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**MEDICINAL PLANTS AND
PRIMARY HEALTH CARE -
An Expanded Partnership in Health***

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* The views expressed in this paper are the author's and do not necessarily reflect the views of the Secretariat of UNIDO. Mention of firm names and commercial products does not imply the endorsement of UNIDO. This document has not been edited.

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ABSTRACT

Traditional medicine, which is widespread throughout the world, has been recognized by the World Health Organization as an essential building block for primary health care. One of the chief contributions that traditional medicine has made to health is the discovery and use of plants of medicinal value. "Save Plants that Save Lives" is a call to safeguard this heritage. This paper outlines the role of medicinal plants in primary health care, focusing on action that national health and development authorities should take to obtain the maximum benefit from this natural resource. The paper also outlines WHO's strategies and reviews some activities undertaken by the Organization in this domain. The role that UNIDO, in collaboration with WHO, has played in this endeavour is also discussed.

1. INTRODUCTION

The discovery and use of sulpha drugs, as well as antibiotics such as penicillin, led to a dramatic decline in the popularity of medicinal plant use in therapy. Now the pendulum has swung to the other extreme. A resurgence of interest in the study of medicinal plants has been taking place during the last two decades. Also a considerable growth has occurred in popular, official, and commercial interest in the use of natural products. WHO and UNIDO have done their share to further awareness of the importance of traditional medicine to the majority of the world's population, and to promote increased rational exploitation for all present and future peoples of the world of safe and effective practices, including the use of medicinal plants.

Much, if not most, of what constitutes modern drugs owes its presence directly or indirectly to chemicals originally found in plants. In spite of this, the vast majority of plants have never been assessed pharmacologically for potential medicinal value, even those that are currently being used for medicinal purposes by indigenous people. Thus plants represent a largely untapped resource, but unfortunately, one whose very existence is being threatened by the same forces that are contributing to the destruction of the world's great forests. It has been estimated that no less than 60,000 plants, nearly 1 in 4 of the world's total, could become extinct by the middle of the next century, if present trends continue. The concern with medicinal plants therefore is intimately tied up with concern with the conservation of nature in all aspects.

Most of the plant variety in the world is to be found in the tropics and subtropics, which are the least developed areas in social and economic terms and most in need of more effective and lower cost health care. Thus the full exploitation of medicinal plants must be seen as part of the larger need for national socio-economic development, the improvement of health care systems and the preservation of a natural resource for sustained use in the future. It would, therefore, not be an exaggeration to say that what we do to meet the genuine aspiration and needs of the developing world, today, may be an important contribution to other measures intimately linked with the preservation of our global village.

2. POLICY BASIS

The Traditional Medicine Programme has its policy basis in a number of resolutions adopted by the World Health Assembly *and the Regional Committees. These draw attention to the reality that: (i) the majority of the world's population depends on traditional medicine for primary health care; (ii) the manpower represented by practitioners of traditional medicine is a potentially important resource for the delivery of health care; and (iii) medicinal plants are of great importance to the health of individuals and communities.

In addition, the Declaration of Alma-Ata (1978) recommended, inter alia, the accommodation of proven traditional remedies in national drug policies and regulatory measures.

In May 1988, the Forty-first World Health Assembly drew attention to the Chiang Mai Declaration of 1988 "Save Plants That Save Lives", and endorsed the call for international cooperation and coordination to establish a basis for the conservation of medicinal plants, and to ensure that adequate quantities are available for future generations (resolution WHA41.19).

It is worth emphasizing that the drive towards "Saving Lives by Saving Plants" is a part of WHO's wider concern for the environment. Medicinal plants are a small but important part of the biological heritage of the earth. Traditional societies, who are also rapidly vanishing, place a high value on this inheritance, which they express through their intimate relationship with and respect for nature. What is significant today is the growing recognition from individuals and governments of the industrialized world that these so-called traditional values are also valid for all people. Responding to the environmental and ecological deterioration and iatrogenic disasters that threaten health and development everywhere, a worldwide movement has arisen to awaken humanity to the dangers facing our planet and to help preserve its ecological integrity.

In 1989, a resolution was adopted (WHA42.43) that recalled earlier resolutions on traditional medicine and affirmed that together they constituted a comprehensive approach to the study and utilization of medicinal plants in health services. This resolution requested the Director-General to prepare a progress report for consideration by the forty-fourth World Health Assembly.

The World Health Assembly adopted resolution (WHA44. 34) on Traditional and Modern Health care, In 1991, which also recalled earlier resolutions on traditional medicine. The resolution was mindful of the fact that many species of medicinal plants are threatened by ecological and environmental changes, it specifically requests the Director-General:

- (1) to continue to recognize the high importance of this programme and to mobilize increased financial and technical support as required;
- (2) to ensure that the contribution of scientifically proven traditional medicine is fully exploited within all of the Who programmes where plant-derived and other natural products may lead to the discovery of new therapeutic substances;
- (3) to seek appropriate partnership with governmental bodies and non governmental organisations as well as with industry in implementing this resolution;

Thus, policies regarding traditional medicine, especially as they relate to medicinal plants, have evolved over the last 10 to 15 years from a somewhat passive recognition of their role in the provision of medical care to an active promotion of their identification, conservation and further exploitation - including industrialization of their production - especially in the light of the alarming loss of plant diversity around the world due to habitat destruction and unsustainable harvesting practices.

3. IMPORTANCE OF PLANT-DERIVED DRUGS

The success of any health system depends on the ready availability and use of suitable drugs on a sustainable basis. Medicinal plants have always played a prominent role in health care, and plant-derived medicines are used in self-medication in all cultures. It is within that context that WHO considers the important role that plants can play in the health of humankind.

Medicinal plants are commonly available in abundance, especially in the tropics. They offer the local population immediate access to safe and effective products for use in the prevention and treatment of illness through self-medication.

Furthermore, they are valuable for modern medicine in four basic ways: (i) they are used as sources of direct therapeutic agents; (ii) they serve as a raw material base for the elaboration of more complex semi-synthetic chemical compounds; (iii) the chemical structures derived from plant substances can be used as models for new synthetic compounds; (iv) finally, plants can be used as taxonomic markers for the discovery of new compounds.

Many examples of the benefits that have already been drawn from tropical plants can be provided. A number of essential drugs used in modern-day medical practice are plant-derived: atropine (anticholinergic), codeine (antitussic/analgesic), colchicine (antigout), digitoxin/digoxin (cardiotonic), vincristine (antitumour), morphine (analgesic), quinine/artemisinin (antimalarial), reserpine (antihypertensive), and physostigmine (cholinergic). Saponin extracts that are chemically altered to produce sapogenins necessary for the manufacture of steroidal drugs, until relatively recently, were obtained from extracts of neo-tropical yams of the genus *Dioscorea*. Cocaine derived from *Erythroxylon coca* provided the chemical structure for the synthesis of procaine and other related local anaesthetics. Many more well-known examples can be cited.

For the developing world, the use of medicinal plants based on local production also offers the possibility of reducing dependence on imported drugs requiring the expenditure of scarce hard currency, and at the same time promoting economic self-reliance and cultural acceptability of the medicine(s) offered. In the Region of the Americas, for instance, the Government of Costa Rica recognises the importance of plants, including medicinal ones, and has set aside 25 per cent of its land as forest preserves. The National Institute of Biodiversity of Costa Rica (INBio) has signed an agreement with the US firm Merck and Company Inc. by which INBio will conduct a programme in Costa Rica to provide Merck with plants, and environmental samples as well as the opportunity to evaluate these samples for pharmaceutical and agricultural applications. In return, and as part of the two-year agreement, Merck will provide INBio research funding annually plus certain start-up expenses, as well as royalties on the sale of any products that Merck ultimately develop from an INBio sample. Part of the research funding will pass directly to the Costa Rican National System of Conserved Areas for conservation of biological diversity in the field from which these samples are drawn. As an article by William E. Steven entitled "Shamans and Scientists Seek Cures in Plants" appearing in the New York Times of 28th of January 1992 emphasized "Everybody wins: the world gets new drugs, the pharmaceutical companies earn profits, and people in the tropics are justly compensated for their "intellectual property" and their collection efforts. In this way, the local people are encouraged to protect the source of the compensation and the forests are preserved, and thus able to fulfil vital ecological and environmental functions like stabilizing the planet's climate."

WHO has estimated that perhaps 80% of the more than 4000 million inhabitants of the world rely chiefly on traditional medicines for their primary health care needs, and it can safely be presumed that a major part of traditional therapy involves the use of plant extracts or their active principles. Data in support of an accurate assessment of the real value of such usage, either in health or in economic terms, are difficult to come by as detailed studies are costly and require scientific skills that are in scarce supply in most of the countries where medicinal plants are in active use.

Some years ago, an inventory was drawn up of medicinal plants used in different countries on the basis of national official publications (pharmacopoeia, formularies, relevant legislative texts) or published research results. For this purpose, literature from 91 countries and the classical texts on Ayurvedic and Unani medicines were consulted. More than 21,000 species of medicinal plants were included in the inventory. However, the compilation contains much replication since botanical verification was not attempted. Furthermore, the list provided only Latin binomials and the countries where the plants were used, but excluded data indicating what the plants were used for.

More recently, an attempt was made to list as many examples as possible of plant-derived drugs of known chemical composition used in primary health care or otherwise recognized as valuable non-prescription drugs. This list was compiled after studying selected contemporary national pharmacopoeias and the current global clinical literature, and the authors' collective background of knowledge of traditional drug use in various countries. A total of at least 119 distinct chemical substances has been identified. These embrace some 62 therapeutic categories and are obtained from only 90 species of plants.

An attempt has also been made to investigate these 119 substances by correlating the uses of the plants from which they are derived with the pharmacological activity of the isolated components. These studies are still continuing, but already some interesting correlations have emerged. Thus far, 31 of these substances could not be shown to be related in any possible way. It is believed that a more exhaustive study of the older literature may establish correlations, even in some of these cases. Nonetheless, it is already possible to say that at least 75% of these substances may well have been discovered as a result of chemical and pharmacological studies of plants used in traditional medicine.

NAPRALERT, which is the acronym for a computerized database, has documented ethnomedical uses alone for about 9200 of 33,000 (ca 28%) species of monocots, dicots, gymnosperms, pteridophytes, bryophytes and lichens. In the People's Republic of China, it is reported that 5000 of 35,000 (ca 14%) species of plants still growing are used as drugs in Chinese traditional medicine. Taking the range of 14-28% as being an indication of the percentage of plants that are used as drugs, and accepting the conservative number of 250,000 higher plant species on earth, one can estimate that 35-70,000 species have at one time or another been used in one culture or another for medicinal purposes.

Turning to the economic value of medicinal plants, data are available from only a few countries. For example, in a report of a WHO meeting, the annual production of traditional plant remedies in China was valued at US\$ 571 million, and countrywide sales of crude plant drugs at US\$ 1400 million in 1985. In the USA, 25% of all prescriptions dispensed from community pharmacies from 1959 to 1980 contained plant extracts or active principles prepared from higher plants, estimated in 1980 to have cost consumers more than \$8000 million.

A survey of the current status of the use of medicinal plants in selected countries, mainly industrialized ones, was undertaken by the World Federation of Proprietary Medicine Manufacturers (WFPM) in 1990 on behalf of WHO. The results show that the number of individuals using medicinal plant remedies is large and on the increase, especially among younger people. The population studied uses plant-derived medicinal products responsibly, for daily therapeutic indications such as common cold, insomnia, indigestion, loss of appetite and nervous tension. In spite of these figures, pharmaceutical concerns in industrialized countries have little or no interest in exploring plants as sources of new drugs. Serious consideration is, however, given by scientists to the study and use of plants in China, Germany, Japan, and to a lesser extent in India.

4. THE SELECTION AND USE OF MEDICINAL PLANTS IN HEALTH CARE

Alma-Ata opened the door for a dialogue between what had previously been two distinct systems of health care, the traditional and the modern. From the early stages of this dialogue it had been stressed that the endorsement at Alma-Ata of traditional medicine, including its practitioners and its remedies, must work its way through a process of eliminating unsafe practices and promoting only what is both safe and effective.

To this end, WHO collaborates with Member States in their review of national policies, legislation and decisions on the nature and extent of the use of traditional medicine in their health systems. This includes assisting ministries of health in establishing mechanisms for the introduction of traditional remedies into primary health care programmes, in assessing safety and efficacy, and in ensuring adequate supplies and the quality control of raw and processed materials.

Safety should be the overriding criterion in the selection of herbal medicines for use in health service systems. Procedures for screening, chemical analyses, clinical trials and regulatory measures should be applied to the various groups of products, namely:

**wholes or parts of plants;
crude extracts; or
pure phytochemicals.**

Whereas a less stringent criteria procedure could be applied to the first two groups (especially in cases of long-standing usage), the procedure applied to the last group should be identical to that for synthetic drugs. In addition to the need for descriptive monographs on plant material, there is also occasionally a need for reference substances.

As part of the Organization's efforts to establish the safety of medicinal plants, a series of WHO/DANIDA interregional workshops were organized on appropriate methodologies for the selection and use of traditional remedies in national primary health care programmes (Bangkok, 1985; Kadoma, Zimbabwe, 1989). These workshops addressed problems of safety and efficacy involved in the use of traditional remedies, including related issues of standards, stability and dosage formulation.

The programme is collaborating with other interested and supporting agencies and with the 27 WHO collaborating centres for traditional medicine, of which five are located in the African Region, three in the Region of the Americas, one in the Eastern Mediterranean Region, three in the European Region, three in the South-East Asia Region, and twelve in the Western Pacific Region.

Other examples of steps being taken to ensure safety are the workshops held in connection with both the Fourth and Fifth International Conference of Drug Regulatory Authorities, co-sponsored by the Ministry of Health and Welfare of Japan, and the Ministry of Solidarity, Health and Welfare of France and WHO. These workshops acknowledged that traditional medicines play an important part in health care - particularly in informed self-medication - in many countries, developed as well as developing. The consensus was that truly traditional practices are more amenable to influence through education and training than by statutory control. These workshops concentrated on the exploitation of

traditional medicine through over-the-counter sales of labelled products on a commercial basis, and addressed the need for legislation, quality standards, and information. To this end it was proposed that guidelines should be drawn up for eventual adaptation by countries.

Following a series of informal meetings, guidelines were finalized at a recent WHO Consultation to Review the Draft Guidelines for the Assessment of Herbal Medicines, which was held in Munich, Germany, in 1991.

The guidelines address the following points:

1. Pharmaceutical assessment

Crude plant material
Plant preparations
Finished product
Stability

2. Safety assessment

Toxicological studies
Documentation of safety based on experience

3. Assessment of efficacy and intended use

Pharmacological activity
Evidence required to support indication

4. Combination products

5. Product information for the consumer

6. Promotion

WHO has circulated these guidelines widely to drug information officers in countries. These are senior government officials designated by their ministries to assist WHO in its task of promoting the exchange of information on drugs. Their constructive suggestions have been incorporated into the final version. They

were presented in Ottawa (1991) to the 6th International Conference of Drug Regulatory Authorities who adopted them as a recommendation to regulatory authorities for action. The final guidelines have been circulated for adaptation by countries to meet their particular circumstances and needs.

For individuals, families and communities in both the industrialized and developing countries, the proper use of medicinal plants plays a very important role in self medication, thereby reducing demands on the precious time of the already overtaxed health professionals. In order to assist Member States in further developments of their medicinal plants resources WHO has developed guidelines for the assessment of herbal medicines. These guidelines highlight the important issues that need to be addressed by countries when considering licensing of manufactured herbal medicines. They include such topics as combination products and preventive indications of medicinal plants etc. It should be pointed out that WHO is not a supranational body, consequently there can be no deadline within which countries would have to adopt the guidelines for their use. While the guidelines do not pretend to be the final authoritative statement on the subject, nevertheless, they represent a synthesis of the collective views of interested individuals and national representative groups. They could therefore serve as building blocks for the furtherance of other efforts on this topic.

The guidelines can be regarded as the first *official* guidance for health authorities, industry, academic community and other interested parties for the assessment of herbal medicines and can, later on, be adopted for the assessment of other natural products.

5. AGRO-INDUSTRIAL DEVELOPMENT OF MEDICINAL PLANTS

The WHO Programme on Traditional Medicine is now part of the WHO global programme concerned with drug management and policies. The key reasons for this are: first, the recognized importance of plants as sources of products of medicinal value; and second, the recognition that an adequate technological infrastructure is required for this potential to be realized. The specific technologies needed are found mainly in industry, particularly the pharmaceutical industry. Where countries are in the process of building up such an industry, the natural resources that they possess in the form of medicinal plants should be correctly exploited to their fullest potential⁽¹⁸⁾.

The large number of plants that have not been studied represents a potentially

rich resource for the developing world to explore. This is where modern technology can play a useful role. It took several decades for the drugs previously mentioned to emerge from initial studies to become included in the modern pharmacopoeia. Today's technology can speed up this process tremendously.

The application of modern scientific methods in the selection, cultivation, and manufacture of proven herbal medicines is an appropriate way to transform traditional trade into modern industrial practice. In this connection, the Chinese and Japanese models, along with other models that may be identified, could be considered by other countries when developing their own systems. Industrial production would require the adoption of appropriate agro-industrial technology to obtain adequate quantities of medicinal plants of standard physical and chemical quality. There is thus a need for the large-scale cultivation of such plants and for attention to be devoted to their genetic improvement.

The WHO Traditional Medicine Programme has outlined two basic strategies for the agro-industrial production and use of medicinal plants of standardized pharmacologically active constituents: (i) the application of known and effective agro-industrial technologies to the cultivation, processing and manufacture of herbal medicines, and (ii) the establishment of a large-scale distribution network to make available seeds or plants to individuals and communities, to be cultivated in home gardens for consumption as infusions for selected prevailing health conditions.

For many developing countries it may be of vital importance for the utilization of medicinal plants in the health services to be placed on an "industrial" basis to ensure that adequate funding is made available to support the technical and scientific activities outlined in the other sections of this paper. Furthermore, as indicated earlier, governments promoting greater self-reliance can look to the local manufacture of pharmacologically active products as one means for achieving this cultural and economic goal.

Thus, WHO is working closely with UNIDO to realize the industrial use of medicinal plants, including herbal remedies, and ways to promote technical cooperation among developing countries in the development of the plant-derived pharmaceutical industry. Various avenues are open for such a development. For example, commercial arrangements could be sought by developing countries, which would include a strengthening of local technological skills and capacities. A natural starting point would be the strengthening of data gathering and analysis capabilities required for economic mapping of medicinal flora with a view to industrial applications. If the economic potential is great enough, steps could be taken to establish data centres on medicinal plants and plant-derived products at national or regional levels to facilitate the exchange of information. Such information systems could be part of a wider information system related to health, the environment, economic development or other sectors, as appropriate.

6. INFORMATION EXCHANGE

The exchange of information is a vital WHO role, not only in traditional medicine but in virtually every aspect of public health. *The International Traditional Medicine Newsletter*, published by the Chicago Collaborating Centre gives individuals and institutions a valuable means of exchanging information and of keeping in touch with developments in other parts of the world. As mentioned earlier, the Centre also has developed and maintains a computerized database on the medicinal uses of natural products, which includes ethnomedical, pharmacological and phytochemical profiles, called Natural Product ALERT (NAPRALERT). Through a special arrangement with the WHO Traditional Medicine Programme, information is available on request and, in the case of developing countries, without charge. This centralized, computerized service makes possible a great saving in time, effort and financial resources.

In recent years there has been a surge of public interest in the use of traditional remedies and practices, especially herbs and other plants. The subject has received extensive coverage in the press and lay publications, much of it uncritical and unverified, and some even dangerous. Therefore, ensuring safety in the use of medicinal plants and the remedies derived from them requires not only control measures but also a substantial effort in public information and professional education.

7. RESEARCH AND DEVELOPMENT

Clinical and scientific investigations as rigorous as those required for modern medicine are also needed for the study of medicinal plants to be used in the health services. National establishments engaged in research on traditional medicine continue to be identified and contacted by WHO. Within the context of an overall health research strategy, such centres are encouraged to investigate the safety and efficacy of many of the remedies used by traditional health practitioners.

For viral diseases or syndromes, such as AIDS, for which no vaccines are available, therapeutic agents capable of selectively blocking the replication cycle of the virus are clearly needed. One recent development in the Traditional Medicine Programme is the investigation of traditional medicinal plants considered to have anti-viral properties or activity against opportunistic infections occurring in patients with AIDS.

A number of natural products have demonstrated an anti-HIV or anti-reverse transcriptase activity *in vitro*; for example, castanospermine, derived from the Australian chestnut tree, and glycyrrhizin, derived from liquorice. Such natural products have been tested in limited clinical trials in some countries. A meeting was organized in Geneva, in 1989, in collaboration with the biomedical research unit of the WHO Global Programme on AIDS, to consider the systematic and scientific assessment of potential anti-HIV activity for further clinical evaluation.

Medicinal plants that have been used in the prevailing systems of traditional medicine in different geographical areas as anti-infective agents are being systematically collected in order to evaluate their anti-HIV potential. This is a collaborative project with the WHO Collaborating Centre for Traditional Medicine at the University of Illinois, USA, which has been designated as the Coordinator for the preparation of primary extracts for bioassay. The extracts are then sent to the WHO Collaborating Centre for AIDS at the National Bacteriological Laboratory in Stockholm for anti-HIV testing *in vitro*. Some 200 extracts representing 100 plant species had been submitted to this laboratory for evaluation by the end of 1990. Of the 200 extracts, 24 have been found to be active and of great interest because of their low toxicity. The 24 active extracts represent 20 plant species that were collected in Brazil, Ecuador, Ghana, Madagascar and Thailand, and can be expected to serve as candidates for bioassay-directed fractionation and eventual isolation of active principles and drug development agendas. It is WHO's policy to ensure that the benefits from the development of drugs as a result of collaborative efforts like this are, as far as possible, made widely available on an equitable basis.

As a further step in collaboration between the Traditional Medicine Programme and the Global Programme on AIDS, a joint meeting on "Traditional Medicine and AIDS: Clinical Evaluation of Traditional Medicines and Natural Products" was held in Geneva in September 1990. The meeting elaborated guidelines and protocols for clinical evaluation of the safety and efficacy of traditional remedies. The protocols will provide guidance for the conduct of clinical studies on medicinal plants, and serve as a framework for the comparison of clinical trial results within and between countries.

The above discussion regarding AIDS applies to all other diseases and conditions that might be candidates for research in this area. Countries wishing to make full use of their heritage of traditional medicine, including the wealth of medicinal plants which most of them possess, thus have a special interest in sponsoring ethno-medical studies, bringing together botanists, clinicians, pharmacologists and others for the purpose of assessing and realizing the potential of developments in this area.

These studies would include reviewing and making an inventory, on a national basis, of the utilization of medicinal plants and of medicaments derived from them. Such inventories, still to be made in many countries, would need to describe the geographic and climatic distribution of these plants, their source (collection from the wild, cultivation *in situ* or *ex situ* in botanical gardens, commercial plantations, etc.) and an indication of their relative abundance or scarcity.

For each plant there would be an account of its utilization (e.g. folk medicine, traditional healers, pharmaceutical or food industries) and its place in commerce (eg. local use, internal trade, export). There would also be a description of the preparation of traditional remedies, their constituents, pharmacological properties, and therapeutic indications.

Research and development in this area pose certain specific challenges. For example, in many countries, traditional formulations usually contain a combination of several plants, it being held that some plant constituents are effective only in the presence of others. This renders assessment of the efficacy and, eventually, identification of active principles much more difficult than for single plant preparations. The whole subject of the rationale for the use of compound prescriptions of medicinal plants offers a vast field and an exciting opportunity for research. The addition of modern synthetic drugs to traditional remedies complicates the matter of evaluation even further and should therefore be avoided.

Logically, as indicated earlier, the investigation, utilization and exploitation of medicinal plants by a country should include measures for conservation. Conservation and inventories of medicinal plants should go hand in hand, the latter being essential for the identification of endangered species, for setting priorities, and for monitoring the situation.

On a plant-by-plant basis, pharmacological and clinical studies could be carried out to assess their safety, therapeutic efficacy and potential for commercial utilization, leading to the development of policies for their conservation. Conservation and commercial exploitation would then concentrate on:

- plants that are commonly used in folk medicine and are of proven safety;
- other plants which may be used in treating serious conditions and are valuable because of their proven therapeutic efficacy;
- still others which may be of great economic importance as items of internal trade or export.

This wide-ranging programme of activities has important developmental and technological ramifications. Few developing countries can afford the luxury of esoteric studies; national resources are too scarce and competing priorities too great in most instances. Pragmatism should be encouraged and opportunities for linkages with other interests must be seized. Where agriculture and forestry departments are developing national resource maps, medicinal plants can be added to them. Where universities and research and development institutions are involved in the study of the environment and ecology, a place can be found for medicinal plants, especially those whose survival is threatened. Where emphasis is placed on the development of small local industries, the industrial potential of medicinal plants can be given priority. Where ministries of education are seeking innovative approaches for teaching the natural sciences or for promoting knowledge of traditional values, the use of local medicinal plants can be incorporated into school curricula.

What is needed, therefore, is a comprehensive approach, to bring together the main disciplines and interests concerned - health, agriculture, industry, trade, universities - under some form of coordinating mechanism. Such a body would assess needs and priorities, formulate national policy, help to mobilize resources, and ensure the orderly development of work and research in this field.

The priority to be given to this subject can be argued rationally in the modern terms of utility and economics, but one must not forget the cultural importance of traditional medicine. Many traditional cultures are being threatened by new values, some modern and some foreign. Governments concerned with safeguarding national identity may very well wish to explore traditional medicine with this intent. In the same way that the genetic richness and diversity of tropical plants ensures their greater biological potential, mankind should look to its own cultural diversity as a source of strength for future development.

8. CONCLUSIONS

The proper use of medicinal plants is a necessity, not a luxury. A critical element for the success of any health care system is the availability and use of appropriate drugs. The Alma-Ata Conference on Primary Health Care recommended to governments that they should give high priority to the utilization of traditional medicine, including the incorporation of proven traditional remedies into their national drug policies and regulations. In more than 13 years since Alma-Ata, decision-makers in the health sector of many countries have taken the initial steps in association with WHO. Among these is the identification of locally available plants or plant extracts that could usefully be added to national lists of drugs for use in the health system, and which could even replace some pharmaceutical preparations that need to be purchased and imported.

In taking these steps, countries are making safety a prime consideration, not only through the training of professional and technical staff and the application of standards, specifications and good manufacturing practices, but also by seeing that the public is kept well informed on the subject.

The challenge is particularly acute, as the potential of activities in this area is at present far in excess of the resources readily available either to WHO and UNIDO or, more importantly, to the developing countries where the need is greatest. Clearly a major problem remains how to mobilize more resources, while at the same time remaining faithful to the desire that activities carried out should first and foremost benefit the developing world. Many WHO and UNIDO programmes face the dilemma that the scientific and technical know-how is almost all to be found in developed countries. This dilemma applies to the subject of medicinal plants, where, with the exception of a handful of countries and the countless traditional practitioners who demonstrate their expertise in the use of medicinal in their daily work, little local capacity is to be found. If we add the commercial dimension, which also has its economic and human demands, the dilemma is further accentuated.

Paradoxically, it is the commercial factor which probably provides the incentive and a key to developing a strategy which could best safeguard the interests of the developing world. But such a strategy can only succeed against a background of a responsible public strategy, one which fully recognizes the importance of the conservation of natural resources and which supports the sustainable exploitation of such resources for the overall public good. It is this balance of

interests which forms the essential base of activities in this exciting and challenging area.

The last decade has seen considerable growth in the interest in traditional remedies. In fact, this growth has been dramatic. To realize this, one need only look back to the 1970s when some medical circles sarcastically denigrated WHO with lead headlines in their journals announcing that the Organization had sold its soul to the "witch doctors"! But even without this historical point of comparison, I do not think that I am exaggerating in using the term "dramatic". Dramatic because the whole forest of traditional plants is opening up possibilities for action and development totally unforeseen by both Organizations twenty years ago. From an initial programme orientation largely driven by renewed sociocultural values following political independence of many developing countries, we have moved to a stage where the global concern for environment and sustainable economics growth must be added to these values.

In this new arena, much remains to be done. The role of WHO and UNIDO as catalysts in direct support of their Member States and as international clearing-houses of information exchange will continue. But this role needs to be strengthened if the full promise of the future is to be realized. Our role in the promotion of research and development activities in the developing world is limited in comparison to other health development programmes. Our ability to attract young scientists to explore this subject, which they literally can do in their own backyards, is hampered by the lack of an adequate promotional and funding framework. So much more could be done to bring the expertise that lies in the developed world together with the opportunity for study and action which lies largely in the tropical and subtropical countries.

A constant thread through out all of the above has been the importance given to conservation and industrial development. This reached a logical conclusion in the Chiang Mai Declaration of 1988, "Saving Lives By Saving Plants". It is now time to turn to the practicality of this declaration:

How can plants be used rationally?

Who will carry out the steps in the various resolutions passed?

How will required scientific and the industrial skills be mobilized?

Under what institutional arrangements? What kind of funding mechanism is required?

The emphasis given to linking medicinal plants with agroindustrial development opens up one possible line of action that might lead to some of the answers to these questions. But this is *not* the only line available; in this context a potential role for industry may be envisaged.

There is much to be said in favour of industry being at the centre of national medicinal plant development strategies. Industry can provide a physical location around which a base technical and administrative infrastructure can be built. Such an institutional base could negotiate with interested public and private sectors, especially that of health, the additional technical and financial investments required to carry out all of the studies required to convert plant

materials into safe and effective drug products. In this connection the association of WHO with WFPMM can prove to be very helpful.

It is for those who are responsible for the development of medicinal plants to take up this challenge at the national as well as international levels. WHO stands ready as a full partner to cooperate and collaborate with interested parties in the pursuit of such a meaningful development, one that is long overdue.

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BACKGROUND INFORMATION

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