# Conservation and Sustainable Use of Medicinal Plants in Ghana

## Conservation Report


2002

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ABURI BOTANIC GARDEN

Department of Botany

CERSGIS

Botanic Gardens Conservation International

ROYAL BOTANIC GARDEN EDINBURGH

UNEP WCMC

This report is available on the project website:

http://www.unep-wcmc.org/species/plants/ghana

or on the project CD-ROM available from:

Information Officer
UNEP-WCMC
219 Huntingdon Rd
Cambridge CB3 0DL
UK
Tel: +44 1223 277314
Fax: +44 1223 277136
Email: info@unep-wcmc.org

# Conservation and Sustainable Use of Medicinal Plants in Ghana

## Conservation Report

Authors

D. Abbiw
T. Agbovie
B. Akuetteh
K. Amponsah
F. Dennis
P. Ekpe
H.Gillett
W. Ofosuhene-Djan
G.Owusu-Afriyie

Editor

H. Gillett

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## Acknowledgements

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**Aburi Botanic Gardens**
The Director, George Owusu-Afriyie, supervised project implementation at Aburi. The Curator, Theophilous Agbovie, supervised the project team and activities involved with the ethnobotanical survey. William Ofosuhene-Djan was responsible for development of the medicinal plant garden, and for supervising the garden staff. O'Rorke Crentsil assisted in the development of the nursery and managed the propagation trials. Konnings Amponsah was responsible for managing the data on the medicinal plant, managing the database and running backups and preparing reports. All of the Aburi Gardens project team assisted in the implementation of the ethnobotanical survey and the production of the manual.

**Department of Botany, University of Ghana, Legon**
Professor Enu-Kwesi (current Head of Department) and Professor Odamtten (previous Head of Department) supervised project implementation within the Department. Prof. Odamtten contributed to the Manual and the Ethnobotanical Survey. Daniel Abbiw provided taxonomic support and identified herbarium specimens of medicinal importance. Patrick Ekpe had overall responsibility for specimen data entry and export, managing the database and running backups. Both Daniel Abbiw and Patrick Ekpe assisted the Aburi Botanical Gardens with the identification of the plants within the medicinal plant garden. Alex Assase assisted with specimen data entry. Mary Yankson supervised development of the medicinal plant nursery.

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Dr. Amamoo-Otchere supervised project work undertaken by the Centre. Sam Adu-Prah provided technical support for the first year of the project. Ben Akuetteh provided subsequent technical support for management of the species data and production of the project maps and undertook the GIS analysis.

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Fiona Dennis supervised production of, and edited, the Ethnobotanical Survey and Manual. She also provided horticultural guidance for the establishment of the nursery and medicinal plant gardens at Aburi and the University of Ghana, Botanic Gardens.

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Dr. Kerry Walter installed the data management systems at Aburi Botanic Gardens and the Ghana Herbarium and trained project staff in data management.

**UNEP World Conservation Monitoring Centre**
Harriet Gillett managed the project, trained staff in data management, produced the Conservation Report and designed the project website, posters and CD-ROM. Gerardo Fragoso supervised implementation of the project. Julie Reay and Lise Jackson provided administrative support; Paul Birrell and Phill Fox provided technical support; Ian May produced the maps; Mary Edwards produced the posters and Laura Nicholls and James O'Carroll developed the web site.

# Contents

## Foreword

The completion of the project on conservation and sustainable utilisation of medicinal plants in Ghana is welcome news to the Ghanaian public, and in particular to those of us in the country who are responsible for the national implementation of the articles of the Convention on Biological Diversity.

The good news this project brings is underscored by the following reasons:

- There is now a system in place for the identification of appropriate conservation needs together with the provision of information products providing an insight and guidance into the sustainable use of medicinal plants. This will help ensure that the current use of medicinal plants will not reduce their potential for future use.

- The wide recognition of herbal medicine in Ghana coupled with the increase in both the practitioners and their clients can be sustained and will not exert the anticipated pressure on raw materials harvested form the wild since alternative options on sources of raw material and utilisation are being made available.

The project has indeed put into operation, through medicinal plants, ways to achieve two of the three objectives of the Convention on Biological Diversity (CBD) in a national setting.

As a nation, there is so much concern about the loss of biological diversity as a result of our own actions and inaction. Sometimes we do not even seem to be aware that certain behavior patterns of ours destroy biological diversity. The Ghanaian public through this project should therefore be properly informed about the consequences of these human failings, including the disappearance of medicinal plant species which provide the base for the cure of many ailments, so that basic concepts of conservation and sustainable use can be appreciated.

Prof. A. A. Oteng-Yeboah
Deputy Director-General
Council for Scientific and Industrial Research
Ghana

May 2002

## 1. Summary

A capacity building project was undertaken by six partner organisations, to support the long term conservation and sustainable use of medicinal plants in Ghana.

A broad approach was followed, involving: development of medicinal plant gardens at two Botanic Gardens; an ethnobotanical survey undertaken at six villages; production of a manual for the propagation and cultivation of medicinal plants; development of computerised information systems at the Ghana Herbarium and Aburi Botanic Garden to allow analyses to be undertaken illustrating the status of medicinal plants in Ghana in the wild, particularly in relation to land use and protected areas.

This report provides details on the methodology followed and the status of each of these outputs and preliminary analyses of the computerised collection data. These analyses illustrate the importance of computerising plant record data held at biological institutions. They demonstrate the use to which the resulting information can be put in terms of generating material that is readily accessible and easily understood by those responsible for making decisions concerning the long term survival of one of the world's natural resources of key importance for human health.

Full details of the project, copies of project outputs and all species maps are available on CD-ROM.

# 2. Introduction

## 2.1. Overview

The current project was designed to address some of the issues faced in the continued use of medicinal plants in Ghana by building the capacity of relevant organisations in Ghana. The two main collaborators in the UK were UNEP World Conservation Monitoring Centre (UNEP-WCMC) and Botanic Garden Conservation International (BGCI). UNEP-WCMC operates in the area of information management for biodiversity conservation and sustainable use, and BGCI provides support to Botanic Gardens throughout the world, including provision of technical guidance and information management. The Royal Botanic Garden Edinburgh (RBGE) also particapted in the provision of technical and training support.

The use to which plants are put in West Africa is well-documented, an excellent summary being given by Daniel Abbiw, previously curator at the Ghana Herbarium, medicinal plant expert and author of *Useful plants of Ghana* (Abbiw, 1990). This covers hundreds of species, with a wide variety of uses including: food; industrial and cash crops; furnishings; fuels; tools; dyes; poisions; and medicines.

The proposal to undertake the current project was developed following meetings between UNEP-WCMC staff and Daniel Abbiw and between BGCI staff and the Director of Aburi Botanic Garden. During these discussions the potential was recognised for a collaborative project to help mobilise information and resources to create an information base on medicinal plants of relevance to a wide spectrum of users from village level to national policy planners.

The project was designed to illustrate the importance of information in the process of conserving and using medicinal plants sustainably and provide a pilot model for development within the country and relevant for expansion within the region of West Africa.

The project took a broad approach in the development of information resources in support of medicinal plant conservation and sustainable use. At one extreme this involved documentation of the country's medicinal plant resources at the Ghana Herbarium and Aburi Botanic Gardens, providing a readily accessible record of distribution of medicinal plants within the country and medicinal plants under cultivation. At the other extreme medicinal plant demonstration gardens have been established as an educational resource and as a source of material, in conjunction with development of a manual on cultivation techniques. Literature and village surveys have also been undertaken to identify information sources on medicinal plants and to assess existing use.

## 2.2. THE IMPORTANCE OF MEDICAL PLANTS IN GHANA

*Daniel K. Abbiw*

### Background

In Ghana, successive governments have recognised the importance of traditional medicine, because an estimated 75% of the population in both the urban centres and the rural areas depend on it for their everyday health-care needs. About 82% of the population in developing countries like Ghana live in rural areas. With a population of 18 million therefore, it means there are some 14.8 million rural dwellers in the country. The reasons for this dependence on plant medicine among rural communities in developing countries are:

- That plant medicine is more easily available and they are comparatively cheaper in the rural areas. In some instances plant medicine is entirely free of charge.
- That the practitioners live mainly in the rural areas.
- That there are very few hospitals or health posts in the rural areas and these are often inaccessible.
- That there are even fewer medical officers among rural communities. The figure is about one medical officer to 70,000 people in the rural areas, as compared to one medical officer to 4,000 people in the urban centres.
- That the high cost of western or imported drugs can not be easily afforded by many rural dwellers.

As proof of the governments intention to promote the development of traditional medicine in the country, the following institutions have been established:

- 1961 - the formation of the Ghana Psychic and Traditional Healers Association.
- 1975 - the establishment of the Centre for Scientific Research into Plant Medicine.
- 1991 - the establishment of a unit for the co-ordination of Traditional Medicine (now known as Traditional and Alternative Medicine Directorate – headed by a Deputy Minister of State).
- 1992 - the establishment of the Food and Drug Board.
- 2000 – the enactment of an Act for the establishment of the Traditional Medical Council, which is tasked with the responsibility for the registration of all Traditional Medical Practitioners in the country.

**Concerns**

Ironically, while the government has been leaving no stone unturned over the years to encourage and promote traditional medicine in the country for obvious reasons, the main base of the practice medicinal plants are now threatened because of over-exploitation. Although man depends heavily on plants for his basic survival, and on plant products for food, medicine, clothing, shelter and numerous other needs, man's activities tend to destroy the forests and woodland – the natural habitats of these plants.

The slash and burn system of traditional farming, with it's associated shifting cultivation, is the principal cause of forest destruction and environmental degradation. Other activities which have contributed to the demise of the forests throughout the country include:

- collection and gathering of fuel- wood
- burning of charcoal
- commercial timbering
- hydro-electric power generation
- exploitation of mineral resources by both large-scale and small-scale miners
- road and trail construction
- housing, factories and other infrastructure
- industrial pollution
- bush fires during the harmattan season
- exploitation of plant medicine from the wild for both local use and for export.

In addition to the above is the invasion of farmlands and secondary vegetation by *Chromolaena odorata* Siam weed, popularly called 'akyeampong', a notorious weed of cultivated land throughout the forest zone. Consequently, there is hardly any intact virgin forest left outside the constituted Forest Reserves besides sacred groves. These groves are most often perfectly intact relics of the original forest. There are about 2,500 such groves of all sizes in the country, from an acre or two to five square miles. Some of these were formerly burial grounds for Chiefs and important people.

**Strategies**

In view of the importance of plant medicine in the health care of the people, it is imperative to conserve it for the present and future generations. Measures to contain the situation include:

- Educating the people on the importance of plant medicine and the need to conserve the forests and woodlands which protect this heritage. The education should not be limited to medicinal plant collectors alone, but should also include the school children and the youth. In addition to the direct benefits derived from the forests and woodlands there are also indirect benefits as well. These are:

    i. amelioration of local climate
    ii. protection of watersheds, catchment areas, animals and crops, and
    iii. the prevention of erosion

- Protecting medicinal plants in Forest Reserves, Sanctuaries like Sacred or Fetish Groves, Arboreta, Botanical Gardens, National Parks and Biosphere Reserves from which exploitation by rotation is strictly controlled on the sustained yield system.

- Cultivating medicinal plants – practitioners and exporters of medicinal plants should be encouraged and financed to cultivate medicinal plants. In Ghana, The Darwin Initiative is sponsoring the cultivation of medicinal plants in the Aburi Botanical Gardens and neighbouring villages and the University of Ghana, Legon, Botanical Gardens. The UNDP's Global Environment Facility (Small Grants Programme) is also supporting the cultivation of medicinal plants by Tamaecko, an NGO at Tamale. The big time commercial manufacturers, distributors and sellers of plant medicine could also channel some of their profits in establishing medicinal plant plantations.

- Commercial exploitation of whole plants, bark, roots and tubers, corms and rhizomes from the wild should be banned by legislation. As a deterrent, defaulters should be made to pay heavy fines- in addition to the confiscation of the plant material illegally collected.

- Sustained harvesting of medicinal plants. For instance, traditionally, plants dug for their roots are covered up again with soil, allegedly to ensure the efficiency of the medication, but it appears the practise is, in effect, a conservation measure.

- Encouraging some of the traditional methods of protecting medicinal plants from destruction, abuse or misuse, for instance:

    i. surrounding medicinal plants with superstition, myths and taboos
    ii. the belief that some medicinal plants are fetish and should therefore neither be cut or used for fuel.

**Conclusion**

Plant medicine is a heritage from past generations. However, the present practise of collecting medicinal plants almost entirely from the wild with impunity is gradually reducing the populations of some species. Unless immediate measures are taken:

i. to halt the destruction
ii. to embark on a serious cultivation programme to meet the needs of the large numbers of the population who still rely on plant medicine for their everyday health care.

There will be no forests or woodlands left in the future from where plant medicine shall be harvested. Furthermore, many of our present day medicinal plants will be either endangered or completely wiped out into extinction.

## 2.3. Forest loss in Ghana and its impact on access to wild medicinal plants

*Patrick Ekpe*

### Deforestation

Ghana had about 82,000 km$^2$ of forest cover at the beginning of the last century, representing 34% of the total area of the country. Forest and Game and Wildlife reserves cover about 18,000km$^2$ representing 22% of the forest zone (Hall & Swaine, 1981). This implies that off-reserve (unreserved forest) area is about 64,000 km$^2$. The proportion of forest outside reserves declined from 20% in 1955 to 5% in 1972 according to estimates in the annual reports of the Forestry Department for those years (Hall & Swaine, 1981). Forest quality in most of the forest reserves has also left much to be desired.

Historically, deforestation started well before the 18$^{th}$ century. This necessitated the colonial government to invite H.N. Thompson, then Conservator of Forest in Nigeria, to study and report on the status of forests in Ghana (then the Gold Coast). His report, which noted massive deforestation at the time, recommended the creation of forest reserves (Thompson, 1908). This culminated in the reservation of forestlands under Cap 127. Deforestation in Ghana has legal, illegal or intentional causes namely; subsistence agriculture, industrial plantations, mining, wildfires and uncontrolled timber extraction.

### Agriculture – subsistence farming and cash cropping

Coffee as the first export crop introduced into the country and cocoa later in 1878 all had their toll on removal of forest cover. Low prices offered in the world market for these commodities recently, has forced farmers to increase their acreage resulting in further lost of forest.

Most Ghanaian farmers are poor and lack capital for intensive agriculture; hence they practice slash burn agriculture their subsistence. This involves cutting down and burning primary or secondary forest, grow crops for two to three years, move to clear another forest while leaving the previous farmland to fallow for about 7 – 10 years. Due to population pressure the fallow period is often shortened hence it is unable to restore the soil fertility to initial level. The consequence is lost of forest cover and environmental degradation.

However, as with any other renewable resource, if harvesting exceeds annual production, the resource will progressively be depleted and become locally extinct. Medicinal plants treasured for their roots and bark or whole plant are particularly prone to unsustainable use. Examples are *Croton membranaceus* and *Cryptolepis sanguinolenta* in Ghana and *Prunus africana* and *Pausinystalia johimbe* in Cameroon.

Cultivation of medicinal plants and other non-timber forest products (NTFPs) could go a long way to reduce the pressure to harvest from the wild.

### Mining And Quarrying

Mining operations, particularly surface mining, are a serious threat to forests in certain areas of the country. Iron ore extraction in Afao Hills Forest Reserve, around Awaso caused a considerable damage to the forest. Bauxite mining in Atewa Range and Tano-Offin Forest reserves took place between 1960s and 1970s, but with little impact (Hall et. al, 1973). Gold mining, however, is a major serious threat, particularly to forests in Wet Evergreen forest zone which harbour most of Ghana's genetic hotspots. A painful example is a large scale gold surface mining established in the early 1990s, which chopped off the northern half of Neung North Forest Reserve, one of Ghana's outstanding botanical hotspots.

The present situation is very alarming as massive deforestation is taking place in forest reserves under the pretext of gold exploration, where surface mining is hardly discernible from exploration. Ghana's mining regulation, which permits mineral exploration in forest reserves, is the main culprit.

### Industrial Plantations

Clearing of natural forests for plantation reduces the diversity of species. Plantations are usually made up of one or two species whereas mature, natural forest contain up to 300 species per hectare. Conversion of natural forests to rubber plantation and part of Subri River Forest Reserve to *Gmelina arborea* plantation, intended for paper production which never materialize, all in the Western region of Ghana are examples. There is no doubt that converting natural forest into single-species plantations deprives the indigenous people of some of their domestic supplies, particularly medicinal plants.

### Timber Extraction

Timber extraction, if appropriately managed, posed no serious threat to forest vegetation. The current management prescription of 1 tree/ha in 40-year, if strictly adhered to, will keep the disturbance well-dispersed with minimal effect on species composition in the long term. In the short term, structural changes (forest disturbance) are obvious and localised in logged forest as seen in loading bays, logging roads and skid trails. These areas often suffer from soil erosion and poor plant regeneration. In recent times illegal logging (non-adherence to rules) plagued the timber industry thereby making 'nonsense' in the management prescriptions for sustainable forest management. Improperly logged forest has a high tendency to suffer from forest fires with resulting deforestation and degradation.

### Wildfires

Fire is a very serious threat to the survival of forests and presents the biggest challenge for forest protection as it has a negative influence on forest regeneration. About 30% of the forests in the Moist Semi-deciduous zone were destroyed by fire, especially in the 1980s.

THE NEED FOR FOREST CONSERVATION

The forest is nature's pharmacy shop and many medicinal plants come from the forest. Medicinal plants have been used for a millennia and would continue to be used for a long time. The present spate of bio-prospecting for natural based products and the search for a cure for diseases like AIDS, have added a new dimension to the harvesting of wild medicinal plants. Hence, the present high rate of deforestation would have a detrimental effect on the heath care delivery system in Ghana since the majority of rural poor depend on traditional medicine for their health care needs. Wild medicinal plants and other Non-Timber Forest Products (NTFPs) are excluded from management prescriptions for sustainable forest management. Proposals have been made in this direction though, and NTFP inventory is currently in progress in forest reserves. Promoting and assigning commercial value to NTFPs would make forest conservation initiatives more appealing at the local communities.

## 2.4. THE IMPACT OF FOREST LOSS IN THE ABURI AREA -THE LAST FIFTY YEARS

*William Ofosuhene-Djan*[1]

Environmental awareness is as old as man and man could not have survived if he had not sought to understand his environment.

TRADITIONAL LAWS AND SACRED GROVES

In the olden days, there were traditional laws on the environment, which were formulated by the chief and his people. These laws were guiding their human activities not to go farm or fishing on specific days. Certain areas were set aside as sacred groves where their 'gods' were kept for worship. It was a taboo for anyone to farm in these sacred areas. The strict adherence to these laws created awareness among the people on conservation practices.

Certain trees such as *Milicia excelsa* (Odum), *Alstonia boonei* (Oyamedua) were branded as sacred and were never touched. The number of palm trees to be felled for palm wine had to be counted and marked. Permission had to be sought for felling trees for Housing Projects. Palm trees provided material for basketry. *Raphia palm* provided materials for can chairs, fans, basketry and ropes. Trees like *Teclea verdoorniana* and *Garcinia kola* were used for tooth cleaning. Thus the awareness created in the past seems to be neglected by this present generation. Over population and urbanization had led to changes in the environment resulting in the loss of forest cover.

[1] William Ofosuhene-Djan was born at Aburi in 1939 and has worked in the area throughout his life, first as a teacher and since 1991 with medicinal plants

## THE LAST 50 YEARS

The past fifty years has seen a lot of changes in the vegetative cover of Aburi area. If one drives from Aburi to Nsawam through Brekuso and back one sees a lot of changes in vegetation. This area used to have a luxurious forest cover abounding in flora and fauna. There have been a lot of human activities such as cutting down of trees for fire wood, farming, charcoal burning, lumber for housing and also quarrying. The result is the loss of many medicinal plants in the wild. The idea people had was that the forest would be there for generations to come forgetting that over population, drought, bushfires and housing projects would put pressure on the land.

This specimen of *Ceiba pentandra* is the sole survivor of the original forest that once covered the Aburi hills.

In the early eighties, precisely 1983 there were bushfires all over the country due to severe drought. Aburi area was not left out. Most forests were burnt down resulting in the loss of most of the medicinal plants. It has taken about 10-20 years for some areas to recover. Trees like *Milicia excelsa, Teclea verdoorriana, Garcinia kola* and *Dialium dinklaigei* are very scarce. There is therefore the need to cultivate all the lost species. This has created secondary and open forests and one could count trees easily in the distance. Some important medicinal plants such as *Cassia sieberiana, Trema orientalis, Treculia africana, Trichilia monadelpha* and *Antiaris africana* have all disappeared around Konkonuru.

## KONKONURU – STORIES FROM A VILLAGE

Konkonuru is a village in Aburi area just 5km away. Historically it is about 200 year old. The village used to be the home of the standing army of the chief of Aburi. During war time concoctions were prepared for the soldiers to fortify themselves against bullet shots, body injuries and to treat other ailments. After many wars of conquest, the people settled down as farmers and herbalists. This is how the village became famous in herbal medicine till this day.

The Queen Mother of Konkonuru and traditional healers – long term users of medicinal plants

Madam Okomfo Kyerewa who is about 75 years, a Herbalist and Traditional Birth Attendant has this to say; "I began practicing in the forties, and medicinal plants for curing diseases were around homes, notably *Ocimum gratissimum, Ocimum canum, Cassia alata* and *Cassia podocarpa.* Plant collection was very handy. This saved much time to give first Aid. Now it is very difficult and I have to walk more than 1 km for collection."

Mr. Isaac Osae, 60 years, has this to say, " I learnt to practice herbal medicine from my late father. I used to collect plant parts just around the house and I did not have to walk more than 100m. Over the years, most of the important medicinal plants have gone due to human activities especially farming. We have not been aware for the past thirty years that one day we will be facing difficulties in the environment."

Mr. Kwame Kwesi, middle-aged herbalist, specialising in extraction of gun-shot pellets. "The plant I use is herbaceous and in the dry season it dies and I have to find it only in moist places in the forest. Since the forest is gone, it is very hard to come by. It is very sad to say that we have not thought of cultivating plants like *Xylopia, monodora* and ginger, which we use as spices in decoction preparation. The Medicinal Plant Conservation Project has come at the appropriate time to make us aware of the problem of forest loss in our area. We appreciate the effect is making to cultivate and conserve medicinal plants for generations to come."

Medicinal plant experts from Konkonuru and Aburi

There is the need therefore to cultivate and conserve medicinal plants. Education therefore plays an important role in this direction. Community participation is essential to create the awareness that they will benefit economically to grow medicinal plants for export to generate some income. They will have to involve the local schools to cultivate the habit of taking care of plants for a brighter tomorrow.

# 3. Medicinal Plant Garden development

## 3.1. Medicinal Plant Garden development: Aburi

For a history of Aburi Botanic Garden, see:

http://www.unep-wcmc.org/species/plants/ghana/aburi.htm

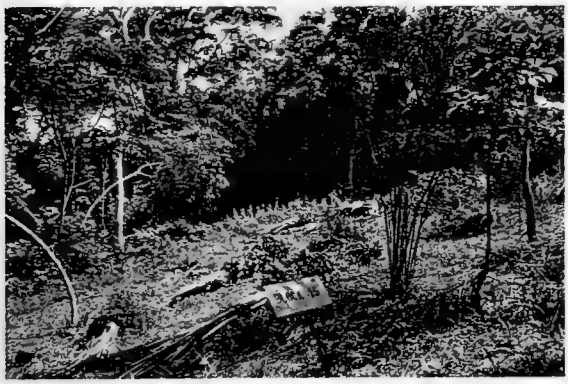
Under the project, a medicinal plant garden was developed at Aburi, with the joint aims of: providing a location for *in situ* and/or *ex situ* conservation; providing an educational resource; providing a source of plant material for villages interested in developing their own medicinal plant gardens.

### 3.1.1. Development Of The Garden

*Theophilous Agbovie*

Land

50 acres of the botanical reserve in Aburi Botanic gardens was donated for the project. The land was demarcated in 50 plots of one acre each with walkways.



One of the fifty plots. This one is being prepared for cultivation of herbaceous medicinal plants.

Surveys

Staff of the Centre for Scientific Research into Plant Medicine (CSRIPM) undertook a survey of the area and produced a checklist of 52 important medicinal plants found at the site. Staff from the Herbarium (University of Ghana) also undertook a second survey resulting in the second checklist of 259 plants and their uses.

Medicinal Plants List

A list of threatened medicinal plants species was produced by the project team supported by some staff members of CSRIPM.

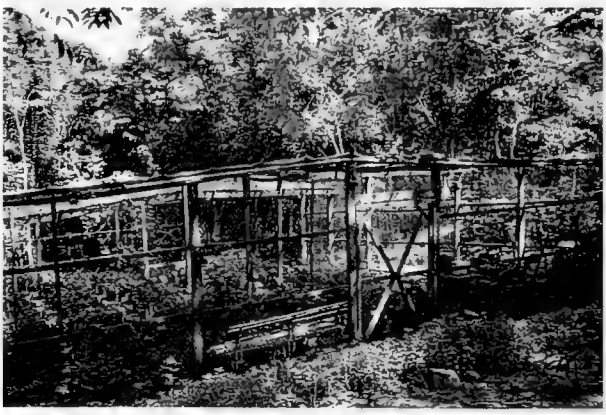
NURSERY

A plant nursery including a protected lath house, has been established for the project.


Entrance to the nursery and medicinal plant trail

The lath house, can take over 5,000 potted seedlings. Propagation boxes have also been constructed. Pipe borne water has been connected to the site. Three water tanks with sheds have also been constructed to store water.

Secure nursery lath house, providing shade.



By early 2002, the plant population at the nursery was 4,196 potted seedlings and 463 on beds. The project team carried out propagation trials on 20 selected plants.

Seedlings planted out into raised beds.

LABELING

1,000 Metallic labels were fixed on identified plants, denoting: Scientific name; Family; Local name; Accessions number. Educative panels have also been fixed on 50 selected medicinal trees, denoting: Scientific name, Family, Local name, Medicinal use.


Plant with name plate, including accession number.

Data on all plants with accession numbers have been computerised, allowing an accurate record to be maintained of species in cultivation at the garden

Information panel for *Monodora myristica*


*"Medicinal Use: The seeds are aromatic and used all over West Africa as spice and as a condiment in soup or as seasoning. When seeds are roasted and ground they are applied to sores, including those of Guinea worms. The seeds, chewed and rubbed on the forehead cure headache. The seeds are much used in the preparation of enemas for constipation."*

ENRICHMENT PLANTING

One thousand three hundred and sixty-one (1,361) seedlings were planted out onto the various plots within the garden between August 2000 and December 2001. About 60% are doing well.

The long drought season (December-March) accounted for the low survival rate.

Transplanting seedlings from the nursery into the garden.

William Ofosuhene-Djan and Daniel Abbiw inspecting the nursery.

### 3.1.2. ABURI BOTANIC GARDEN CONSERVATION REPORT

*George Owusu-Afriyie*

BACKGROUND

Over the years Aburi Botanic Gardens has received several requests to harvest medicinal plants in the botanical reserve or give information on their location and uses. This persistent demand prompted the Director to enter into discussions with and seek assistance from the appropriate institutions/agencies. By setting up the medicinal garden we can now reach out to a more varied clientele and satisfy their diverse needs.

LINKAGES

As a result of this project Aburi has established strong and fruitful links with the Botany Department University of Ghana, the CSRIPM, PGRS, association of practising Herbalists in the Eastern Region of Ghana and some communities.

AWARENESS CREATION

A good measure of success has been achieved in this direction. The project was launched at four places namely Accra, Aburi, Adeiso, and Konkonuru. In attendance were Traditional rulers, Ministers of religion, Church groups, Opinion leaders, Practitioners of plant medicines, Parliamentarians, Ministers of state, etc.

Project awareness raising discussion with the local school teacher at Konkonuru

SUPPORT

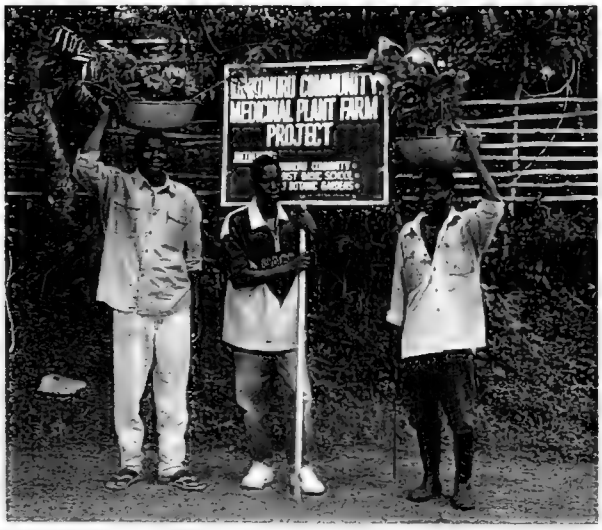
As a result of this campaign three communities have stood out prominent among several others who have embraced the conservation message and are desirous of setting up medicinal and community farms of medicinal plants. However, the concept of self-support and ownership was not tasteful as most of them lacked the finances to translate these lofty ideas into reality.

The expectation was that Aburi Botanic Garden would support them with tools, materials and some sort of loan for a smooth take off. Had this been the case medicinal plant farms would have sprung up all over the place and would be the latest vogue in the country.

## ACHIEVEMENTS

As mentioned above, three communities have started work to establish their own farms. They are Adeiso, Konkonuru, and Kofisah. In Adeiso a parcel of sacred grove was donated by the chief of the town for work to begin. Smaller pieces of land have also been acquired at Konkonuru and Kofisah.

Konkonuru: forest once covered these hills. Habitat destruction has resulted in medicinal plants becoming much more scarce.




Gardeners from Aburi Botanic Gardens taking seedlings from the Gardens and a sign board, to the medicinal plant project farm at Konkonuru.


Konkonuru villagers at the Community Medicinal Plant Farm

Aburi Botanic Gardens donated 50 acres of semi-forest land to establish the medicinal garden, as described under 3.1.1.

Monthly reports on development of the medicinal plant garden and trails are produced.

Report for December 2001 (excerpts):

Plant hunting from the main forest yielded seeds of *Penianthus patulinervis* and seedlings of *Cinnamomum zeylanicum*. Mr. Danso brought about 600 seeds of *Turraea heterophylla*. These were propagated. This yields about 560 young seedlings, which were put in propagation bags.

Trails in plots 8 and 9 down in the valley were cleared. There was enrichment planting outside the nursery and plot 1.

There was an outreach programme visit to Kofisah to interact with the community. Seedlings of *Trichilia heterophylla*, *Treculia africana*, *Tetrapleura tetraptera*, *Cinnamomum zeylanicum* and snake plant all numbering 50 were sent.

The total population of plants as at December 2001 is 4,196.

William Ofosuhene-Djan, Project Officer

WORK OUTSTANDING

There is the need to continue work on the farm beyond the life span of the project.

The number of small name plates has to be increased from 1,000 to 5,000. Similarly the educational panels should be increased from 50 to 500.

The present list of living collections needs to be improved upon.

### 3.2. MEDICINAL PLANT GARDEN DEVELOPMENT: LEGON

Work was undertaken at the University Botanic Garden, to develop a medicinal plant nursery. A plot has been cleared, shading erected and seedlings transplanted. Due to drought during 2001 and the absence of irrigation, growth has been limited. However the garden provides the scope to act as an important source of medicinal plant material if an adequate water supply can be provided.

Medicinal plant nursery established at the University Botanic Garden

Mrs. Mary Yankson, Director of the Botanic Garden and Mr. Daniel Abbiw, medicinal plant expert, discussing development of the medicinal plant nursery.

## 4. Ethnobotanical survey

An ethnobotanical survey was undertaken, with interviews made in six villages in the Aburi region: Adeiso, Aburi, Konkonuru, Kofisah, Mampong and Nkoraza. The survey identified medicinal plants currently considered to be of importance to local villagers, together with an indication of the view of the villagers on the ease of cultivation of each species.

The ethnobotanical survey is available as an Annex to this report and is also available on the web.

The Director of Aburi Botanic Garden, George Owusu-Afriyie, explaining the concepts behind the Convention on Biological Diversity to the village elders of Konkonuru

Village elders discuss their participation in the project.

Villagers working on community land at Konkonuru, allocated for the cultivation of medicinal plants.

## 5. Manual

An important step in encouraging and supporting the cultivation of medicinal plants is the provision of simple but clear instructions on the techniques needed to ensure healthy plants are produced. To provide this, a manual for the propagation and cultivation of medicinal plants was produced by BGCI with support from staff at Aburi and the Department of Botany at the University of Ghana, on techniques to follow. The project provided funds for publication, allowing the manual to be provided free to users at the discretion of the Director of Aburi Botanic Garden.

A copy of the manual may be seen is also available on the web.

# 6. Information management

## 6.1. Information management: Overview

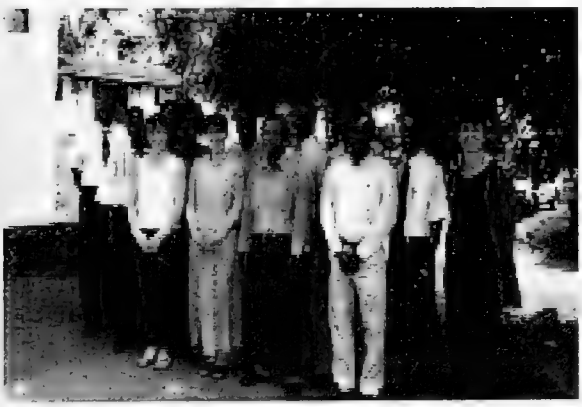
The project provided the funds to install computer hardware and software at the Ghana Herbarium and at Aburi Botanic Garden, as well as funds to recruit members of staff to enter data for the project. In addition to a pc, a printer, zip drive (for back-up) and un-interruptable power supply (UPS) were provided to each organisation. All hardware was purchased locally in Ghana, to prevent problems with importing goods into the country and to ensure that customer service support was available locally. The UPS was of particular importance as electrical supply in the country is unreliable.

Aburi Botanic Garden has dedicated an office that can be firmly secured, for pc use.

The Herbarium has generous bench space for pc use and is firmly secured.

Backups are made daily by both institutions, with the backup disc being stored in separate buildings.

The initial training workshop was hosted by CERSGIS in January 2000. Further training sessions were held at the Herbarium and Aburi in October 2000 and February 2001.



Participants at the initial information management workshop held at CERSGIS, January 2000

Practical training session at the CERSGIS training centre, January 2000

During the training sessions time was spent looking at specimens in the Herbarium, and living plants at Aburi Botanic Garden, to ensure a full understanding of the various issues involved in recording data from herbarium sheets and accession data, including origin of material and location within the garden.

Practical training session at the Herbarium

Discussing specimen material in the herbarium.

### 6.2. INFORMATION MANAGEMENT: HERBARIUM

Many staff were trained in data entry and export, with principal responsibility being allocated to Patrick Ekpe and Daniel Abbiw with support from Alex Asase.

Summary statistics of the state of the data are provided in Table 1. Specimens for 191 species were processed, representing 44 families.

**Table 1: Ghana Herbarium: Summary of specimen data**

| Group | Number | % of all specimens |
|---|---|---|
| Families | 44 | |
| Species | 191 | |
| Specimens: all | 3072 | |
| Specimens with: collection date | 2913 | 95% |
| Specimens with: co-ordinates | 2079 | 68% |
| Specimens with: habitat | 1859 | 61% |
| Specimens with: use | 1688 | 55% |
| Specimens with: altitude | 278 | 9% |
| Specimens with: vernacular name | 247 | 8% |
| Specimens with: abundance | 112 | 4% |

An important objective in computerising information recorded on medicinal plant specimen sheets at the herbarium was to create an electronic file including latitude and longitude co-ordinates that could then be mapped on a Geographical Information System (GIS). More than two-thirds of specimen sheets proved to have adequate information to enable them to be mapped. Either co-ordinates were included on the specimen sheet or sufficient descriptions of locality were provided that co-ordinates could be calculated using the gazetteer of plant collecting localities in Ghana prepared by the previous curator of the Ghana Herbarium, J.B. Hall.

Comments on use were provided on just over half the specimens, but altitude, vernacular name and abundance were rarely recorded.

Figure 1 illustrates the major families represented, in terms of species number. Figure 2 provides a view of the year of collection of specimens throughout the twentieth century.

A comprehensive view of the state of the computerised herbarium data is provided in the project spreadsheet.

**Fig 1: Ghana Herbarium - Families with more than 30 specimens represented in data**

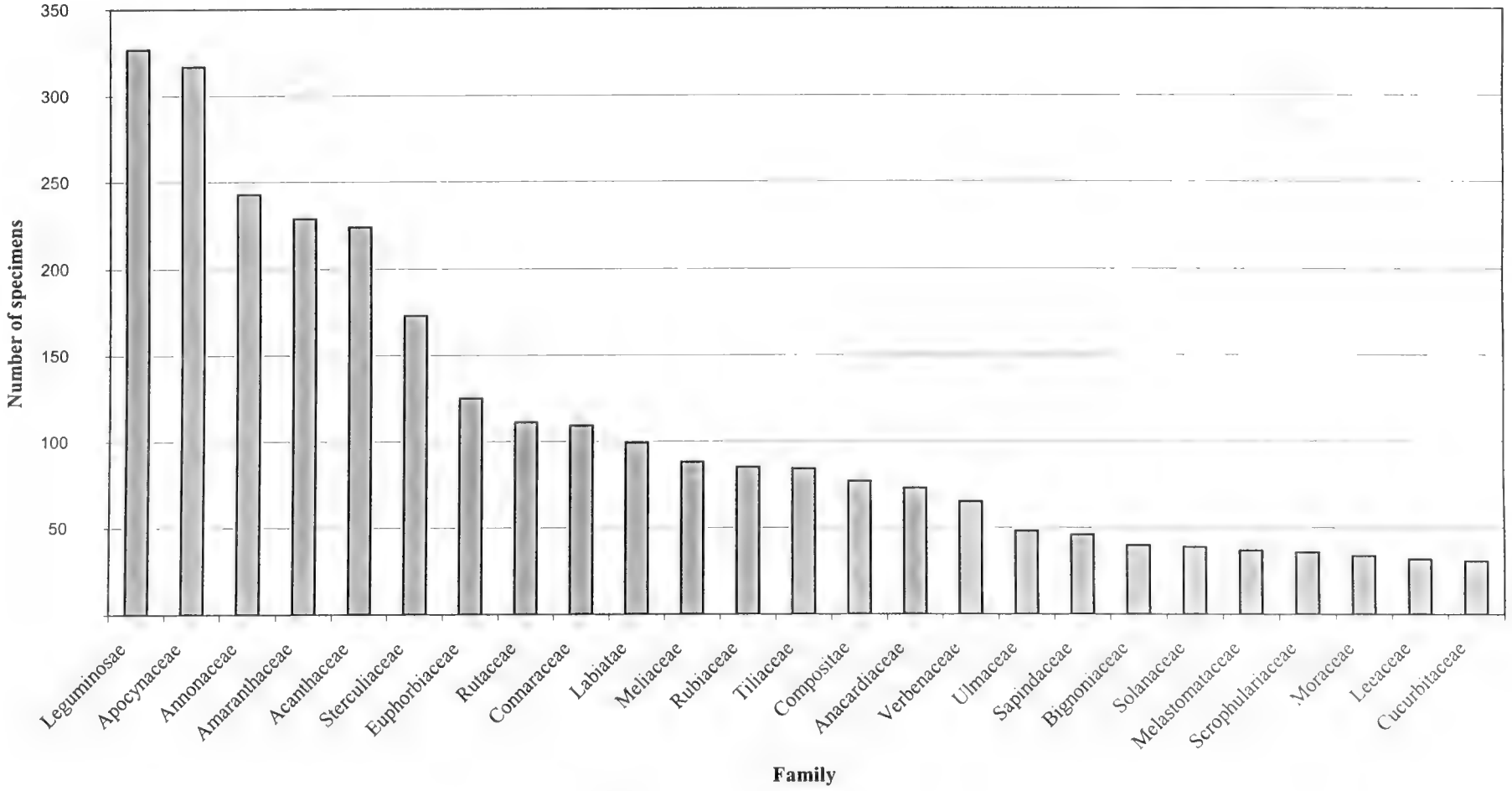
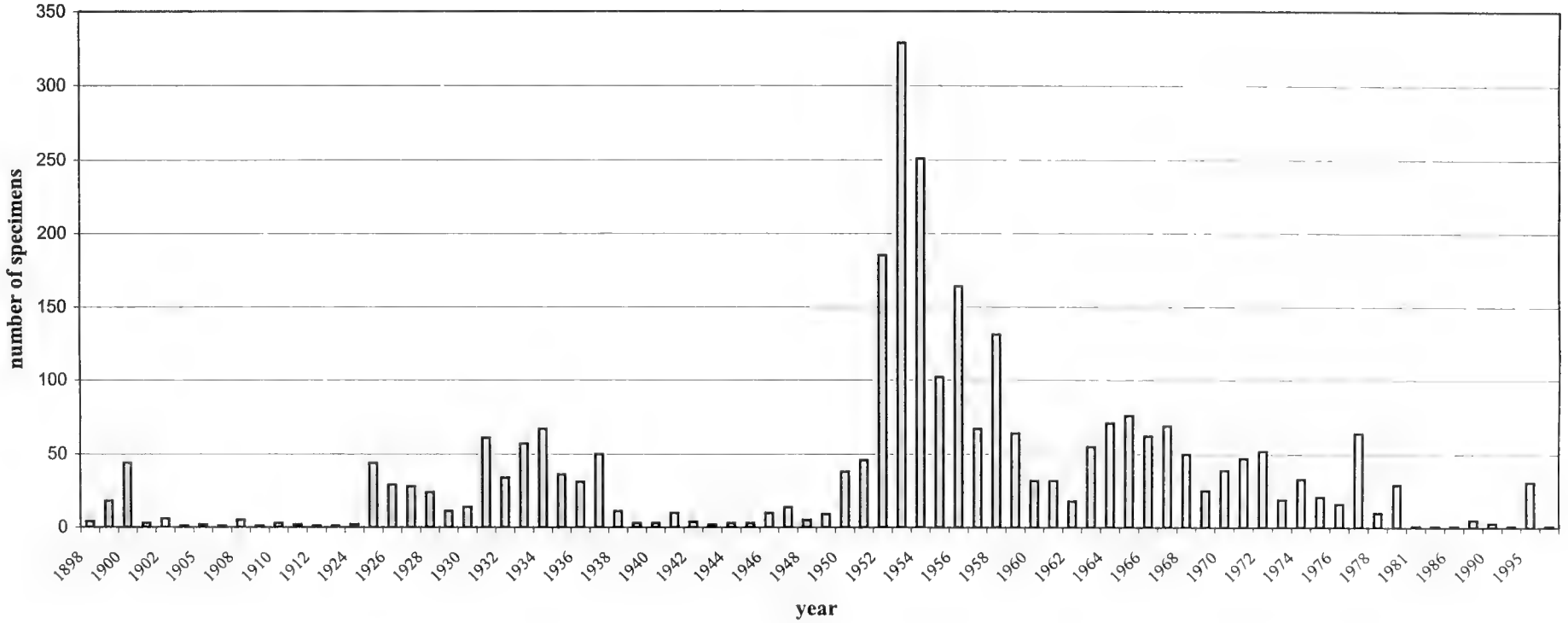


**Fig 2: Ghana Herbarium - Number of specimens per year 1898-2000**



### 6.3. Information management: Aburi Botanic Garden

Many staff were trained in data entry and export, with principal responsibility being allocated to one member of staff, Konings Amponsah, re-located for the task from the Department of Parks and Gardens in Accra.

Summary statistics of the state of the data are provided in Box 1.

Fig 3 illustrates the major families currently cultivated in the medicinal plant garden, in terms of numbers of species.

**Box 1: Database Development**

Theophilous Agbovie and Konings Amponsah

The database was helpful to Aburi Botanic Gardens in management of data collection for the medicinal plant conservation project. It helps to document all the medicinal plant species in the gardens. It also helps in locations of each medicinal plant species.

The project land had been demarcated into nine plots and each plot has been represented in the database, namely nursery and block 1-block 9. All these blocks have been properly documented within the NAMES file, ACCESSIONS files, PLANTS files, LOCATIONS files and PLACES files.

In the database one thousand three hundred and eighty (1,380) accessions have been recorded. Out of this, one thousand one hundred seventy-six (1,176) are medicinal plant species with accessions and their locations. They are properly labled with metallic plates with description, scientific name, local name, family and accessions numbers and this information is documented in the database. Two hundred and four (204) plants are for the Old gardens. Database records computerised by the end of the project are:

| File | Number of records |
|---|---|
| ACCESSIONS | 1,380 |
| NAMES | 3,291 |
| PLANTS | 1,370 |
| LOCATIONS | 23 |

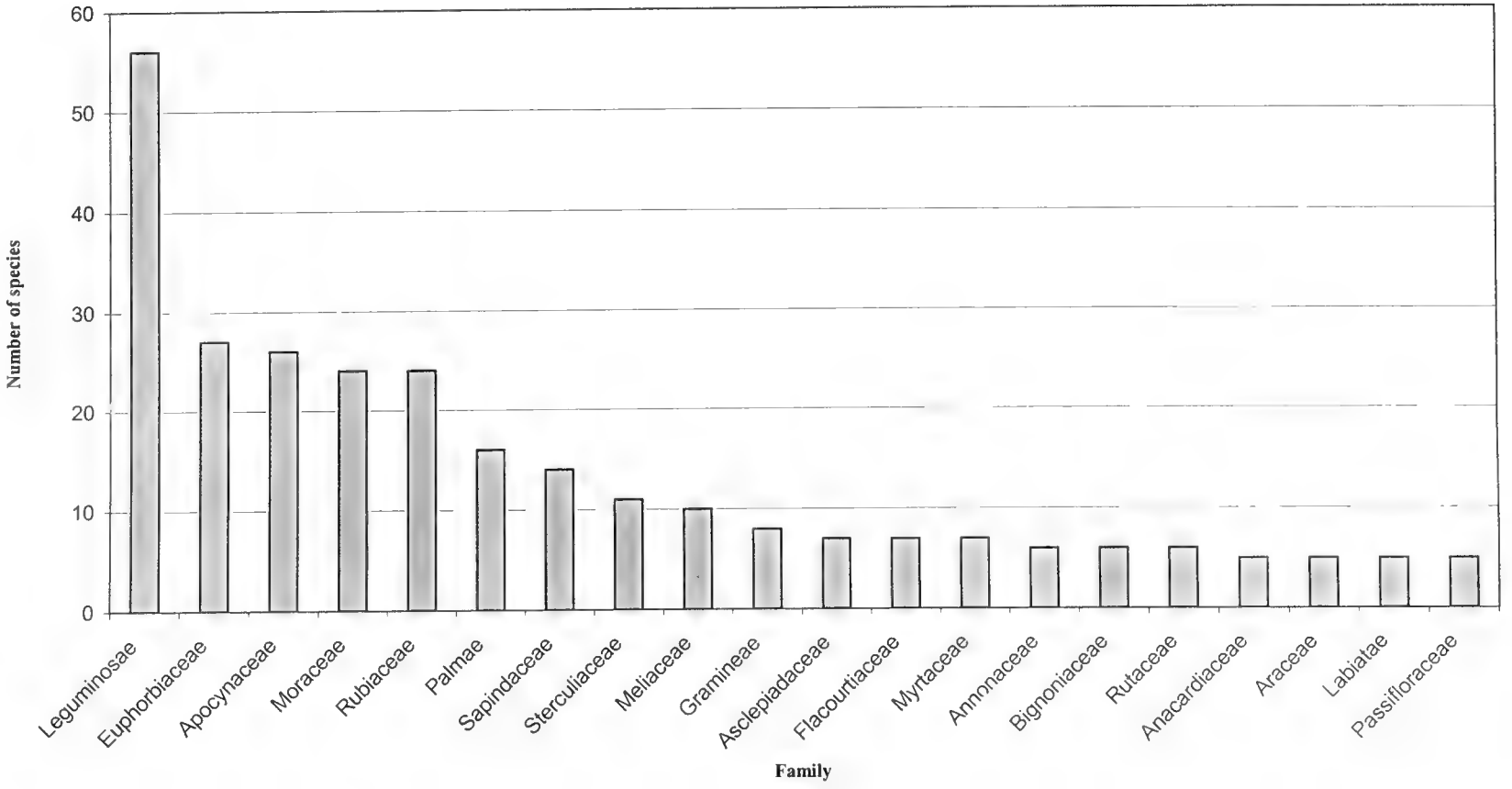
The total population of Plants and the Locations in the medicinal garden are:

| LOCATIONS | Number of plants |
|---|---|
| NURSERY | 119 |
| BLOCK 1 | 252 |
| BLOCK 2 | 152 |
| BLOCK 3 | 99 |
| BLOCK 4 | 117 |
| BLOCK 5 | 107 |
| BLOCK 6 | 100 |
| BLOCK 7 | 81 |
| BLOCK 8 | 68 |
| BLOCK 9 | 9 |

The spreadsheet of Aburi data includes full details of the accession data, summary statistics tables and graphs.

Following completion of the project the computer and database will remain available at Aburi Botanic Garden for future recording of plant accessions. This will provide an easily accessible, on-going record of the state of the medicinal plant garden, the species under cultivation and, the number of accessions of each species. During the current project the emphasis was on recording medicinal plant species growing within the botanic reserve and cultivated within the formal garden that together comprise Aburi Botanic Garden. As a result, most of the current distribution data for source of the material is that for Aburi Botanic Garden, and it is not yet possible to make useful GIS analyses. In the future, however, as collections are made of plants from elsewhere in the country (and the region) and distribution data is recorded for each accession, it will be possible to track the geographical range represented, providing an indication of the infra-specific diversity likely to be represented within the garden.

**Fig 3: Aburi Botanic Garden - Number of species per family (families with more than four species)**



### 6.4. INFORMATION MANAGEMENT: MAPPING

Spatial data were mapped by staff from CERSGIS and UNEP-WCMC to provide an overview of the current state of knowledge of the distribution of medicinal plants in Ghana, based on the point location herbarium specimen data. The Department of Botany is custodian of this dataset.

Baseline polygon data utilised by the project were provided by CERSGIS. These were largely the product of a World Bank funded project "*Ghana – Country at a Glance*" (CAG) co-ordinated by the Environmental Protection Agency. Data were supplied by different organisations in Ghana. These organisations are custodians for the information. Data layers utilised from this project are detailed in Table 2.

**Table 2. Spatial data details**

| Data layer | Details & source of data |
|---|---|
| Specimen data | 2,070 specimen records with geographical co-ordinates, from 190 species, from the Ghana herbarium, collected over a period of more than 100 years. |
| Topography | Elevation zones were derived by CERSGIS from contour data provided by the Survey Department of Ghana. |
| Land use | The land use/land cover database was developed by CERSGIS, derived from 1990/1 LANDSAT TM satellite images, collected and interpreted during the period 1995-1998. Extensive fieldwork has been conducted to verify the satellite image interpretation.<br><br>Originally the database is divided in 4 levels, ranging from level 1 describing very broad land cover categories to level 4 with detailed information on land use and land use systems. The scale of the original data set is 1: 250,000. The data used for this project have been changed to a less detailed 1:1,000,000 scale and use the Level 2 attributes, where major land cover categories are included. This yielded a final data set comprising 26 classes. |
| Rainfall | Mean annual rainfall data were interpolated from mean 1961-1990 station data provided by the Meteorological Service Department. Climate surfaces were derived from the national grid of meteorological stations. The meteorological record for Ghana is good, with a first order station network covering the whole territory and long enough observation periods to generate confident climate surfaces. A total of 50 national station was used for the generation of the rainfall data set. In addition to national stations a selection of 15 climate stations in the surrounding countries was utilised to assure that the interpolation of climate surfaces would be accurate also in the national border areas. |

| | |
|---|---|
| Protected areas | Polygon data were available for all the country's National Parks and Forest Reserves.. Forest Reserve data were provided by the Forestry Department and National Park data were provided by the Ghana Wildlife Department. |
| Boundaries | Country boundaries are taken from Digital Chart of the World, see http://www.maproom.psu.edu/dcw/<br><br>The regional boundaries provided here are preliminary ones, taken from the CAG, and prepared by the Lands Commission for the National Commission on Democracy. |

Maps illustrating: 1) the distribution of computerised collection sites in relation to habitat and protected area data and 2) density of specimens collected at each site are included with this report. Maps for each species, plotted against each spatial layer listed in Table 2 may be viewed on the web.

### 6.5. Information Management: GIS Analyses

Analysis of data using a Geographic Information System involves overlaying two or more spatial data layers and calculating the intersecting or coinciding areas. Data trends can rapidly be plotted in their spatial dimension or distribution, by posing a question to the database.

Maps have been included on the project CD-ROM illustrating the various spatial data layers. Results of analyses of these spatial data are given in tables 2 to 9 below. The analyses of specimen data are presented in terms of both species and specimen number and distribution.

Maps included with hard copies of this report (see Annex) illustrate collection locations (Map 1) and specimen density (Map 2). Two further maps illustrate some of the mapping options on the CD-ROM and web.

Table 3 provides an overview of specimen distribution in relation to landuse type. These maps and table illustrate that collection of medicinal plant specimens has been countrywide, with a predictable cluster in the South around Accra. Figures 4 and 5 illustrate the current extent of each landuse type and the proportion of each landuse type that is protected. Protection levels for each landuse type differ greatly. The three landuse types with greatest protection are forest areas, with >70% closed forest being protected. This largely is a result of the loss of any forest falling outside protected areas. Not surprisingly, planted cover receives very little protection. Additionally, all savanna areas have relatively low levels of protection, despite open cultivated savanna woodland representing the most common landuse type in the country (Fig. 4).

Analyses of specimen data in relation to topography and rainfall are given in Figures 6 and 7. Given the more frequent collections that have taken place near the capital city, on the coastal plain and the general low relief of the country, the distribution of specimens shows a clear decline with altitude. Specimen data in relation to rainfall indicate that most specimens were collected from areas with 800-1,700mm annual

rain, with no specimens from very dry areas and limited numbers from the wettest parts of the country.

Figure 8 illustrates the distribution of specimens in relation to protected areas. The Atewa Range is the only protected area from where more than 25 specimens have been collected. Figures for all other protected areas are low, mostly less than five, suggesting that further studies need to be made to ascertain the role that these protected areas do or should play in terms of protecting one of the country's most valuable natural resources.

Finally, Figure 9 illustrates landuse type and level of protection in relation to data for medicinal plant collection sites, with data presented in absolute number of specimens per land use type as well as number of specimens for a given area. This illustrates clearly the importance of planted cover, this being the landuse type with the greatest number of medicinal plant specimens per unit area. Medicinal plants in this area may well have been planted deliberately to ensure their ready availability, indicating the convenience of cultivating plants rather than depending on wild collection. Three other landuse types appear to be of importance in terms of number of medicinal plants per unit area. These comprise herb/grassland areas, all of which have low areas of protection. This suggests these areas should be investigated with a view to establishing protective measures to ensure long term survival of the medicinal plant species occurring there.

The data computerised to date provide a preliminary view of the status of knowledge regarding the occurrence of medicinal plant species in Ghana. The analyses benefit from the good spatial data that is currently available for landuse, protected area distribution, topography and rainfall. The limiting factor in providing a comprehensive view of the status of medicinal plants in relation to these data is the availability of computerised specimen and collection data. As and when further distribution data for medicinal plants are computerised, progressively better analyses can be made The analyses and graphics provided here do illustrate, however, a methodology that could be relied on to provide the basis for informed decision making.

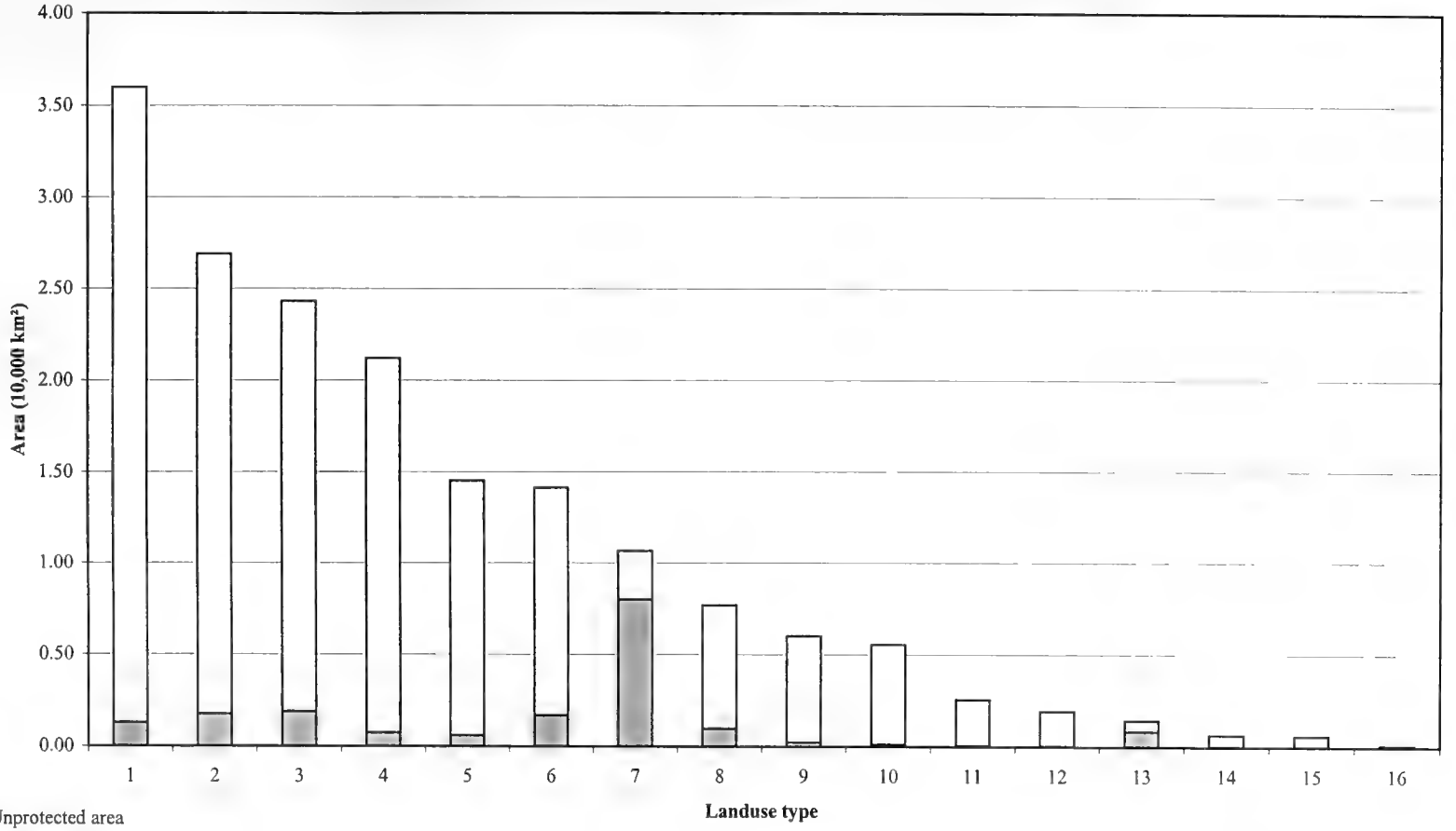
Technical note:

Technological limitations prevent these data from being fully exploitable on the CD-ROM, but further analyses can be undertaken *via* the data available on the web, or *via* the datasets maintained at CERSGIS and UNEP-WCMC.

**Table 3: Landcover type: area protected and species/specimen numbers**

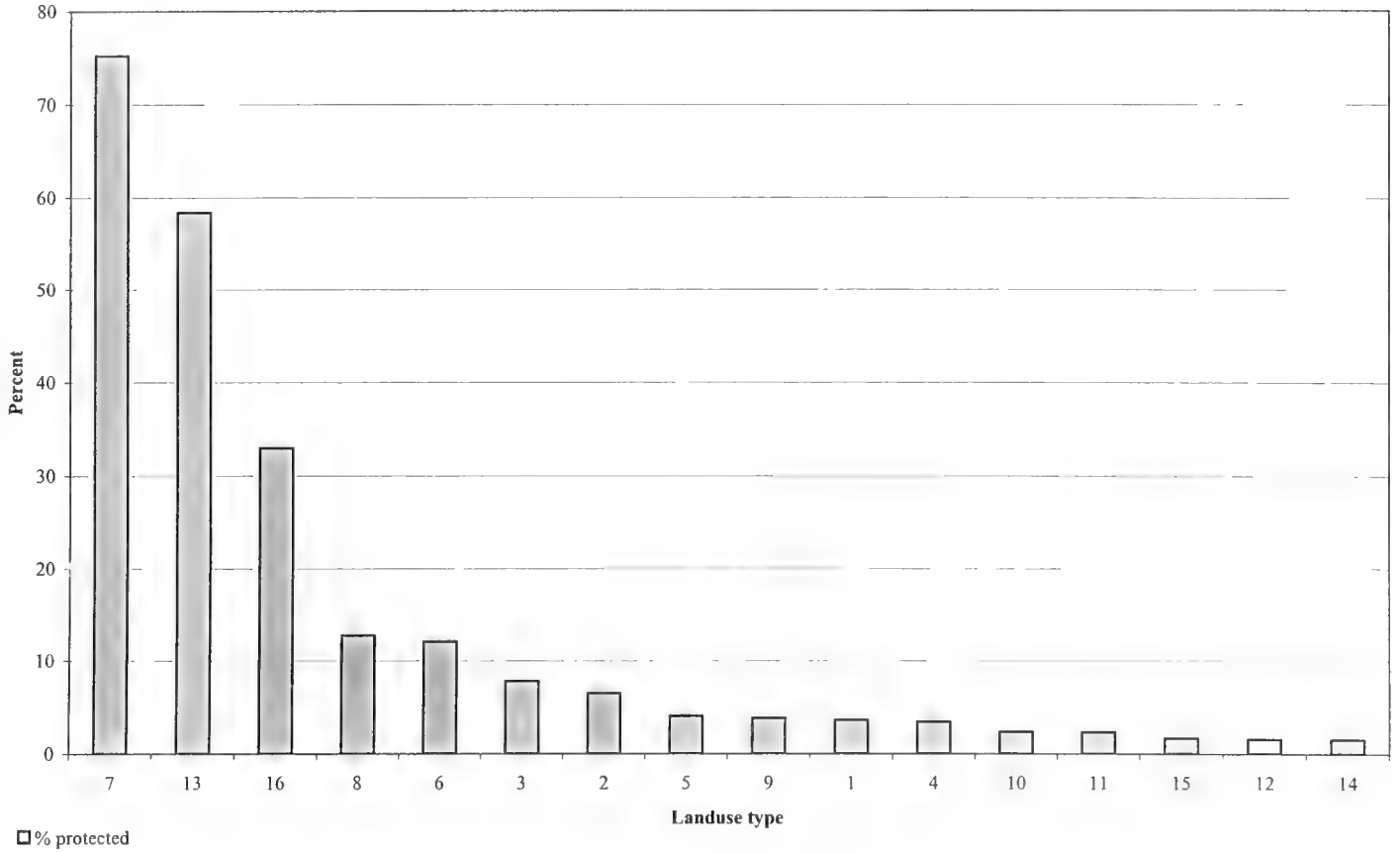
| Code | Landcover | Total area (10,000 km²) | Area protected (10,000 km²) | Number of Species | Number of specimens |
|---|---|---|---|---|---|
| 1 | Open cultivated savanna woodland (11-20 trees/ha) | 3.60 | 0.13 | 53 | 110 |
| 2 | Moderately closed tree (>15 trees/ha) canopy with herb and bush cover | 2.69 | 0.18 | 91 | 183 |
| 3 | Moderately dense herb/bush with scattered trees (<15 trees/ha) | 2.43 | 0.19 | 130 | 483 |
| 4 | Widely open cultivated savanna woodland (6-10 trees/ha) | 2.12 | 0.07 | 63 | 137 |
| 5 | Closed savanna woodland (>25 trees/ha) | 1.45 | 0.06 | 48 | 81 |
| 6 | Open savanna woodland (<25 trees/ha) | 1.41 | 0.17 | 35 | 45 |
| 7 | Closed forest (>60 %) | 1.07 | 0.80 | 19 | 25 |
| 8 | Grassland with/without scattered tree/shrub | 0.77 | 0.10 | 29 | 52 |
| 9 | Grass/herb with/without scattered trees (0-5 trees/ha) | 0.60 | 0.02 | 108 | 244 |
| 10 | Closed cultivated savanna woodland (>20 trees/ha) | 0.55 | 0.01 | 48 | 81 |
| 11 | Riverine savanna vegetation | 0.26 | 0.01 | 17 | 21 |
| 12 | Mosaic of thickets & grass with/without scattered trees | 0.19 | 0.00 | 64 | 119 |
| 13 | Open forest (<60 %) | 0.14 | 0.08 | 19 | 25 |
| 14 | Planted cover | 0.07 | 0.00 | 36 | 56 |
| 15 | Shrub thicket with/without trees | 0.06 | 0.00 | 9 | 10 |
| 16 | Riverine forest vegetation | 0.01 | 0.00 | 0 | 0 |

**Figure 4: Landuse type: total area and proportion protected**




| Key to Landuse Type | |
|---|---|
| 1 Open cultivated savanna woodland (11-20 trees/ha) | 9 Grass/herb with/without scattered trees (0-5 trees/ha) |
| 2 Moderately closed tree (>15 trees/ha) canopy with herb and bush cover | 10 Closed cultivated savanna woodland (>20 trees/ha) |
| 3 Moderately dense herb/bush with scattered trees (<15 trees/ha) | 11 Riverine savanna vegetation |
| 4 Widely open cultivated savanna woodland (6-10 trees/ha) | 12 Mosaic of thickets & grass with/without scattered trees |
| 5 Closed savanna woodland (>25 trees/ha) | 13 Open forest (<60 %) |
| 6 Open savanna woodland (<25 trees/ha) | 14 Planted cover |
| 7 Closed forest (>60 %) | 15 Shrub thicket with/without trees |
| 8 Grassland with/without scattered tree/shrub | 16 Riverine forest vegetation |

**Figure 5: Landuse type: percent protected**




| Key to Landuse Type | |
|---|---|
| 1 Open cultivated savanna woodland (11-20 trees/ha) | 9 Grass/herb with/without scattered trees (0-5 trees/ha) |
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| 5 Closed savanna woodland (>25 trees/ha) | 13 Open forest (<60 %) |
| 6 Open savanna woodland (<25 trees/ha) | 14 Planted cover |
| 7 Closed forest (>60 %) | 15 Shrub thicket with/without trees |
| 8 Grassland with/without scattered tree/shrub | 16 Riverine forest vegetation |

**Fig. 6: Species/specimens by elevation**

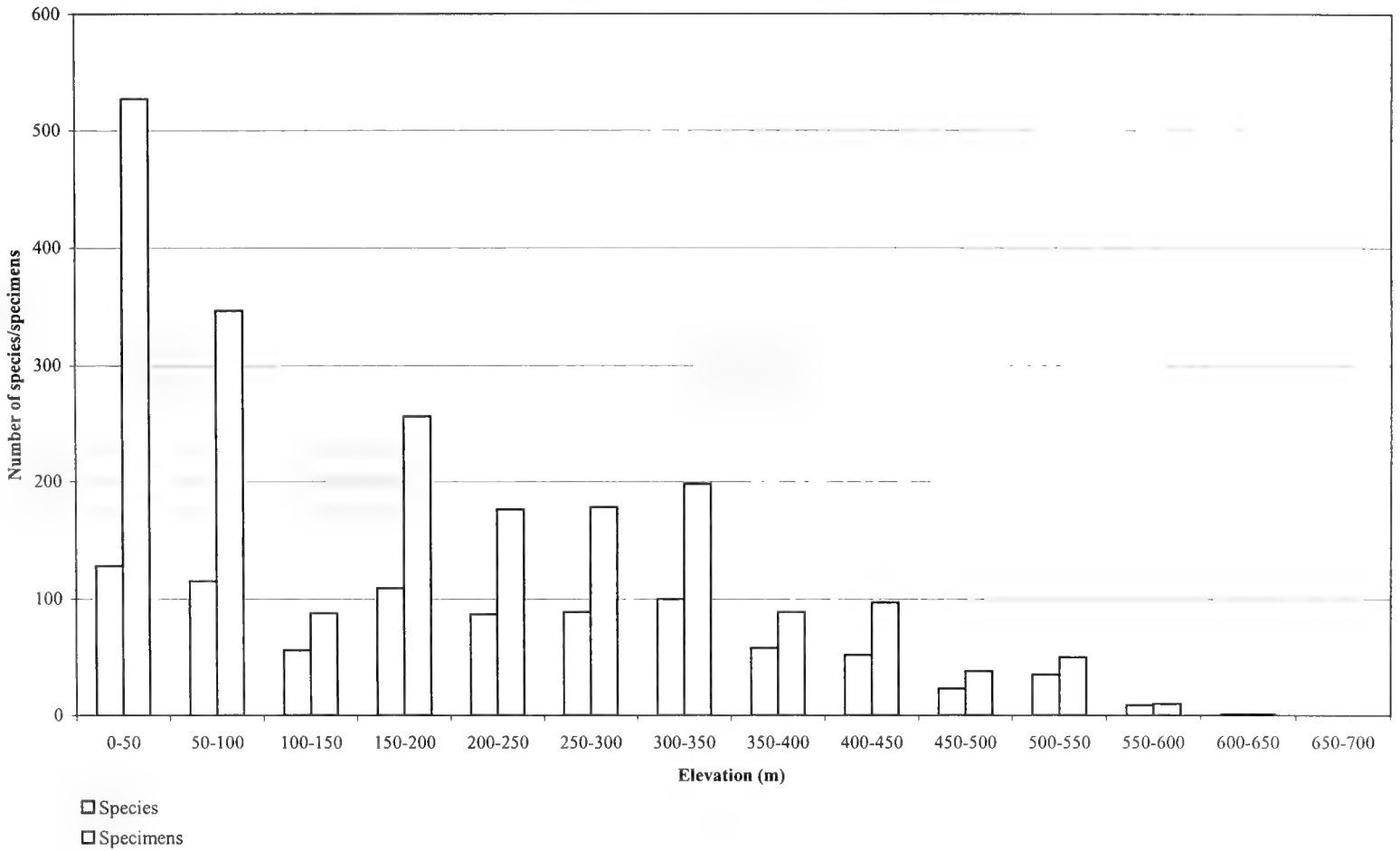


**Fig. 7: Specimens/Species by annual rainfall**

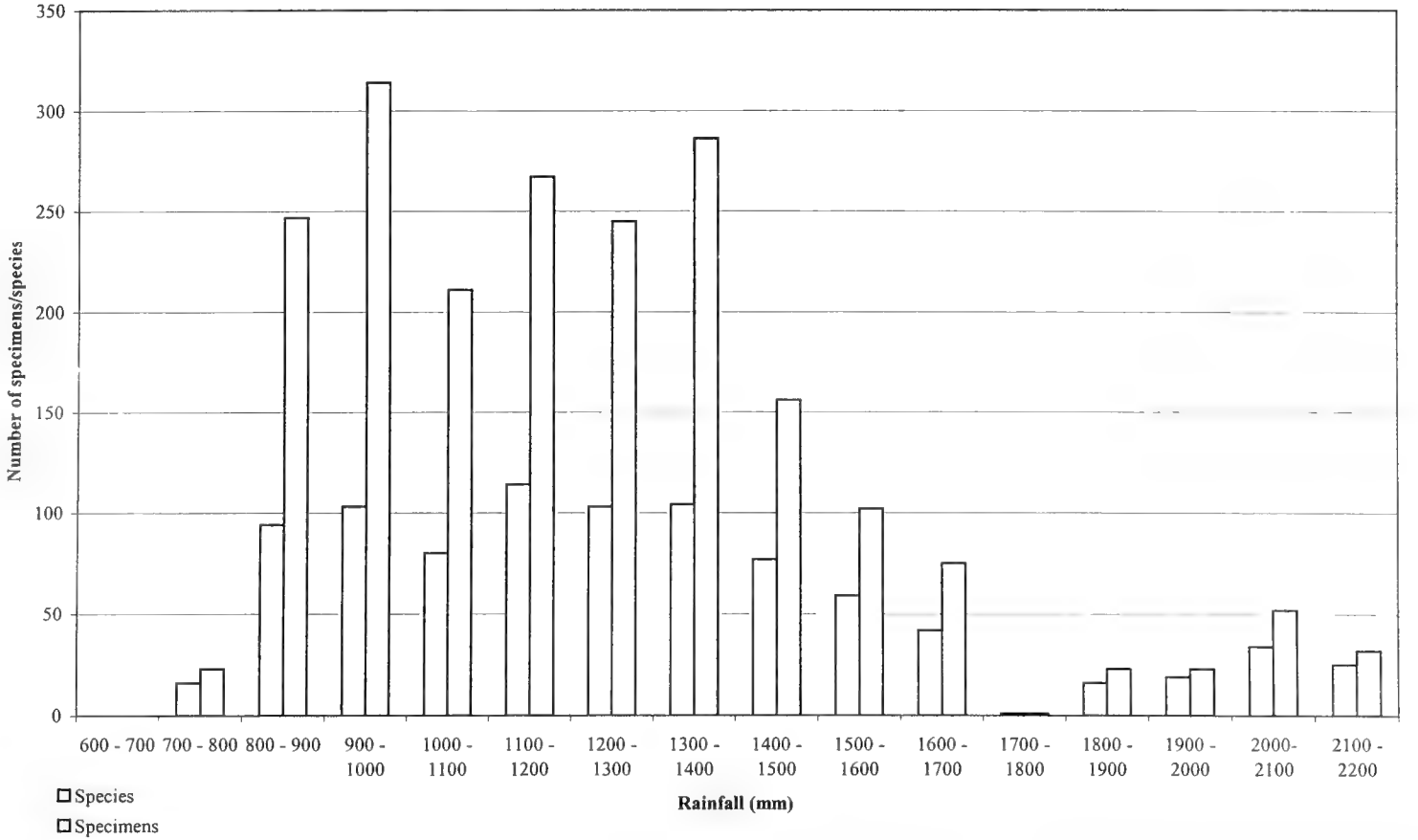


**Figure 8: Species/Specimens per protected area**

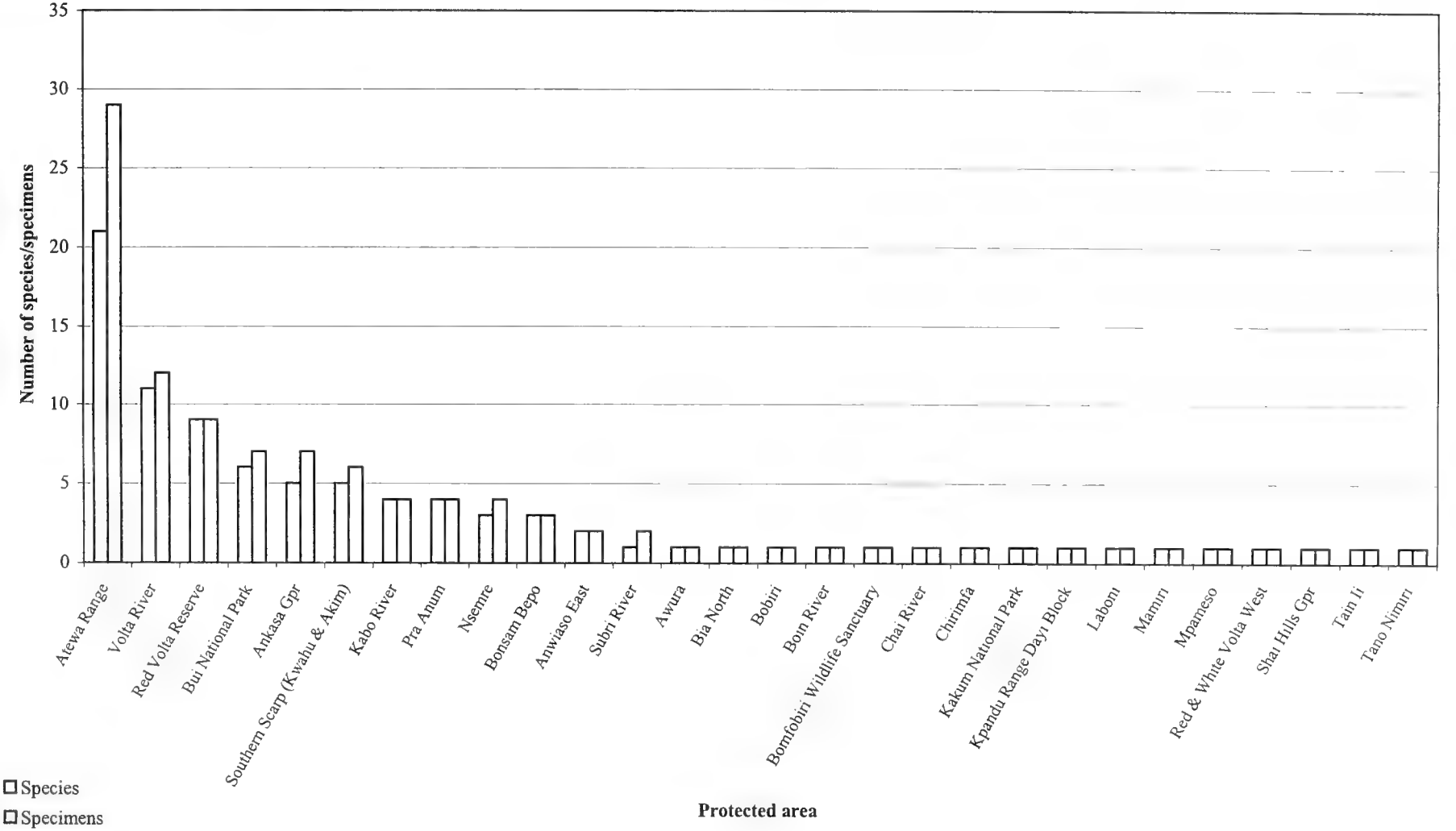
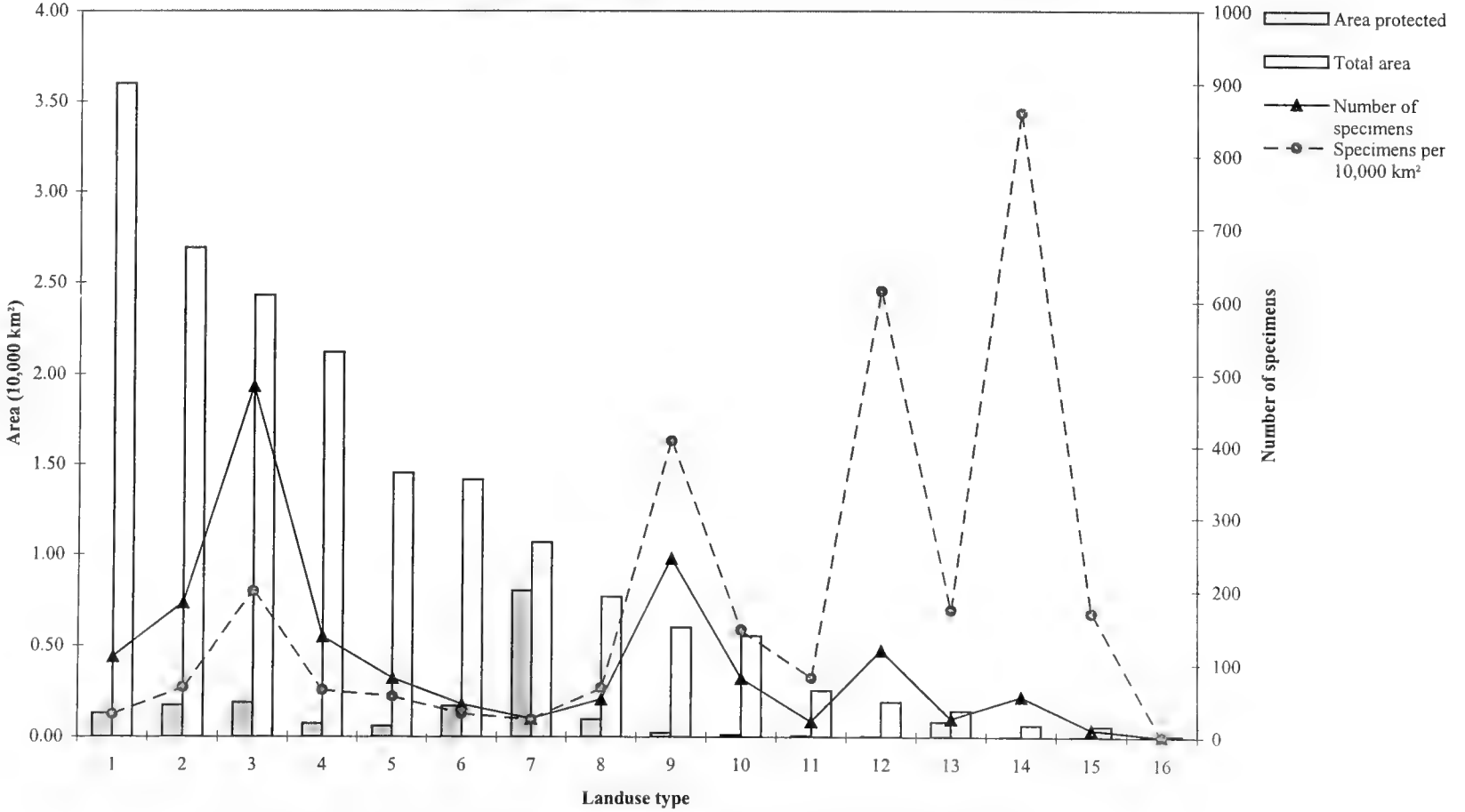


**Fig. 9: Landuse type in relation to medicinal plant specimen collections**




| Key to Landuse Type | |
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| 1 Open cultivated savanna woodland (11-20 trees/ha) | 9 Grass/herb with/without scattered trees (0-5 trees/ha) |
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# 7. Future action

A continual issue that faces short-term development projects is ensuring that the legacy of any project lasts beyond the lifetime of the project. This project is no exception. The ethnobotanical survey and manual are final outputs, but development of the gardens and development of the computerised information systems are activities that need to be on-going. The methodology followed in this project provides a model appropriate for implementation elsewhere. The manual can be customised to include species relevant to different areas. The information management system is appropriate for any collections based organisation, from relatively small to the most complex sites. A key feature in obtaining maximum benefit when extending such a project elsewhere is, ensuring commitment at the highest managerial level from the participating organisations. It is also important to ensure that all the staff involved in the project, work, as far as this is possible, throughout the life of the project and remain on staff for a reasonable period in the future. Four project posters have been produced to provide an overview of the project, illustrating: the importance of medicinal plants; project aims and objectives; mapping techniques; home garden development. Copies have been provided for display at all organisations, the Ministry of Environment, Science and Technology and the UK High Commission in Ghana to ensure maximum visibility for the project to encourage future activities.

## 7.1. Botanic Garden Development

### 7.1.1. Aburi

The Garden is committed to maintaining the medicinal plant garden in its current state as a permanent display with walkways and lables. Equally the Garden will continue to propagate medicinal plant material as a source of seedlings for local use. There is great potential to extend the number of species cultivated, but this, and the ability to continue managing data on future accessions, will depend on future funding.

### 7.1.2. Legon

Public access to the Botanic Garden at Legon is currently not possible due to security problems. The medicinal plant garden established under the project will remain as a resource, providing a source of seedlings on application to the garden. Funding is urgently needed to install a pump to ensure irrigation is possible within the nursery. As and when the garden is open once more to the public, the nursery will provide an import educational display to the public in Accra.

## 7.2. Computerised Information Systems

### 7.2.1. Aburi

During the project life span, all data available from field notebooks relating to the living plants under cultivation at Aburi were computerised. The future need is to ensure that trained staff are available to continue managing accession data as further medicinal plants within the reserve are identified and labled and as further material is collected and brought to the garden for cultivation.

### 7.2.2. LEGON

An estimated 90,000 plant specimens are currently stored in the Ghana Herbarium. Daniel Abbiw and Patrick Ekpe selected relevant species with medicinal qualities for computerisation under the current project. Over 3,000 specimens were finally computerised under this project, leaving many more to be databased in the future. One legacy of the project is provision of the database and software in the Herbarium, allowing the database to be used for training purposes. Further data could be analysed under graduate and postgraduate student projects, or by staff, providing increasingly more accurate information on the distribution of medicinal plants within the country.

### 7.2.3. CERSGIS

This project benefited from the landcover data that was made available as a result of the World Bank study. However, pressure on land use in Ghana is heavy. The rural poor earn little and many small farmers have reverted to subsistence farming. In addition, the population is increasing rapidly: the provisional 2000 population census figure is for 18,412,247, with a UN projected population for 2010 of 25.99m, an increase of over 40%. This will inevitably mean that existing land use maps date rapidly and hence need frequent updates, which CERSGIS are ideally positioned to do, given sufficient funding.

CERSGIS is striving to become a centre of excellence in Africa in the promotion and provision of environmental information services. The mission is "to provide client/use focussed services, undertake research and facilitate capacity development in environmental information management.

## 7.3. CAPACITY BUILDING

### 7.3.1. REGIONAL CAPACITY BUILDING

The three Ghanaian organisations involved in the project are all well placed to support regional capacity building. CERSGIS already plays such a role and Aburi is taking a leading role in the development of a West African Network of Botanic Gardens. This role will be strengthened with the medicinal plant garden and information system as model systems. Similarly, the Herbarium could now act as a model for other regional herbaria, demonstrating the ease with which specimen data can be exploited, once they have been computerised.

### 7.3.2. INTERNATIONAL CAPACITY BUILDING

BGCI, RBGE (through *BG-BASE*) and UNEP-WCMC all operate at the international level, with capacity building as a major objective.

Since it was first established in 1987, BGCI has been active strengthening and supporting all of Africa's botanic gardens. Of the 52 countries in Africa, just over half have functioning botanic gardens, 25 of which are currently members of BGCI. BGCI conducts training workshops in environmental education, strategic planning, records management, horticulture and conservation.

At BGCI's World Botanic Garden Congress in 2000, there was a call for an African Botanic Garden Network to be formally established and for BGCI to manage the

Network and provide logistical support for the production, once more, of the *African Bulletin*, that had previously been produced in 1995. The *African Botanic Garden Network* was officially inaugurated at a meeting held at the Aburi Botanic Gardens and the *African Bulletin* produced. This is distributed biannually by BGCI to all of Africa's botanic gardens. The aim of the Bulletin is to provide a forum in which African botanic gardens can demonstrate the activities and the achievements of their gardens. The first African Botanic Garden Congress, supported by BGCI, will be held in Durban, in November 2002.

The importance of installing a good information management system to document the biological resources (living collections and dried specimens) managed or curated by organisations is now widely recognised. This enables maximum use to be made of these biological resources particularly by supporting conservation planning.

RBGE is involved in capacity building for collections management, through its support to *BG-BASE,* a database application designed to manage information on biological (primarily botanical) collections. It is used in a wide variety of botanic gardens, arboreta, herbaria, zoos, universities, and similar institutions needing to document their collections as well as to maintain other biological information

As of December 2001, *BG-BASE* is installed at 137 sites in 23 countries, making it one of, if not the most, widely used software applications for the management of biological collections. New installations are made on a regular basis. Full details of BG-BASE, including locations of existing installations, are available at http://www.rbge.org.uk/BG-BASE. Training is an essential element of the work involved in each installation, with retraining and additional training provided to cope with staff turn-over and to build skills of staff involved in complex data manipulations.

UNEP-WCMC is UNEP's biodiversity information centre, providing information management services in support of conservation and sustainable use of species. The Centre helps build capacity of national biodiversity organisations through the provision of data and by providing technological support. A main focus is in providing support to implementation of Multilateral Environmental Agreements, notably the Convention on Biological Diversity (CBD), Convention on International Trade in Endangered Species of Fauna and Flora (CITES) and Convention on Migratory Species (CMS) and related Agreements. Data are made available over the Internet, via the Species Database (currently c. 140,000 plant taxa), on CD-ROM and as customised electronic files. UNEP-WCMC has been pioneering the delivery of interactive map-based conservation data on the Internet, technology that has been exploited in this project with the mapping of medicinal species data. These data and further data as they become available may be viewed on the web at:

http://www.unep-wcmc.org /reception/ims.htm

UNEP-WCMC plans to build on the work undertaken in this project, extending the methodology elsewhere in Africa, by working with institutions interested in building their country's ability to manage their medicinal plant resources in a sustainable manner.

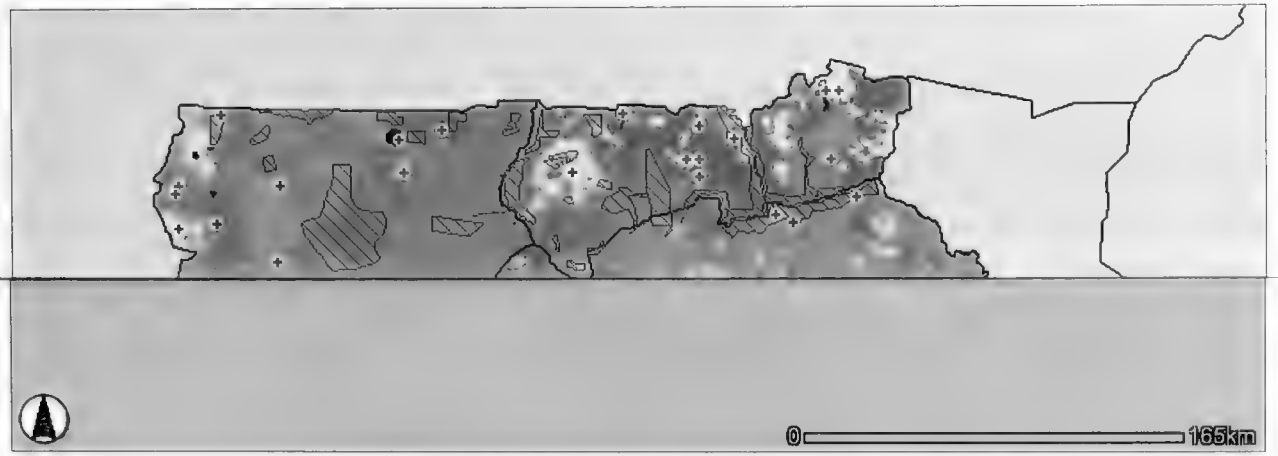
## 8. References

Abbiw, D.K. 1990. *Useful plants of Ghana*. Intermediate Technology Publications and Royal Botanic Garden, Kew. 337pp.

Hall, J.B. & M.D. Swaine. 1981.*Classification and ecology of forests in Ghana*. Ghana University Press

**Annex:** Maps

# Map 1: Medicinal Plants in Ghana: Collection Locations




Legend

- Specimen points
- Administrative Boundaries
- Protected Areas

Land Cover

- Closed cultivated savanna woodland ( >20 trees/ha )
- Lake Volta
- Country Outline

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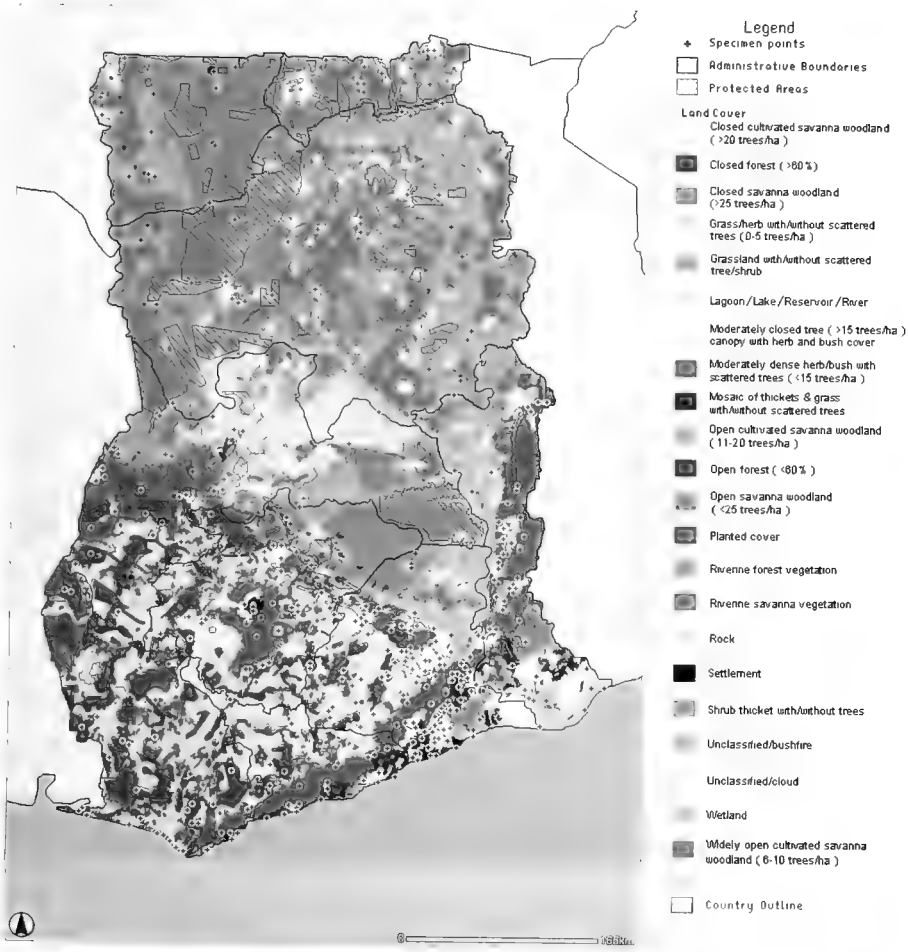
Projection: Geographic

Date Printed: March 2002

# Map 1: Medicinal Plants in Ghana: Collection Locations

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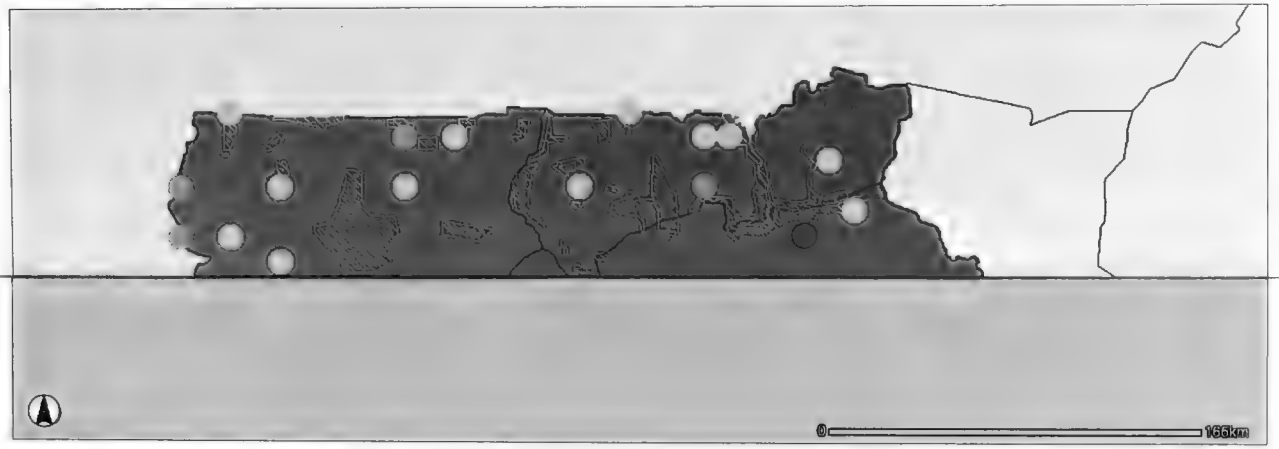
# Map 2: Medicinal Plants in Ghana: Specimen density




Legend

Number of Specimens

1 – 5

5 – 15

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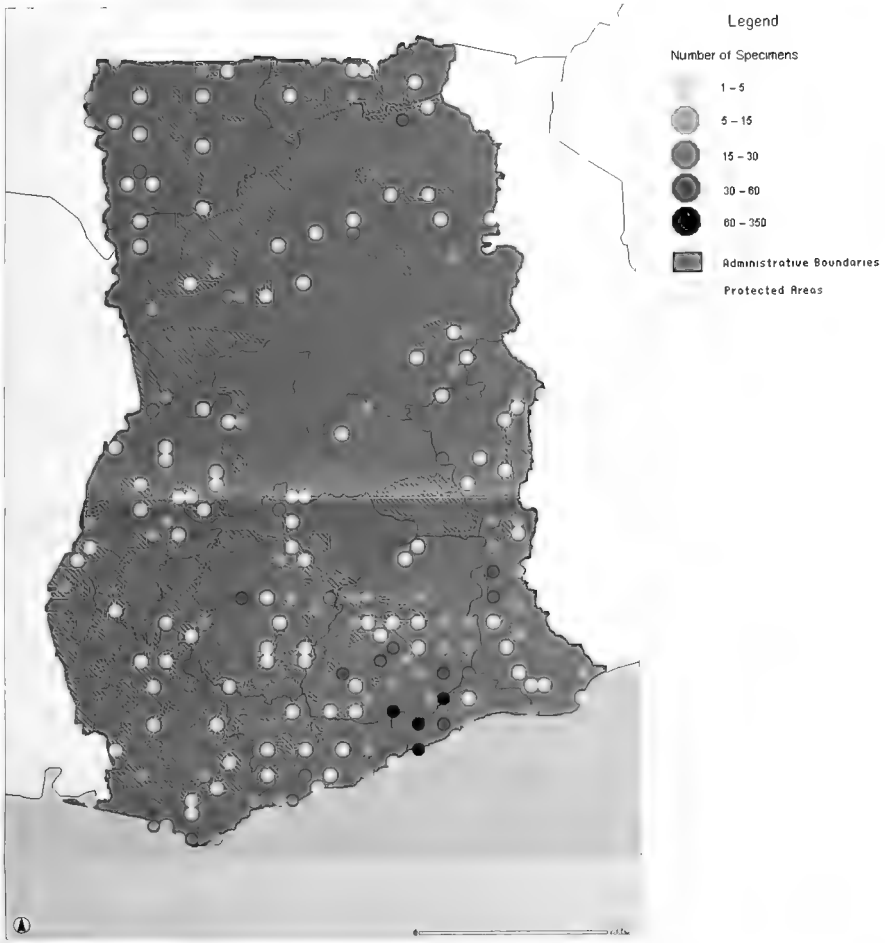
# Map 2: Medicinal Plants in Ghana: Specimen density

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**Map 3 Sample species map**

***Mitragyna inermis*** **mapped against protected areas and habitat data**

# Conserving and cultivating medicinal plants in Ghana 1999-2002

**Species Distribution**

Mitragyna inermis O.Kze.

**Background Layers**

- Protected Areas
- Habitats
- Protected Areas and Habitats
- Elevation
- Rainfall

**Legend**

## Project Collection Locations

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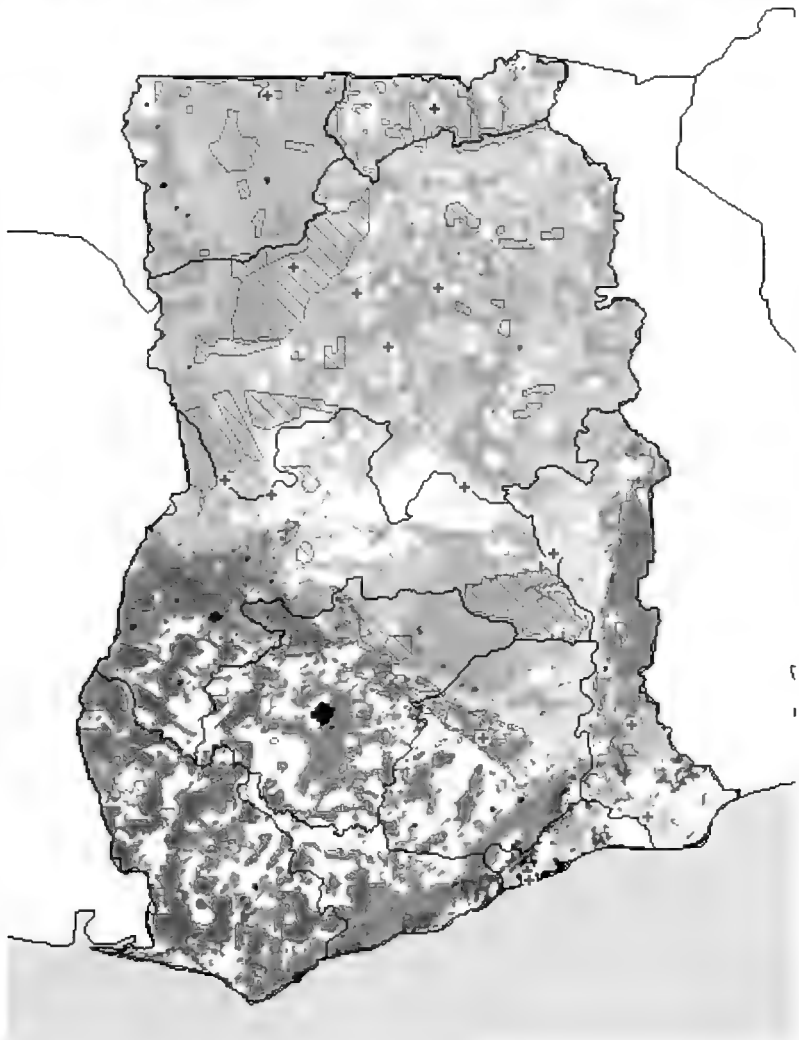



0 165km

**Map 4 Sample species map**

***Mitragyna inermis* mapped against elevation data**

# Conserving and cultivating medicinal plants in Ghana 1999-2002

**Species Distribution**

Mitragyna inermis O.Kze.

**Background Layers**

- Protected Areas
- Habitats
- Protected Areas and Habitats
- Elevation
- Rainfall

**Legend**

## Project Collection Locations

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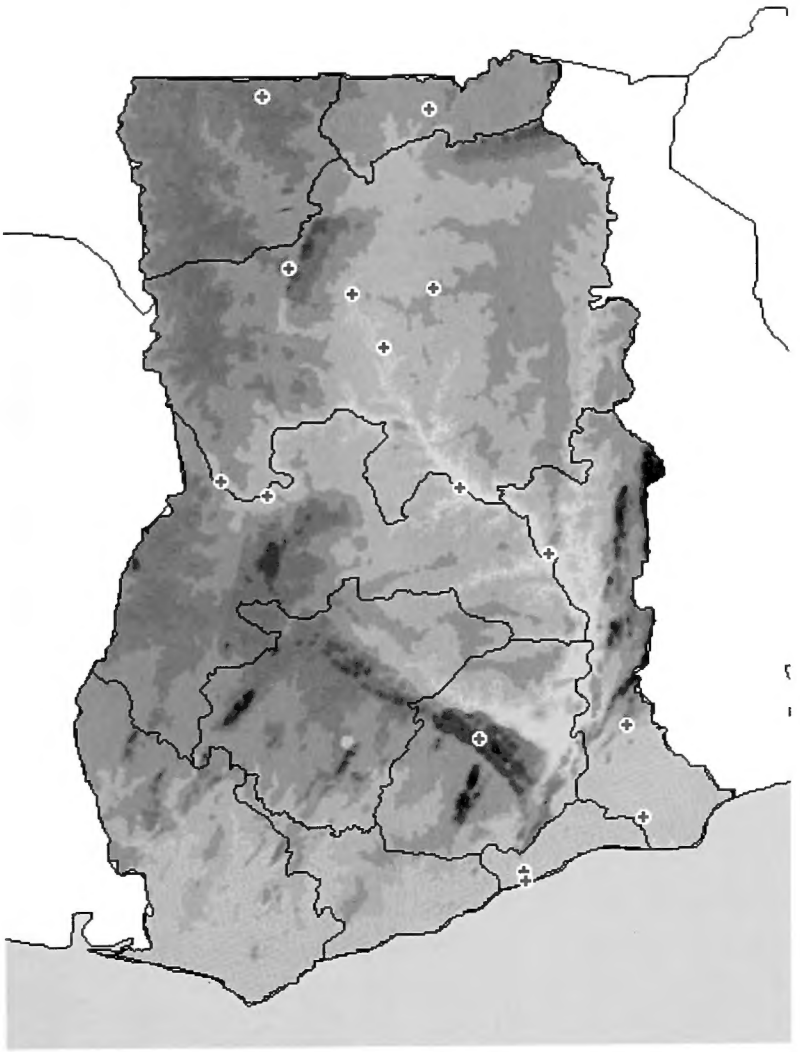



0 165km


# Conservation and sustainable use of medicinal plants in Ghana

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