARI), Uganda

The Institute is essentially involved in research activities of field crops and horticultural and fruit trees. However some field trials were done in the past on few essential oil bearing plants like citronella, geranium, lemongrass and mints by Dr. Mukumbe Zake. The crops of lemongrass and mints did not thrive well due to insect infection in this area and were taken to District Kabalore. Citronella and geranium cultivation practices on mass scale have been given to private entrepreneur. I visited the farms where both citronella and geranium crops were standing. An acre of farm under lemongrass cultivation was also visited. Dr. Imelda Kashaiza took me round the project farms spread in over 300 acres. A project proposal of National Agricultural Research Organization (NARO) may shortly commence at KARI field station on systematic cultivation practices of some essential oil bearing plants.

Guide notes on cultivation aspects of citronella have been prepared by KARI for commercial use. This crop was introduced in 1993 and grew well in the region with harvesting 4 times a year yielding 30 metric tonnes of grass which on distillation yields 130-150 kg oil per hectare.

A project aimed at empowering women to know that they form a lead in protecting food germplasm and herbs for health was recently completed by two scientists of KARI (Mrs) Debora A. Karamura and Mr. Andrew Kiggundu sponsored by Earthcare Africa, an NGO in Nairobi, Kenya. The final report of this project submitted in 1995 clearly showed how women lead in protecting food germplasm and herbs for health in the Sudano-Sahelian region of Uganda. These studies were carried out in Luweero district, once a war stricken region in Uganda with the aim of selecting areas which were remote and far from hospitals, representing a typical rural setup. Women in that region believe that every plant is medicinal in one way or the other. Based on the surveys and experiences of these women, the medicinal plants were identified and categorized as per their usage like fever (12 plants) cough and cold (8 plants) stomach-ache (8 plants) boils (7 plants), sore throat (5 plants), pregnancy, menstruation and syphilis (8 plants), measles, sores and wounds (5 plants) cardiac related diseases (6 plants) ear diseases (3 plants) toothaches, headaches, backache etc. (8 plants) anemia, vomiting (6 plants). Details of their use along with plant parts have been given. Similarly food germplasm and methods of their storage have been provided.

From this project, it is clear that women have been found to be essential to rural development programmes but they will be more effective if both men and women learn to work as part of a team accepting individual and joint responsibilities in order to bring a real change in the community.

Discussion were also held with Mr. Okaasm Opolot of Plant Quarantine Department at KARI who informed that a number of people approach them for export of some medicinal plants from Uganda in Form X and they issue the form only after evaluating the materials, their usage etc. In the past lot of bark of *Prunus africana* was exported to Europe and now it is not allowed. Similarly lot of neem plants (leaf, bark and seed) were exported last year to USA by various herbalists. Sometimes concoction of herbs is exported by herbalists, which the department is trying to prevent.

Department of Environment Protection, Kampala

I met Mr. Willy Kakuru, from National Wetland Conservation Programme who has done a survey of medicinal plants used in Bwindi National Park during 1988-90 under a project sponsored by Global Environment Facility (GEF).

This National Park is in a very remote place, south west of Uganda where the population has no access to modern medicines and the whole population depend on the use of medicinal plants for their ailments. The people have good knowledge of 98 plant species growing in the region which are used routinely. Steps have now been taken to conserve these plants and the Government has gazetted this area. Prominent plants of the area are: *Rytigynia* sps for stomach problems and *Bidens pilosa* for cuts/bruises. The recommendations of the project were oriented towards the following:

- (i) Proper methods of standardization of dosage
- (ii) Encourage people to document knowledge in standard format.
- (iii) Domestication of these plants
- (iv) Create awareness in people to use properly these plants and not witchcraft.

THETA Project, Kampala

This project started in April 1992 involves traditional healers and modern health practitioners together against AIDS. This project is funded by MSF, Switzerland and ODA (Overseas Development Agency, Britain) and some overseas agencies involved in AIDS research.

I held discussion with Dr. Donna Kabatesi, Project Clinician who is a modern medicine specialist. Along with four more modern clinicians are associated in this project and eight traditional doctors well known for their involvement in treatment of Aids related symptoms. An active collaboration of traditional healers and modern doctors at TASO Mulago Hospital at Kampala on AIDS symptoms reveal that the patients get faster relief in herpes zoster and chronic diarrhoea with herbal treatment. The studies compare the clinical evaluation of HIV positive patients treated with traditional herbal medicine with the control group treated with conventional modern medicines. Although the immediate objective of this study was clinical research, and long term goal is to initiate collaboration between medical doctors and traditional healers for the benefit of the community. The project report on completion of one year clearly reveals that some herbal preparations are useful in the treatment of chronic diarrhoea and herpes zoster in at least 40 patients treated.

National Drug Authority, Kampala

In order to find the role of Drug Authority in regulating practice of traditional medicines, I held discussion with Mr. Deus K. Mubangizi, Chief Inspector of Drugs. The National Drug Authority was commissioned in 1993. In the Drug Policy 1993, Section 3.I.G states that "Intensify Research in all types of drugs including traditional medicines". Section 6 of the policy states functions of Drug Authority and section 6G states that "Encourage Research and Development of Herbal Medicines". Keeping in view these requirements, an Ad-hoc committee on herbal medicines was formed to frame guidelines on the use of these medicines. These guidelines are yet to be received from the committee. In the absence of such guidelines, no progress has been made in regulating the practice of traditional medicines. A number of traditional doctors approach the National Drug Authority to permit them to open shops for selling the traditional medicines and medicinal plants.

In December 1994, a symposium was organized by Global Initiative for Traditional System of Health (GIFTS) from Boston (USA) with an objective to mobilize and sensitize the Government to enact legislation on the development and use of traditional medicines and integrate into health systems. The recommendations of this symposium are being studied by the Government for implementation.

Uvan Ltd., Kawanda

I visited the farms of M/s. Uvan Ltd on the outskirts of Kampala about 25 km away where the essential oil bearing crops like geranium (2 acres) citronella (2 acres) lemongrass (1.5 acres) and eucalyptus (about 1 acre) are grown. The nursery plants of geranium are raised through cutting in sand beds and then transferred to polybags before planting in fields. Lemongrass and citronella are directly sown in fields whereas eucalyptus is propagated through seeds. The Director, Mr. A. Schalala took me round the farms and informed that he is ready to cultivate these crops on a larger scale provided he finds sufficient markets. His farm has 450 acres and is also willing to cultivate potential medicinal plants provided the markets are established. He does not wish to work with traders. A plant for the production of vanillin has spare capacity of boiler and therefore wishes to introduce new crops. The vanilla beans are cultivated in the Lake region, which is most favourable for their growth where he has involved 200 farmers for cultivation and transportation to the factory. All the vanilla production is exported to USA (about 10 tons/year) and the demand is increasing. He processes 8000 kg of beans per shift.

The essential oil samples have been sent to French buyers for their evaluation and on receipt of the results and orders he will increase the acreage of these plants. It is only since last two years that he has undertaken systematic trial cultivation of these essential oil bearing plants from technical know-how of KARI.

St. Luke Ganda Traditional Medical Clinic and Research Centre

This Centre of Traditional Medicine which is very well known and popular in Uganda, is run by Bannakaroli Brothers Kiteredde. I had discussion with Brother/Father Anatoli Wasswa, Chairman of the Centre. About 15 years back this clinic was started in Kyotera District Rakai, about 110 miles away from Kampala. There a medicinal plant garden in 4 acres was started 10 years back where from they collect the plants for use in patients. They have recently acquired 300 acres in that area for extension of medicinal plant cultivation since many plants have started becoming extinct in the area because of the destruction of trees. At Kyotere Centre there is a 20 Beds hospital donated by CONCERN (an Irish Organization) since last 15 years. A small research laboratory is also there for systematic research in HIV/AIDS. 2 Doctors are regularly attending the patients there and one doctor (modern) at Kampala Clinic. Most of the patients who come to the clinic are treated for diabetes, high blood pressure, sickle cell, asthma, allergy, skin rash and HIV symptoms. They have established 13 centres in the country, and involve women in villages for collection of medicinal plants. They regularly impart training to these for proper identification of plants and each survey/collection is documented. One Brother is in USA studying modern methods of processing of medicinal plants into proper dosage forms which they want to adopt in Uganda.

Serefaco Consultants Ltd., Kampala

This company was founded in 1981 with the aim of developing a comprehensive approach to sustainable development for countries in East Africa. Serafaco is a multi-disciplinary consulting firm in the field of Agriculture, livestock and fisheries, forest and wood industries, medical sciences and services etc. They undertake systematic studies in various disciplines on pre-feasibility and feasibility studies, project identification, pilot plant projects, turnkey projects and project management. They also represent Fisher, UK for various instruments and apparatus for supply in Uganda. I had a meeting with the Chairman Mr. K.K. Chapaa, to ascertain the facilities for after sale service support for various instruments of Fisher. They have fairly well organized system of working in different disciplines and have trained engineers for looking after the break-downs in electronic equipments and other instruments, etc.

Mr. Chapaa welcomed the efforts of UNIDO in assisting NCRL for their research programmes. Mr. Chapaa said that his company would be willing to diversify into production of herbal formulation in Uganda provided the availability of raw materials are assured and their processing methods established. They have a close association with NCRL and are supplying them the latest instruments ordered like GC, HPLC, IR, solvents, pharmacological equipments, glassware, etc under the Health Services Rehabilitation Project of the Ministry of Health of Uganda, amounting to £ 343,058.

Medvet Laboratories Ltd., Kampala

They are the largest producers of veterinary medicines and poultry chemicals and feed, in Uganda since 1991. They produce of antibiotics like oxy-tetracycline soluble powder, sulphadimidine solution and some multivitamin preparation. Several disinfectants and antiseptic preparations are also manufactured.

They are planning to diversify into manufacture of pharmaceuticals and cosmetic preparations and have applied to the National Drug Authority for license. They are also interested in the manufacture of herbal formulations provided the raw materials are available in sufficient quantities and marketing support is provided. I had a meeting with the Director of Production, Dr. Lamech M. Kirinya and Pharmacist Mr. Anthony K. Nakibinge. The company is looking for assistance from the Government in providing a subsidized bank loan or some incentives which will help them in diversifying into new areas for the benefit of the country.

Joint Clinical Research Centre-Kampala

This Centre was established about six years back with a specific objective of carrying out scientific research on AIDS and AIDS related conditions including treatment and prevention since AIDS was recognized as a major problem in the country. The Government of Uganda has set up this centre with assistance of friendly countries and institutions. A number of projects on the integrated approach of medicinal plants/traditional medicines with modern medicines have been systematically evaluated at this Centre.

I was taken round the Centre by the Director, Dr. Peter N. Mugenyi, who showed me the reports of several successful projects involving use of traditional medicines in various ailments like tuberculosis, malaria, STD's and AIDS related problems. It undertakes systematic clinical trials of both modern medicines (new products) from European Pharmaceutical Companies and also traditional medicine of Uganda. The laboratories are very well equipped with latest instruments and equipments, clinical evaluation apparatus for hematology, immunology, microbiology and biochemistry.

Various collaborating agencies like Case Western Reserve University, Ohio (USA), University of California at San Francisco and Bernhart Noht Institute for Tropical Medicine, Hamburg (Germany), are closely monitoring the clinical trials of various products. A new extension block of the institute will be operational within next 10-15 days and has provision of indoor patient treatment for various AIDS-related diseases (16 beds). A new hospital with 100 beds is being added within the next couple of months. A few comparative clinical trial studies using herbal preparations and modern medicines revealed that the herbal preparations were very effective as anti-malarials and in STD's in relation to HIV-1 serostatus. Extended clinical trails are being planned for these herbal preparations. The centre has a close association with some traditional healers and based on their interaction and close scrutiny of the traditional medicine, these herbal preparations are identified. For consistent quality parameters help is sought from Kew Gardens at London for proper identification and processing of medicinal plants. Due to positive results obtained for various closely monitored clinical evaluations of herbal preparations, the studies are extended in other areas like skin diseases and tuberculosis.

SCIPHOGEN Ltd., Kampala

This company is one of the leading suppliers of chemicals, solvents, various laboratory equipments and instruments in Uganda. I visited the Centre and found most of the chemicals/instruments routinely required in laboratories for analysis etc. The Managing Director, Mr. R. Katumba-Bisaso informed that they keep sufficient inventory of commonly used chemicals/equipments. Any other specific items are procured against orders.

The other major suppliers are M/s Karanga International (U) Ltd., representing Jencous Scientific Ltd., and M/s SEREFACO representing Fisher, UK. They regularly supply to various departments of Makerere University, especially Chemistry Department.

Ministry of Trade & Industry, Kampala

I had a meeting with Ms. Jane Mambule, Principal Industry Officer of the Ministry (also UNIDO Desk Officer) and discussed about the industrial utilization of medicinal and aromatic plants. I briefed her about the meeting I had with various traditional doctors and some entrepreneurs who are interested in the cultivation of medicinal plants. She is also of the opinion that an organized cultivation of medicinal plants is the prime requirement before any industrialization, could be thought of. She feels that strengthening of the NCRL in processing of medicinal plants into standardized extracts should be initiated besides the cultivation programme which needs active collaboration of the Agricultural Institute. She is aware of the various ethanobotanical surveys conducted by NCRL in various districts of the country and based on the

regular interaction of NCRL with traditional doctors and herbalists, the medicinal plants for common use in Uganda could be taken up for systematic studies. Moreover, the integration of traditional doctors and modern doctors is growing as is evident from various joint projects especially in relation to AIDS research for which NCRL can play an important role. She also said that the traditional doctors are very secretive of their practices and are not divulging with information and this area of bringing confidence levels and sensitizing them is of utmost importance. I informed her that as a first step it is desirable to undertake systematic cultivation trials of selected medicinal plants for use of these traditional doctors who are open to this and have shown keen desire during my interaction with them. Most of these traditional doctors find it difficult to get medicinal plants for their use and have now realized their cultivation is the only answer.

She suggested to meet officials of Uganda Investment Agency and Small Scale Industries Association for their views on incentives for the industrialization of medicinal and aromatic plants in the country.

During my meeting with Ms. Mambule, I had the occasion of interacting with Mr. George Tabah, UNIDO Country Director, who happened to be there for some time and exchanged views with him.

Government Chemist and Analytical Laboratory - Kampala

This centre is the premier Government Forensic Laboratory under Ministry of Internal Affairs and is fully equipped to analyze mostly Drugs of Abuse like narcotics. Cannabis is a commonly abused drug being cultivated here and the laboratory also analyses contraband drugs seized by customs. They have the necessary instruments like gas chromatograph, UV spectrophotometer and TLC equipments. The chemists are suitably trained in the analysis of such narcotics in minor quantities. They also analyze some medicinal plants used for poisoning in rural areas, both accidental or intentional especially ones used for inducing abortion. Sometimes, certain herbs are eaten by villagers due to poverty or scarcity of food and manifest poisoning symptoms. These cases are referred to this laboratory. In the past Chief Pharmacist used to send pre-purchase samples of all medicines for chemical assay before import into the country but now the National Drug Authority responsible for the import of drugs get these tested mostly at Bureau of Standards Laboratories.

I had a meeting with Mr. John Robert Erone, the Chief Government Chemist, who also informed that a plant known as "Khat" introduced into this country from Somalia is used as a narcotic, though it has not yet been classified as narcotic. The abuse of this plant is especially with truck drivers and its action is milder as compared to cannabis. The shoots and leaves of this plant are chewed and has the tendency to get addiction.

Uganda Small-scale Industries Association-Kampala

This Association has over 700 active members at present, which started functioning in June 1979 with specific objectives of mobilizing of all SSI units in the country and to bridge the gap between the Government and the SSI. The other objectives and activities of Association are related to training opportunities, marketing, procurement of raw materials and also influence government policy on development of SSI's. The members belong to various industries like:

- (a) Metal Fabrication and Engineering
- (b) Foods and Beverages
- (c) Textile and Garments
- (d) Woodcraft
- (e) Leather products
- (f) Chemicals and Pharmaceuticals
- (g) Building materials, ceramics etc.

Mr. Barnabas M. Sekabembe, Executive Secretary of the Association informed that there was no member from traditional medicine manufacturers though some of these had affiliation to NACOSTHA. He appreciated the efforts of UNIDO and NCRL in bringing up the important issue dealing with health care of people. He felt that some of the members especially in the field of chemicals and pharmaceuticals would be interested in taking up the systematic manufacture of these herbal medicines provided raw materials are available regularly in sufficient quantities.

Musabody Construction Co. (U) Ltd., Kampala

This place is one of the major fabricators of equipments in Uganda, though it does not have expertise to make any major chemical processing units. It has a suitable workshop where they mainly fabricate crushers, juice extractors etc. They can make only containers and not the pilot plant type equipments involving vacuum or steam jacket fabrications.

Vivi Enterprises Ltd., Kampala

This organization is the largest distributors of pharmaceuticals in Uganda and are authorized stockists of several European and Indian pharmaceutical companies. It started operations in 1990 at a stage when there was no organized way of import and distribution of medicines in the country. Initially, they dealt with Generic medicines but now are representing companies like Sterling Health-Beecham, Glaxo Wellcome, Proctor & Gamble, IPCA, Nicholas, Sarabhai, Sun Pharma. They have recently bought over Uganda Pharmaceutical Company and are in the process of reviving this sick unit of the Government of Uganda. They are rebuilding the structure and are modifying the layout of the factory to meet GMP's. Suitable equipments are added to meet the production norms in tune with the capacities. I had a detailed discussion with Mr. Atul Asgaonker, General Manager. He felt that the company may be interested into manufacture of herbal medicines after few years when they would have done market surveys and feasibility studies of such medicines. They feel that in Kenya this field is fairly well developed and would be interested only after raw material position improves by systematic cultivation of important medicinal plants.

Kampala Pharmaceutical Industries (U) Ltd., Kampala

I met Mr. Aziz A. Damani, Managing Director and discussed about the possibilities of manufacture of herbal medicines. He is very keen on the manufacture of traditional medicines of Uganda as he realizes the potential but because of lack of expertise and non availability of medicinal plants in sufficient quantities, he has not been able to diversify. This production facility has a well laid out plant with a number of products manufactured as tablets, capsules, liquids, ointments and creams. The capacities are not fully utilized because of market limitations since most of the medicines are imported from India, Pakistan and some European countries. The production area is well segregated and all machinery are of international standards. The production is done as per GMP norms with lot of emphasis on quality control standards. They are keen to collaborate with NCRL so that some common traditional medicines of Uganda could be taken up for regular manufacture in modern dosage forms.

UNDP, Kampala

I had a meeting with Mr. Aeneas C. Chuma, Deputy Resident Representative, Mr. Haruna Kyamanywa, Asst. Resident Representative UNDP, Mr. Sam Ibanda, and Mr. Wilson Kwamya, Programme Officers, UNDP and Mr. Paul Tremmel, UNIDO Junior Professional Officer and discussed with them about the mission and my observations based on my visits to various Institutes and meetings with people concerned. They appreciate my views regarding support towards cultivation programme which is in my view the priority area without which industrialization would not be possible. At the same time support to NCRL for appropriate training in processing of medicinal and aromatic plants would be necessary so that the expertise is available by the time sufficient quantities of commercially grown medicinal plants are

available for processing. UNDP has been requested by the Government for support in different areas, viz. private sector industrialization, rural women involvement, etc. so that sustainable incomes can be assured. However, the critical areas have yet to be identified for support. It may be possible to link these programmes provided the Government includes traditional medicines on the priority list.

3. CONCLUSIONS

The Minister of Health, Uganda, had advised Mr. N.K. Mubiru, Director, NCRL, to interact with me closely on various aspects of the traditional system of medicine so that the practice could be organized scientifically. The Minister interacts very regularly with the Director and also with the Association Chairman of Traditional Doctors. I also had a detailed discussion with the Chief Inspector of Drugs, National Drugs Authority of the Ministry of Health who is preparing guidelines for the proper regulation of the traditional system of medicine. The Director of NCRL was authorized by the Minister of Health to finalize the priority areas of recommendations based on this fact finding mission of UNIDO.

During my discussions with the Deputy Resident Representative, Assistant Resident Representative and some field officers of UNDP, I was assured of linking the recommendations with the planned projects of UNDP, especially based on agro-development schemes, involving rural population including women, which will help in alleviation of poverty. The emphasis of the Government is on privatization for which the help and support of UNDP is being sought. This is also being focussed in my report. The private entrepreneurs have been identified who are willing to get involved in the manufacturing of traditional medicine.

While interacting with the principal Industrial Officer of the Ministry of Trade and Industry who is also the UNDO desk officer in the Ministry, I was assured of support from the Government on the recommendations of this fact finding mission which would ultimately lead to industrialization of this important health care segment.

After visiting various institutions and holding discussions with the persons connected with the use of traditional medicines, medicinal and aromatic plants, the following conclusions were drawn keeping in view the objectives stated in the job description.

Assess the Potential of Medicinal and Aromatic Plants Indigenous to Uganda for Industrial Utilization

Over 300 medicinal plants are commonly used by various traditional doctors and herbalists. A recent survey on traditional medicines and Pharmacopoeia published in 1995 has listed these plants as per their usage by various herbalists throughout the country. All these medicinal plants have been identified botanically and specimens preserved in the NCRL. All these plants are collected by the traditional doctors or their representatives from wild growing plants in various regions of the country. No steps have been taken so far to cultivate any of these which are required in substantial quantities. Thus many species have already become endangered and extinct for which steps have now been initiated for conservation. Apart from this, detailed surveys of various districts on specific use of different medicinal plants by herbalists have been undertaken and 26 out of 39 districts covered. Based on these surveys a list of 25 most commonly used medicinal plants by the herbalists has been drawn. Steps should now be taken to systematically organize their cultivation initially for use of herbalists and subsequently for industrialization. Involvement of traditional doctors and herbalists in the cultivation programme will be essential both for creating awareness among their members as well as for marketing of the produce.

In the past many of the medicinal plants especially Prunus africanum was exported to France and Spain in substantial quantities. This has now been stopped by the Government since the trees had started becoming endangered. Last year substantial quantities of Neem have been exported to USA. There are no records of export of any other medicinal plants although the authorities believe that many more plants of medicinal value are regularly exported by various individuals under different names especially to European countries.

As for aromatic plants no data is available on the systematic cultivation of these except for cultivation trials conducted by Kawanda Agricultural Research Institute two years back on citronella, geranium, lemongrass and Eucalyptus. Based on these cultivation trials, a private entrepreneur has initiated systematic cultivation of these aromatic plants successfully, in his farms in the same region. He has distilled these oil bearing crops and submitted samples to overseas buyers for their approval. He is awaiting their confirmed orders for oils so that he can extend cultivation on a larger acreage as per the demand. He does not have marketing expertise and is trying to identify direct consumers of these essential oils. If proper marketing support is available, these plants could be cultivated on a mass scale by villagers in the area and earn valuable foreign exchange for the country.

Assess the progress in cultivation and post harvest treatment of medicinal and aromatic plants

As mentioned above, no steps have been taken so far to cultivate any of the medicinal plants being used by herbalists. It is therefore essential that cultivation practices of selected medicinal plants in common use be initiated preferably in association with Agricultural Research Institute who have the required infrastructure for systematic growing of the plants. After the cultivation practices are established, the technology could be transferred to villagers for mass cultivation. This will prevent the plants becoming extinct. But it is essential that marketing techniques are developed especially in collaboration with traditional doctors and herbalist who require these plants at this stage. Industrialization will be possible only after consistent availability of these plants in substantial quantities is assured.

Similarly marketing expertise for essential oil bearing plants is essential before the mass scale cultivation of these plants is taken up by villagers. Some new potential plants could be identified for their essential oils as per the international demand and their cultivation practices initiated. Due to favourable weather conditions and fertile soil, Uganda has an advantage of growing a large number of medicinal and aromatic plants which should be taken up systematically to enable the country to earn valuable foreign exchange and help the rural population increase their livelihood by involving themselves in cultivation and related activities of post harvest technologies.

Assess the Progress in the Current Production of Herbal Pharmaceuticals and Essential Oils

There is no organized production of herbal pharmaceuticals in this country based on indigenous plants. The traditional doctors and herbalists dispense the medicines themselves in the form of powdered herbs to be boiled before use. Some of these preparations are dispensed in the form of crude decoctions. Therefore the production of herbal preparations in modern dosage form is yet to be initiated. There is no expertise available in processing of herbal plants into suitable extracts for use in modern dosage forms.

Similarly there are no essential oils produced in the country on commercial scale. Some efforts have been initiated by a private entrepreneur but still in trial cultivation phase. The potential is good and can be taken up on a commercial scale if marketing expertise is provided and proper consumers identified. After this is achieved, proper distillation equipments will have to be used in the fields itself in rural areas. To-day the distillation methods are rudimentary and need to be upgraded.

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

There is no industrial unit which can take up production of traditional medicines, based on standardized extracts nor is there any expertise available. Small production units at present prepare powdered crude herbs and put them in 10 g plastic containers and advise patients to boil these and take extracts of the powder. Similarly a few preparations available in liquid form has no consistency or proper filtration process adopted. Some of these products have labels and few have even date of manufacturing and expiry printed, but most of these are coded by numbers. Some of these private entrepreneurs are keen to organize the production on scientific lines with proper hygiene but due to limited resources, they are unable to undertake such ventures. Some of them have mechanical grinders for powdering but most of them grind herbs manually.

Most of the modern medicines are imported into the country and only two indigenous pharmaceutical companies produce few modern medicines viz Kampala Pharmaceutical and Medipharm Ltd. The Uganda Pharmaceutical Ltd., a Government of Uganda undertaking has recently been purchased by private entrepreneurs M/s Vivi Enterprises who are trying to restart the industry and adopt modern methods of manufacturing by adding new machines etc as per GMP norms.

A number of persons are interested in production of herbal preparations based on traditional medicines required by the herbalists but are unable to start because of non availability of consistent supply of medicinal plants and no expertise available for proper processing into modern dosage forms.

At present there is no major industrial requirement of essential oils locally but keeping in view the export potential some initial cultivation trials have been undertaken. Since marketing channels are yet to be established the mass scale cultivation and distillation in appropriate units have to be organized. Domestic demand for essential oils may be seen when major cosmetic manufacturing operations are started. Some soap manufacturers who need these are importing the oils for their use.

In terms of institutional infrastructure, the National Chemotherapeutic Research Laboratory was set up by the Ministry of Health long back in 1965 with clear objectives of systematic evaluation of medicinal and aromatic plants used by traditional doctors and herbalists. The various laboratories for studies on different aspects like proper identification, chemical analysis, instrumental analysis, pharmacological and toxicological evaluation were well planned including a pilot plant set-up for processing of herbs. But because of political problems, the expected growth and proper development of this centre received a setback. Now with the new government realizing the need for this important health care system practiced by 90% of the population, the Ministry of Health has decided to rehabilitate this centre with appropriate funds for resuming the research activities on traditional medicines. The basic infrastructure exists and some equipments, instruments and laboratory glassware and other consumables have been ordered and are expected to be received in the laboratory within the next 1-2 months. The Laboratory would then be fully operational. Senior scientific staff is already there except for a Pharmacologist post which is to be filled now. Some trainee chemists and technicians are also to be recruited, who are available in the country. However, the pilot plant facility and database for medicinal and aromatic plants need to be augmented as they are not covered by the project funds provided by the Ministry. This Laboratory needs to collaborate with Agricultural Research Institutes for systematic cultivation practices to be established for selected medicinal plants commonly used by the traditional doctors and herbalists. The laboratory has close interaction with various associations of herbalists and traditional doctors who interact with them on a weekly basis.

Only after a regular supply of medicinal plants is assured, the private entrepreneurs will take up organized production of these traditional medicines. By then the Laboratory staff would be fully trained in processing of medicinal plants into extracts, duly standardized and formulated including toxicity studies data.

For any specific requirements, the laboratory can seek assistance from Makerere University College of Medicine and Departments of Pharmacy, Chemistry and Botany.

For essential oil plants, marketing requirements need to be assessed before taking systematic cultivation.

Assess the current research capabilities and status of equipment for the natural products based drug development

As already described above, most of the research capabilities exist except for some advanced training to be given to the staff members in processing as per modern methods adopted in developed countries. Also appropriate training in standardization techniques and product development methodology needs to be provided. Most of the equipments/instruments, laboratory glassware and solvents/consumables are on order. Only pilot plant for processing medicinal/aromatic plants into extracts/essential oils need to be provided. Exposure to proper packing norms suitable for various dosage forms also needs to be provided. A process development laboratory for formulation development in appropriate dosage forms need to be set up fully equipped with essential laboratory scale equipments.

Assess the market potential and economic viability of industrial production of plant based products

No systematic market research has been conducted for any herbal product in the country. But herbal medicines are used by almost 90% of the population who do not have access to modern medicines especially in rural areas. There is a strong belief in herbal medicines by the population and the traditional doctors/herbalist of Uganda estimated to be over 1,00,000 in number regularly prescribe these medicinal plants either simply or in combination of several plants in the form of powdered mixture or decoction of herbs.

Recent systematic clinical trials of some of these medicines especially useful in HIV/AIDS related symptoms by various agencies in association with modern clinicians has proved beyond doubt the usefulness of the traditional medicines. But these have to be properly prepared scientifically. The findings of these comparative clinical trials have boosted the image of the traditional doctors/herbalists. Thus modern clinicians are willing to undertake studies on other important diseases like malaria, high blood pressure, STD's etc.

Prepare a priority list of plants for industrial utilization based on raw material availability, market potential and economic viability of their industrial use

Based on various ethanobotanical surveys conducted by the scientists of NCRL and the interaction with traditional doctors and herbalists, a priority list of 25 medicinal plants have been drawn which are commonly used by them for various ailments. These are currently collected from wild growing plants. The first step should be to organize systematic cultivation of these plants and supply to traditional doctors. Market potential today exists only through herbalist/traditional doctors. After systematic production of these medicines in modern dosage forms, the appropriate economic viability can be assessed. The plants identified are:

- Vernonia amygdalina
- Prunus africanum
- Momordica foetida
- Lantana trifolia
- Gynandropsis gynandra
- Bidens pilosa

- Solanum incanum
- Microglossa pyifolia
- Sida cuneifolia
- Aspilia africana
- Leonotis nepetifolia
- Fagara chalybeum
- Crassocephalum vitellinum
- Hoslundia opposita
- Cassia didymobotrya
- Acalypha villicaulis
- Draceana fragrans
- Maytenus senegalensis
- Indigofera arrecta
- Carissa edulis
- Securidaca longepedunculata
- Securinega virosa
- Acacia sps
- Cissampelos mucronata
- Ocimum basilicum

Study the feasibility of establishing small scale production units for essential oils and herbal preparations in rural areas

Various medicinal plants are collected in villages of Uganda by herbalist and traditional doctors or their representatives for use in the treatment of the people. These are dried and powdered and in some cases decoctions are prepared. But there is no organized industry where these could be properly processed mainly because the traditional doctors have been very secretive of their recipes and do not wish to document these. Moreover, because of poverty, no resources for industrialization, there has not been any attempt made for commercial scale processing. Therefore no effort have been made to cultivate any of these medicinal plants.

Similarly no efforts have been made to undertake market potential of essential oil bearing plants, especially for export and thus no aromatic plants have been identified although many grew well throughout this country, being blessed with very favourable climatic conditions and very fertile land throughout with appropriate rainfall.

Recently attempts have been made to systematically cultivate some of the internationally known aromatic oil bearing plants like geranium, lemongrass, eucalyptus and citronella. The oils are being evaluated by international buyers and the crops are expected to be cultivated on a much higher scale. However the expertise for proper distillation and its facilities are lacking. The area needs to be strengthened. Proper technology need, to be provided to these entrepreneurs in their fields, for proper distillation and appropriate distillation unit recommended for obtaining optimum yield of good quality oil which can compare with world standards.

4. RECOMMENDATIONS

About 85-90% population of about 18 million in Uganda depend on use of traditional medicines for primary health care dispensed by traditional doctors/herbalists spread all over the country. The Government has realized the importance of traditional medicines and are strengthening the NCRL for the systematic development of these medicines. The traditional doctors and herbalists are more open now on discussing

the problems they face in proper identification of plants used regularly and also are willing to share their knowledge. Many projects involving comparative clinical trials of traditional medicines and modern medicines especially in HIV/AIDS related symptoms are currently going on in various clinics/hospitals on protocols laid down by modern clinicians. These studies are conducted and closely monitored by these clinicians and regular interactions with traditional doctors/herbalists take place. The important aspect is to standardize these plants so that supply of these are assured and quality maintained. As on today only wild growing plants are collected and used. Now systematic cultivation trials of these medicinal plants need to be initiated so that the plants are protected from getting extinct and a continuous flow of raw herbal materials could be assured.

Appropriate agro-techniques for systematic cultivation need to be provided before the technology is transferred to villagers for mass cultivation. For this NCRL will have to work in collaboration with the Agricultural Research Institute which has the infrastructure of availability of land and other inputs required. Assistance will be needed for the procurement of planting materials and appropriate training in cultivation practices.

There is good export potential of some essential oils. Appropriate marketing expertise need to be provided so that these aromatic plants are taken up for mass cultivation and distillation. The country can thus earn valuable foreign exchange

In order to process medicinal plants into standardized extracts and subsequently develop into modern dosage forms, a multipurpose pilot plant (Annex 8) should be installed at NCRL. Essential oil distillation of aromatic plants could also be taken up for optimum parameters development so that the oils obtained meets international standards.

A Formulation Development Laboratory equipped with requisite plant and machinery for systematic product development into modern dosage forms is recommended. This expertise has to be developed before any industrialization can be thought of.

NCRL has conducted various surveys and collected useful information on use of various medicinal plants by traditional doctors/herbalists. This information need to be computerized and a database on medicinal and aromatic plants prepared. Appropriate support in this area is recommended.

In order to process medicinal plants, appropriate training has to be given to the scientific staff in different disciplines, like cultivation practices, extraction methods, chemical standardization techniques, formulation development and marketing techniques.

In order to attract entrepreneurs into systematic production of traditional medicines, some incentives should be provided by the Government so that these medicines are manufactured as per latest GMP norms, to meet the requirements of Uganda population and also for export.

ACKNOWLEDGEMENTS

I would like to express sincere thanks and gratitude to all the persons contacted during the fact finding mission in Uganda without whose co-operation the task would not have been accomplished.

I am grateful to Mr. N.K. Mubiru, Director Natural Chemotherapeutic Research Laboratory and his colleagues for their help and co-operation.

My sincere thanks go to Mr. A.B. Kakooko for his help in organizing meetings with concerned people and institutions.

PROJECT IN UGANDA**JOB DESCRIPTION**

- Post Title:** Chemical Technologist
- Duration:** 1.5 m/m
- Date Required:** August 1996
- Duty Station:** Kampala, Uganda
- Purpose of Project:** Fact-finding and preparatory assistance mission to assess the potential and prepare a plan of action for the industrial utilization of medicinal and aromatic plants.
- Duties:** The expert will work in collaboration with counterparts to accomplish the following:
- 1) Assess the potential of medicinal and aromatic plants indigenous to Uganda for industrial utilization.
 - 2) Assess the progress in cultivation and post harvest treatment of medicinal and aromatic plants.
 - 3) Assess the progress in the current production of herbal pharmaceuticals and essential oils.
 - 4) 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) Assess the current research capabilities and status of equipment, for natural product based drug development.
 - 6) Assess the market potential and economic viability of industrial production of plant based products.
 - 7) Prepare a priority list of plants for industrial utilization based on raw material availability, market potential and economic viability of their industrial use.
 - 8) Study the feasibility of establishing small scale production units for essential oils and herbal preparations in rural areas.
 - 9) Prepare a comprehensive report containing the findings, conclusions and recommendations and a plan of action and 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 an industrial production unit and a R & D laboratory for the processing of medicinal and aromatic plants.
- Qualifications:** A Pharmacist/Chemical Technologist with at least 10 years experience in industrial utilization of medicinal and aromatic plants and with experience in developing countries
- Language:** English

List of Endangered/Extinct Plant Species

	Plant	Main Uses
1.	Rawolfia vomitoria and Rawolfia oxyphylla	Anti-hypertensive epilepsy
2.	Warburgia ugandensis	Molluscicidal, expectorant malaria, anthelmintic.
3.	Spathodea companulata	Otitis media, jaundice diarrhoea.
4.	Prunus africanum	Fever, anthelmintic.
5.	Fagara chalybea	Fever, malaria, cough
6.	Steganotaenia araliacea	Diarrhoea, scabies, epilepsy, sickle-cell anaemia.
7.	Erythrina abyssinica	Dysentery, ulcers, abdominal pain, epilepsy.
8.	Dioscorea Sps	For sapogenin content
9.	Securidaca longepedunculata	Astringent, purgative malaria.
10.	Maytenus senegalensis	Backache, jaundice, infertility.
11.	Rhus vulgaris	Cough, diarrhoea, infertility
12.	Carissa edulis	Jaundice, backache, infertility.
13.	Dracaena steudneri	Cough, epilepsy, herpes
14.	Capparis erythrocarpos	Menstrual pain, infertility anaemia.
15.	Lonchocarpus laxiflorus	Abdominal pain, backache, malaria, dysmenorrhoea, pneumonia

List of Plants most commonly used in Uganda

Vernonia amygdalina

Prunus africanum

Momordica faetida

Lantana trifolia

Gynandropsis gynandra

Bidens pilosa

Solanum incanum

Microglossa pyrifolia

Sida cuneifolia

Aspilia africana

Leonotis nepetifolia

Fagara chalybeum

Crassocephalum vitellinum

Hoslundia opposita

Cassia didymobotrya

Acalypha villicaulis

Dracaena fragrans

Maytenus senegalensis

Indigofera arrecta

Carissa edulis

Securidaca longepedunculata

Acacia spp.

Cissampelos mucronata

Ocimum basilicum

Securinega Virosa

**BWAKEDDE MPULIRA TRADITIONAL CLINIC
 NEW NAKIVUBO MARKET
 OFF KISEKKA ROAD
 P.O.BOX 11988
 PLOT J 0011/J008
 KAMPALA**

CARD No......

NAME.....

VILLAGE.....

DATE.....

DATE	DIAGNOSIS		TREATMENT	REMARKS



**GWOWONYA EGGERE LTD
HERBAL CLINIC**

Kampuni eyegulidde erinya mukujanjaba
okuwonya endwadde zabuli kika mu Uganda
Africa nensi yonna okutwanra awamu

**MASAJJA VILLAGE BUSABALA ROAD
P.O. BOX 30982 KAMPALA Tel: 267221**

Reg. No.

Name(s).....

Village/ Street

Date:.....

Please bring the card every visit

DATE

REMARKS

DATE

REMARKS

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BULL'S MEDICAL CLINIC



P.T. Number _____

Patient's Name _____

Sex _____ Age _____ Tribe _____

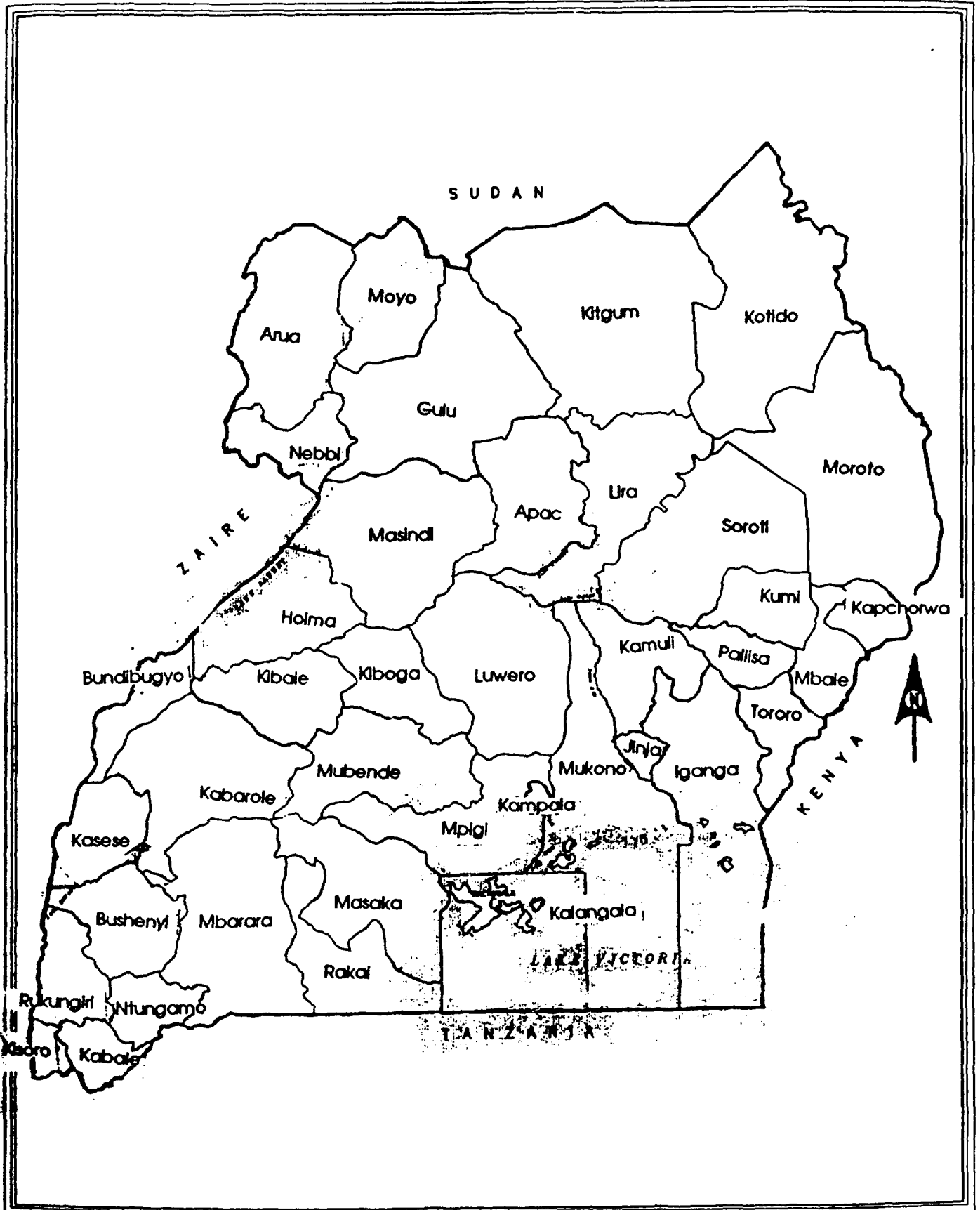
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Diagnosis _____

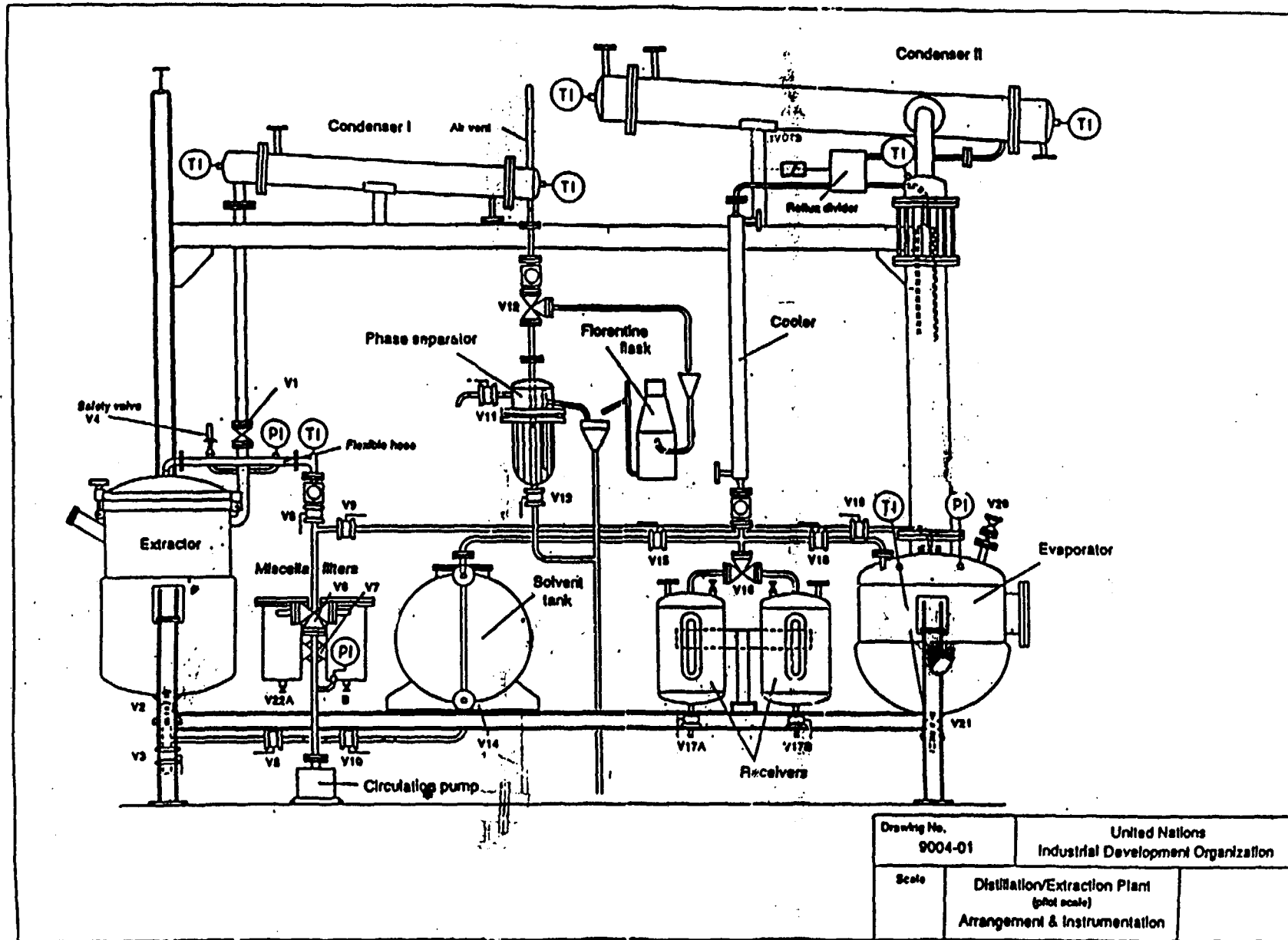
Date	Clinical Notes	Lab. Report	Treatment

Administrative Map of Uganda

Annex 7

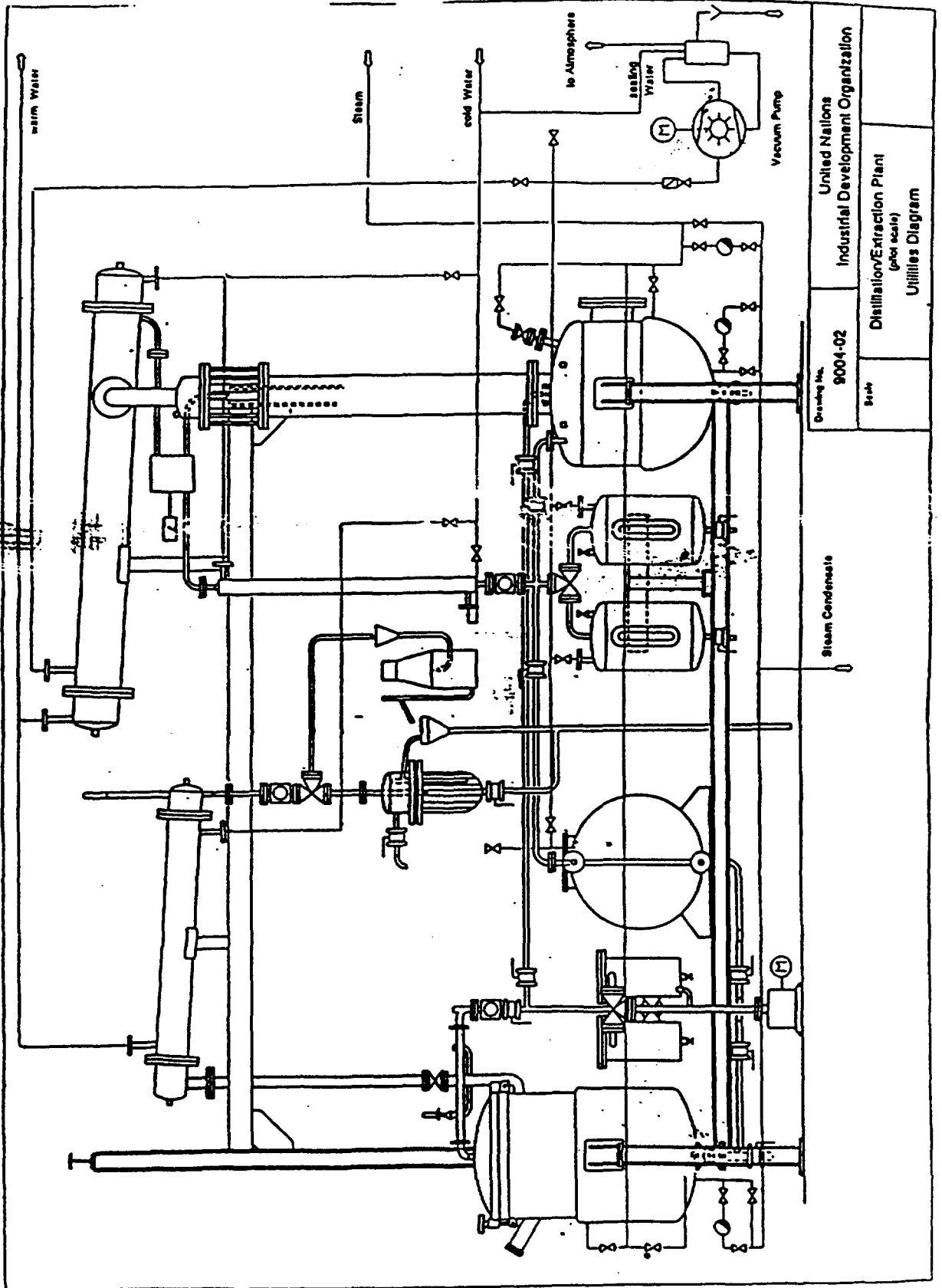


ARRANGEMENT AND INSTRUMENTATION OF POLYVALENT PILOT PLANT UNIT



Drawing No. 9004-01		United Nations Industrial Development Organization	
Scale	Distillation/Extraction Plant (pilot scale)		
	Arrangement & Instrumentation		

UTILITIES DIAGRAM OF PILOT PLANT UNIT



Drawing No. 9004-02	United Nations Industrial Development Organization
Scale	Distillation/Extraction Plant (pilot scale)
	Utilities Diagram

Persons Contacted

1. Natural Chemotherapeutic Research Laboratory, Kampala.
 - Mr. N.K. Mubiru - Director
 - Mr. A.B. Kakooko - Taxonomist
 - Mr. C.A. Amia - Plant Chemist
 - Ms. S.K. Apio - Botanist
 - Dr. Grace Nambatya - Chemist
2. Department of Chemistry, Makerere University.
 - Dr. S. Mukasa, Head.
3. Department of Botany, Makerere University.
 - Dr. R. Bukenya Ziraba, Head.
 - Ms. Olivia Wanyana-Maganyi, Curator
4. Department of Pharmacy, College of Medicine.
 - Dr. Richard Odoi Adoma, Head
 - Dr. Olwa Odyek, Associate Professor
 - Dr. B. Onegi, Pharmacognosist
5. Department of Pharmacology, Makerere Medical School.
 - Prof. W.W. Anokbonggo, Head
 - Dr. Jasper W. Ogwal-Okeng, Senior Lecturer
6. Uganda Herbalists Association, Kampala.
 - Dr. Haji Lutakome Sentamu, Chairman
7. Gwowonya Eggere Herbal Services Ltd, Masajja.
 - Dr. Sheik Muhamood Kayira, Director
8. Bulls General Agencies (SALONPAS) Ltd.
 - Haji Twaha Lubowa, Managing Director
9. Entebbe Botanic Gardens, Entebbe.
 - Ms. Florence Ochola - Curator
10. Department of Forestry, Kampala.
 - Mr. Fredrick William Kigenyi, Deputy Commissioner.

11. National Bureau of Standards.
 - Ms. Hope Kamusiima, Analyst.
12. National Council of Traditional Herbs and Herbalist's Association, Kampala.
 - Dr. J.B.K. Musaasizi, Chairman.
 - Dr. Kibuka Swakiryanga, Member
 - Dr. Mukisa Sabban, Member
 - Dr. Munyango Kyoraba, Member
 - Dr. Katerega, Member.
13. Kawanda Agricultural Research Institute.
 - Dr. Imelda Kashaiza, Nematologist
 - Dr. Mukumbe Zake, Horticulturist
14. Department of Environment Protection.
 - Mr. William Kakuru, Scientist
15. THETA Project.
 - Dr. Donna Kabatesi, Clinician
16. National Drug Authority, Kampala.
 - Mr. Deus.K. Mubangizi, Chief Inspector of Drugs
17. Uvan Ltd, Kawanda.
 - Mr. A. Schalala, Director
18. St. Luke Ganda Traditional Medical Clinic & Research Centre.
 - Brother/Father Anatoli Wasswa
19. Serefaco Consultants Ltd, Kampala.
 - Mr. K.K. Chapaa, Chairman
20. Medvet Laboratories Ltd, Kampala.
 - Dr. Lameck M. Kirinya, Director Production
 - Mr. Anthony K. Nakibinge, Pharmacist
21. Joint Clinical Research Centre, Kampala.
 - Dr. Peter N. Mugyeni, Director
22. Sciphogen Ltd Kampala.
 - Mr. R. Katumba-Bisaso, Managing Director

23. Ministry of Trade & Industry, Kampala.
 - Ms. Jane Mambule, Principal Industrial Officer
24. Government Chemist & Analytical Laboratory, Kampala.
 - Mr. John Robert Erone, Chief Government Chemist.
25. Uganda Small Scale Industries Association, Kampala.
 - Mr. Barnabas M. Sekabembe, Executive Secretary.
26. Musabody Const. Co (U) Ltd, Kampala.
 - Mr. Haji Musa Body, Managing Director.
 - Mr. Kibuuka Jolly, Administration Manager
27. Vivi Enterprises Ltd, Kampala.
 - Mr. M. S. Parikh, Group General Manager
 - Mr. A. Atul Vijay, General Manager
28. Kampala Pharmaceutical Industries Ltd, Kampala.
 - Mr. Aziz A Damani, Managing Director
29. UNDP, Kampala.
 - Mr. Aneas C. Chuma, Dy. Resident Representative
 - Mr. Haruna Kyamanywa, Asst. Resident Representative
 - Mr. Paul Tremmel, Programme Officer
 - Mr. Sam Ibanda, Programme Officer
 - Mr. Wilson Kwamya, Programme Officer