Chapter 5

CASE STUDIES

CASE - 1 — FOUNDATION FOR REVITALISATION OF LOCAL HEALTH TRADITIONS. FRLHT

With its Head Quarters at Bangalore, FRLHT was founded as an independent Non-Governmental society in 1991. The organisation has a core team of senior foresters, botanists, computer professionals, traditional physicians and researchers.

Since 1993, FRLHT has initiated collaborative programmes in response to the crisis of dwindling medicinal plant resource. FRLHT, in collaboration with State Forest Departments, local NGOs and Research Institutes has established a chain of conservation sites in the Eastern and Western Ghats across the States of Kerala, Tamil Nadu, Karnataka and Maharashtra.

This network is called the Medicinal Plant Conservation Network (MPCN). The MPCN today is conserving about 1400 species of medicinal plants including 70 Red-listed species. The two pronged strategy of MPCN aims at in situ conservation by setting up of MPCAs (Medicinal Plant Conservation Areas) and ex situ
conservation by MPCPs (Medicinal Plant Conservation Parks). There are 7 MPCAs and 3 MPCPs located in different agro-climatic regions of Kerala (Appendix XI).

In the MPC Network, local communities are being motivated to form management and protection committees to look after long-term conservation of medicinal plants in their natural and other habitats. Training programmes are conducted for which simple literature has been developed by FRLHT on conservation and utilisation aspects of medicinal plants, for being used by foresters, NGOs, community leaders and tribals.

Small enterprises related to growing of medicinal plants and their value addition are being promoted among rural communities as an integral part of conservation strategy. These units demonstrate as to how the local communities that live around the natural habitats of medicinal plants can economically benefit from conservation projects. A chain of seed banks have been established around the conservation sites to provide basic planting material to noncommercial as well as commercial user groups. It is reported that this nursery network raises about 400 species and is spread across different agro-climatic regions of South India.

'geneNet', the informal newsletter of MPCN gives information on the conservation activities of the MPCN and establishes links with the end-users of medicinal plants.

The Medicinal Plants Conservation Research Herbarium and Database unit of FRLHT has developed a consistent multi disciplinary, computerised medicinal plant database which is regularly being updated. The main objective of the database is to generate reliable multi disciplinary information on the identity, distribution, threat and conservation status, trade data and agro technology of medicinal plants. This data will cater the needs of sectors like forestry, conservation science, agriculture, drugs and cosmetics and trade.

The FRLHT bio-cultural herbarium houses and maintains records of over 1500 voucher specimens of known medicinal plants and another 800 plant species holding
promise of untapped potential. The organisation has made pioneering efforts to assess the rare, endangered and threatened medicinal plants of South India based on the guidelines prepared by the IUCN, and a Red Data Book of Medicinal plants is being prepared. This would help to promote the conservation of these species, facilitate their propagation and cultivation, and ultimately reduce the pressure of their exploitation in the wild.

Recognising that the success of the initiatives depends on active support from public at large, FRLHT has set up a communication and education materials development unit. The unit coordinates activities to create public awareness for the conservation and sustainable use of medicinal plants. These include the bimonthly magazine Amruth — India’s only magazine on medicinal plants, newsletter geneNet, books, films, puppet shows, exhibitions, posters and manuals. The publications and collateral communication material produced by FRLHT are listed in Appendix—XIV.

FRLHT is thus, actively engaged in the field of conservation of medicinal plants.

It provides:

1. Planting material
2. Information on the propagation techniques of medicinal plants
3. Reliable educational material for conservation and sustainable use of medicinal plants.
4. Training packages on various aspects of conservation.
5. Advanced training (international courses on medicinal plants conservation)
6. Consultancy services on specific aspects of conservation of medicinal plants:
   —In undertaking research on threat status, trade, distribution and inventories
   —in the evaluation of projects
   —in the choice of species for cultivation in particular habitats
   —in the design of large scale medicinal plants conservation projects
   —in the design of medicinal plant databases.
TBGRI is an autonomous organisation established in 1979 under the Department of Science and Technology and Environment, Government of Kerala. It is located at Palode—40 kilometers away from Thiruvananthapuram in Trivandrum—Shencottai State highway and covers 121 hectares (300 acres) of forest land which lies between 8° 5' and 8°47' North latitude and 71° 1' and 71°4' East longitude, at an altitude of 70—160 m above MSL. It is situated at the foot hills of Western Ghats, and receives an average annual rainfall of approximately 300 cms and the temperature varying from 34°c to 19°c. The natural vegetation is secondary, comprising of evergreen deciduous, riverine and marshy components. Open grasslands and exposed rocks have created added plant diversity. The river Chittar borders the southern side of the garden.

The prime aim of TBGRI is to conserve tropical plant genetic resource and develop strategies for their sustainable use. Since inception, special attention is being paid for the conservation of medicinal plants.

Presently, there are 4 sections in the Institute/Garden working on various aspects of medicinal plants.

Section 1 : Ethno pharmacology and ethno medicine

Section 2 : Medicinal plants

Section 3 : MPCR and Ethno-medicinal Forest (Collaboration with FRLHT, Bangalore)

Section 4 : Gene Bank (under DBT, Government of India)
Section 1 aims at recognising and supporting traditional know-hows on herbal medicine and practices. In this context, a total approach of conserving both traditional knowledge as well as medicinal plants is opted. With well-conceived programmes in the fields of research, education, conservation and community development; the division of Ethno-medicine in TBGRI started functioning from 1992. The thrust areas of this section are:

(i) Survey and documentation of ethno-medically important plants of tribals and folk-healers of Kerala.

(ii) Ethno—medico—linguistic studies of selected medicines.

(iii) Computerised database of medicinal plants

(iv) Publication of authentic literature in the discipline.

Section 2. Department of medicinal plants at TBGRI was sanctioned in 1979 and started functioning in 1983. A live field collection of 600 species of medicinal plants was established in 1984, with accessions from different regions of the Western Ghats. With the original idea of a herbal garden that would constitute living collections, it continues to function even after the devastating flood in the Chittar river during 1992 causing loss to hundreds of species. As on today, the garden grows 450 species of medicinal plants.

Even though the thrust area is conservation, preliminary aspects on propagation and cultivation of selected medicinal plants were studied and the information published in 1991. In the same year, the department conducted hands on training programme for farmers in the cultivational aspects of medicinal plants which attracted a large number of farmers across the state.
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The collection of medicinal plants in the Herb Garden of TBGRI under the Department of Medicinal Plants fulfils the following requirements of the society.

- Popularisation of medicinal plants
- Aesthetics
- Conservation
- Primary Health Care
- Research
- Education

Section 3. Department of MPCP and Ethno-Medicinal Forest at TBGRI was established during 1995-1996 in collaboration and funding from FRLHT Bangalore. Ex situ conservation of medicinal plants is being carried out by this department in the most viable form with carefully surveyed accessions of germ plasm of wild medicinal plants and by establishing a nursery as well as live collections of Red-listed medicinal plants.

The thrust area of this wing is setting up of an Ethno-Medicinal Forest (EMF). Almost 25 acres of land is set apart for this EMF. An exhaustive survey was conducted to enumerate the existing medicinal plants. Microclimatic features of the area was also studied. The distribution map was then prepared to enable fixing up of suitable planting areas for introduction of the species. The entire area of 25 acres was divided into 20 sq.m blocks and a map in 1:1000 cm scale was prepared. Each block is being planted with different species considering their association with other plants and the microhabitat.

In these blocks, a multi-cultural planting pattern of growing trees, shrubs, climbers
herbs etc. is followed. The established plants are allowed to grow freely as if they are in their natural habitat as an inbreeding group producing fruits and seeds so that the biological process can continue.

Regular field trips are organised by the Department in different seasons based on the botanical survey calendar prepared for Kerala to collect planting materials, information on plants, raw drugs, and herbarium. The plants collected are well nurtured in the nursery and later will be transplanted in the suitable block of Ethno-Medicinal Forest during rainy season. The living collections at TBGRI EMF serves as a refugium for the Rare, Endangered and Threatened medicinal plants and also as a centre for conservation, education, research and community development.

74 RET species of medicinal plants have been collected and maintained in the demonstration garden whereas multi-locational collections of 26 RET species are being planted in the Ethno-Medicinal Forest. (Table :5.1)

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>No.</th>
<th>Species</th>
<th>No.</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Saraca asoca</em> Roxb.</td>
<td>10</td>
<td><em>Celastrus paniculatus</em> Willd.</td>
<td>19</td>
<td><em>Tylophora indica</em> Burm.f.</td>
</tr>
<tr>
<td>2</td>
<td><em>Rauvolfia serpentina</em> Linn.</td>
<td>11</td>
<td><em>Casscinum fenestratum</em> Gaertn.</td>
<td>20</td>
<td><em>Trichopus zeylanicus</em> ssp travancoricus</td>
</tr>
<tr>
<td>3</td>
<td><em>Aristolochia tagala</em> Linn.</td>
<td>12</td>
<td><em>Gephila reniformis</em> Linn.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><em>Acorus calamus</em> Linn.</td>
<td>13</td>
<td><em>Dysoxylum malabaricum</em></td>
<td>21</td>
<td><em>Jasminia arayalpatra</em> Joseph &amp; Ch.</td>
</tr>
<tr>
<td>5</td>
<td><em>Alstonia venenata</em> Roxb.</td>
<td>14</td>
<td><em>Helmyanthostachys zeylanica</em></td>
<td>22</td>
<td><em>Jhottee dinghouri</em> Clarke</td>
</tr>
<tr>
<td>6</td>
<td><em>Aegle marmelos</em> Linn.</td>
<td>15</td>
<td><em>Kaempferia galanga</em> Linn.</td>
<td>23</td>
<td><em>Piper barbleri</em> Wall.</td>
</tr>
<tr>
<td>7</td>
<td><em>Alpinia galanga</em> Linn.</td>
<td>16</td>
<td><em>Holostemma adakadian</em> Schultz</td>
<td>24</td>
<td><em>Rauvolfia beddomei</em> Bedd.</td>
</tr>
<tr>
<td>8</td>
<td><em>Canarium strictum</em> Roxb.</td>
<td>17</td>
<td><em>Kaempferia rotunda</em> Linn.</td>
<td>25</td>
<td><em>Rauvolfia micrantha</em> Linn.</td>
</tr>
<tr>
<td>9</td>
<td><em>Bacopa monnieri</em> Linn.</td>
<td>18</td>
<td><em>Mimusops elengi</em> Linn.</td>
<td>26</td>
<td><em>Ochrienauclea missionis</em> DC.</td>
</tr>
</tbody>
</table>

*Table 5.1 List of RET species planted in TBGRI EMF (Multi locational collections)*

In the wake of the issue of decreasing forest cover and ever increasing demand for herbs and other medicinal plants—most of these wild growing, TBGRI MPCP is now embarked in the development of agro-technology for 36 species of wild medicinal plants which fall in the Endemic, Rare, Endangered and Threatened
categories, in order to promote their cultivation.

TBGRI MPCP has also implemented a programme “Herbs for all and Health for all”, in order to promote awareness among common people and to provide training for selected community groups at TBGRI in the sustainable utilisation of local resources. Here, the conservation of medicinal plants is closely associated with the local community development programmes with the greater emphasis on the unsustainable harvesting and wastage of natural resources. The nursery attached to the Ethno-Medicinal Forest enables supply of medicinal plant seedlings to various end users.

Section 4. Gene Banks of the TBGRI became operational in 1993 with financial assistance received from the department of Biotechnology, Government of India. The proposal was materialized after the G 15 summit in Caracas in 1991, and is known as G 15 GEBMAP (Gene Bank for Medicinal and Aromatic Plants) Programme. The major aim of this wing is short, medium and long term conservation of germ plasm of medicinal and aromatic plants of Peninsular India by establishing Field Gene Bank, Seed bank, \textit{in vitro} repository and Cryo bank.

The Field Gene Bank (FGB) has been established in about 20 hectares of land inside the garden. This acts as the \textit{ex situ} conservation area for MAPs from Kerala, Tamil Nadu, Karnataka and Maharashtra. The proposed pattern has been later modified into a novel field conservation method for medicinal and aromatic plants by linking \textit{in situ} and \textit{ex situ} means, to be designated as ‘simulated’ \textit{in situ} gene bank. A protected, degraded but densely regenerated forest plot with natural populations of several species was selected and introduction of species was done considering various factors peculiar to their natural habitats. Presently, there are
5000 accessions including about 100 Endemic/Rare/Endangered/Threatened species of medicinal plants. All possible samples including a broad spectrum of genetic variants—cytotypes, ecotypes, morphotypes and chemotypes of selected species depending on the variability are introduced and maintained.

The Seed Bank is intended for short to medium term conservation of species through seeds collected from medicinal plants of peninsular India. Seed Bank is functioning in the laboratory cum library complex of the Institute. The idea of the seed bank is to preserve viable seeds until they are sown according to the schedule of short term or medium term conservation efforts. Both orthodox seed species and recalcitrant seed species are stored in the Bank.

Seed deterioration and changes in the genetic composition of the seeds are prevented by drying them to very low moisture contents of 5—10 percent and successfully stored in moisture proof containers at low or subfreezing temperatures up to 5 years. For still longer periods, the storage temperature is 18°C. Recalcitrant seeds are also stored under cryo-preservation techniques. Presently, 200 species of medicinal plants are conserved as seeds and stored in the seed bank at TBGRI.

Tissue culture unit and Cryo-bank are established in the Plant Biotechnology Division of the Institute, which is equipped with modern equipment for tissue culture and cytological, biochemical and cryo-preservation works. The sophisticated instruments available in the institute include high-speed refrigerated centrifuges, UV-visible spectrophotometer, electrophoresis and isoelectric focussing units, densitometer, planer cryo-preservation system, -70°C freezer etc.

The priority seed species for cryo-preservation are Coscinium fenestratum (recalcitrant), Holostemma adakodien, Embelia ribes and Trichopus zeylanicus.
(orthodox). Priority species under vegetatively propagated categories include *Janakia arayalpatra, Adathoda bejdomei, Nervilia prainiana, Paphiopedilum druryi, Rauvolfia micrantha, Piper trichostachyon*.

Priority species are shortlisted based on the following aspects:

i. Conservation status (RET)

ii. Established use(s) in traditional systems of medicine

iii. Species used by ethnic and tribal communities

iv. Difficulties in conventional propagation

v. Known intra-specifications

vi. Commercial importance (modern medicine, industry)

vii. Amenability of the species to micro-propagation

viii. Importance in current and future bio-technical applications

ix. Problems in the exchange of germ plasm.

TBGRI, with the mandate of conservation and sustainable utilisation of medicinal plants, has accomplished a very large collection of rare, endangered and precious plants and making it as a animating sanctuary with the dynamics of fixing and ensuring their total preservation. The frontier research areas of the institute encompass eco-rehabilitation, gene pool development, botanical studies, rapid clonal multiplication, root culture, plant biotechnology, micro-propagation and development of skilled human resource in horticulture.
Aromatic and Medicinal Plants Research Station, Odakkali, (AMPRS) was established in 1951 as “Lemongrass Breeding Station” under the Department of Industries of the erstwhile Travancore—Cochin Government and was renamed later as “Lemongrass Research Station” under the Department of Agriculture, Government of Kerala with effect from 1-8-1954. Consequent to the formation of Kerala Agricultural University in 1972 the station became an integral part of University’s research network and was brought under the control of University in 1982, renamed again as Aromatic and Medicinal Plants Research Station (AMPRS).

The AMPRS, Odakkali lies between 10° 5' 40" and 10° 6' 0" North latitude and between 76° 32' 35" and 76° 32' 55" East longitude in the Asamannur village of Kunnathunadu Taluk in Ernakulam District. It has a humid hot climate, annual rainfall is approximately 332 cms and mean maximum and minimum temperatures, 32.6°C and 20°C respectively. The total geographical area of 12.57 Hectares (31 acres) is situated at an elevation of 60m above MSL and represents typical soil and agro-climatic features of the midlands of the State.

Lemongrass (Cymbopogon citratus) occupies the major share of the planted area. Pepper (Piper nigrum) vines are trailed on coconut palms, which form the avenue trees. Other major aromatic and essential oil yielding crops in the station are palmarosa (Cymbopogon martinii), Vetiver (Vetiveria zizanoides), Citronella, Ocimum (Ocimum sanctum), Cinnamon (Cinnamomum camphora), Nutmeg (Myristica fragrans), Clove (Syzygium aromaticum) and Eucalyptus (Eucalyptus globulus).

The station has been taking a lead in the collection and preservation of medicinal plants so as to popularize their cultivation and use. A herbal garden comprising of
about 350 species of medicinal herbs is being established at the station with objectives of identification and documentation of genuine medicinal plant species, conservation and propagation of rare/endangered species and education, demonstration and reference centre. Large scale cultivation (intercropping) of the following species of medicinal herbs has been undertaken in the farm (Plates 25—28).

1. Kaempferia galanga
2. Asparagus recemosus
3. Plumbago rosea
4. Adathoda beddomei
5. Tinospora cordifolia
6. Dioscorea floribunda
7. Desmodium gangeticum
8. Zingiber officinale
9. Curcuma longa
10. Piper longum
11. Maranta arundinacea

A nursery cum sales centre has been established to produce planting materials of medicinal plants for distribution among interested cultivators. Planting materials of about 70 species are readily available in the centre.

Thrust areas of research on medicinal plants are:

i. Exploration, collection and evaluation of germplasm of medicinal plants

ii. Crop improvement in medicinal plants

iii. Standardization of agro-techniques for selected medicinal plants as pure/intercrop.

iv. Management of diseases and pests attacking medicinal plants

v. Utilisation and marketing of medicinal plants

The station maintains a good liaison between producers, traders and user industry of medicinal plants. Dissemination of information and technology is efficiently carried through farmer contact programmes, correspondences, newspapers, audio and visual media. Village adoption programmes, lab to land programmes and conducting agro-clinics are the outstanding extension activities of the station.
CASE - IV — KERALA FOREST RESEARCH INSTITUTE, PEECHI.

KFRI

Kerala Forest Research Institute, (KFRI) Peechi established in 1979 has been doing pioneering researches on the flora and fauna of the forests of Kerala. Medicinal plants being considered as Minor Forest Produces (MFP) or Non Timber Forest Produces (NTFP) became an integral part of the researches in the Institute Survey, documentation, collection and propagation of the medicinal plants are the thrust areas of research. The pioneering studies conducted by the scientists laid emphasis on the need for in situ conservation of medicinal plants after assessing the threat status of the species in the wild.

The KFRI is also involved in ex situ conservation by setting up of a herbal garden in 0.5 Hectares of land in the institute campus. There are 300 species of medicinal plants collected exclusively from the forests of Kerala. The plants enjoy natural forest conditions in this garden (a replica of their natural habitat).

The garden serves as a centre for education, authenticating genuine species and repository for genetic material for production of propagules.

Planting material is given at a very low cost to the entrepreneurs. Authentic planting material of 30 species propagated through conventional methods are available on request. No pesticides are being used in the garden and cow dung is the only manure used.

The herbal garden and the attached nursery is under the department of Botany of the KFRI and serves as a centre of par excellence for identification of genuine medicinal plant species and supply of their authentic planting materials.

KFRI keeps a very good herbarium of authenticated species of medicinal plants collected from the different forest types of Kerala part of the Western Ghats. These specimens and the live plants of the garden are now being used for authentic identification of specimens brought by the medicine manufacturing units. This procedure helps the units in discarding the alternatives or adulterants in the place of original raw drugs.
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**CASE - V — ARYA VAIDYA SALA, KOTTAKKAL. AVS**

Founded in 1902 by the Great visionary Late Vaidyaratnam P.S. Varier, Aryavaidyasala, Kottakkal (AVS) is the most outstanding institution in India dedicated to the cause of Ayurveda. Continuing as an industrial giant in the field of Ayurvedic medicine, AVS consistently put pioneering efforts in the field of academy as well as research and development. Recognising the problem of threat to the medicinal plant resource, AVS stepped into the scenario of preserving the common as well as Rare, Endangered and Threatened medicinal plant species as early as 1978.

Backed by an expert panel of technical experts and scientists, AVS today has the most exhaustive *ex situ* collection of medicinal plants. Spread across an area of 25 acres in different locations, the herbal garden houses not less than 800 species of medicinal, ornamental, exotic and other plants. The main objective of the herbal garden is to conserve as well as to promote the concept of conservation of gene pool of the medicinal plants belonging to the endangered, threatened and rare category (Plates 29—32).

Ongoing research and development activities include computerised medicinal plants database and raising of an authentic nursery of medicinal plants. Medicinal Plants (India) Project is an important project undertaken by the AVS with the financial assistance from the International Development Research Centre (IDRC), Canada. The project was started in 1993. The main objectives of the project are:

i to locate medicinal plant species in their natural habitats.

ii to establish a germplasm bank
iii to identify markers through pharmacological studies.

iv to evolve techniques for propagation of medicinal plant species on a large scale for enabling homestead cultivation.

v to develop models for on-farm cultivation

vi to draw up recommendations for their conservation and regeneration in forests.

Two National conferences under joint auspices of IDRC and AVS were held in September 1995 and December 1996. The principal scientist and project co-ordinator in the AVS herbal garden is a permanent member of IUCN, and the activities of this institution is attracting the global attention in the recent years.

Current extension activities include organising ex situ conservation training programmes for farmers, distribution of genuine medicinal plant propagules to farmers, conducting training on the cultivation of medicinal plant species which could be used as first aid in the households and growing species which can be reintroduced into natural habitats.

Large-scale cultivation of selected medicinal plants were taken up by AVS during 1990-1998. Since the yield could not be properly utilized (due to technical reasons posed by traditional crude drug suppliers to AVS) the programme of cultivation had not gained momentum. The existing marginal cultivations are intended only to meet the shortage of raw drugs from traditional suppliers.
CASE - VI — KERALA AYURVEDA PHARMACY LIMITED, ALUVA. KAPL

The medicinal plants division under R & D wing of Kerala Ayurveda Pharmacy Limited (KAPL), Aluva was established in 1991. This centre has been approved and accredited by the Department of Science and Technology (DST), Government of India. The prime objective of the Division is to raise an *ex situ* germ plasm collection of medicinal plants. Presently, the herbal garden houses 400 species of medicinal, aromatic, ornamental and exotic plants (Plates 33,35). Spread over an area of 2 hectares, the unit undertakes conservation, cultivation and nursery practices. Medicinal plants collected from the forests of Maharashtra, Karnataka, Tamil Nadu and Kerala are preserved in the garden. The nursery was started in 1994 and as on today, 50 species are readily available for sale and another 30 are available on request. Research institutions, entrepreneurs and local bodies of the government are regular buyers of planting material from this garden.

Cultivation of selected medicinal plants is being successfully undertaken in this centre *Kaempferia galanga, Alpinia galanga, Coleus vetiveroides, Indigofera tinctoria, Plumbago rosea* are the species under cultivation and the produce is directly utilised by the company (Plates 34,36). The unit projects *Alpinia galanga* as the most successful principal cultivation in terms of quality drug and economic value. In pursuit of excellence in cultivation, KAPL has an exclusive farm of 16 hectares started in the year 1994 at Thali, near Dharmapuri in Karnataka, started in the year 1994. No chemical fertilizers or pesticides are being used in the conservation/cultivation areas.

The Department of medicinal plants at KAPL has tie up and exchange programmes with Department of Botany, University of Poona; Agarkar Institute, Madhya Pradesh and Kerala Agricultural University (Odakkali Centre).
During 1998, KAPL collaborated with Dhanwatari-vana at Jnanabharati, Bangalore for exchange of medicinal plants and planting materials.

Though KAPL adopts advanced practices and techniques in the medicine manufacturing sector, medicinal plants division does not utilise any advanced techniques of biotechnology in the conservation or cultivation attempts.

**CASE - VII — OUSHADHI, THRISSUR**

Located at Kuttanellur, Thrissur, Oushadhi is the only large scale Ayurvedic medicine manufacturing unit under the Government of Kerala. Oushadhi also concentrates in the field of cultivation of medicinal plants rather than their conservation. In this direction a 5 year project funded by the department of Health and Family Welfare, Government of India was taken up by Oushadhi during 1992-1997. An area of 4 hectares in the factory premises was earmarked for the project with an estimate of 5 lakh rupees. The project was implemented after consulting resource persons of KAU. 24 species were taken up for trial cultivation. At the end of the project period in 1997, Oushadhi could perfect the technique of cultivation of species like *Plumbago rosea*, and *Vetiveria ziznoides*. Cultivation in respect of *Kaempferia galanga* and *Holostemma adakodien* was not proved successful. Failure was attributed to the reason of converted paddy field being used for cultivating these crops. However, no chemical fertilizers or pesticides were used in these cultivations.

Project II at Oushadhi was started in 1997 to use waste lands for cultivation of medicinal plants. This is also a centrally funded project started in an area of 2 hectares to cultivate the following species of medicinal plants (Plates 37,38,40).
— Saraca asoca
— Pterocarpus santalinus
— Phyllanthus emblica
— Aegle marmelos
— Caesalpinia sappan
— Wrightia tinctoria

This ongoing project is being guided by resource personnel from KFRI, Peechi.

A new project for the cultivation of medicinal plants under the auspices of Oushadhi is under consideration of the State Government in 28 hectares of land at Pariyaram, Kannur.

A herbal garden is also being maintained at Oushadhi premises with nearly 100 species (Plate 39)

CASE - VIII — NAGARJUNA HERBAL CONCENTRATES, THODUPUZHA

Since 1991, Nagarjuna Herbal Concentrates, Thodupuzha, the popular Ayurvedic Pharmaceutical Company is in the forefront in conducting various awareness programmes on the cultivation of medicinal plants. The Manager (Agriculture) coordinates various activities in this direction. In 1991, the Agriculture Department of the company collaborated with tribal societies in Idukki District for promoting cultivation of medicinal plants as intercrop with buy-back guarantee. Successful crops raised under the scheme were Indigofera tinctoria, Adathoda beddomei, Alpinia galanga and Kaempferia rotunda. Failed crops included Andrographis paniculata, Holostemma adakodien, Vitex negundo and Plumbago rosea.

In 1994, the company established an authentic nursery cum herbal garden for
medicinal plants. There were accessions from Mysore, Coimbatore, KAU Mannuthy and various other reliable institutions (Plates 41,43)

Understanding the importance of extension activities to ensure public awareness and involvement, Nagarjuna has adopted various strategies in the past 5 years.

i Nagarjuna provides consultancy and advice on setting up herbal gardens. 30 Arts and Science colleges under Mahatma Gandhi University make use of the expertise for setting up of small scale herbal gardens in their campuses.

ii Imparts training to unemployed youths in raising nurseries of medicinal plants with assurance to buy-back the planting material.

iii Conduct demonstration classes, and seminars on raising planting material and also on cultivation of medicinal plants. The resource person attends as much as 2 sessions of such classes/seminars weekly. The People’s participation programmes under Grama Panchayats extensively make use of these facilities.

iv To promote cultivation of medicinal plants, Nagarjuna has instituted awards annually like the P.K. Narayan Memorial ‘Oushadhamitra’ award worth Rs. 15000/- for the best medicinal plant cultivator in the State.

v Issue regular newspaper advertisements carrying slogans and messages on aspects of medicinal plants conservation and cultivation.

vi Publish leaflets and brochures with information on conservation and cultivation of medicinal plants.

vii Nagarjuna has a mobile unit to ensure door delivery of planting materials of medicinal plants thus maintaining wide distribution network.
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viii Publishing books that aid in cultivation of medicinal plants like Oushadha Sasyangalude Krishi Reethikal, Vrikshayurveda etc.

ix Conducting popular serial programmes in AIR like ‘Sasyajam Mrithyunjayam’.

The nursery maintained by Nagarjuna is the largest in the State (Plates 42,44). This nursery meet bulk orders/ demand of planting material. There are nursery stocks of nearly 50 herbs and 50 trees used in medicine. The planting material is sold at competitive prices.

Since four years, Nagarjuna has shown successful cultivations of the following species as intercrops in the 10 hectares of rubber plantation in Marthoma Estate at Thodupuzha.

- *Piper longum*  
- *Bacopa monnieri*  
- *Vetiveria zizanoides*  
- *Acorus calamus*  
- *Desmodium gangeticum*  
- *Indigofera tinctoria*  
- *Alpinia galanga*  
- *Rauvolfia serpentina*  
- *Plumbago rosea*  
- *Andrographis paniculata*  
- *Kaempferia rotunda*  
- *Holostemma ada-kodien*  
- *Ricinus communis*  
- *Kaempferia galanga*  
- *Zingiber officinale*  
- *Curcuma longa*  
- *Adathoda beddomei*
CASE IX — HERBAL GARDEN AND MEDICINAL PLANTS CONSERVATION PARK (MPCP) AT KANJIKODE

The herbal garden at Kanjikode, Kerala was raised by the Arya Vidya Pharmacy (AVP) having head office at Coimbatore, during 1970-1980. 150—200 common and rare species of medicinal plants are maintained with accessions from different parts of the State. In 1993, the garden was baptized as MPCP in collaboration with FRLHT, Bangalore. The scientific team of MPCP Kanjikode conducted an exhaustive botanic survey in the Western Ghats to identify and collect medicinal plants so as to introduce them into the MPCP. During the survey, the team collected herbarium specimens, seeds, raw drugs as well live specimens of RET medicinal plants with help of the local people, making the venture a Community Participatory Programme (CPP).

The MPCP Kanjikode stressed the importance of medicinal plants in the Primary Health Care (PHC) and encouraged setting up of school herbal gardens, home herbal gardens, community herbal gardens, kitchen herbal garden and maintenance of sacred groves (Plates 49, 50).

On the cultivation scenario, the MPCP, Kanjikode collaborated with the ‘Girijyothi’ Project at Attappadi implemented by the District Revenue authorities. In popularizing the cultivational trends of medicinal plants, there is an attached nursery housing 130 species as planting material. MPCP, Kanjikode supplies planting material to entrepreneurs, krishibhavans and grama panchayats.

During 1995, the new concept of Ethno-Medicinal Forest (EMF) was also incorporated in the garden. 130 species are thus raised in the EMF. Live fencing of the grids were done with thorny species. An authentic model of sacred grove is also set up in the garden.

Put together, the 5 hectares of the MPCP, EMF and nursery at Kanjikode are good examples of a successful self explanatory model of integrated ex situ conservation activities (Plates 45, 46, 47, 51 & 52)