

M. S. SWAMINATHAN RESEARCH FOUNDATION

1996-97
**SEVENTH ANNUAL
REPORT**

Centre for Research
on Sustainable Agricultural
and Rural Development,
Chennai.



Front Cover

Left : *Cosciniium fenestratum* (Gaertner) Coleb. - an endangered medicinal plant collected from the forests of Wayanad, Kerala

Right : Commemorative sculpture associated with the 1996 Blue Planet Prize awarded to MSSRF

Back Cover

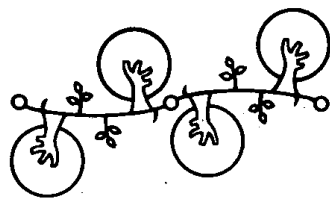
Top Left : Water harvesting in "the Pulse Village" (Kavadipatti, located in a dry zone of Ramanathapuram, Tamil Nadu)

Top Right : Hybrid rice demonstration in a farmer's field (Kizhur village, Biovillage Project)

Bottom : Residents of Pichavaram (located near the mangrove forest) preparing a resource map during a Participatory Rural Appraisal interaction.

Seventh Annual Report

1996 - 97



M.S. Swaminathan Research Foundation
*Centre for Research on Sustainable Agricultural
and Rural Development*

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Introduction

1997 marks the 5th anniversary of the UN Conference on Environment and Development held at Rio de Janeiro in 1992 and the 25th anniversary of the UN Conference on The Human Environment held at Stockholm in 1972. A report prepared by the United Nations for consideration at a special session of the UN General Assembly convened in New York in June 1997, to review the progress made since 1992 in giving operational content to the concept of sustainable development, warns, "the state of the global environment has continued to deteriorate. Reversing the trend is more urgent than ever."

Also, according to UNDP's 1997 Human Development Report, the human development index declined during 1996 in 30 countries, more than in any year since the first report was issued in 1990.

The world is thus still in search of methods of giving practical shape to the concept of sustainable and equitable development. To achieve this, several forms of tensions such as the following need to be resolved :

- between individual gain and common good
- between short-term opportunism and long-term stability
- between job-less economic growth and the livelihood security of the poor

- between resource extraction and ecological sustainability
- between market economy and "marketization" of society
- between greed and need

Only that kind of development which can help to resolve such tensions, will be sustainable in the long run. Many non-governmental organisations around the world are successfully opposing un-sustainable development. What however is equally important is proposing sustainable development options. This is particularly true of population-rich but land-hungry countries like India where millions suffer from extreme poverty and deprivation. We therefore need an ecology of hope and action, since inaction is the greatest enemy of sustainable development.

The major focus of the work of MSSRF is the testing and standardisation of sustainable options in the areas of agriculture and rural livelihoods. The strategy involves making the conservation and sustainable use of natural resources the pathway for sustainable food and livelihood security. In other words, the aim is the creation of an economic and social stake in conservation. Since the integration of gender dimensions in such work is vital for achieving this goal, the following two major steps were initiated during the year:

- Organisation of a Resource Centre for Gender and Development

- A detailed analysis of the gender dimensions of biodiversity management in India.

It was a source of encouragement to the scientists, scholars and staff of the Foundation when their work on linking the ecological security of an area with the livelihood security of the communities living in that area received recognition through the award of the 1996 Blue Planet Prize. The text of the acceptance speech delivered at Tokyo on November 1, 1996 sets out the strategies followed to reach the goal of promoting job-led economic growth in rural areas, rooted in the principles of ecology and gender and social equity.

During 1996-97, the Trustees and staff of the Foundation initiated a process of consolidation and concentration of their efforts in the areas of participatory, policy and action research, capacity building, networking and advocacy. Such a step became timely, since two major projects supported by the Swedish International Development Co-operation Agency (SIDA) and the Government of Italy through the International Plant Genetic Resources Research Institute came to an end. SIDA's generous support played an important part in helping the Foundation not only in organising its community Biodiversity Programme, but also in developing its research and training infrastructure. The conclusion of these projects was managed without disrupting the impact of the work started under their auspices, because of the withdrawal

strategy built into the design and implementation of all of the Foundation's programmes. Simultaneously, efforts to build a corpus fund to insulate core activities from the vagaries of project support were redoubled. The funds associated with the Blue Planet Prize helped to accelerate the process of building a corpus.

The financial sustainability of a voluntary R&D organisation is vital for both staff morale and programme continuity. Without a critical mass of financial stability, an institution will be tempted to chase funds and in that process become a donor-driven organisation. *It is the firm conviction of MSSRF that money should not be allowed to define its mission. Rather, money should be sought to achieve the fulfilment of its mission from those who share the vision of a more equitable and hunger-free world.*

Fostering an *ecology of hope* is the mission of MSSRF. Such a mission can be achieved only by enlarging the concept of sustainability from a purely economic perspective to an inclusive one which embraces the environmental, gender and poverty dimensions. It would be useful to review briefly the work done during 1996-97 from this angle. Since the details of the results achieved are described later, attention is drawn in this Introduction only to a few highlights.

In Programme Area 100, dealing with coastal systems research, all on-going programmes were unified under a

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project on Coastal Mangrove Wetlands Conservation sponsored by the India-Canada Environment Facility. A co-ordinated programme for the conservation and sustainable management of mangrove forests along the East Coast of India, covering the States of Tamil Nadu, Andhra Pradesh, Orissa and West Bengal, was initiated. The programme aims to understand the precise causes for the degradation of mangrove wetlands, identify and test suitable remedies for the identified maladies and develop a system of Joint Mangrove Forest Management involving the coming together of the Forest Departments and the mangrove forest dependent communities into a symbiotic partnership.

Programme Area 200, dealing with Biodiversity and Biotechnology, was also reorganised during the year. All the ongoing work on biodiversity was brought together in the form of a Technical Resource Centre for the implementation of the equity provisions of the Convention on Biological Diversity (TRC-CBD). This TRC-CBD, dedicated to tribal and rural women and men and inaugurated by Mrs. Elizabeth Dowdswell, Executive Director, United Nations Environment Programme in July 1996 has the following components:

- Working with tribal and rural families to promote the revitalisation of their *in-situ*, *in-situ-on-farm* and *ex-situ* conservation traditions.
- Empowering local communities to deal with issues like "prior informed consent" by training youth from such communities and organising them in the form of an *Agrobiodiversity conservation corps*.
- Developing multimedia databases for taking up with the designated authorities the question of recognising the contributions of tribal and rural families and compensating them for their efforts in genetic resources conservation and enhancement from the proposed National Biodiversity and Community Gene Funds.
- Operating a Community Gene Bank and Community Herbarium for serving as authentic reference sources.
- Linking conservation and commercialisation in a mutually reinforcing manner so that an economic stake in conservation replaces the prevailing economic interest in unsustainable exploitation.
- Organisation of Trainers' Training programmes for representatives of non-governmental organisations and servicing a NGO-community Biodiversity Conservation Alliance.

The TRC-CBD undertook the following four major studies during the year and submitted detailed reports to the sponsoring agencies:

- Priorities for the Global Environment Facility (GEF) in the area of agrobiodiversity conservation – report for GEF.

- Operationalising the concept of Farmers' Rights – Report for FAO.
- Integrating Gender Dimensions in Biodiversity Management – Report for FAO.
- Implementing the Equity provisions of CBD – Report for the United Nations Environment Programme (UNEP).

Based on these studies, the organisation of an All-India Coordinated Action Research Project on Gender and Biodiversity Conservation and Management has been recommended. Similarly, practical methods of implementing the equity provisions of CBD and the Farmers' Rights concept of FAO have been recommended to the concerned Ministers of the Government of India. The following are the recognised methods of conserving biodiversity:

- *In-situ* conservation through a Protected Areas Network
- *Ex-situ* conservation in Gene Banks and Botanical and Zoological Gardens.
- *In-situ* on-farm conservation of land races of neglected crops by tribal and rural women and men.

While the first two forms of conservation are supported from public funds, the *on-farm* conservation efforts of tribal and rural families are yet to be recognised and rewarded. Since their efforts benefit the public, their work also deserves to be supported from public

funds. Concrete steps have been suggested for this purpose.

With the help of an endowment grant made by the MAHYCO, a chair titled "B.R. Barwale Chair in Community Biodiversity" has been established to provide continuity in leadership to the work of TRC-CBD. Also, a National Action Plan for saving lives by saving plants was developed at a Consultation on Medicinal Plants organised in January 1997, with the support of the Ministry of Environment and Forests and the Foundation for the Revitalisation of Local Health Traditions (FRLHT).

The infrastructure for the activities of TRC-CBD was strengthened by establishing a community Agrobiodiversity centre at Kalpetta, Wayanad District, Kerala. The work of the TRC-CBD is guided by a National Policy Advisory Committee.

In the area of biotechnology as related to the conservation and sustainable use of biodiversity, the on-going programmes were consolidated into the following four discrete but interacting activities, with programme support from the Department of Biotechnology, Government of India:

- Genetic enhancement with particular reference to tolerance/resistance to coastal salinity
- Bio-monitoring of ecosystem health
- Micropropagation of Red Data Book species and Mangroves

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- Standardisation of community bio-prospecting procedures based on principles of ethics and equity.

The work of the biotechnology group is guided by a Bio-safety and Bio-ethics Committee, which has among its membership a representative of the World Conservation Union (IUCN).

The work in progress under Programme Area 300 was reorganised under the following two major centres :

- J.R.D. Tata Ecotechnology Centre, established with generous financial support from several Tata trusts
- B.V. Rao Centre for Sustainable Food Security, set up with an endowment grant from the Venkateshwara Group of Companies.

The programme priorities of these two centres are shown in Figures 1 and 2. A building to house the J.R.D. Tata Ecotechnology Centre is currently under construction in land generously made available by the Government of Tamil Nadu. The building of the J.R.D. Tata Ecotechnology Centre will be dedicated on July 29, 1998 on the occasion of the birthday of the late Bharat Ratna JRD Tata.

The Biovillage Programme in progress in the Union Territory of Pondicherry with the support of UNDP, will be placed on a long-term foundation by integrating its work with the core activities of the J.R.D. Tata Ecotechnology Centre.

Among the significant activities undertaken by the B.V. Rao Centre for Sustainable Food Security, the following merit mention:

- A detailed report on priorities in the food and nutrition sector for UNDP
- A report on operationalising the concept of Small Farmers' Agri-business Consortium (SFAC) in the Dharmapuri district of Tamil Nadu for UNDP
- Developing a programme jointly with the Central Food Technological Research Institute (CFTRI) for the *in-situ-on-farm* conservation of nutritious grains (these are minor millets unfortunately christened by FAO and government agencies as "coarse grains") by linking their use in the preparation of processed foods
- Assisting the Tamil Nadu Government in the development of an integrated implementation strategy for the Chief Minister's programme for the eradication of poverty-induced hunger.

The J.R.D. Tata Ecotechnology Centre concentrates on promoting sustainable livelihood opportunities in rural India. It services the Asian Ecotechnology Network sponsored by UNESCO and the Cousteau Foundation. The B.V. Rao Centre strives to promote public policies which can help to end endemic and silent hunger in the country.

The work under Programme Area 400 is being reorganised under the Re-

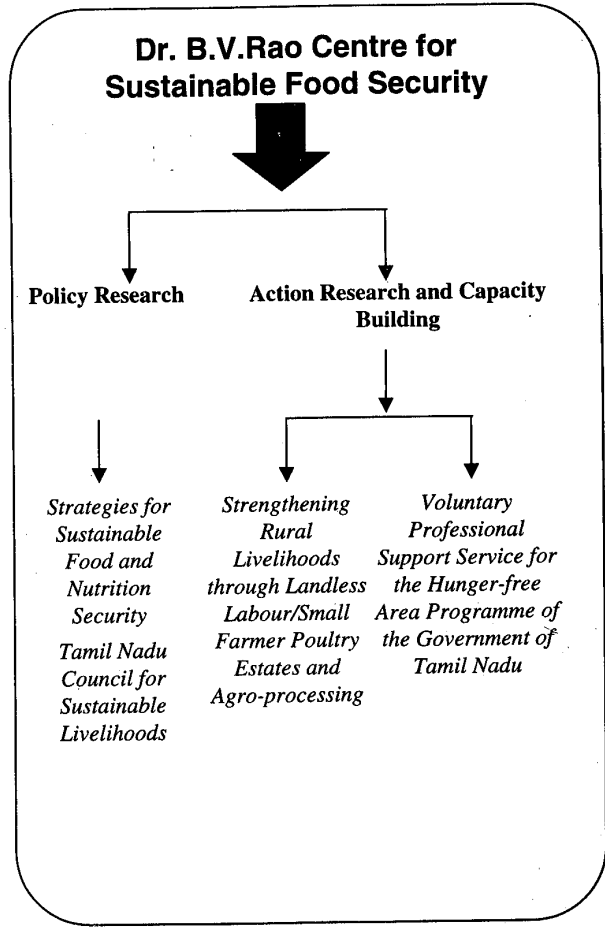
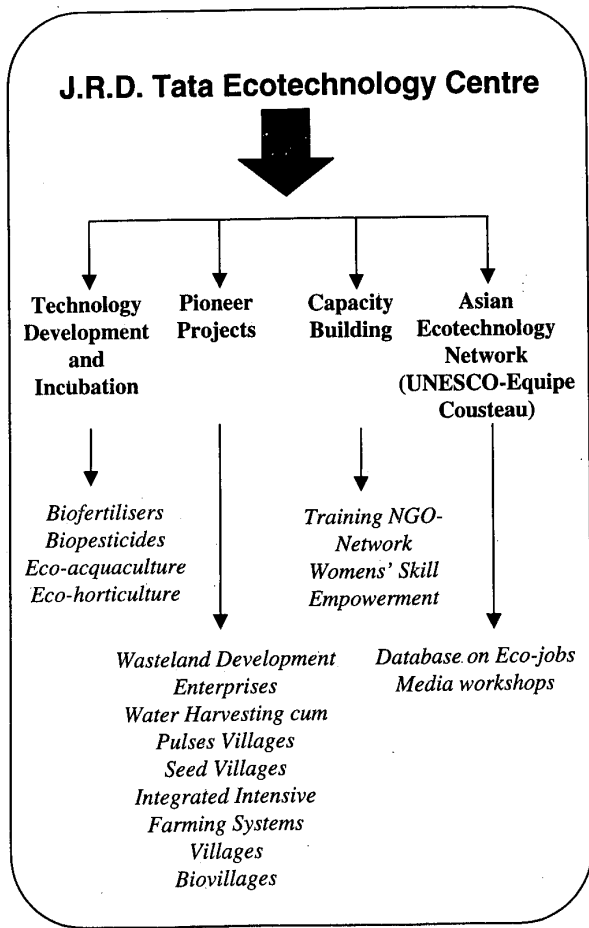


Fig. 1 and 2

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source Centre for Gender and Development. This Resource Centre will be headed by the person holding the Smt. Uttara Devi chair on Gender and Development. Gender equity and justice constitute the core of MSSRF's strategies for sustainable societies. An important activity of the Centre was the organisation of a National Consultation on the gender dimensions of MSSRF's programmes in the areas of biodiversity, ecotechnology and biovillages.

The activities of Project ACCESS, which coordinates the Tamil Nadu Forum for Crèche and Child Care Services (TN FORCES) through its project Children on the Agenda (COTA) have had considerable impact at the field level. The maximum impact was achieved by the communication strategies adopted for advocacy. With the continued cooperation of the Doordarshan Kendra, Chennai, several video spots on gender issues and burden-free education are being frequently shown on television. The series *Messages that Move* did indeed move many parents to change their attitude towards the education of their children and make them realise that children must not be denied their childhood. *Voicing Silence*, a programme sponsored by The Hunger Project-India, continued to draw significant attention from the public and media for its efforts to communicate gender issues through theatre.

The major aim of all these programmes is the promotion of the welfare of women and children. While Project AC-

CESS strives to advocate investment in children, the training modules prepared for empowering the elected women and men members of Village and Mandal Panchayats and Nagar Palikas to prepare socio-demographic charters for their respective areas, are designed to create conditions where children are born for happiness and not for mere existence.

Programme Area 500 deals with training, information and communication. From the foregoing it will be evident that seemingly impossible tasks can be accomplished by activating the power of partnership. Hence, the 1997 Interdisciplinary Dialogue was on the theme of *Building Partnerships for Sustainable Food and Livelihood Security*. Partnership ensures that irrespective of the individual strengths of the different partners, their collective strength becomes considerable.

The Informatics Centre of MSSRF is now acknowledged as one of the best of its kind in the world. One of the new databases being developed by the Centre, focuses on eco-jobs. Such information will be helpful in promoting a green productivity movement in agriculture and industry. The Informatics Centre also helped the International Crops Research Institute for the Semi-arid Tropics (ICRISAT) to design and commission its world-wide web-site. Another important activity relates to the mapping of science in India in the areas of agriculture and biology through analysis of publications.

Finally, two steps were initiated during the year for women's technological and economic empowerment and for mobilising the voluntary services of professionals for the elimination of endemic hunger. Following an Asia-Pacific Conference of Women Scientists and Technologists hosted by MSSRF in December 1996 in collaboration with UNDP and UNIFEM, steps were taken to organise a *Women's Biotechnology Park* in the Chennai area. This park will provide opportunities for professional women to take up a career of self-employment in a wide range of biotechnological enterprises. The response has been overwhelming and over 250 professional women have expressed interest in starting enterprises in the Park. The Women's Biotechnology Park will be supported by the Department of Biotechnology, Government of India and the Government of Tamil Nadu through the Tamil Nadu Industrial Development Corporation. Marketing opportunities and arrangements guide the choice of the technologies for introduction in the Park. When established, this will be the first Women's Biotechnology Park in the country.

The Women's Biotechnology Park initiative has also revealed that in urban areas professionally qualified women, who could not take up full time employment during the reproductive stage of their lives because of home/child care and other responsibilities, are longing for intellectually stimulating and economically rewarding opportunities for

the expression of their dormant professional training and talents. Based on the experience gained from the Chennai Park, it may be worthwhile spreading such opportunities in other major cities and towns.

An effort to revitalise and strengthen the spirit of voluntarism in helping to overcome endemic hunger was launched in June 1997 with the promotion of a Voluntary Professional Support Service to assist in the effective implementation of the Hunger-free Area Programme of the Government of Tamil Nadu. Tamil Nadu is the first state in the country to introduce a Nutritious Noon Meal Programme in all the schools of the State, which has been in operation since 1981. The multiple benefits conferred by this visionary political decision are now well known. In 1996, the State took the next major step to fulfil the goal of "Food for All" when the Chief Minister, Dr. M. Karunanidhi, announced the initiation of a Hunger-free Area Programme to eradicate poverty-induced hunger. MSSRF helped to co-ordinate the preparation of a seven point action plan for implementing HFAP. The components of this plan are:

- Identification of the ultra-poor by local communities themselves.
- Information empowerment through a household entitlements card.
- Eliminating protein-calorie under-nutrition.

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- Eliminating silent hunger caused by deficiencies of micronutrients.
- Improving the biological absorption and retention of food through the provision of safe drinking water and environmental sanitation.
- Improving the purchasing power of the ultra-poor through micro-enterprises and micro-credit.
- Ensuring that special programmes intended for women and children reach them.

It is obvious that such an integrated hunger elimination strategy needs for its success the whole-hearted cooperation of society and mass media. The Voluntary Professional Support Service is designed to provide the expertise and assistance of professionals, who are willing to give their time and talent in an honorary capacity to official agencies. The response for enrolment in this service has been overwhelming. The spirit of voluntarism promoted by Mahatma Gandhi is strong and is being harnessed on the occasion of the 50th anniversary of India's independence to fulfil Gandhiji's vision of a country where everyone will have opportunities to earn his or her daily bread.

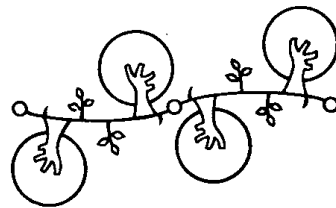
The Foundation continues to accord the highest priority to promoting the professional growth of young researchers. Several of them have registered for their Ph.D. degree. Many participated in national and international sym-

posia and workshops. Several were sent abroad for training in specialised areas. Staff were encouraged to publish their work in peer-reviewed journals. They were also encouraged to include the excluded in knowledge and skill empowerment and communicate their results in Tamil and local languages.

Our sincere gratitude goes to the national and international donors listed in the Report, but for whose financial support and encouragement the work described in the following pages would not have been possible. Our thanks go to the many eminent scientists, administrators and other professionals for the time they have so generously spared to serve on different committees and guide our work.

We thank Dr. V. Balaji and Dr. (Mrs.) Nandini Iyengar who served as Editors of this Report. Particular thanks are due to Mr. N. Ram, and the staff of *Frontline*, for designing and printing the cover of this Report. Above all, we are deeply indebted to tribal and rural women and men and farm families for their whole-hearted co-operation, guidance and affection. Programmes like Biovillage and *Voicing Silence* are designed to promote the emergence of new leaders and voices among resource poor rural families, particularly among women. These new leaders and new voices help us to believe that achieving the integrated goals of natural resources conservation and poverty alleviation in rural India are attainable objectives.

Programme Area 100



Coastal Systems Research

The focus of this programme continued to be on the integrated development of coastal zone with concurrent attention to the ecological security of coastal areas and the livelihood security of Coastal Communities. A programme for the conservation of coastal mangrove wetland ecosystems along the east coast of India was launched during this year with support from the India-Canada Environment Facility.

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Sub Programme Area 101 Coastal Wetlands : Mangrove Conservation and Management

Importance of Mangrove Wetlands

Mangrove wetlands, the fragile but dynamic ecotone found between land and sea on tropical and subtropical coastlines, are an important ecological asset and an invaluable economic resource to the coastal communities. They act as a barrier against cyclonic storms, restrict the inland entry of saline water during storm surges and act as a buffer against floods, thereby averting soil erosion in the coastal zone. Coastal wetlands provide nursery ground for many of the commercially important prawns, fish and crabs. In addition, they enhance the productivity of fish in adjacent coastal waters by providing large quantities of organic and inorganic nutrients. Besides, they provide habitats for wildlife ranging from migratory birds to estuarine crocodiles. Their economic value stems from a variety of products :

- wood products ranging from timber and poles to firewood;
- non-wood products such as fodder, honey, wax, tannin, and dye
- aquatic products like fish, prawns, crabs, clams, molluscs and oysters.

The Project

A variety of biophysical and human induced stresses, resulting from unsustainable activities both within and outside the mangroves, cause the rapid degradation

of many mangrove wetlands throughout the world. Mangrove resources can be utilised on a sustainable basis if development and restoration activities are integrated with conservation policies.

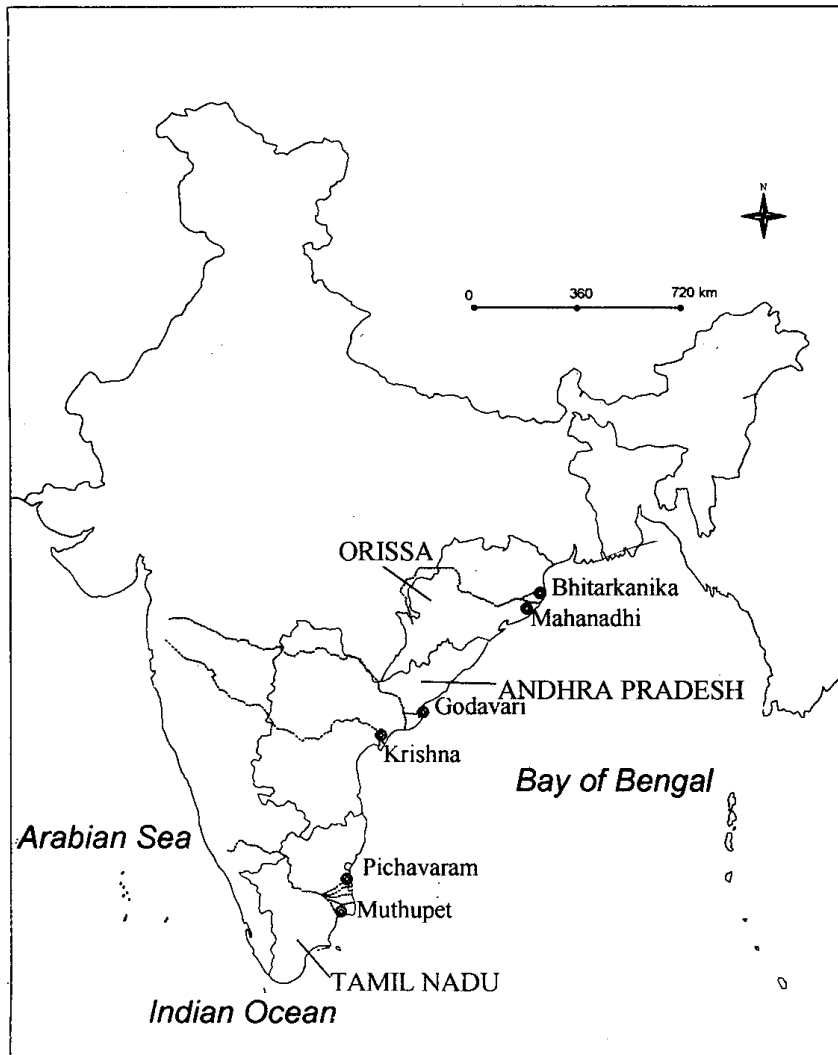
With the objective of enhancing national capacity and national action in the conservation and sustainable management of coastal mangrove wetlands, a project was launched in May 1996, known as "Coastal Wetlands: Mangrove Conservation and Management". This project is being financed by India Canada Environment Facility, New Delhi, for a period of 5 years and is operating in the mangrove areas listed in Fig. 1.1.

Causes of Mangroves Degradation

In the first phase of the project, causes for the degradation of mangroves and the potential for restoration in the six sites (Fig. 1.1) are being identified through surveys and Participatory Rural Appraisals, review of published literature, consultations with local communities, forest officials, scientists and non-governmental organisations who have been working in this area. Degradation is found to be caused by the dual phenomena of physical changes and human induced stresses.

Physical Causes

1. Changes in topography : In certain sites, a major cause for the degradation of mangrove wetlands has been identified as reduction in the quantity and periodicity of freshwater inflow, allochthonous sediment and consequent changes in the topography and tidal



PROJECT AREAS

Tamil Nadu

- Pichavaram (1,400 ha)
- Muthupet (13,000 ha)

Andhra Pradesh

- Krishna Delta (16,500 ha)
- Godavari Delta (33,000 ha)

Orissa

- Bhitarkanika (15,500 ha)
- Mahanadi Delta (4,000 ha)

West Bengal

- Sunderbans (2,00,000 ha)

Fig. 1.1 : Project Areas

flushing pattern. In Pichavaram mangroves, the main cause of degradation is increase in soil salinity, caused by changes in the topography of the wetland by formation of troughs, which favour stagnation of tidal water. Field studies indicate that this factor is responsible for nearly 60% of the degradation of Pichavaram mangroves.

2. Changes in the configuration of the coastline : Various changes have been occurring in the physical features of the shoreline bordering mangroves.

The shoreline is undergoing severe erosion. If this rate of erosion continues, mangroves will soon be exposed directly to the sea, where the wave action is high. This may result in the uprooting of trees that are exposed to high wave energy. Regeneration will be adversely affected as the waves wash away the seeds. On the other hand, due to geomorphological changes leading to formation of sand bars as in Pichavaram, and oyster beds as in Muthupet, the tidal water flow into the mangrove wetland becomes less,

leading to increased salinity of the stagnant water due to evaporation. Less than optimal environmental conditions such as these result in loss of biodiversity.

Human Induced Stresses

Human induced stresses include the following:

3. Felling of mangrove trees for fuel, charcoal and occasionally for timber and implements
4. Grazing by domestic and feral cattle
5. Diversion of land for agriculture, human settlements, saltpans and aquaculture
6. Indiscriminate fishing and collection of prawn seeds
7. Diversion of fresh water flow, leading to reduction in inflow of fresh water,

nutrient input and sediment supply, which adversely affect the water regime and quality of water.

Human induced stresses have a great impact on the ecosystem as shown in Fig. 1.2.

The physical and human-induced causes vary in intensity (Table 1.1) in the six sites that are being studied.

Preparation of GIS - Maps for Planning

In order to identify the status and extent of vegetation, forest cover, wetland and other land use, the regions are being mapped in consultation with user departments and Space Application Centre (Indian Space Research Organisation, Ahmedabad). These maps provide the geomorphological configuration and wetland status. Maps of Pichavaram and Muthu-

Table 1.1 : Intensity of factors causing degradation

Cause *	Pichavaram site	Muthupet site	Krishna site	Godavari site	Bhitarkanika site	Mahanadi site
1	H	H	M	L	L	X
2	H	H	M	L	L	L
3	M	H	H	H	L	M
4	M	M	M	M	M	H
5	X	M	M	L	H	H
6	L	M	M	L	M	M
7	H	M	M	L	L	M

* Physical and human induced causes as on page 2-4
 H - high, M - medium, L - Low, X - Nil

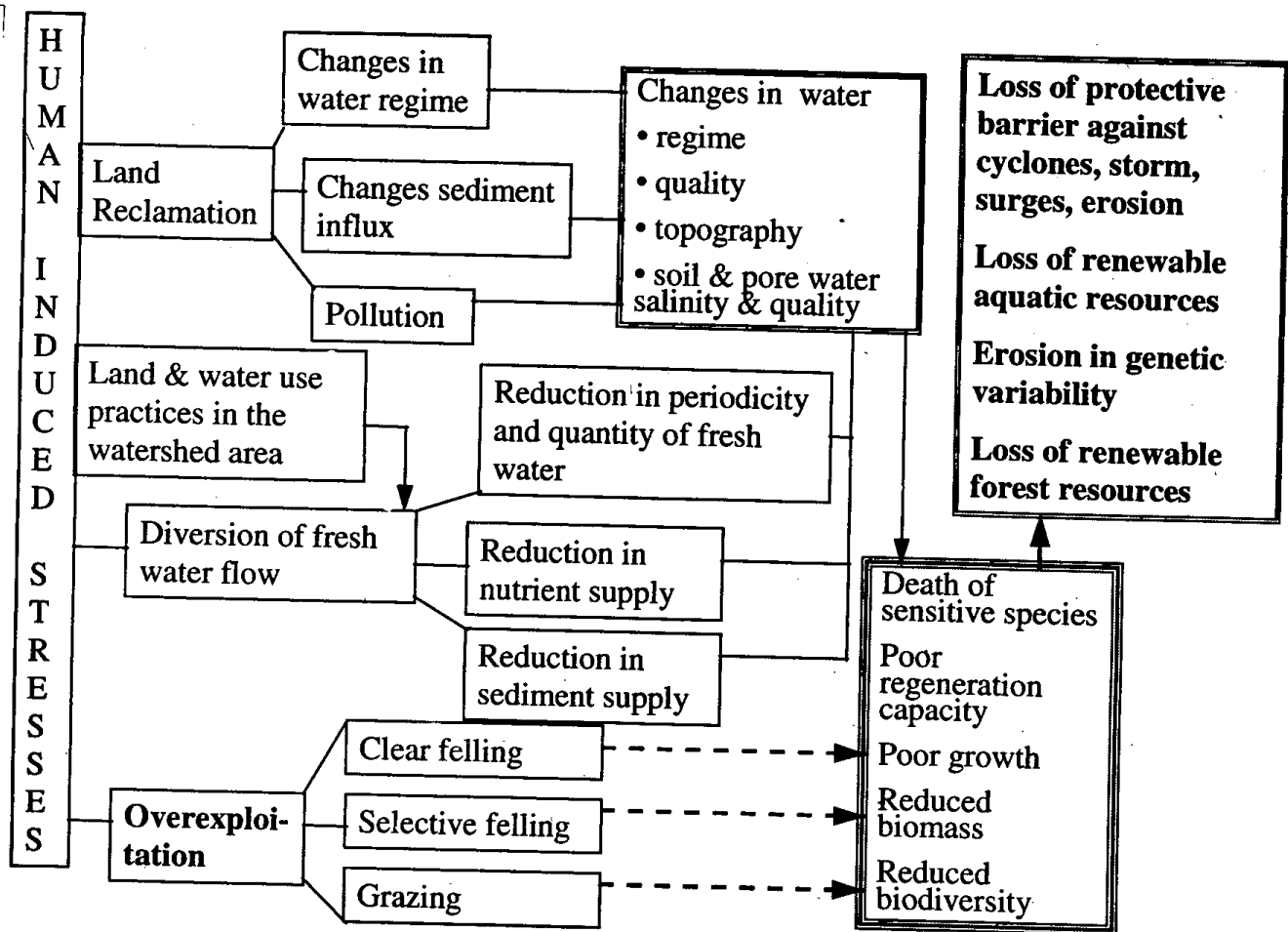


Fig. 1.2 : Results of Human-induced Stresses

pet in Tamil Nadu , Krishna and Godavari in Andhra Pradesh and Bhitarkanika mangroves in Orissa have been prepared, using satellite data by visual interpretation technique. Validations of these maps have been carried out by extensive ground truthing. Detailed vegetation survey has been initiated in these sites with the help of the GIS maps and satellite imagery. IRS 1C LISS III sensor imagery have been procured for all the mangrove sites for the preparation of thematic maps (Fig. 1.3).

The validated maps and Survey of India (SOI) base maps are being digitised and

entered in GIS for adding other spatial data like drainage, watershed etc. along with non-spatial socio-economic data. Universities and other academic institutions have been contacted to collect available data on flora, fauna and hydrology relevant to mangroves. To understand the shoreline changes and the specific impact on the mangrove wetlands, 1970-SOI topomaps and recent IRS data are being analysed using Arc/Info GIS software. On the basis of this analysis, shoreline change maps of 1:50,000 scale are being prepared (Fig. 1.4).

Anthropogenic Dimensions

The objective of the project is to build enough capacity in local communities, the Forest Department and other government agencies, voluntary organisations, grass root level democratic institutions (Panchayats and Nagarpalikas) and MSSRF to conserve, restore and sustain mangrove wetlands in an integrated manner through participatory research, training and extension.

In order to establish the dependency on the mangrove forests and to determine the socio-economic profile of the mangrove forest-dependent communities before making any specific intervention in the mangrove areas, a benchline survey has been conducted in Pichavaram and Muthupet mangrove areas of Tamil Nadu. Besides, Participatory Rural Appraisals are going on in various sites for resource mapping and for understanding the areas of concern of the people as the entry point for seeking community participation.

The preliminary results of the surveys show that the main occupation of the people is either fishing or farming. Those who live inside or very close to the mangrove forest areas depend heavily on the mangrove forest for fuelwood, fodder and fencing, thatching and fishing material. Aquaculture has made inroads in the land-use pattern in the coastal tracks adjoining mangrove forests. Fuelwood collection and selling to the nearby semi-urban communities is a source of livelihood in some areas like Muthupet in Tamil Nadu and Coringa in Godavari District, Andhra Pradesh.

Some tribes practise non-conventional fishing methods in these areas. Fishing is not the traditional occupation of a tribe called *Vedars* living in Pichavaram. Some of them follow an innovative method in which a mud embankment of 30 to 50 cm height is constructed 6 to 10 m from the edge of the mangroves. It has a narrow opening in 3 or 4 places. During the spring high tide, tidal water, along with fishes and prawns, enters through these openings in the embankments. When the water begins to recede during the low tide, the openings are blocked with nets which allow only the tidal water to pass through. All the fishes and prawns are thus trapped and are later collected. Some of the *Vedars* even construct small embankments around individual trees of *Rhizophora* to trap the fishes and prawns. The mud embankments are usually constructed at an elevation of 25 to 30 cm from the low tide level and hence the total height of the mud embankment exceeds the level of spring high tide. The normal flow of tidal water is severely affected by these embankments which, in turn, adversely affects the soil condition.

Community Mobilisation

The surveys revealed that in order to have full support and participation of the community, action has to be taken on the following lines :

- Generating an awareness of the benefits of mangroves and the devastating effects of their degradation
- Providing alternative sources of fuelwood, fodder, fencing and thatching material



Fig. 1.3 : *IRS - 1C Liss - III of Godavari Mangroves Satellite Imagery*

- Creating an economic stake in conservation
- Conserving mangrove forests through participatory management.

NGOs

Non-governmental organisations have been identified and shortlisted in all the

sites for joint action. In Tamil Nadu a workshop was conducted near Pichavaram in which 8 NGOs and one representative from the Forest Department participated. The causes of degradation of mangroves were identified and probable solutions discussed. In Tamil Nadu and Andhra Pradesh shortlisted NGOs have pre-

6. Role of women in natural resource management.

Considering the enormous responsibility vested with MSSRF and the magnitude of action to be taken at different levels by different stakeholders, committees have been formed at various levels. At the national level the Project Management Committee offers policy guidance and supervises the execution of the project. Technical Advisory Committees for monitoring and evaluation of the project at the state level have been formed for Tamil Nadu and Andhra Pradesh. Joint Working Groups are being formed with the district collector as the Chairperson. A syllabus committee has been formed to prepare a training manual to train :

- Forest officials
- Planners and policy makers (MPs, MLAs and senior administrators) whose decisions directly affect the mangroves and related resources such as water resources, irrigation, agriculture, fisheries, land-use, environment, finance and energy.
- Local communities and others who directly use or indirectly influence mangroves.

The basic structure of the curriculum for the courses/workshops and training programmes is being worked out by three sub-committees consisting of members of the syllabus committee.

User Promotion Activities

One of the major outcomes of this project will be a plan for sustainable management of mangroves involving the local community, Forest Department and other government agencies and NGOs. As people have to be oriented towards using this plan, user meetings are being conducted. Such meetings help the project staff to understand the specific requirements of the users and to collate relevant information available with the user departments and agencies.

The First User Interaction meeting (for Tamil Nadu state) was conducted in December 1996. Seven potential downstream user departments participated in the meeting. Specific requirements of users were identified, for example, the State Forest Department showed interest in using the mangrove zonation map prepared from IRS 1C data. Information on the availability of relevant spatial and non-spatial data with different user departments was gathered. Discussions were held on Remote Sensing and Geographical Information System work plan with the officials of State Forest Departments at Pichavaram, Kakinada and Bhitarkanika. For conducting short term user training programmes on RS and GIS applications with particular reference to mangroves and also for producing mangrove wetland atlas and GIS database for the user community, the process for entering into MoU with the Space Applications Centre has been initiated.

**Sub Programme Area 102
Biodiversity Conservation
Prioritisation Programme -
Coastal Sites and Stretches
on the Indian Mainland**

This programme was initiated in September 1996 and the main objectives are:

- To prioritise sites and stretches of coastal ecosystems on the basis of their biodiversity and socio-economic value.
- To identify strategies for conservation of biodiversity.
- To develop, use and describe a participatory methodology for such conservation activities.

A working group was formed, comprising representatives of various scientific, government and non governmental agencies such as ZSI, CMFRI, NIO. Universities working in coastal areas and researchers working in specific fields such as waterfowl, coral, sea grasses and mangroves are also represented. Some biodiversity - rich coastal areas were selected from a list of 43 coastal wetlands. The work was distributed among the group and it was decided to use published documents and personal communications rather than field visits to collect information. It was also decided that the group would correspond with experts on either site or species, to obtain information. If necessary, the nodal agency would send a person to collect the information.

The criteria for the selection of the test site are as follows.

1. It is a good representative example of a wetland.
2. It supports an appreciable assemblage of rare, vulnerable and endangered species or subspecies.
3. It is of special value as a habitat of plants and animals at a critical stage of their biological cycle.
4. It is a wetland of substantial socio-economic and cultural value.

Details of the selected sites are provided in Table 1.2. Information on each site, in accordance with these criteria, was to be gathered within a timeframe of three months.

The second workshop was held in May 1997 in order to evaluate the information and the selection of sites. A select group of scientists who had rich experience and who could aid the process of final evaluation of the sites were invited for this exercise. Tabulated information on the sites and species was presented at this meeting. The sites were classified into four broad divisions to enable evaluation. It was noticed that the economic criterion was the least studied and that information on social relevance of a site was also poorly represented in the research studies.

A set of criteria site prioritisation were developed at a workshop held in November 1996 (Table 1.3). These criteria are based on the work of the Commission on National Parks and Protected Areas.

The future plan is to gather more information on the social and economic values of the sites and to prepare strategies to conserve and enhance the rich biodiversity of these coastal sites.

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Table 1.2 : Sites selected for conservation

Name	Biogeographic subdivision	Criteria for inclusion	Ecosystem subtype	Important groups
Gujarat				
Gulf of Kutch	Saharo Sindian	1,2,3,4	Mud flats, coral reefs corals	Sea grasses, marine algae and
Gulf of Khambat	Kathiawar	1,2,3,4	Mudflats	Mangroves
Maharashtra				
Malvan	Konkan	1,2,4	Estuary and rocky beaches corals	Mangroves, marine algae and
Karnataka				
Kundapur Mangroves	Malabar	1,2,4	Estuary	Mangroves / Strand Vegetation
Kerala				
Kottampalli Swamps	Malabar		Lagoon	Sea grasses
Tamil Nadu				
Gulf of Mannar	Coromandel Circa	1,2,3,4	Coral Reefs	Sponges, Corals, Balanoglossus and Dugong
Kaliveli Tank	Coromandel Circa	1,3,4	Estuary and Lagoon	Avifauna
Pulicat Lake	Coromandel Circa		Lagoon	Fisheries and Avifauna
Andhra Pradesh				
Coringa Mangroves	Coromandel Circa	1,3,4	Estuary	Mangroves
Kakinada Bay	Coromandel Circa	1,3,4	Bay	Benthic fauna
Orissa				
Chilka Lake	Utkal	1,2,3,4	Lagoon	Avifauna
Bhitarkanika Mangroves	Utkal	1,2,3,4	Estuary, Sandy beach	Mangroves, Turtles, Avifauna and Salt water crocodile
West Bengal				
Sunderbans Sagar Island	Bengal	1,2,3,4	Estuary, Mudflats	Mangroves, Avifauna and Salt water crocodile

Table 1.3 : Criteria for prioritisation of biodiversity conservation

Biogeographic	<ul style="list-style-type: none">• presence of rare biogeographic qualities or representative of “type”
Geomorphology	<ul style="list-style-type: none">• unique or unusual geological features
Ecological	<ul style="list-style-type: none">• essential part of a process or life support system• the degree to which the area by itself or in association with other protected areas encompasses a complete ecosystem• the variety of habitat• habitat of rare and endangered species• nursery, juvenile areas, feeding, breeding or rest sites• rare or unique habitat for any species• genetic diversity and keystone species
Naturalness	<ul style="list-style-type: none">• extent to which the area has been subjected to human induced changes
Economic importance	<ul style="list-style-type: none">• existing contributions• (recreation, subsistence of traditional users, appreciation by tourists, nursery area or a source of economically important species)• potential contributions
Social importance	<ul style="list-style-type: none">• value to local and national communities for its heritage, historical, cultural, educational or recreational use• value for research and monitoring
International / National significance	<ul style="list-style-type: none">• potential as a world heritage site, biosphere reserve, Ramsar site, or is subject to an international or national conservation agreement
Practicality / feasibility as a protected area	<ul style="list-style-type: none">• degree of insulation from external destructive forces• social and political acceptability (community support)• compatibility with existing users• accessibility for education, tourism, recreation• ease of management or compatibility with existing management regimes

Sub Programme Area 103 Rejuvenation of Degraded Mangroves at Bhitarkanika

Evaluation of Storage Life of Mangrove Seeds and Propagules

The storage life of the seeds of 5 mangrove species was studied. Non-infected, non-malformed and properly matured seed-stock from each species was collected from parent trees and kept in a polyhouse. The germination and establishment of 100 of these were tested at regular intervals after planting them in plastic bags. They were watered regularly.

It was found that the Rhizophoraceae members, especially *Kandelia candel* and *Bruguiera gymnorrhiza*, showed maximum ability to withstand a storage period of 45 days, along with *Pingamia pinnata*. *Avicennia* (Avicenniaceae) spp. and *Heritiera fomes* (Sterculiaceae) showed minimum storage life of 15 days.

Monitoring the Growth Rate of Mangroves in Plantations

Mangrove seedstock/hypocotyles planted during 1995-96 are doing well and the growth rate is tabulated (Table 1.4). The plantation is being damaged by buffalo grazing and crab and prawn collection by local people. In addition to this, damage due to barnacles is also noticed in *Rhizophora mucronata* and *Rhizophora apiculata*. Barnacle damage is more pronounced in seedlings growing close to the low tide mark. Care is being taken to plant this year's seedstock beyond this point, towards the higher stream bank. Restoration of dieout patches was also done during the current season.

Plantation of Mangrove Propagules in 50 ha of Degraded Land

A total of 32 ha have been planted during the current plantation season of 1996-97. 13 species of mangroves have been planted in the area adjacent to and continuous

Table 1.4 : Growth rate of 13 month -old mangrove seedlings (n=50)

Sl No.	Species	Height (cm)	Diameter of stem (cm)	No. of leaves	Infection %
1.	<i>Bruguiera parviflora</i>	28.16	4.88	16	28
2.	<i>Bruguiera cylindrica</i>	40.57	2.36	12	36
3.	<i>Ceriops decandra</i>	12.77	2.12	11	100
4.	<i>Avicennia</i> spp.	48.10	3.07	>90*	100
5.	<i>Kandelia candel</i>	61.4	3.07	16	100
6.	<i>Xylocarpus granatum</i>	70.8	3.31	9	12
7.	<i>Rhizophora apiculata</i>	69.85	3.69	16	96
8.	<i>Rhizophora mucronata</i>	75.43	6.11	61	20

* All the trees had more than 90 leaves

with last year's plantation. Species selection was done keeping in view the present and past natural vegetation in this area and in consultation with the forest officials. Two species which are not reported in this area, *Amoora cucullata* and *Pongamia pinnata*, have also been introduced. The former is a rare species and the latter has economic importance and medici-

nal value. Table 1.5 gives in detail the plantation activity during the current season.

While planting, the spacing between seeds was maintained at 1.5 mts, 2.0 mts. and 2.5 mts. Two nurseries, one at Dangamal and the other at Jagatjori, provided seedlings of 7 species out of the total 13 species planted.

Table 1.5 : Detailed list of mangrove species planted during the season 1996-97

Species	Collected From	Planted Through	Total No. Collected	Planted	Rejected	Rejected %
<i>Aegialitis rotundifolia</i>	Kansaridiha	Direct	51	46	5	9.80
<i>Xylocarpus granatum</i>	Bhitarkanika Kansaridiha	Nursery	261	235	26	9.96
<i>Pongamia pinnata</i>	Bhitarkanika	Nursery	390	390	-	0
<i>Ceriops decandra</i>	Kansaridiha Bhitarkanika	Nursery	487	390	97	19.91
<i>Amoora cucullata</i>	Bhitarkanika	Nursery	450	450	-	0
<i>Bruguiera gymnorrhiza</i>	Kans, Bhitarkanika	Nursery, Direct	2,635	2496	139	5.27
<i>Heritiera fomes</i>	Bhitarkanika	Nursery	2300	1900	400	17.39
<i>Kandelia candel</i>	Kansaridiha	Direct	13,350	12,626	724	5.42
<i>Bruguiera parviflora</i>	Kansaridiha	Direct	19,375	17,982	1,393	7.18
<i>Aegiceras corriculatum</i>	Kantilo, Kansaridiha	Nursery	39,000	28,000	11,000	28.20
<i>Rhizophora apiculata</i>	Kansaridiha	Direct	64,896	62,544	2,352	3.62
<i>Bruguiera cylindrica</i>	Kansaridiha	Direct	93,142	83,558	9,584	10.28
<i>Avicennia spp.</i>	Tanda	Direct	3,19,400	2,98,400	21,000	6.57

(Broadcast)

A cheaper method of raising nurseries on beds and digging out the seedlings when desired was followed in the case of 4 species, *Xylocarpus granatum*, *Pongamia pinnata*, *Amoora cucullata* and *Aegiceras corniculatum*. The field transfer of such bed raised seedlings was found to be successful. However, mass multiplication of mangroves has to be cheaper if it is to be economically suitable to the local people.

A total of 8.48% of the collected seedstock was rejected either due to malformation, insect damage or because of the presence of roots in the case of seeds/hypocotyles picked up from the ground. The total area restored this year through plantation activities is 40 ha. For planting the remaining 10 ha during the current year an additional 20,000 seeds of *Pongamia pinnata* have been collected and sown in the nursery. Further, 10,000 seeds of *Thespesia populnea* have been sown in the nursery for the distribution of plants to local villages.

Induction of Rooting in Stem Cutting and Propagules by using Plant Growth Hormones

Induction of rooting in stem cuttings of 8 mangrove species was undertaken in polyhouse, using plant growth hormones during the reporting period. The species taken up and their response to the different growth hormones and to different doses are summarised in Table 1.6. It was found that out of 8 species tried for induction of rooting, two species *X. molluccensis* and *M. angulata* did not respond to any growth hormone. The other species were

found to produce coppicing shoots but the response varied with different hormonal concentrations. *Heritiera fomes* produced roots through treatment of growth hormone IBA. About twenty rooted stemcuts were transferred to polypot condition from the plastic containers and were hardened. Those that survived during hardening were transferred to the soil. The other five species sprouted but did not produce roots. Hence the experiment is being repeated with different hormonal combinations. The following species have also been included in the experiments during the year: *Ceriops decandra*, *Aegialitis rotundifolia*, *Amoora cucullata*, *Aegiceras corniculatum*, *Intsia bijuga*, *Bruguiera parviflora* and *Pongamia pinnata*.

Horticultural Propagation of Mangrove Species

Eight mangrove species were chosen to try out horticultural methods of propagation. Out of these, *M. angulata* and *C. manghas* are endangered species which have a very low natural regeneration capacity *in situ*.

Air layering was done by making a bark opening of 2-3 mm in a ring. Soil (silty clay) and moss were tied over the incisions with a polythene wrap. The results are awaited.

As an experimental control stem cuttings of the following 8 species are being grown in a mixture of cow dung and sand (1:3): *Avicennia alba*, *Heritiera fomes*, *Xylocarpus molluccensis*, *Bruguiera gymnorrhiza*, *Intsia bijuga*, *Sonneratia apelata*, *Pongamia pinnata*, *Amoora cucullata*.

Table 1.6 : Stem cutting experiments of mangrove species, Dangamal

Species	Hormone Concentration (ppm)	Dipping Time	No. Spouted (n=10)	
			IAA	IBA
<i>Bruguiera gymnorrhiza</i>	Control			
	100	12 hr	nil	1
	500	QDM	nil	1
	1000	QDM	nil	nil
	2000	QDM	nil	2
<i>Xylocarpus molluccensis</i>	Control			
	100	12 hr	nil	nil
	500	QDM	nil	nil
	1000	QDM	nil	nil
	2000	QDM	nil	nil
<i>Kandelia candel</i>	Control		nil	nil
	100	12 hr	1	3
	500	QDM	nil	3
	1000	QDM	3	nil
	2000	QDM	nil	3
<i>Cerbera manghas</i>	Control		4	nil
	100	12 hr	nil	nil
	500	QDM	nil	nil
	1000	QDM	nil	2
	2000	QDM	nil	4
<i>Avicennia officinalis</i>	Control		nil	3
	100	12 hr	nil	nil
	500	QDM	nil	nil
	1000	QDM	nil	nil
	2000	QDM	1	nil
<i>Heritiera fomes*</i>	Control		nil	nil
	100	12 hr	nil	3
	500	QDM	nil	4
	1000	QDM	nil	6
	2000	QDM	nil	8
<i>Merope angulata</i>	Control			
	100	12 hr	nil	nil
	500	QDM	nil	nil
	1000	QDM	nil	nil
	2000	QDM		
<i>Xylocarpus granatum</i>	Control		nil	nil
	100	12 hr	nil	1
	500	QDM	nil	1
	1000	QDM	nil	2
	2000	QDM	nil	1

* Rooting response was noticed

School Children's Mangrove Awareness Programme

Two schools near the restoration site were identified for imparting mangrove conservation awareness. Students of age group 14-16, studying in 8th, 9th, and 10th standards (High School) were selected and a detailed discussion on the importance of environment, forest and mangroves, with special reference to degradation and conservation necessities were elaborated upon. The two schools are 1. Badapali High School, Badapalli, (PO. Suniti, Via. Mahakalpara, Dist. Kendrapara, Orissa) and 2. Gugua-Chakada High School, Village Gugua, Via. Mahakalpara, Dist. Kendrapara, Orissa.

After the programme, an informal discussion with the students in the presence of teachers of the school was organised. Various questions were put forward for participatory discussion. The teachers were required to discuss these issues in their classrooms later. A feedback response taken from the teachers was used to evaluate the programme.

Training Programme on Nursery Raising and Mangrove Plantation Techniques

Training programmes on mangrove nursery raising and field plantation techniques were undertaken, keeping in mind the prospects of income generation for locals and involving them in mangrove protection work. A total of 106 participants have

been trained at two sites, one at the plantation at Jagatjori and the other at Khoja, Bhitarkanika mangroves.

46 trainees from 5 villages (Kantilo, Guldia, Kalatunga, Kharianta and Kansar) have been trained through the on-field training programme at the plantation site. They have been taught to identify mangrove species that are found in Orissa, their importance and the threats. They have been engaged in restoration plantation work. Both direct plantation and nursery method of mangrove plantation were described and these techniques were put into practice during field plantation.

60 trainees from 9 villages (Dangamal, Bankual, Lalitapatia, Rajandranarayanpur, Iswarpur, Jambusagar, Dighi, Righagarh, Govindapur) were trained at our second site at Khola, Bhitarkanika. The trainees were engaged in the propagation of mangrove species through the nursery phase. The preparation of nursery beds, keeping in mind inundation, watering, methods of seed sowing etc, were described to them and the trainees followed these techniques in the field condition. They were paid allowances for their participation in the programme.

The trainees of our programme were almost exclusively engaged by the forest department in the restoration of mangrove areas at Jagatjori. The project has been able to contribute to the income of locals and to involve them in mangrove conservation.

Sub Programme Area 104 Monitoring the Breeding Habits of Olive Ridley Turtle

The coast of Orissa is currently the largest breeding ground of the Olive Ridley turtle (*Lepidochelys olivacea*) that has been internationally recognised. Between 3,00,000 to 6,00,000 turtles breed along this coast annually. In order to conserve and monitor the breeding populations a project was launched by the MSSRF in collaboration with the Wildlife Institute of India, Dehradun. The primary objective is to mark individual turtles with specially made metal tags and monitor the population.

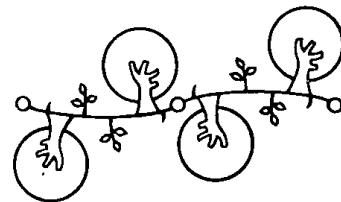
This is a project sponsored by the NORAD in which the mandate is to tag 35,000 sea turtles along the coast of Orissa over a 3 year period. The project was sanctioned in December 1995. The tags however arrived for field use only in May 1996. During the period starting March 1996 till now two breeding seasons have been monitored.

In the year 1996 an estimated 3,50,000 Olive Ridley turtles nested in the Gahir-

matha beach. An additional 1,30,000 turtles nesting in Rushikulya about 300 kms south of Gahirmatha were discovered recently by the researchers of the Wildlife Institute of India. During the breeding season of 1997 there was no mass nesting of turtles in either of the rookeries in Orissa. Therefore the targeted 15,000 turtles could not be tagged. Nevertheless a total of 3,000 have been tagged between the two sites. It has been confirmed (at least in a few instances) by resighting marked female turtles that the same female nests more than once during the same breeding season in different beaches.

As part of the project, efforts are being made to create public awareness directly and through the local newspapers. A number of local youth have been involved in the census, tagging and measurement of sea turtles. Some of these volunteers patrol the beach during the nights and report the arrival of turtles for nesting. The Rushikulya rookery that was recently discovered has been brought to the attention of the State Government. The Government of Orissa has expressed its intention to declare this rookery as a sea turtle sanctuary.

Programme Area 200



Biodiversity and Biotechnology

During the year, this Programme centred around the standardisation of transparent and practical methodologies for implementing the provisions of the Convention on Biological Diversity relating to equity and ethics in benefit sharing. A Community Agrobiodiversity Centre was set up in the Wayanad District of Kerala. The gender dimensions of biodiversity management were studied in different parts of India. Work on genetic enhancement with reference to tolerance to salinity, biomonitoring and micropropagation of endangered plants was intensified.

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**Sub Programme Area 201
Technical Resource Centre for
the Implementation of the
Equity Provisions of the
Convention on Biological
Diversity**

Since 1990, MSSRF's programmes in the area of biodiversity have focussed on the following three aspects :

- Conservation of genetic resources.
- Sustainable utilisation.
- Equitable sharing of benefits.

The various sub-programmes dealing with the above aspects were unified into an integrated programme during 1996 in the form of a Technical Resource Centre (TRC) for the Implementation of the Equity Provisions of the Convention on Biological Diversity (see box). This TRC was formally dedicated to tribal and rural families by Ms. Elizabeth Dowdswell, Executive Director, United Nations Environment Programme on July 18, 1996. The work carried out under the TRC during 1996-97, fall under the following six broad categories (see also Fig. 2.1):

- Chronicling the contributions of tribal and rural families to the conservation and enhancement of plant genetic resources.
- Organisation of an *Agrobiodiversity Corps* of tribal and rural youth.
- *Revitalization* of the on-farm genetic conservation traditions of tribal and rural communities.
- Maintenance of a *Community Gene Bank and Herbarium*.
- Development of multimedia databases on the IPR contributions of tribal and rural families for the purpose of getting them recognition and reward from the proposed Biodiversity and Community Gene Funds.
- Harmonising conservation and commercialisation by creating an economic stake in conservation through symbiotic social contracts between the conservers and public and private sector industry.

The TRC brings together the programmes earlier reported under the N.I. Vavilov Centre generously supported by the Swedish International Development Cooperation Agency (SIDA).

Convention on biological diversity

Articles relevant to issues of Ethics and Equity

Article 8(j) : Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote

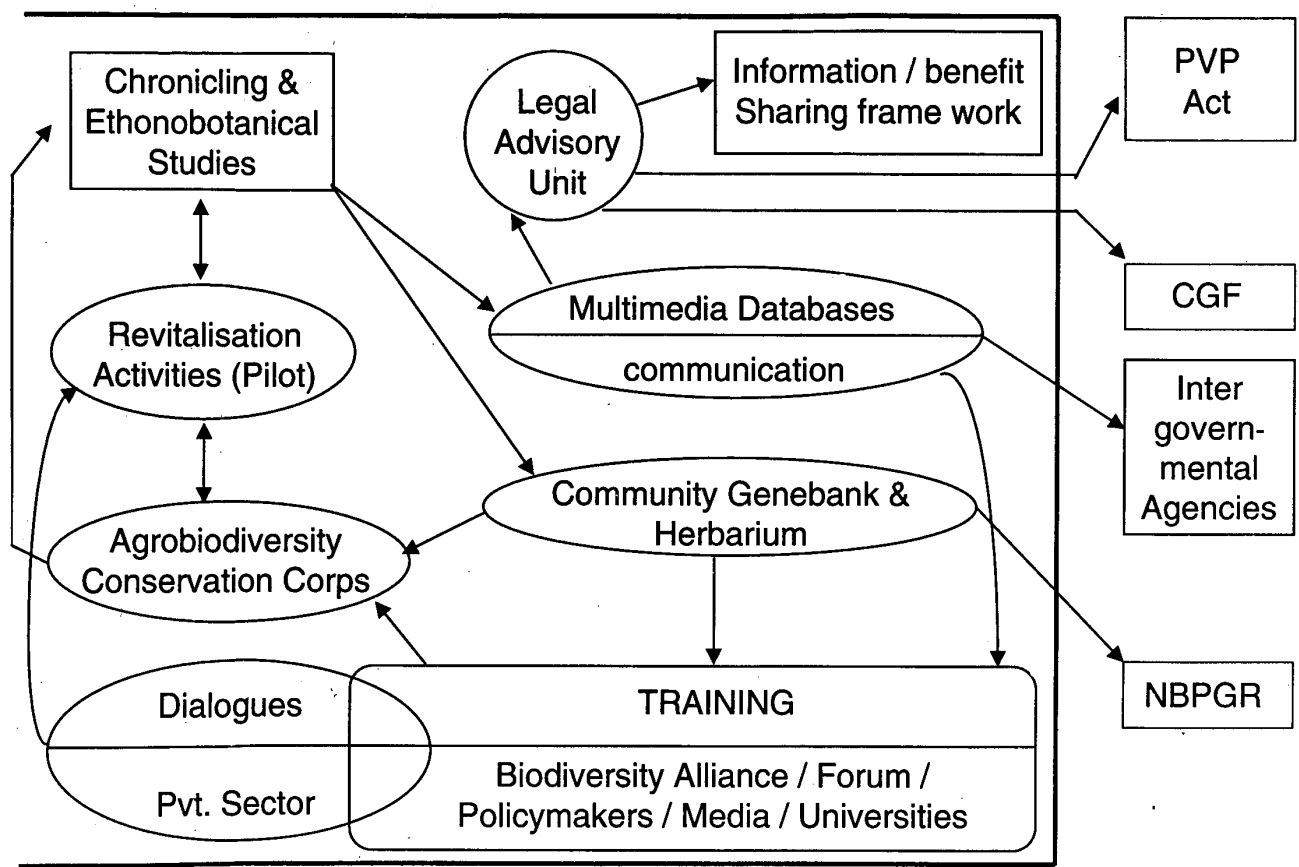


Fig. 2.1 : Technical Resource Centre for the Implementation of the Equity Provisions of the Convention on Biological Diversity

their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilisation of such knowledge, innovations and practices.

Article 9(b) : Establish and maintain facilities for *ex-situ* conservation of and research on plants, animals and micro-organisms, preferably in the country of origin of genetic resources.

Article 10(c) : Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements.

Article 15(7) : Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources. Such sharing shall be upon mutually agreed terms.

Article 16(1) : Each Contracting Party, recognizing that technology includes biotechnology, and that both access to and transfer of technology among Contracting Parties are essential elements for the attainment of the objectives of this Convention, undertakes subject to the provisions of this Article to provide and/or facilitate access for and transfer to other Contracting Parties of technologies that are relevant to their conservation and sustainable use of biological diversity or make use of genetic resources and do not cause significant damage to the environment.

Article 19(3) : The Parties shall consider the need for and modalities of a protocol setting out appropriate procedures, including, in particular, advance informed agreement, in the field of the safe transfer, handling and use of any living modified organism resulting from biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity.

Chronicling of the Contributions of Tribal and Rural Families to the Conservation and Enhancement of Plant Genetic Resources

Tamil Nadu

The Kolli Hills area in Namakkal Rajaji district is of critical importance as most of the traditional crops and associated agricultural practices are under threat

of disappearing due to the pressure of alternative land use practices such as the cultivation of tapioca and high yielding rice varieties.

Documentation of the traditional crops and tribal knowledge is hence of interest in this area. Another major component of the study is to place emphasis on *in situ* on-farm conservation activities in pockets where threats to agrobiodiversi-

ty have been identified. Our emphasis has been on arresting the decline in cultural knowledge about traditional crops and practices and on revitalising their role in *in situ* on-farm conservation of their traditional food crops particularly minor millets like Thinai (*Setaria italica*) and Samai (*Panicum milliare*).

To get an insight into the issues affecting the traditional paddy and millet varieties information was gathered from general field surveys in 31 villages. During the survey, farmers, both men and women, were interviewed. The information gathered and observations made during the general survey may be applicable to other parts of Kolli Hills with certain variations.

A summary of the information and data gathered is given below.

1. Traditional crops, particularly minor millets such as samai (*P. milliare*), thinai (*S. italica*) and panivaragu (*Panicum milliaceum*), are giving way to more remunerative cash crops like tapioca and HYVs.
2. More than 50 per cent of the people interviewed are of the view that decline in cattle population (for want of grazing land and persons to tend them) is one of the major factors contributing to the displacement of the traditional upland crop varieties.
3. Another discouraging trend is the decline or disappearance of some of the traditional agricultural practices and associated indigenous knowledge.

4. A few of the traditional crops like varagu (*Paspalum scrobiculatum*) have almost been lost. Consequently, there is a danger of losing knowledge related to these crops.
5. The displacement of traditional crops has adversely affected the household nutritional security, as rice has replaced the nutritionally rich pulses.

Revitalisation of in-situ Conservation Traditions in the Kolli Hills

During the documentation process it was felt that this situation could be salvaged to some extent, with immediate intervention. People have shown their interest and cooperation in retaining the traditional varieties and reviving the crops which have become rare.

People came forward to revive the crops that have not been cultivated by them for some years. Taking advantage of this, two varieties of *S. italica*, *Koran thinai* and *Senthinai*, were re-introduced in Arippalatti village, consisting of 32 households. A traditional rice variety known as *Samba* has found its way again to this village after nearly twelve years. It is a small beginning which we hope to extend and strengthen further.

The study has helped to revive the interest of the locals in traditional crops and associated cultivation practices. It has motivated us to intensify our efforts to rediscover the value of indigenous trees, fruits and their multiple uses and save them from becoming the "lost crops of Kolli Hills".

The minor millets should more appropriately be referred to as "nutritious grains" rather than being classified as "coarse grains". This will help to change the mind set of the public as well as policy makers. There is potential to increase the production and utilisation of traditional varieties, particularly minor millets, which can be realised by supporting research activities that increase yield, food quality and processing technologies. Further, the use of minor millets in commercial food products should be explored and an efficient marketing system developed. With the rapid rise in demand for processed and semi-processed foods in urban areas, these nutritious grains offer great scope for facilitating balanced diets.

Orissa

Seven tribal districts, namely Mayurbhanj, Keonjhar, Phulbani, Rayagada, Koraput, Nabrangpur and Malkangiri districts, were covered for documenting economically useful plants. The major tribes of these districts are *Kandha, Soara, Paroja, Godaba, Koya, Bonda, Bhatara, Juang, Bhuiyan, Munda, Saunti, Bhatudi, Kolha, Santal* and *Ganda*, who belong to different ethnic stocks. They depend on the forest flora for their livelihood, i.e., food, timber, fibre, medicine, fuel, agricultural implements, insect and pest repellents etc. In recent years, the forest flora is being depleted because of over-exploitation. Rice and minor millets formed their staple food but in recent years their food habit is changing because of over-emphasis on rice and neglect of minor millets by the Developmental Agencies.

However, the tribals still depend on several edible fruits, green leaves and wild tubers from the forests to supplement their food requirement. An interesting point is that they depend only on nature for their needs. Though the walls of houses are constructed with mud, the roof is made of timber, or bamboo and thatched with wild grasses and/or *sal* leaves. Their agricultural implements are made of wood and they have very specialised knowledge about the different plant species that are to be used for specific agricultural implements (Table 2.1). They have knowledge about the plant species that make good or bad fuel.

The tribal people have very detailed knowledge of medicinal plants for curing humans and animals. They have precise knowledge about plants that are used as insect and pest repellents, fish poison and other usages such as for making bows, arrows, ropes, brooms, musical instruments etc. Thus, the tribals depend upon hundreds of plants for their food and health security.

Detailed information about these plants, the purpose and method of their usages including beliefs and taboos of the people, was recorded. Further details on the ways in which various plants are used by the tribal people of Orissa are provided in Tables 2.2 - 2.3.

Andhra Pradesh

The tribes: Konda Reddy and Konda Kamara of the East Godavari District.

**Table 2.1 : Some of the plants used for agricultural implements
by the tribal families of Orissa**

Implement	Local Name of the Plant	Botanical Name	Tribes
Plough	Sal	<i>Shorea robusta</i>	Kondha, Paroja,
	Sahaja	<i>Terminalia alata</i>	Bhatra,
	Bija	<i>Pterocarpus marsupium</i>	Gadaba,
	Kusuma	<i>Schleichera oleosa</i>	Langja Soura,
	Kendu	<i>Diospyros melanoxylon</i>	Bhumia,
	Muhula	<i>Madhuka longifolia</i>	Santala,
	Mundi	<i>Mitragyna parvifolia</i>	Kolha,
	Moi	<i>Lanea coromandelica</i>	Bhumija Juanga, Bhuyan
Yoke	Dhamana	<i>Guazuma tiliifolia</i>	-do-
	Palasa	<i>Butea superba</i>	
	Bandhana	<i>Desmodium oojeinense</i>	
	Gambhari	<i>Gmelina arborea</i>	
Levelling plank	Sal	<i>Shorea robusta</i>	-do-
	Bija	<i>Pterocarpus marsupium</i>	
Mud breaker	Kusuma	<i>Schleichera oleosa</i>	-do-
Threshing log	Kusuma	<i>Schleichera oleosa</i>	-do-
Threshing stick	Mahula	<i>Madhuka longifolia</i>	-do-
Miller (dhenki)	Kusuma	<i>Schleichera oleosa</i>	-do-
	Kendu	<i>Diospyros melanoxylon</i>	
	Sal	<i>Shorea robusta</i>	

The hamlets: Tadepally (Thotamamidi vee-dhi, Yegava vee-dhi), Maddhiveedu, Mallavaram, Putta Gondhi Lanka, Kodavati Lanka and Nethedichilaka, are situated 19 km from Rampachodavaram. These hamlets lie at an altitude of 450 to 500 m. above

mean sea level. The forest is of dry deciduous to moist deciduous and falls under Eastern Ghats. The entire area is undulated with many hillocks which are used by the tribes for "podu cultivation" (slash and burn or shifting cultivation).

Table 2.2 : Plants used for treating health disorders (Orissa)

Local Name	Botanical Name	Purpose	Tribe
Hinjala	<i>Barringtonia acutangula</i>	Mental retardation	Santal
Mahakala	<i>Barringtonia acutangula</i>	Rheumatism, Evil spirit	Saunti
Muturi	<i>Smilax zeylanica</i>	Menstrual disorder	Kolha
Agara	<i>Argemone mexicana</i>	Scabies	Gonda
Kastandi	<i>Saccharum spontaneum</i>	Bone fracture	Bathudi
Agnijhala	<i>Clausena excavata</i>	Griping	Barabhuiyan
Gamhari	<i>Gmelina arborea</i>	Indigestion	Munda
Bhuinkakharu	<i>Ipomoea digital</i>	Lactation, filaria	Bhuiyan
Bhalia	<i>Semecarpus anacardium</i>	Sprain Scabies Worm infection Cut wound	Kandha
Banajira	<i>Centratherum anthelminticum</i>	Piles	Sudra
Mahakala	<i>Trichosanthes bracteata</i>	Stomach pain Evil spirit Cough Fever Epileptic fits	Bhumia
Bhuinlimba	<i>Andrographis paniculata</i>	Malaria Black water fever Relapsing fever	Paroja
Amda	<i>Spondias pinnata</i>	Menstrual disorder	Rana
Nalabeli	<i>Cipadessa baccifera</i>	Diarrhoea	Bonda
Karada	<i>Cleistanthus collinus</i>	Footsore	Rana, Kondha

Table 2.3 : Various usages of a single plant by the tribals of Orissa
Example : Kumbhi (Careya arborea)

Plant part	Used for	Tribe
Bark	Blood dysentery, cuts and wounds	Halva
Fruit	Snake repellent, poultry lice repellent, and edible	Halva
Flower	Pest repellent	Halva
Bark	Myalgia, Profound weakness	Sana Paroja
Bark	Pain due to injury	Santal
Bark	Blood dysentery	Kolha
Bark	Fever, cold and cough	Gopal (OBC)

Hamlet profile : The tribal areas of the present study fall under the panchayat system. There are five villages under Tadepalli panchayat, namely Tadepalli, Maddhiveedu, Mallavaram, Doramamidi and Putta Gondhi Lanka, comprising 1500 inhabitants in 500 houses.

Chronicling activities : A detailed study was conducted on the Ethnobotany and Ethno agricultural aspects of the local communities (Table 2.4) and their resource utilisation practices were carefully documented (Table 2.5). Ethnobotanical information on 66 wild plant species used by these tribals for their nutrition, medical and other requirements was documented. Voucher specimens of the plant species used were collected for the herbarium. Traditional agricultural practices of the tribes are being studied in detail. Varieties of local crop plants were identified (Table 2.6). These studies indicate the richness in the diversity of the crops that are cultivated by the local communities. According to the local people, each plant species has its own value. A few of these varieties are being maintained under *ex-situ* conditions in the Community Gene Bank of MSSRF.

A couple of important observations are reported below :

- A wild legume locally called *Dhamalu*, belonging to Family Papilionaceae (Fabaceae) the *Mucuna* sp. cultivated by Konda Reddys, is a very hard species and this is consumed by the locals after thorough processing by repeated washing in running water.
- Multiple uses of *Borassus* palm : The leaves are used for thatching houses. Fibre from the leaves is used for house construction. The fibre has commercial value and is sold at Rs.7 to 8 per kilogram. The fruits are edible. Tender fruits are highly relished. Tender sprouts are cooked and eaten. Toddy is extracted from mature trees and is almost the staple diet of the local people. It takes nearly 20 years for a plant to reach maturity. The population of *Borassus* trees needs to be increased to meet the requirements of the local populace.

Sacred Groves in Tamil Nadu

Sacred Groves constitute an important traditional method of both *in-situ* and *ex-situ* conservation of tree species of ecological, economical and spritual significance. As an initial step toward protecting and preserving indigenous knowledge of this conservation tradition, base line data was recorded on 266 Sacred Groves in 14 districts of Tamil Nadu through extensive surveys. The districts covered are Chengalpattu, North Arcot, Thiruvannamalai, Karur, Perumpidagu Mutharaiyar, Perambalur - Thiruvalluvar, Pudukottai, Pasumpon Muthuramalingha Thevar, Ramanathapuram, Madurai, Thirunelveli Kattabomman, Kamarajar and Kanyakumari.

Information on 212 Sacred Groves has been incorporated in the FRIS databases (SPA 503). Our preliminary studies reveal that the *Kallars*, *Thevars*, *Maravars*,

Table 2.4 : Plant germplasm resources used by the Konda Reddy tribals

Type of plant germplasm	No. of Species/ Varieties
Ethnobotanically valuable species	28
Traditional cultivars cultivated in the Podu\Shifting cultivation	20
Traditional cultivars cultivated in the plains	2
Vegetables and fruits cultivated	8
Plants of commercial value collected as NTFP	11
Plants of social, material and economic value	7

Table 2.5 : Ethnobotanically valuable plants (Konda Reddy, Andhra Pradesh)

Plant (Botanical Name)	Local Traditional Name	Use/Value
<i>Cardiospermum halicacabum</i> L.	<i>Ubbakura</i>	Leaf paste applied on the trunk of the toddy tapping part of <i>Caryota urens</i> for inducing toddy.
<i>Cassia occidentalis</i> L.	<i>Thanthemu</i>	Quoted as highly useful, but nobody mentioned its use.
<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	<i>Paathala garida</i>	Fruits used in snake bite and for dysentery.
<i>Sterculia urens</i> Roxb.	<i>Kovela</i>	Gum extracted from stem bark has commercial value. Roasted seeds edible.
<i>Hemidesmus indicus</i> (L.) R. Br.	<i>Pala</i>	Root juice used for cooling effect.
<i>Crinum defixum</i> Ker-Gawl	<i>Seepa chettu</i>	Leaf juice used for ear infection.
<i>Oroxylum indicum</i> (L.) Benth. ex Kunz	<i>Paampana</i>	Stem bark along with <i>Peda thanthemu</i> used for menstrual disorders.

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Table 2.5 contd...

Plant (Botanical Name)	Local Traditional Name	Use/Value
<i>Annona reticulata</i> L.	<i>Raama seetha</i>	Fruits edible.
<i>Schleichera oleosa</i> (Lour.) Oken	<i>Kusuma/Boosi</i>	Fruits edible; also used in ulcers and gastric trouble. Seed oil used in skin diseases.
<i>Strychnos nux-vomica</i> L.	<i>Musidi</i>	Stem bark ground with turmeric and one teaspoonful administered for speech impairment.
<i>Strychnos potatorum</i> L.f.	<i>Indhumu</i>	Fruits used as poison.
<i>Clausena heptaphylla</i> Wight & Arnott	<i>Jeede koora/ Adavi karepaku</i>	Leaves used as substitute for curry leaves.
<i>Fern</i>	<i>Kollem koora</i>	Tender fronds edible, eaten for cooling effect.
<i>Zizyphus xylopyrus</i> (Retz.) Willd	<i>Gotti kaya</i>	Fruits edible.
<i>Mucuna monosperma</i> DC.ex Wight	<i>Gurrapu dekka</i>	Seed paste applied for migraine and mumps.
<i>Abrus precatorius</i> L.	<i>Guruvinda</i>	Seeds used for abortion.
<i>Xylia xylocarpa</i> (Roxb.) Taub	<i>Konda tangedu/ Adda pikka</i>	Seeds roasted and eaten.
<i>Holarrhena</i> <i>antidysenterica</i> (Roxb. ex Fleming) Wall	<i>Paala</i>	Latex used for cuts and wounds. Stem bark ground and taken for dysentery (one spoonful three times).
<i>Bauhinia vahlii</i> Wight & Arn.	<i>Adda aaku</i>	Leaves used as meal plates. Stem bark used as fibre.

Table 2.5 contd...

Plant (Botanical Name)	Local Traditional Name	Use/Value
<i>Caryota urens</i> L.	<i>Jeelugu</i>	Toddy tapped from the tree.
<i>Madhuca longifolia</i> (Koen.) Macbr. var. <i>Latifolia</i> (Roxb.) A. Cheval	<i>Ippa</i>	Calyx edible. Seed oil used in cooking. Latex used for tooth infection. Stem bark juice dropped into the left ear if tooth decay is on right side.
<i>Syzygium cumini</i> (L.) Skeels	<i>Neredu</i>	Fruits edible
<i>Buchanania lanzan</i> Spreng.	<i>Jaaruga, Jaaru mamidi</i>	Fruits edible
<i>Streblus asper</i> Lour.	<i>Baranika</i>	Fruits edible, latex used for curdling milk. Stem twigs used as tooth sticks.
<i>Manilkara hexandra</i> (Roxb.)Dubard	<i>Paala</i>	Fruits edible.
<i>Mangifera indica</i> L.	<i>Konda maamidi</i>	Raw fruits used as vegetable.
<i>Cassia fistula</i> L.	<i>Rella chekka</i>	Stem bark ground with jaggery and taken for chest pain.
<i>Cleistanthus collinus</i> (Roxb.) Benth. ex Hook.f.	<i>Odise</i>	Wood is very strong and used for cross beams in house construction and leafy branches used for fencing. Fruits used as fish poison.

Table 2.6 : Traditional varieties of crops cultivated by the tribes in Konda podu (shifting cultivation)

Traditional Cultivar	Botanical Name	English Name
Konda jonna	<i>Sorghum bicolor</i>	Sorghum
Konda mokka jonna	<i>Zea mays</i>	Maize or Indian corn
Konda saama	<i>Panicum miliare</i>	Little millet
Konda korra	<i>Setaria italica</i>	Italian millet
Konda Bontha	<i>Echinochloa sp.</i>	
Konda sode	<i>Eleusine coracana</i>	Finger millet
Konda kandhi *	<i>Cajanus cajan</i>	Red gram
Konda budama	a variety of <i>Oryza sativa</i>	Paddy
Gongura	<i>Hibiscus sabdariffa</i>	Roselle plant
Konda benda	<i>Hibiscus esculentus</i>	Okra
Pandiri pandlu	<i>Lycopersicon sp.</i>	Tomato
Vari	<i>Oryza sativa</i>	Paddy
Dhamalu	<i>Mucuna sp.</i>	
Dippalu	<i>Lagenaria ciceraria</i>	Bottle gourd
Donki	<i>Lagenaria sp.</i>	Bottle gourd
Gummadi		Pumpkin
Bobbaru	Two varieties available	
Kulamalu	<i>Cucurbit sp.</i>	

* There seems to be three varieties, of white, black and red colours, cultivated.

Muthiravar, *Vanniyars* and other Scheduled Caste groups maintain Sacred Groves in rural areas, whereas *Kani*, *Paliyar* and *Malayali* tribals are preserving a large number of Sacred Groves in Eastern and Western Ghats.

An in-depth study of two Sacred Groves of South Arcot Vallalar district was un-

dertaken. 180 plants were collected and ethnobotanical information on 98 plant species was recorded.

The studies conducted so far indicate that documentation will be an important step in chronicling the slowly vanishing knowledge of our traditional conservation practices. The rationale for the choice of tree

species which go into a Sacred Grove constitutes the intellectual property contributions of local men and women.

Sacred Groves as Refugium of Endangered and Relict plants

The Sacred Grove located at Suriampettai village, South Arcot Vallalar District situated near the village boundary, covers ten acres of natural vegetation. *Ayyanar* is the deity of the Sacred Grove. A large banyan tree (*Ficus benghalensis* L.) a key stone species, is found inside the Sacred Grove, providing a niche for a large number of birds and animals.

Interestingly this Sacred Grove has a few evergreen elements such as *Malakuzhigai* (*Dimorphocalyx lawianus* Hkf.) *Tricalysia spherocarpa* Gamble, which are generally seen above 900–1500 m. in Western Ghats. These species do not occur anywhere else outside the grove in this area. Palynological and fossil evidences prove that this geographical area was covered by lush evergreen forest during the lower cretaceous period.

Though there are many ecological factors governing the existence of these species in the area, strong taboos attached to the grove protect these relict evergreen species.

About one hundred plant species, belonging to 39 families, have been collected and properly identified. Ethnobotanical information of 85 plant species was recorded. Of these, use values of 4 species has been newly reported (Table 2.7) and that of 19 species has been documented (Table 2.8).

Gender and Biodiversity Management

The gender dimensions of biodiversity conservation and management in India is being studied. (The results of this work were discussed at a Workshop held on June 9-10, 97 at MSSRF under the sponsorship of FAO and *The Hindu*. (SPA 502)).

Current Scenario

The following is a summary of the current state of our knowledge.

- While women probably constitute the largest group of farmers who have conserved and improved agrobiodiversity, they have often no property rights to land. Also, they tend to be bypassed by development schemes relating to biodiversity. Women's University, Home Science colleges and other educational institutions catering to women's needs seldom include biodiversity as a field of specialisation.
- The fast growing literature on Intellectual Property Rights (IPR), *sui-generis* systems of plant variety protection and Farmer's Rights also reveals a lack of gender sensitivity in relation to the issues under discussion. There is practically no literature dealing with gender and IPR.
- The evidence within the literature dealing with plant genetic resources, whether wild or domesticated, when disaggregated by gender, presents in general overwhelming evidence of clear gender dimensions of labour, knowledge and management. The same is true of agro-

Table 2.7 : Medicinal uses of plants in Sacred Groves

Species	Curing illness	Parts used
<i>Crinum viviparum</i>	Antiseptic	Leaf
<i>Garcinia spicata</i>	Body Pain	Leaf
<i>Pterospermum canescens</i>	Head Ache	Leaf
<i>Dimorphocalyx lawianus</i>	Body Pain	Leaf

Table 2.8 : New uses of plants (Sacred Grove at Suriampettai village)

Species	Curing illness	Parts used
<i>Ficus racemosa</i>	Antiseptic	Latex
<i>Melothria maderaspatana</i>	Cough	Leaf
<i>Morinda citrifolia</i>	Cold	Leaf
<i>Enicostema axillare</i>	White discharge	Root
<i>Justicia gendarussa</i>	Anti Allergic	Leaf
<i>Albizia lebbek</i>	Gastric problem	Leaf
<i>Cardiospermum halicacabum</i>	Gastric problem	Leaf
<i>Limonia acidissima</i>	Gastric problem	Fruit
<i>Plumbago zeylanica</i>	Gastric problem	Fruit
<i>Abrus precatorius</i>	Gastric problem	Leaf
<i>Butea monosperma</i>	Gastric problem	Leaf
<i>Cassia auriculata</i>	Ulcer	Leaf
<i>Cyphostemma setosum</i>	Indigestion	Leaf, Bark
<i>Cadaba fruticosa</i>	Indigestion	Leaf
<i>Croton bonplandianum</i>	Anti Diarrhoea	Leaf
<i>Calotropis gigantea</i>	Psoriasis	Leaf
<i>Sapindus emarginatus</i>	Whooping - Cough	Fruit
<i>Sesamum indicum</i>	White discharge	Leaf
<i>Phyla nudiflora</i>	White discharge	Leaf

biodiversity in home gardens, forests and cultivated and fallow land. It is hence surprising that the insights gained from over two decades of analysis of farm households and gender relations are not being applied critically to research on biodiversity.

Lessons from Case Studies

Studies carried out by MSSRF scientists in Kerala, Tamil Nadu, Orissa, Arunachal Pradesh, Mizoram and Lakshadweep islands brought to light the following features :

- In the mountains of Southern Western Ghats, of which Wayanad, Kerala, forms a hot spot biodiversity area, women play a critical role in conserving traditional varieties of food crops as well as medicinal plants.
- The varied landscape of the Kolli Hills of Tamil Nadu is an area of considerable agrobiodiversity. Women here play a major role in seed selection and seed storage.
- The forests and hills of the Jeypore Tract of Orissa are known for its rich diversity of rice and considered as a home for many tribal communities. Both women and men are involved in the conservation and their knowledge is found to be eroded.
- The Bhitarkanika sanctuary on the Orissa coast is a protected deltaic area, with considerable mangrove diversity. Caste and social divisions are of considerable significance in determining both gender roles and relations.

- Sparsely populated Arunachal Pradesh has great ecological and socio-cultural diversity. The stratification, vulnerability and low status of tribal women could have a far reaching impact on the prospects for biodiversity conservation.
- In Mizoram, on the other hand, different topographical conditions and the practice of slash and burn (*jhum*) agriculture have eroded the biodiversity. New methods of organic cultivation, which are the outcome of a blend of traditional and modern practices, are emerging.
- The coral reefs and lagoons of the Lakshadweep Islands determine both gender roles and knowledge base of women and men.

A Blue Print for Action

A blue print for Action to include Gender Dimensions in the proposed National legislation, Indian Forest Services, Panchayat Raj Institutions and All-India Coordinated Project with the support of ICAR, ICFRE, ICMR, CSIR, ICSSR, UGC, DBT, DST and the Ministry of Environment and Forest has been suggested.

Agrobiodiversity Conservation Corps

Agrobiodiversity is a primary component of both sustainable agriculture and food security. In order to create awareness amongst local communities and ensure their participation in the conservation of agrobiodiversity a 5 year programme was launched by the MSSRF in 1996 with

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the support of the Netherlands Ministry of Foreign Affairs. The programme of identifying and training rural youth volunteers has been initiated in two sites in Orissa (Bhitarkanika and Malkangiri), Kalpetta (Wayanad) in Kerala, Minicoy and Kavaratti in the Lakshadweep Islands, Ariyur Solakkadu (Kolli Hills) in Tamil Nadu and in Dharmapuri (Erimalai, Pudupatti and Belurampatti) in Tamil Nadu. In all 45 volunteers including women have been identified.

Training material introducing the concept of agrobiodiversity has been prepared in both Tamil and Oriya. This material has been used and various levels of training including lectures, participatory resource mapping, group discussions and field exercises of inventorying biodiversity have been imparted to the selected volunteers.

Methodology

The goal being *in situ* conservation of agrobiodiversity, the emphasis is on the *active participation* of the communities, and *capacity building* of the volunteers identified/selected. Several institutions and scientists gave their time and knowledge in training the volunteers.

The following steps were taken for identifying volunteers:

- A profile of the natural resources and the different communities inhabiting the locality was compiled.
- The local people, leaders and government officials were appraised of the objectives and purpose of the current project.
- Participatory exercises, primarily the Participatory Rural Appraisal (PRA) techniques, were used to obtain their perceptions on resource-availability and resource-crunch.
- Several open and participatory meetings were held to explain the scope of the project and to call for volunteers, who would constitute the Conservation Corps.

During the reporting period considerable progress has been made in identifying and training the volunteers who constitute the Agrobiodiversity Conservation Corps (Table 2.9). Training in agrobiodiversity conservation is being imparted at various basic levels.

Progress made in the 5 sites

The relative ease of communication in Lakshadweep Islands and the 2 sites in Tamil Nadu has given the programme a good start. Volunteers in the Lakshadweep Islands are mostly graduates and have shown the ability to follow English.

Lakshadweep Islands

The Islands were visited four times. The local language is Malayalam with a mixture of Male dialect. Additionally, the volunteers speak a bit of Hindi and can read English.

The resource mapping exercise was initiated during the training programme. A 3-day workshop on *Community Biodiversity Registers* and agrobiodiversity inventorying was conducted at Kavaratti.

Table 2.9 : Volunteers in the agrobiodiversity conservation corps

Locality/Sites	No. of volunteers	Remarks
Wayanad – Kalpetta	5	all men
Dharmapuri		
Erimalai	5	all men
Pudupatti	2	both women
Belurampatti	3	all women
Kolli Hills – Ariyur Solakaddu	10	6 women and 4 men
Lakshadweep Islands		
Kavaratti	7	all men
Minicoy	3	2 women and one man
Orissa		
Malkangiri	5	all men
Bhitarkanika	5	all men

The volunteers have by now drawn up an inventory of the vegetation on Kavaratti with the active participation of Mr. S.S. Koya, Environmental Warden, Science, Technology and Environment (Kavaratti). Mr. Koya visited the MSSRF to identify the various species of plants preserved on herbarium sheets. He also demonstrated how data is being recorded in Malayalam by the volunteers.

The Lakshadweep islands are endowed with some of the finest and diverse coral reefs of India. During April and May 1997, the volunteers and the interested local residents were trained in conservation and monitoring of coral reefs.

Dharmapuri District

In this district of Tamil Nadu we have so far identified 10 volunteers distributed in

3 villages. The District Forest Officer has shown a keen interest in the project and has extended all support.

A brief orientation programme was held in Erimalai for men and women of the village. The villagers participated in a resource mapping exercise.

Erimalai has been selected by the District Forest Officer (DFO), Tamil Nadu Forest Department, Dharmapuri, for the demonstration of participatory forest management. The DFO requested the MSSRF team to liaise between the Forest Department and the local people and provide a feedback on the people's immediate felt needs. Consequently, the MSSRF team held a group discussion in Erimalai. Of the various felt needs, adequate water supply to the village emerged prominently.

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Five volunteers from Erimalai were introduced to the concept of biodiversity, agrobiodiversity and sustainable agriculture. They were requested to study the material provided and discuss it amongst themselves. At the request of the District Forest Officer, a team of 2 MSSRF staff visited Erimalai and mapped the entire village for its water resources with the participation of the volunteers and other villagers. A detailed report of the present status and problems of water availability in the village was prepared and given to the DFO.

A two day workshop was held in April 1997 at Hogganekal and the following exercises were given to the volunteers:

- A test of perception.
- Reorientation to the basic concepts.
- Clarification of doubts regarding the lessons provided earlier.
- Field visit for inventorying biodiversity.
- Natural resources and social mapping.
- Discussions.
- Future plan of work.

Kolli Hills

Tamil lessons prepared for the purpose were distributed at this time. In April 1997 all the 10 volunteers assembled at Semmedu and the following exercises were provided:

- Test of perception.
- Field indexing of biodiversity.
- Landscape mapping.

- Clarifying doubts regarding the notes provided.
- Collection of traditional crop varieties.
- Future plan of action.

Orissa

Initially it was planned to have all 10 volunteers in the rice growing tract of Jey-pore but the Forest Department of Orissa, which has been very co-operative, suggested that coastal agrobiodiversity should also be monitored. It was decided to recruit 5 volunteers from Bhitarakanika, a site of an ongoing coastal project here. These volunteers are working with MSSRF staff and are being trained in selection, storing and propagation of mangrove seeds, maintaining nurseries and monitoring growth of mangrove seedlings in planted areas. They are also involved in documenting coastal traditional rice diversity.

A second set of 5 volunteers have been identified in Malkangiri, an area well known for its rice genetic resources. The local volunteers speak Oriya and Telugu. An orientation programme was conducted in February 1997. For purposes of training in both Bhitarkanika and Malkangiri, Oriya notes have been printed. (This material has been translated from the original English version on *Biodiversity Indexing in Agriculture* which was printed as part of the FAO/UNDP/UNIDO FARM programme.)

Wayanad

MSSRF has initiated a Community Agrobiodiversity Centre at Kalpetta in Waya-

nad District of Kerala to train local youth in agrobiodiversity documentation and conservation. Of the youth thus selected, 5 have been adopted by the project as members of the Agrobiodiversity Conservation Corps. The volunteers are being oriented to the basic concepts. Training is continuing in this centre. Stationery items and field kits are being supplied to the volunteers.

Community Gene Bank

The Community Gene Bank has been specially designed to preserve plant genetic resource material (seed) which is related to safeguarding the Intellectual Property Rights of the tribal and rural farming communities. The characteristic feature of this Community Gene Bank at MSSRF is to be a *backup storehouse* of the seed material collected from tribal and rural villages and the accessions are available only to the tribal and rural farming communities. This Community Gene Bank acts as a reference centre which holding the indigenous germplasm along with information collected through the Biodiversity Programmes of the MSSRF.

The primary objective of this Community Gene bank is collection, cataloguing, conservation, distribution and documentation of farmer conserved and developed seed materials. The information which is collected along with the seed material is being catalogued and linked with the FRIS databases (SPA 503). This will be utilised for recognition, reward and in the protection of the *intellectual property rights* of the tribal and rural farming communities, under the proposed Community Gene Fund.

Sources

MSSRF selected a few places from Tamil Nadu, Andhra Pradesh, Orissa and Kerala for conducting intensive study. Through this programme, scientists collected indigenous germplasm available within the study area. Apart from the MSSRF's collection, interested NGO's from Chengam, Tirunelveli and Trichy (in Tamil Nadu) are also sending valuable seed collections from their locality. The information on sites and sources is given in Table 2.10.

Activities

During the year 1996-97, the number of accessions in the Community Gene Bank has increased to a total of 633, which comprises cereals, millets, pulses, endangered and medicinal plant species. During this year, it was decided to carry out multiplication trials in the original habitats considering the logistics involved and the difficulty of multiplying in a different environment. Steps have been initiated to conduct these trials both in Tamil Nadu and Orissa. Some of the accessions preserved during the year 1994 were taken out of storage and tested for viability. These tests revealed that the accessions have 85-100 percentage viability. Steps have been initiated to photograph all the accessions at the time of processing for the documentation, and some of the photographs have been merged along with the updated passport database. Accession register, herbarium, photographs and other essential information are also maintained and updated.

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Table 2.10 : Community gene bank : seed collection sites and sources

State	District Villages/ Blocks	Localities	Tribal Community	
Tamil Nadu	Coimbatore	Siruvani Udumanparai Valparai	Irula Kadar Muthuvan	
	Dharmapuri	Chitteri	Malayali	
	North Arcot Ambedkar		Malayali	
	Salem	Kolli Hills	Malayali	
Andhra Pradesh	East Godavari		Konda Reddy	
Kerala	Wayanad		Kattunaykkan Kurichiya Kurumba Mullu Kurumba Paniya	
Orissa	Koraput	Boripariguda Borigumma Jeypore Koraput Kotpad Kundra Nandapur Pottangj	Bhumia Kui Mali Paroja Pentia Rana	
		Malkangiri	Kalimela K.Gumma Khairput Korkunda Podia	Bonda Dora Gadaba Koya Kutia Paroja
		Nabarangpur	Nabarangpur Papadahandi Raighar Umerkote	Bhatra Gond Kolar
		Phulbani	Daringbadi Khajuripada Phringia Phulabani Tumudibandha	Kutia Sabar Kandha
		Rayagada	Chandrapur Gunupur Kashipur K. Singhpur Kulnara Rayagada	Kandha

Community Herbarium

MSSRF has established a herbarium, called "Community Herbarium" to act as a local reference centre for the identification of landraces, traditional cultivars, rare, endangered and medicinal plants species. Information on specimens collected from selected areas of Tamil Nadu, Orissa, Kerala and Andhra Pradesh is regularly updated. It serves as an invaluable repository of the vast indigenous flora, will provide data on the indigenous knowledge and verify the identification of the plant taxa. Presently the Community Herbarium comprises 500 voucher specimens collected from Tamil Nadu and Andhra Pradesh.

Special Study : The Role of the Global Environment Facility (GEF) in Helping Protect Agrobiodiversity of Global Significance.

This study was undertaken by the Foundation on behalf of the GEF for assisting them in their efforts to help nations conserve agrobiodiversity for the use of the present and future generations of humankind. The major aims of the study are :

- Mapping the location of globally significant and threatened agrobiodiversity
- Learning from successes and failures
- The social, economic and environment sustainability of one-time GEF interventions
- Baselines for agrobiodiversity interventions
- Guidelines for the development of schemes to estimate biodiversity related incremental activities

- Catalytic and strategic role of the GEF within current and planned initiatives of globally significant agrobiodiversity.

On the basis of detailed analysis, this document stresses the need for GEF to accord priority to the following :

- a) Saving endangered habitats, species and land races rich in agrobiodiversity
- b) Revival and revitalisation of the *in situ* and *on-farm* conservation traditions of indigenous communities
- c) Supporting emergency conservation action in countries and regions affected by civil strife, ethnic conflicts or social disintegration.
- d) Capacity building for launching integrated agrobiodiversity conservation strategies involving appropriate combinations of *in situ* and *ex situ* measures.
- e) Training biosystematics and conservation professionals.
- f) Helping to organise regional and national *agrobiodiversity corps* of women and men dedicated to the cause of preventing gene erosion, promoting a conservation ethic among local communities and building partnerships among government agencies, the civil society, farm families, academia and mass media.
- g) Establishing Technical Resource Centres for implementation of the equity provisions of the Convention on Biological Diversity. In particular, prior-

ity should be given to recognising and rewarding communities engaged in conservation efforts with implications for public good.

- h) Helping nations to implement appropriate components of the Leipzig Plan of Action and to develop and implement a *National Agrobiodiversity Programme for Sustainable Food and Livelihood Security*.

The paper adopts an ecosystem approach in its analysis, and outlines a process by which the products, namely the GEF priority programmes in agrobiodiversity may be realised. Bamboo, rattan and rice are taken up as examples of cross-ecosystem plants, and their diversity has been studied in detail.

The studies leading to this document were conducted by a team consisting of experts in crop genetics, coastal and marine biodiversity and forestry.

Sub Programme Area 202 Saving Endangered Plant Species and Habitats

Western Ghats - a 'Critical' Ecosystem

The Western Ghats, an almost continuous range of mountains except for the Palghat gap, lie between 8°20' - 20°40' N and 73°-77° E and cover a distance of about 1400 sq km. These ranges run almost parallel to the west coast of India, and abound in diverse habitats, luxuriant flora and fauna. This geographic zone

is now one of the most extensively disturbed ecosystems of the world and has been experiencing extreme environmental degradation. Attempts at species introductions in the name of greening, have often further threatened the native flora by directly altering the natural habitats. The richness of the plant species diversity is evidenced by the occurrence of more than 4000 species of flowering plants, 150 species of ferns and fern allies, 200 known species of bryophytes, and an equal number of algae, 600 species of fungi and about 800 species of lichens and several hundreds of microbial organisms. The flora of this region is very characteristic, with a well-marked pattern of endemism in all the groups of species. About 33 % of endemism is observed in flowering plants, most of which have a very restricted range of distribution and chronically small populations. This is the most threatened group, with a very high rate of extinction as well as genetic deterioration. The number of species which are threatened is increasing day by day.

Endangered Flowering Plants and Key Areas for Conservation

The southern half of the region has greater diversity and is also experiencing greater threats to the survival of various species. There are more than 700 species of threatened flowering plant species reported from this narrow geographic zone. About 171 extremely threatened plant species are distributed in Tamil Nadu alone and 111 amphibians out of a total of 117 present throughout the Western Ghats. The area that lies south of the

Palghat gap (8-9°) is richest in biodiversity, with 44 amphibian species. Key areas and priority species for conservation have been identified in this region. Some of them are, Agastyamalai, Eravikulam National Park, Silent Valley, Anamalai, Kankumbi, Koyna Valley, Mudumalai and eastern slopes of the Nilgiris.

Conservation Action Programme

One of the effective mechanisms to slow down the species loss is their systematic collection, for purposes of rapid and mass multiplication and reintroduction into their respective habitats. Many species of this region have not been scientifically studied. Intensive surveys were conducted in the southern Western Ghat area in seven different localities. Several field trips of seven to ten days duration were made, often to the same areas repeatedly, to study rarity and associated features of individual species. The collection of ex-plants were made for micropropagation. Live specimens of many of these species are being maintained in the green house and the voucher specimens are kept at the herbarium in MSSRF. The study has resulted in the collection of over 200 taxa which include over 125 rare and threatened species, of which 22 are listed in the Red Data Book of Indian Plants. The work of assessment and review of the 125 spp. based on revised IUCN (1994) and Mace & Stuart, guidelines was completed during the year.

Community Agrobiodiversity Centre

The Community Agrobiodiversity Centre established at Kalpetta, Wayanad is de-

signed to assist the ongoing efforts to introduce the principles of equity and ethics in the conservation and utilisation of agrobiodiversity. It is working in close collaboration with Kerala Forest Research Institute, Kerala Sasthra Sahitya Parishad, Indian Institute of Spice Research and other appropriate governmental and non-governmental organisations. The aim is to supplement the on-going work rather than duplicate it. The work of the centre is guided by a local level committee chaired by the District Collector.

The Study Area

Wayanad, is situated in a high mountainous plateau in the southern crest of Western Ghats. Wayanad district, predominantly a hilly terrain of 2131 sq. km. in size is located in the north-east part of Kerala, adjoining Tamil Nadu and Karnataka. This tract which was extremely forested till recently; is now highly fragmented because of intensive cultivation of cash crops and plantations mainly tea, coffee, and pepper. Nevertheless, various studies conducted in this region show that this district is floristically and culturally still rich in genetic wealth.

The total population in the district is about 6,72,000 as per 1991 Census in an area of 2131 sq. km. Wayanad has the least Scheduled Caste Population (0.91%) and highest Scheduled Tribe population (35.82%) of the State. The scheduled tribes are the *Paniyas, Kurichiyas, Kurumbas, Kattunaykkans* and *Mullu Kurumbas*.

As of today, a large proportion of these tribals are landless; only 10 % of them

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(largely the *Kurichiyas* and *Kurumbas*) have their own land. However, they have been still preserving their tradition and culture as evidenced by the presence of many traditional varieties and landraces and usage of various kinds of herbs for their primary medical requirements. Their knowledge of natural resources and tradition of conservation which are quite fascinating, are disappearing.

The objectives of the Centre are to :

1. Generate public awareness and participation in strengthening on-farm and *in-situ* conservation traditions of farm families.
2. Build capacity of the stake-holders to prepare Community Biodiversity Register through the training of local youth, which will lead to the organization of an Agrobiodiversity Conservation Corps.
3. Save the endangered plant species and varieties of species.
4. Train local NGO representatives, students, tribal youth in the biosystematics, tribal taxonomy and bioindicators.
5. Create an economic stake in genetic resource conservation tradition by commercialising plants of economic value.
6. Assist the designated official agencies to implement provisions relating to Farmers Rights.
7. Network with concerned government

and voluntary organisations in the area of conservation of genetic wealth.

Activities

The activities of the Centre were started in December 1996. A meeting of the Policy Advisory Committee for the Centre was organised at Kalpetta under the chairmanship of Prof. M. S. Swaminathan. The Meeting was attended by eminent persons from different domains largely biodiversity, socio-economics and mass media.

1. Kottathara panchayat has been selected for detailed biodiversity inventory to make strategies for the economic development of the people. This is one of the tribal dominated panchayaths in the district. A large amount of secondary data has been gathered to generate background information. The methodology manual prepared by Sesshagiri Rao and others (Indian Institute of Science, 1996) is used for documenting the people's knowledge. Inventorisation for higher plant diversity is in progress. About 50 locally important medicinal and nutritional plants have been collected. There are several edible plants distributed in the study area. One such species, *Ceropegia candelabrum* var. *biflora* is locally very rare. (Fig 2.2).
2. Five youths have been selected from rural and tribal families to serve as Conservation Corps. These youth are helping the scientists in survey and documentation. Necessary collection manuals are prepared in the local lan-

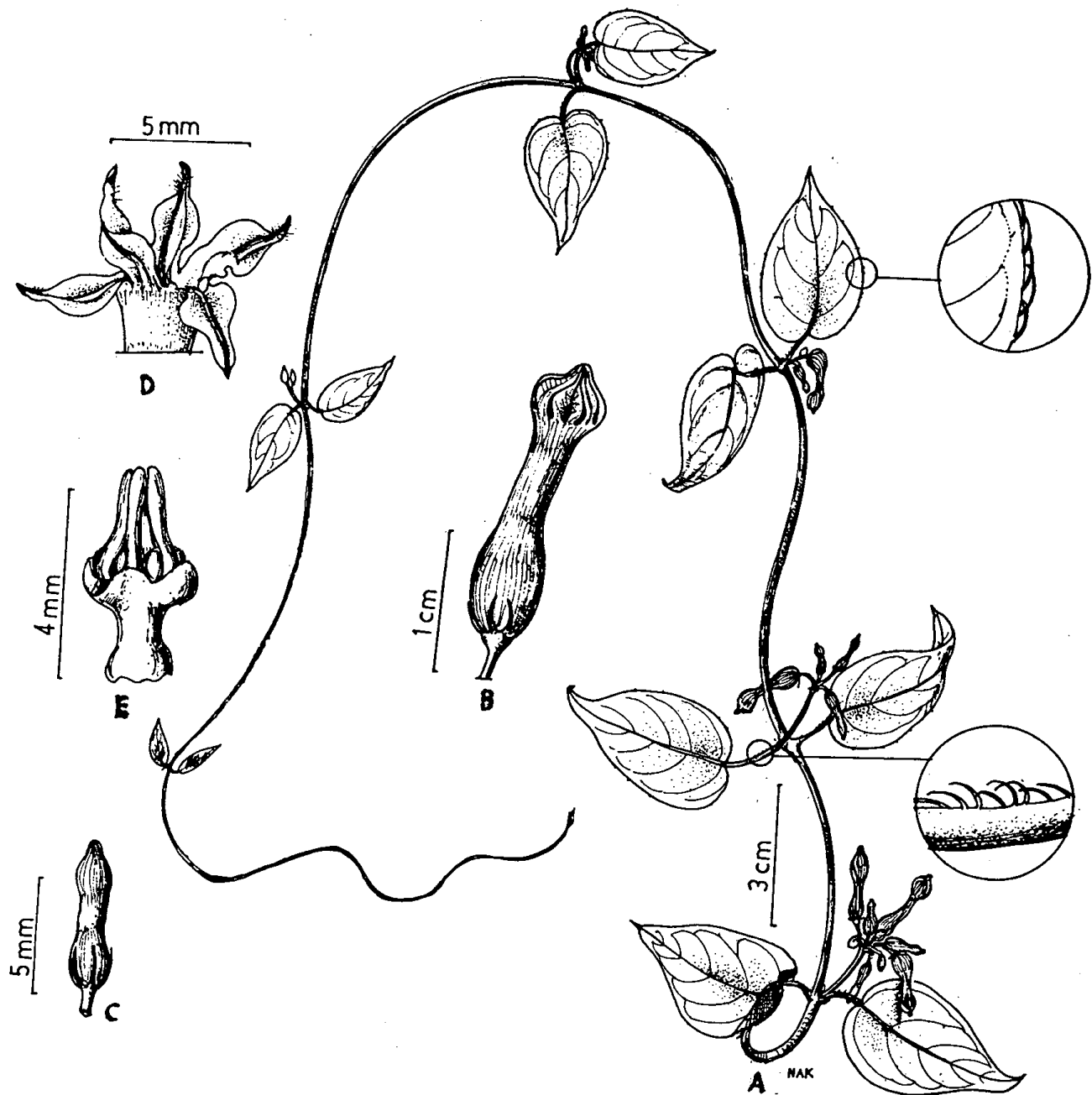


Fig. 2.2 : *Ceropegia candelabrum* Linn. var. *candelabrum*. A. Twig; B. Flower; C. Flower bud; D. Corolla upper portion; E. Corona

guage for this purpose. An awareness programme on various aspects of biodiversity conservation has been organised for them and other community leaders in the district.

3. A survey of threatened and endangered plant species in the district is in progress. Species like *Osmunda regalis*, *Kammettia caryophyllata*, *Myristica malabarica*, *Coscinium fenestratum*, *Lagenandra meeboldii*, *Quisqualis malabarica*, *Arenga wightii*, *Gnetum edule*, *Sarcostigma klenii* have been collected. Many interesting plant species are being maintained at the CABC estate. The inventory for lost crops of the district was just begun. Initial studies in Paddy show that a minimum of twenty of its varieties have disappeared from the district.
4. Documentation of indigenous knowledge systems with special emphasis to Kurichiya tribes, has been initiated. Gender dimensions in biodiversity management among this particular tribe in the study area has been analysed.
5. Cultivation of medicinal plants in collaboration with Priyadarshini Tea Estate, Wayanad has been initiated. For this purpose three species (*Adhatoda beddomei*, *Nilgirianthus ciliatus*, and *Baliospermum solanifolium*) have been selected and raised in a nursery.

Patterns of Distribution of Vertebrate Diversity on the Great Nicobar Biosphere Reserve

During the period the number of species of vertebrates indentified in the Great

Nicobar Island is nearly 100. Of these there are 9 species of amphibians and 16 species of reptiles. A species of Krait (*Bungarus* sp.) has been reported for the first time from the Island. Further the sight record of the marbled cat (*Felis marmorata*) is remarkable. Hitherto it was not known whether any wild cats existed on the Andaman and Nicobar Islands.

The Island has been more or less fully surveyed for vertebrates and impact of human beings on the vegetation. Preliminary analysis of the human impact has suggested that the southern part of the island is more disturbed than the northern part. This may be attributed to the availability of extensive roads in this area and the considerable population of immigrants who have settled along the roads.

Sub Programme Area 203 Conservation of Endangered and Medicinal Plants

Survey, Collection, Propagation and Field Evaluation of Endangered Plant Species

Emphasis was laid on re-evaluating the efficiency of protocols for multiple shoot production, hardening methodologies, field transfer of the micropropagated plants, field evaluation of the plants transferred and confirming the genetic fidelity of the plants.

Several species including those of *Rauwolfia micrantha*, *Rauwolfia tetraphylla*, *Piper longum*, *Piper barberi*, *Ceropegia jainii*, *Hydrocotyl conferta*, *Uraria picta*, *Freria indica*, *Kampheria galanga* were re-assessed and improved for their potential in both multiple shoot production and hardening. Although the protocols were developed during 1994-95 for some of these plants the efficiency of such protocols were repeatedly evaluated and made cost-effective. Vegetative propagation through cuttings has been standardised in several species including *Kampheria galanga*, *Freria indica*, *Piper longum* and *Hydrocotyl conferta*. These plants were transferred to the field and assessed for their adaptability in the natural habitat. Several forest department officials and local people were trained in the propagation techniques. An initiative has already been made by the Forest Department at Gudalur to micro propagate a few of these species with our technology and expertise. Thus we have envisaged a continuity in the entire process of conservation at the grassroot level.

One more field transfer to Gudalur gene pool area was carried out during the current year. Our interest in reintroduction over a period of time has the following reasons.

1. Many species require particular periods of incubation in the field to establish. Transferring over a certain period of time spread over few seasons made us standardise the appropriate time and climatic factors for successful establishment of field transferred material.
2. Survival rate was better monitored since the chances for mass scale mortality is reduced.
3. Appropriate changes in conditions and duration of hardening were standardised, avoiding large scale failures of field establishments.

The transfer was carried out in designed plots viz., Randomised plot design and Species specific plots, to check the rate of survival of different species in a given edaphic and environmental condition and to find any possible clues of inter-specific competition. We may need a longer incubation time of at least 1-2 years before any conclusions can be drawn.

Genetic diversity analysis indicated some interesting variants in the propagated material especially in species like *Piper longum* and *Piper barberi*. Such variants are being continuously monitored now. Studies are underway to assess the amount of diversity in the field populations of endangered plants and critical minimum population needed to conserve whole diversity of a species in a region.

Conservation of Mangrove Tree Species

Indiscriminate over-exploitation of the mangrove resources without any coastal area development plan has degraded this fragile inter tidal ecosystem in India. Silvicultural practices like regeneration, restoration and afforestation of mangroves can be the answers to these otherwise serious problems.

Our methodology includes the identification of plus trees using morphological,

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physiological and molecular markers, standardisation of vegetative and micropropagation techniques to propagate these plus trees and establishment of mangrove genetic resources conservation centres which will include the germplasm of all the Indian mangrove species.

Emphasis was laid on identification of plus trees; development of air layering methods in *Excoecaria agallocha*, *Avicennia marina* and a sterile hybrid of *Rhizophora*; establishment of Mangrove Genetic Resources Conservation Centre which presently has 16 species of mangroves collected from various places of India; and developing micropropagation techniques for *Heritiera fomes* and *Xylocarpus granatum*.

Air layering was attempted in the species which are recalcitrant to rooting when cuttings are used. Success was achieved with *Rhizophora* hybrid, *Avicennia officinalis*, *Excoecaria agallocha*. The establishment of micropropagation protocols for *Excoecaria agallocha*, *Avicennia marina* and *Acanthus illicifolius* has been reported in previous reports. During the current period we aimed at improving the multiplication rate and field transfer.

In situ conservation is one of the methods recommended and most desirable for conserving forest genetic resources as it usually allows natural evolution to continue. A mangrove nursery that will constitute various species collected throughout India has been established at Pichavaram, Tamil Nadu. Material originating from the nursery was evaluated for initial performance in terms of establishment and hardened in the low-cost hardening chambers. After hardening the material was field transferred to Mangrove Genetic Resources Conservation Centre (MGRCC) between December 1996 and March 1997. The MGRCC comprises three sites with variable salinity levels, pH and surface water temperature (Table 2.11). Species now found in the MGRCC are listed in Table 2.12.

Studies on Porteresia coarctata and Traditional Rice, Oryza sativa

Successful protocols were developed for micropropagation of *P. coarctata*, including callus cultures. Genotype specificity of responses to culture has been confirmed. Association of endophytes with

Table 2.11 : Details of water properties at all the three sites selected for MGRCC

	MGRCC I	MGRCC II	MGRCC III
Salinity (ppt)	17 - 33	17 - 29	5 - 22
pH	6.2 - 7.2	6.3 - 7.1	6.4 - 7.3
Temperature (°C)	29 - 33	26 - 31	30 - 33

Table 2.12 : Details of the number of propagated material transferred to the MGRCC

Name of spp.	Site of collection	No. of individuals transferred	Mode of propagation
<i>Rhizophora apiculata</i>	Pichavaram	1036	Propagules
<i>R. mucronata</i>	Pichavaram	1148	Propagules
<i>R. stylosa</i>	Andamans	20	Propagules
<i>R x hybrid</i>	Pichavaram	95	Propagules/ air layering
<i>Ceriops decandra</i>	Pichavaram	708	Propagules
<i>Brugiera cylindrica</i>	Pichavaram	332	Propagules
<i>B. gymnorhiza</i>	Bhitarkanika, Orissa	40	Propagules
<i>B. parviflora</i>	Ceylon	9	Propagules
<i>Aegiceras corniculatum</i>	Pichavaram	459	Seed
<i>Avicennia marina</i>	Pichavaram	411	Seed/Air layering
<i>A. officinalis</i>	Pichavaram	1485	Seed/rooted cuttings/ air layering/ micropropagated plants
<i>Excoecaria agallocha</i>	Pichavaram	442	Seed/rooted cuttings/ air layering/ micropropagated plants
<i>Xylocarpus granatum</i>	Bhitarkanika	20	Seed
<i>Heritiera fomes</i>	Bhitarkanika	168	Seed
<i>Intsia bijuja</i>	Bhitarkanika	144	Seed
<i>Sonneratia apetala</i>	Bhitarkanika	8	Seed
<i>Acanthus illicifolius</i>	Pichavaram	286	Seeds/Cuttings/ Mist propagation/ Micropropagation
<i>Cerbera manghas</i>	Bhitarkanika	502	Seeds
<i>Kandelia candel</i>	Bhitarkanika	79	Propagules
<i>Deris trifoliata</i>	Bhitarkanika	56	Seeds

both *P. coarctata* and traditional *O. sativa* were discovered and this will be a prelude to further work on engineering insect resistance into cultivated rice. Compilation of morphological, physiological, biochemical and molecular characterisation of *P. coarctata* is complete and is currently being considered for publication by IPGRI, Rome. Development of F1s with salt

tolerant *O. sativa* and susceptible varieties has been completed and F2s will be developed for further characterisation. RFLP studies involving cDNA clones revealed homologies between *P. coarctata* and salt tolerant *O. sativa*. Development of specific PCR fragments using the cDNA sequence information and generating PCR primers was completed and the PCR frag-

ments have been cloned. Further characterisation of these sequences associated with salt tolerance is in progress.

Sub Programme Area 204 Biomonitoring

Monitoring Ecosystem Health Using Bioindicators

The effectiveness of using microbial diversity (including macromycete and lichen diversity) as an early warning system of major threats to ecosystem health depends upon the understanding of the following: general diversity in different seasons, in patterns of distribution through sampling and identification of species having significance in terms of bioindication. This data provides a baseline against which the impact of environmental and landscape changes can be measured over a period of time. The mangrove ecosystem at Pichavaram is being monitored (using microbial diversity including lichens) and has been extended to the Siruvani Hills (Fig.2.3) of the Western Ghats (macromycetes and lichens). Significant progress has been made with reference to the use of soil biological criteria for monitoring the health of the mangrove ecosystem in Pichavaram and with reference to the use of macromycetes and lichen in monitoring the Siruvani Hills ecosystem health. Since monitoring is a continuous process, this year has essentially been a continuation and consolidation of last year's work. More species under lichen, macromycetes and soil biological criteria have been collected and identified for the

base line data in relation to these organisms in these areas. All the isolates are being maintained as culture collections/herbaria in the microbiology laboratory at MSSRF.

Monitoring through soil biological criteria: The analysis of the isolates (both phenotypic and genotypic) obtained from the intertidal region of Pichavaram mangrove ecosystem over a period of a year and half was completed and consolidated. Although this year the emphasis was on the genetic characterisation of the isolates, the monitoring was continued on the same lines using soil biological tools and compared with the base line data generated through the earlier exercise. It was observed that there were no significant changes in the microbial flora of these regions. In essence this year the consolidation of the work has resulted in the complete grouping and identifying of the bacterial isolates (313) obtained from the intertidal region. The completion of this exercise has not only created a base line data for the culturable bacteria of this region but has also highlighted the need for more intensive studies of a similar kind as nearly 30% of the isolates remained unidentified. The dendrogram constructed on the basis of phenotypic results (Fig 2.4) of the isolates got from the intertidal region in the three different zones of Pichavaram revealed inter group similarities ranging from 11 - 100%, suggesting that a significant diversity existed among the strains isolated from Pichavaram Mangrove Ecosystem. The diversity index, when compared between sites, was seen to be almost the same in the two near nor-

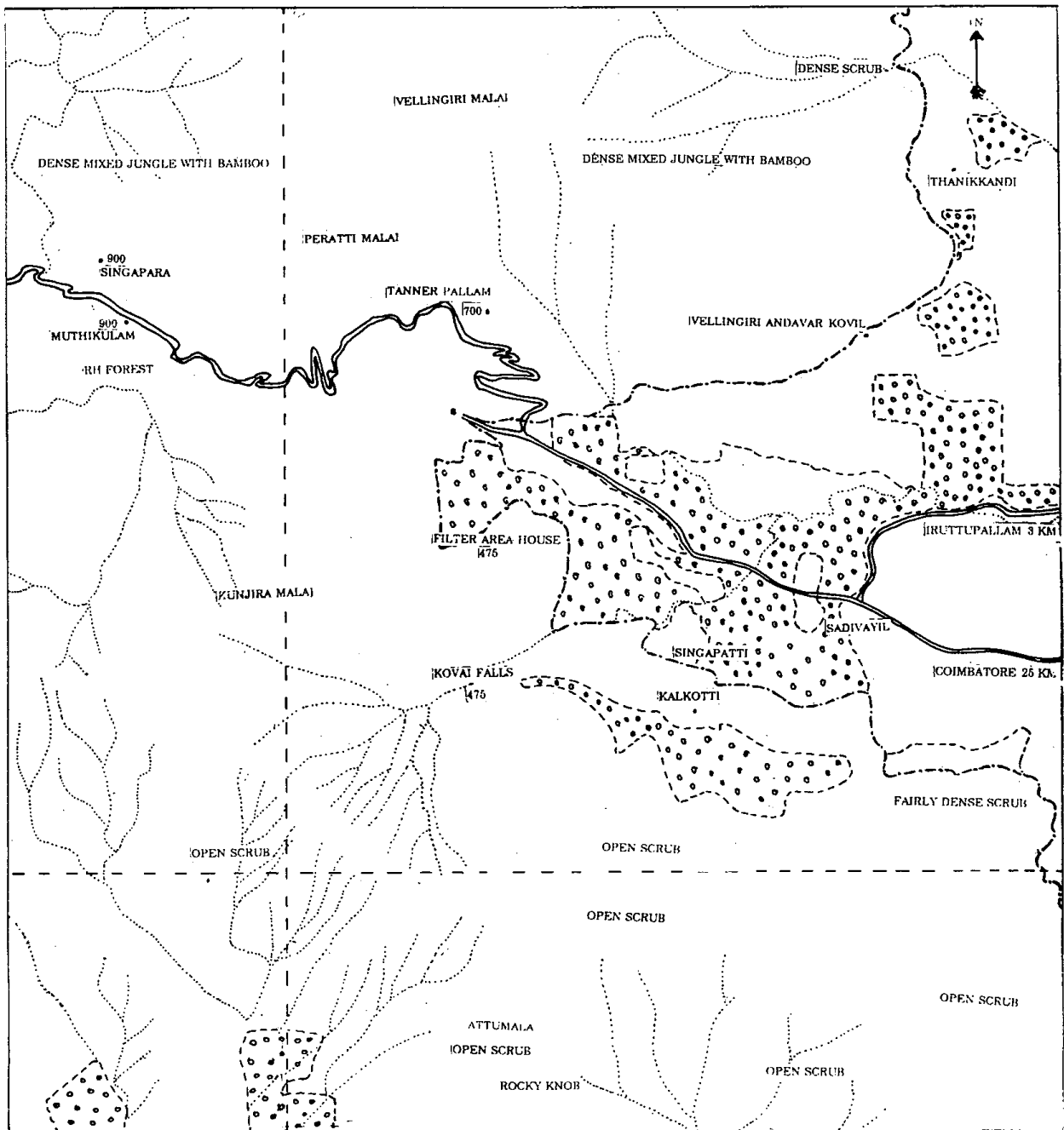


Fig. 2.3 : Map of Siruvani Hills showing collection localities

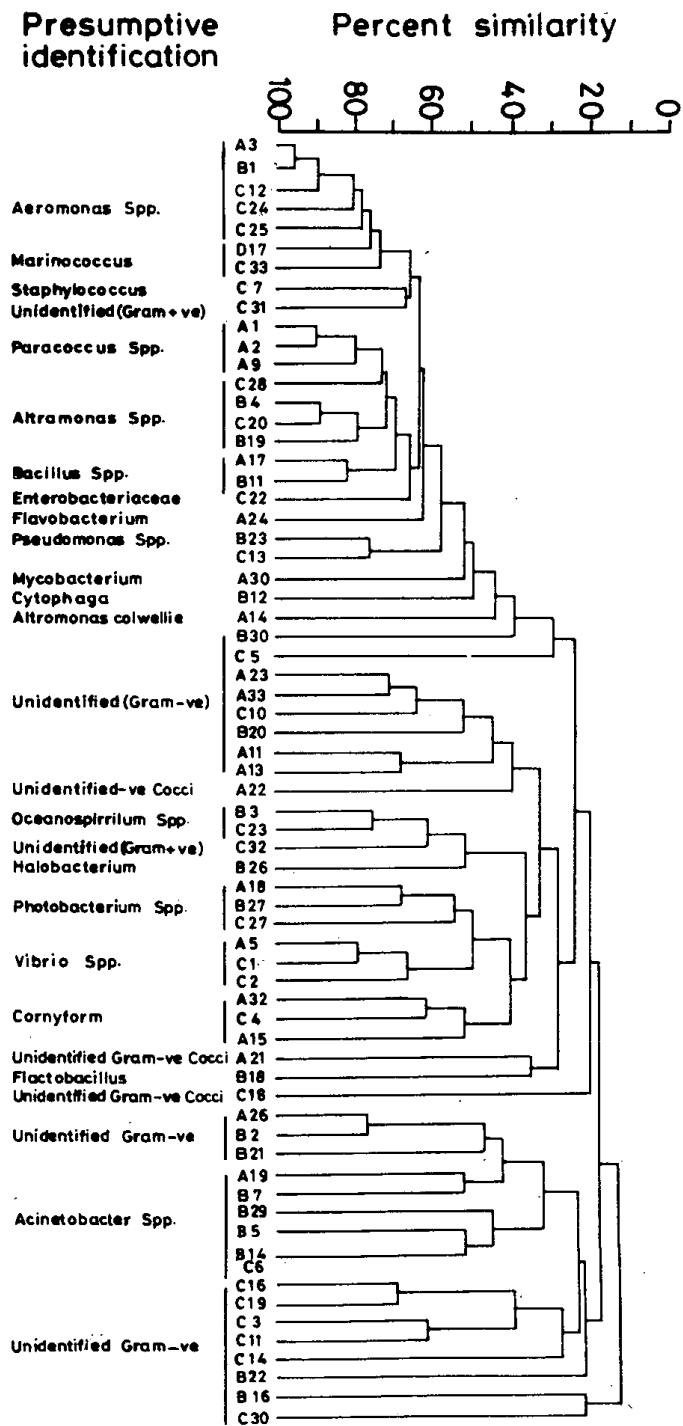


Fig. 2.4 : *Dendrogram based on phenotypic results of isolates from Pichavaram*

mal sites of Periguda and Neduodum supporting a lot of microflora. In Kudianthittu where it is disturbed due to several anthropogenic pressures, the vegetation is sparse; hence the diversity is comparatively low. No two isolates showed identical RAPD fingerprints when analysis was performed on them, indicating that they were different from each other and that diversity was high. Only two groups had two isolates in the clusters they formed thereby suggesting that identical or highly related RAPD pattern always had similarity indices of above 85%. The rest showed a similarity value far less thereby proving their highly heterogeneous nature which was the trend observed in the phenotypic analysis of the same isolates. This suggested that such a study using the diversity index of bacteria could be used as indices of environmental disturbances between sites.

Monitoring through lichen and macromycetes diversity of the Siruvani Hills : Consolidation of the distribution pattern of the Lichen species within Siruvani Hills was done in order to identify the ecological continuity and forest disturbance of various sites. 1500 specimens were collected and 250 spp have been identified so far. Environmental factors affecting the lichen vegetation were recorded. Nine lichen phytosociological federations have been identified within the study sites (Table 2.13). These lichen federations tend to change when there are changes in the key factors determining lichen development in a particular ecosystem. With the help of these lichen phytosociological associations, near

normal, semi disturbed and disturbed sites within Siruvani Hills have been identified (Table 2.14). Quantitative studies on lichen distribution pattern are in progress. All the collected samples are being preserved in the form of reference collection in the microbiology laboratory. It has been observed that the vegetation types within Siruvani Hills are characterised by an interesting and varied flora, particularly regarding the lichens. Records of exceptional floristic interests include the first reports of *Dictyonema sericeum* - a basidio lichen, *Clathroponina olivacia* to India and saxicolous *Poriina interstes* to Indian mainland.

With reference to biological monitoring through macromycetes distribution in the Siruvani Hills, occurrence and fruiting patterns of macrofungi through summer, monsoon and winter seasons have been standardised (Table 2.15). For easy handling and sampling purposes, the macrofungi, as individual taxa, have been empirically classified into 5 operational units (OTU's) (Table 2.16). This will ultimately enable the preparation of simple monitoring methods for the benefit of local lay people and school children. From the observations made so far, members of *Marasmiiales* and *Xylariales* can be indicative of unpolluted soil conditions, whereas members of *Gastromycetes* seem to indicate disturbed forest (clearing) areas. Although not based on data, these observations can be useful in assessing the soil health or the extent of forestry practices in Siruvani Hills. Efforts to quantify the distribution pattern spatially and tempo-

Table 2.13 : Phytosociological classification of the lichen communities recognised in the Siruvani forests

Federation	Unions	Characters
Graphidion	<i>Graphis scripta</i> (C)*, <i>G. longiramea</i> (S), <i>Pertusaria pertusa</i> (C), <i>Pyrenula nitida</i> (C)	Shade loving lichens, found on smooth bark and rock surfaces. Crustose species dominate
Lecanorion	<i>Lecanora allophana</i> and associates	Replaces Graphidion in well-lit areas
Leprarion	<i>Chrysothrix candelaris</i> (C) C. <i>chlorina</i> (C,T)	Moderate shade loving and on rough bark and soils. Leprose species dominate.
Myriotremion	<i>Myriotrema desquamans</i> (C), <i>Porina mastoidea</i> (C), <i>P. internigrans</i> (C), <i>Pertusaria amara</i> (C). when light increases	Moderate shade loving lichens , humidity loving, on smooth bark, crustose dominate, replace Laborion
Physodion	<i>Physcia aipolia</i> (L), <i>P. tribacoides</i> (L), <i>Parmelia austroindica</i> (C)	Sunny habitats, mostly lignicolous - foliose
Lobarion	<i>Sticta sylvatica</i> (M), <i>Collema auriformi</i> (C), <i>Leptogium denticulatum</i> (C), <i>L. cyanescens</i> (C), <i>Heterodermia pseudospeciosa</i> (C), <i>H. comosa</i> (C), <i>Pannaria stylophora</i> (S), <i>Phyllopsora parvifolia</i> (C), <i>Dictyonema ligulatum</i> (S, C)	shade - moisture loving lichens. Mostly on moss covered bark, foliose dominate. Known as old forest indicator species
Usneion	<i>Usnea rubicunda</i> (C), <i>U. picta</i> (C), <i>Ramalina pacifica</i> (C)	Shade - moderately lit-moisture loving lichens, Rough barked trees - trunks and canopy

Contd...

Table 2.13 Contd...

Federation	Unions	Characters
Cladonion	<i>Cladonia coniocraea</i> (T), <i>C. ramulosa</i> (T), <i>Usnea</i> sp. (S).	Sunny habitats - mostly terricolous, lichens with two fold characters dominate
Trichoterion	<i>Parmelia reticulata</i> (C), <i>P. saccatiloba</i> (C), <i>P. tinctorum</i> (C), <i>P. santae-angelii</i> (C)	moderately sunny habitats, on rough barked trees - base, trunk and canopy, foliose lichens dominate, mostly on forest - grassland ecotone.

*C - Corticolous, S - Saxicolous, T - Terricolous, L - lignicolous, M - Musiculous

Table 2.14 : Lichen associations found in Siruvani hills

Collection locality	Forest type	Lichen federation identified	Forest status
Vegetation type near and above Siruvani filter house	Dry deciduous	Graphidion, Leprarion	Near normal
Vegetation type near Kovai falls	Dry deciduous	Lecanorion	Disturbed
Tannerpallam area	S.T. Evergreen Road side interior	Myriotremion, Physodion Lobarion	Disturbed Near normal
Muthikulam lower tank (On the west bank of Siruvani reservoir)	S.T. Evergreen On the forest-grassland ecotone	Trichoterion	
	Interior forests	Lobarion with <i>Dictyonema</i> , <i>Pannaria</i> , <i>Phyllopsora</i> and <i>Leptogium</i>	Forests disturbed during British period - now regenerating

Contd...

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Table 2.14 Contd...

Collection locality	Forest type	Lichen federation identified	Forest status
Muthikulam (Near 20 check post area)	S.T. Evergreen on both the side of the Path Interior Forest	Myriotremion & Usneion, on soil-Cladonion	Disturbed
Singapara Area	S.T. Evergreen forest	Typical Lobarion as above	Near normal Near normal
Pulmedu	S.T. Ever Green	Lobarion	Near normal

Table 2.15 : Occurrence of macrofungal taxa through different seasons at Siruwani Hills

Season	Site	Agarics				Gastero Mycetes	Polypores	Xylariae		Boletes
		S	W	L	D	S	W	L	W	W
S. west monsoon Jun-Sep	Und	24	2	1	-	-	1	1	1	-
	Pd	15	3	2	1	1	2	1	1	1
	Man	2	-	1	-	-	-	-	-	-
	Total	41	5	4	1	1	3	2	2	1
N. east monsoon Oct-Nov	Und	8	6	-	-	-	2	1	2	-
	Pd	9	7	2	2	8	6	2	4	2
	Man	2	-	1	-	-	-	1	-	-
	Total	19	13	3	2	8	8	4	6	2
Winter Dec-Feb	Und	2	1	-	-	-	2	-	-	-
	Pd	4	6	-	3	1	8	-	2	-
	Man	-	-	-	-	-	-	-	-	-
	Total	6	7	-	3	1	10	-	2	-
Summer Mar-May	Und	-	-	-	-	-	1	-	-	-
	Pd	-	-	-	-	-	3	-	1	-
	Man	-	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	4	-	1	-

Und-undisturbed; Pd-partially disturbed (due to human interference);MMF- manmade forest; S-soil; L-litter; W-wood; D- dung

Table 2.16 : Different genera of macromycetes, grouped under five Operational Taxonomic Units (OTU) occurring in various regions of Siruvani Hills

Agarics	Gasteromycetes	Polypores	Xylariae	Boletes
Agaricus (s)	Cyathus (bird's nest)	Ganoderma	Clavari- -adelphus	2 un identi- fied species
Agrocybe (l & s)	Dictyophora (stink horn)	Fomes	Clavulinopsis	
Amanita (s)	Geastrum (earth star)	Hydnum	Daldinia	
Collybia (l & s)	Lycoperdon (puff ball)	Polyporus	Nectria	
Conocybe (l & d)	Phallus (stink horn)	Polystictus	Peziza	
Coprinus (d & s)	Pisolithus	Schizophyllum		
Gymnopilus (w)	Rhizopogon	unidentified (jelly)		
Inocybe (s)	Scleroderma			
Lepiota (s)	unidentified (globose)			
Macrolepiota (s)				
Marasmius (l & w)				
Melanotus (w)				
Mycena (l & s)				
Panaeolus (d)				
Phaeomarasmius (w)				
Pleurotus (w)				
Psathyrella (l & s)				
Psilocybe (s & d)				
Termitomyces (s)				

s-soil; l-litter; d-dung; w-wood

Table 2.17 : Macromycete calendar and field guide for Siruvani Hills *

Season	Species	Identification features	When to look for	Where to look for
SW monsoon	Marasmiales Xylariales	Small brownish Thread like	during rain fall	on litter
NE monsoon	Soil Agarics	mushrooms	immediately after rain fall	widely distributed
Sep-Oct	Gasteromycetes	stink horns, earth star, puff balls, bird's nest	shortly after showers	only in the disturbed areas on soil/litter
Winter	Wood decomposing	bracket fungi (leathery)	almost through out the year	disturbed areas (mainly)

* in local language with illustrative charts and photographs for easy identification

rally using a suitable sampling method are underway. A macromycete calendar depicting their occurrence patterns through different seasons and an illustrative manual in local languages is under preparation (Table 2.17). The calendar and manual will be updated and refined as and when findings from the basic research on inventory and distribution patterns over the next few years come in.

Biomonitoring is a continuous process. Based on our findings and the base line data already generated the study sites will be monitored. In the coming year emphasis will be placed on assessing the soil biological criteria in the agri-ecosystems along the coast line. A comparison will be done in relation to the farming practices and the soil texture. Lichen diversity will be used to monitor and quantify the disturbance of the Siruvani Hills and other areas in the Western Ghats.

Sub Programme Area 205 Molecular Mapping and Genetic Enhancement

The major focus of this programme has been the assessment of genetic diversity, using molecular markers both at inter- and intra-population levels in several mangrove species from Pichavaram mangrove forest. The study also included the identification of stress-induced genes and characterisation of salt-induced proteins from the mangrove species.

Genetic Characterisation and Diversity Studies in Mangroves

Genetic characterisation of a species and the assessment of the degree of polymorphism within it are basic to any meaningful conservation programme. Based on the available reports, it is not possible to partition with reasonable degree of confidence the observed phenotypic variability in mangrove species into environmental and heritable components. Unlike morphological markers, molecular markers are stable and are not prone to environmental influences and precisely portray the genetic relationship between plant groups and hence are widely used in genetic resource characterisation. There are several marker systems available now, such as the Random Amplified Polymorphic DNA (RAPD), Restriction Fragment Length Polymorphism (RFLP) and fingerprinting, that have provided significant insight into the nature and extent of intra- and inter specific diversity in mangrove species.

Inter- and intra-specific genetic diversity and relationship

The study of genetic diversity in mangroves is one of our on-going objectives. So far, the nature and extent of genetic polymorphism at intra- and inter-specific levels have been assessed in as many as 23 species. Studies of each species and their distribution pattern included a number of populations from both eastern and western coasts. Table 2.18 summarises the extent of polymorphism in sixteen mangrove species using RAPD markers.

The studies show that the level of genetic polymorphism in mangroves is species-

Table 2.18 : Extent of Genetic Polymorphism based on RAPD profiles

Species	No. of populations analysed	No. of plants	No. of primers	No. of amplifi- cation products	% polymor- phism
<i>Acanthus ilicifolius</i>	8	48	18	86	7.3
<i>Bruguiera cylindrica</i>	1	16	7	58	10.6
<i>Ceriops decandra</i>	1	15	6	66	11.6
<i>Excoecaria agallocha</i>	6	36	16	149	65.0
<i>Lumnitzera racemosa</i>	1	17	8	48	11.2
<i>Rhizophora apiculata</i>	1	20	12	67	11.1
<i>Rhizophora mucronata</i>	1	25	12	75	12.3
<i>Avicennia marina</i>	10	200	17	172	76.7
<i>A. officinalis</i>	1	20	16	115	32.3
<i>A. alba</i>	1	12	12	111	37.8
<i>Heritiera fomes</i>	1	12	12	96	23.5
<i>Xylocarpus granatum</i>	1	15	16	82	12.6
<i>Sesuvium portulacastrum</i>	1	10	12	46	9.6
<i>Suaeda maritima</i>	1	15	10	74	12.6
<i>Nypa fruitcans</i>	1	10	10	112	14.3
<i>Salicornia bracheata</i>	1	20	12	96	12.6

specific and largely influenced by the micro-climatic and other physical characteristics of their habitats. Morphological and sexual differences have little or no effect on the level of genetic variation. Based on the molecular marker analysis, the species relationship between all the three *Avicennia* species occurring in India has been studied for the first time. In addition, a detailed analysis has been carried out to establish the genomic relationship between 28 species, belonging to 22 mangrove genera based on molecular marker analysis. The interspecific relationship among the mangrove species has also been analysed by studying r-DNA polymorphism using both the full length r-DNA

and the internal transcribed sequence (ITS) region of the ribosomal DNA.

Chromosome analyses have also been carried out in a number of mangrove species. A dendrogram depicting the species relationship appears in Fig 2.5.

Parentage analysis of Rhizophora hybrid

The species and hybrids of *Rhizophora* constitute the dominant component of mangrove ecosystems. There are six species and three putative hybrids reported in *Rhizophora*. *R. x lamarkii* is one of the putative hybrids between *R. apiculata* and *R. stylosa*. Initially, the *Rhizophora* hy-

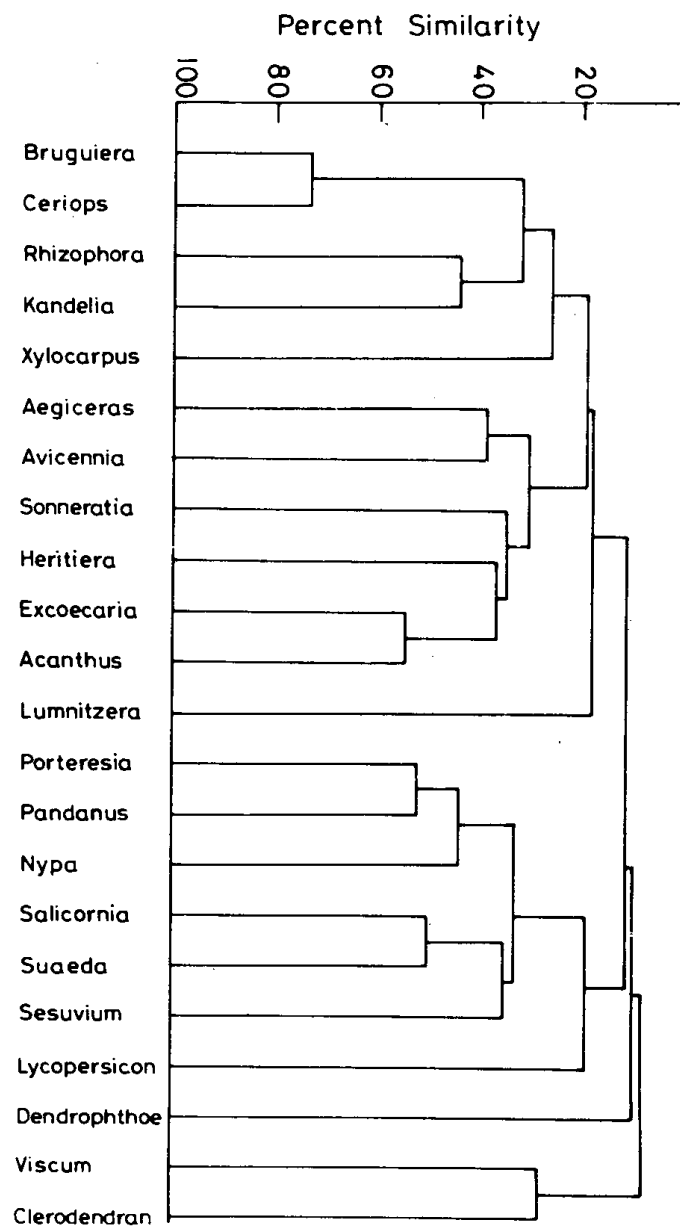


Fig. 2.5 : *Dendrogram depicting relationship between 22 mangrove genera based on RAPD & RFLP profiles*

brid found in Pichavaram mangrove forest was identified as *R. x lamarkii* based on morphological features and co-occurrence of putative parents. However, the parentage of this hybrid was disputed because *R. stylosa* does not occur in Pichavaram mangrove forest and the morphological features of *R. x lamarkii* differed from the earlier published reports. To establish the parentage, both RAPD and RFLP markers were used in representative collections for all the three species from Pichavaram mangrove forest. The hybrid showed about 98 per cent similarity with DNA profiles of the other two *Rhizophora* species occurring in the Pichavaram mangrove forest, thereby suggesting that *R. apiculata* and *R. mucronata* are the parental species of the hybrid.

Using maternally inherited mitochondrial genomic probes, *R. apiculata* was identified as the female parent of this hybrid. It is hoped that identification of the parental species of the hybrid would be of particular use in developing conservation and restoration strategies.

Screening of Genomic Libraries for Repeat-positive Clones and Stress Induced Genes

Genomic clones have been prepared in eight mangrove species e.g. *Acanthus ilicifolius*, *Avicennia marina*, *A. officinalis*, *E. agallocha*, *Rhizophora* spp., *Ceriops decandra*, *Bruguiera cylindrica* and *Lumnitzera racemosa*. So far, about 1500 low-copy clones have been prepared from these species with an overall size range of 0.3-9.0kb. The genomic clones were screened

both for identifying di-, tri- or tetranucleotide positive repeats and genes for stress tolerance. Few (GTG)₅ and (GATA)₄ positive clones have been sequenced to identify the intervening VNTRs and develop section-specific and/ or species-specific flanking primers. The total number of genomic clones generated from the mangrove species and the number of identified repeat-positive clones are detailed in Table 2.19.

Colony hybridization of genomic clones from the above mentioned species have been carried out using stress induced genes like osmotin, thaumatin and betaine aldehyde dehydrogenase (BADH) as probes. Shot-gun cloning has been carried out to identify the above genes in some selected species.

c-DNA library construction is being initiated in one of the most widespread mangrove species, *Avicennia marina*, using mRNA isolated from salt treated genotypes. Cloning of the cDNAs in lambda-gt11 phage vector and expression studies are underway.

Analysis of Salt Induced Proteins

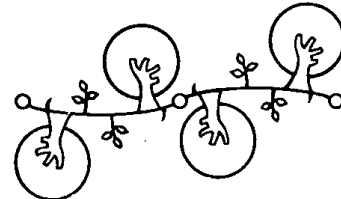
One year old plants of *A. marina* were treated for varying durations at increasing concentrations of NaCl. Crude protein extracts were analysed using SDS-PAGE analysis. It was found that both the basic profile and degree of induction of proteins under stress conditions are genotype dependant. A 22kD protein has been identified which is induced by 1.0 M NaCl treatment within 10hr. The protein was also induced by heat, cold and ABA stress. N-terminal sequencing of this protein is being carried out.

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Table 2.19 : No. of genomic clones prepared from different mangrove species

Species	Cloning site	No. of clones	Insert size Range (kb)	No. of repeat positive clones
<i>Avicennia marina</i>	<i>Pst</i> I	412	1.5 - 9.0	8
	<i>Eco</i> R	60	1.2 - 3.5	6
<i>A. officinalis</i>	<i>Pst</i> I	475	0.8 - 9.0	20
	<i>Eco</i> RI	110	1.4 - 4.5	6
<i>Acanthus ilicifolius</i>	<i>Pst</i> I	320	0.5 - 4.5	10
	<i>Eco</i> RI	80	0.6 - 2.5	3
<i>Excoecaria agallocha</i>	<i>Pst</i> I	75	2.0 - 5.0	1
	<i>Eco</i> RI	22	1.5 - 2.5	
<i>Lumnitzera racemosa</i>	<i>Pst</i> I	25	1.0 - 4.5	-
	<i>Eco</i> RI	10	0.3 - 2.2	-
<i>Rhizophora apiculata</i>	<i>Pst</i> I	78	1.2 - 5.1	-
<i>Bruguiera cylindrica</i>	<i>Pst</i> I	45	0.9 - 4.4	2
<i>Ceriops decandra</i>	<i>Pst</i> I	50	1.0 - 5.0	1

Programme Area 300



Ecotechnology and Sustainable Agriculture

The work under this programme was consolidated through the J.R.D. Tata Ecotechnology Centre and the B.V. Rao Centre for Sustainable Food Security. The Biovillage programme made considerable progress in promoting the twin goals of natural resource conservation and poverty alleviation.

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Sub Programme Area 301

Biovillages

The biovillage programme is focused on 19 villages spread over 3700 ha in the Union Territory of Pondicherry. The biovillage development model is essentially people-centred with a pro-nature, pro-women, pro-poor and pro-job orientation, linking micro-level planning and micro-enterprises with micro-credit. This paradigm addresses concurrently the twin development concerns of :

- integrated resource use to control degradation of the resource base - through the management of the biophysical resources such as land, water and natural vegetation, to which the rural households have access, individually and communally;
- accessing the resource-poor to technology to alleviate persisting rural poverty - through knowledge and skill empowerment for income and employment generation.

On-Farm Research & Demonstration

The emphasis is on research and demonstrations in the areas of seed production, integrated crop management and use of farm machinery.

1. Hybrid Rice Demonstrations

Hybrid rice seeds produced by several private companies and research institutes continued to be tested for adaptation and

yield superiority in the fields on a participatory approach. During the reporting period the hybrids tested were MPH 501, MPH 504, MPH 506, MPH 516, MPH 517, (Maharashtra Hybrid Seeds Company, Mumbai), PHB 51 (Pioneer Hybrid Seed Company), 6201 (Pro-Agro, Hyderabad), Hybrid 1 & 4 (University of Agricultural Sciences, Bangalore), CORH1, TNRH16 (Tamil Nadu Agricultural University; Coimbatore), DRRH1 (Directorate of Rice Research, Hyderabad). The cooking quality of the rice is also being tested.

2. Certified Seed Production in Paddy

In Kizhur village ten farmers have been selected for certified paddy seed production. They have formed themselves into an informal group. They were taken to nearby fields in Pondicherry to interact with farmers who are successfully producing certified seeds. The varieties being grown for seed certification are *Chinna ponna* and *White ponna*.

3. Integrated Crop Management (ICM) Trials

ICM trials for sustainable use of resources continued for *Kuruwai* (May-Aug '96), *Samba* (Sept- Dec '96) and *Navarai* (Jan- April'97). The trials were continued in the villages of Agaram, Mangalam and Kizhur. The synthesised package of management practices for paddy and sugarcane was modified to suit the local conditions. The trial results for the *Kuruwai* '96 season recorded an increase in the yield ranging from 7 to 18 %. The reduced use of inorganic fertilizer and pesticides re-

sulted in the reduction of cost by Rs.850. As part of the nutrient management, soil samples were taken before planting and after harvesting the crop to enable nutrient recommendation on the basis of soil fertility.

The water management practices of the farmers were studied to develop appropriate water management technologies to suit the local conditions. Observations were made in the farmers' holdings for the rate of discharge, number of irrigations and time taken to irrigate one acre of land. The results revealed that for *Kuruvai* and *Navarai* the water requirement is higher, with more water consumption per unit of grain produced. It was found that in the *Samba* season a considerable quantity of water is provided by rainfall.

Integrated Pest Management (IPM), which concentrated on prophylactic and curative measures in the previous seasons, now includes the establishment of a pilot biopesticide unit at Mangalam village. Biodiversity monitoring, pest surveillance (for white-backed plant hopper), Rice tungro virus indexing and awareness creation have also been undertaken. A crop protection field school, for paddy especially, was started at Agaram village for 15 farmers. It covers an area of 23 acres and was started in the *Navarai* season. The field school provides the basic concept of IPM and has helped to reduce the use of pesticides, thereby increasing cost-effectiveness.

Farmers involved in the ICM trial were taken to Tamil Nadu Rice Research Station, Aduthurai; Soil and Water Manage-

ment Research Institute, Tanjore; Irrigation Management Training Institute, Trichy and Farmers Field School, Kumbakonam, in Tamil Nadu as part of the exposure to the concept.

4. Farm Machinery

The drum seeder is a direct seeding machine for pre-germinated seeds, under puddled conditions. It has been developed by International Rice Research Institute (IRRI), Philippines and fabricated by the Directorate of Rice Research (DRR), Hyderabad. Trials are being held under field conditions in Mangalam and Agaram villages. The performance of the machine was good at a forward speed of 0.5 m/sec. The crop performance on visual observation is good and it is yet to be harvested.

The paddy dryer is a low cost machine used for multipurpose seed drying. It was introduced with the help of agricultural engineers from the University of Agriculture and Forestry, Vietnam. The demonstration was held for about hundred farmers at Sivaranthakam village. The dryer has a capacity to dry 1.2 tonnes of paddy in 36 hours by blowing hot air. The equipment is made of locally available bamboo mats, a heating coil and a fan. The seeds are dried at a low temperature of 35 degrees centigrade which prevents the damage of seeds. The germination percentage is about 85 percent, which is 15% higher than traditional sundrying. This dryer is being tested in a number of fields.

A rice husk stove was fabricated and demonstrated to the women in Mangalam village. The husk is got from the modern rice

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mill. The latent heat of the stove is higher than that of traditional stoves. It is currently being tested in other villages.

Enterprises for Enhancing Livelihood Security

1. Mushroom Production by Rural Women

Training in mushroom production has been one of the major programmes. The newly-trained resource-poor women in Kizhur and Mangalam village produced Oyster mushrooms successfully, on a base of rice straw. The entire cost of production was contributed by the participants. The success of this enterprise has fired the imagination of several other women in the villages. Expansion of the programme to other villages is envisaged in the coming year.

Another major activity of the Centre is the carrying out of trials and tests with uncut straw, spawn produced on rice chaff, thin and lengthy bags, PVC pipes instead of plastic bags, and 3 bed layer 'URI' system. Mr. Kumaran was able to produce 120 kg of mushrooms which fetched him an income of Rs. 4,200 (@ of Rs. 35/kg).

The spawn production unit which was functioning successfully in Villianur town has now been shifted to the mushroom training and demonstration centre in Kizhur village. Production will commence in September '97. Mr. Kumaran and Mr. Govindaraj are educated and unemployed youth who will run the centre and provide training. The mushroom participants were also taken to nearby successful

mushroom production centres for an exposure visit. A one day trip to Regional Research Station, Virudhachalam, Tamil Nadu, was organised as part of mushroom production training.

The mushroom participants get additional income from the mushroom waste by vermicomposting it after the harvest. The mushroom participants of Mangalam village have taken up poultry production as an additional and alternative source of income during the hot summer months when mushroom production is low.

2. Group Sericulture

Until February '97 four batches of silkworm were reared in Pillayarkuppam village by eight landless women. Thereafter it was decided to discontinue the rearing as it is not economically viable.

3. Goat Rearing

This programme continued successfully in Pillayarkuppam, Sivaranthakam and Kizhur villages. A total of 80 goats and 50 kids are being reared in the three villages.

It was decided to introduce purebred Tellicherry male goats to upgrade the local goats. Traditional goat rearers in the villages were identified and the Tellicherry male goats given. So far nearly fifty cross-bred kids have been obtained. They gain more weight and fetch more income than the local variety.

4. Dairying

Ten landless women in Pillayarkuppam village are continuing with the project.

The scheme was extended to Melsathamangalam village where seven small and marginal farm women were selected and the first set of cows given. They have organised themselves into a credit management group.

Both the batches of participants are repaying the bank loan regularly and have established fodder plots with CO₂ Cumbu-Napier grass, *Sesbania grandiflora* and *Leuceana leucocephella*. The programme is to be extended to other villages.

5. Poultry Enterprise

Four units of 100 layer birds (day old chicks) were obtained from the department of Animal Husbandry, Government of Pondicherry, as part of the programme in March '97 by participants in Pillayarkuppam, Mangalam and Melsathamangalam villages. In Mangalam village the mushroom participants have taken up broiler rearing as an additional source of income.

6. Fodder Plots for Small and Marginal Farmers

74 fodder plots of varying sizes, with CO₂ Cumbu Napier grass, Subabul (*Leuceana leucocephalla*) and *Sesbania grandiflora*, were established in eight villages during the reporting period. This programme is being implemented with help from POND-LAIT (Pondicherry Cooperative Milk Producers Union Ltd.). Six demonstration fodder plots have also been established. An exposure visit to Auroville dairy farm was organised for the participants.

7. Vegetable Production for Small and Marginal Farmers

The 13-member vegetable growers association in Pillayarkuppam village was reorganised and strengthened. Some of the farmers took up vegetable production individually. A demonstration trial was laid in Sorapet village in collaboration with the MAHYCO (Maharashtra Hybrid Seeds Company, Mumbai). Unfortunately the heavy monsoon rains in December '96 caused severe damage to the trial.

8. Floriculture

The nine jasmine growers in Sivaranthakam village continued the activity. The gardens were pruned in December '96. One of the participants, Ms. Bagyalakshmi, was able to earn Rs. 6,250 from April '96 to March '97. Her garden is a model for training other participants. This programme is being extended to Mangalam village, where fourteen small and marginal farm women are participating. They have established jasmine gardens of varying sizes. They have also taken up Crossandra as an intercrop. These fourteen participants have organised themselves into a credit management group. Initial selection of participants in other villages is being carried out.

9. Crossandra Cultivation

A total of eighteen participants have established Crossandra gardens in Kizhur, Mangalam and Kizhsathamangalam villages. The Mushroom Growers Association in Kizhur village has taken up a com-

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mon Crossandra plot as an additional source of income for the group. This is the first time that a group has taken up a common activity besides their own enterprise. Initial selection of participants in other villages is being carried out.

10. Homestead Nutrition Garden

The mini kit programme from the Department of Agriculture was channelled to the participants in Sivaranthakam village. It is envisaged that they will plant suitable, economically important plants in their respective gardens.

Access to Common Property Resources

Aquaculture in Community Ponds

The nine participants in Kizhur village were able to successfully harvest about 670 kg of fishes, which fetched them a gross income of Rs. 22,500 and a net income of Rs. 11,100. The net income was shared among the participants equally, with one share given to the village temple. The Department of Fisheries and the Fish Farmers Development Agency (FFDA) provided the technical and marketing support.

The pond was restocked with 2750 fingerlings of various carps by the participants in September '96. In December '96, the heavy cyclonic monsoon rain damaged the bunds and the pond overflowed, causing heavy loss to the participants. The pond was repaired, strengthened and restocked

with 3000 fingerlings in January '97. A request has been made to the Govt. of Pondicherry to provide other community ponds on lease in Poraiyur and Vambupet villages for inland aquaculture.

Visits to B.S.P. Swamy fingerling farm at Puthur in Chidambaram District, Tamil Nadu and to the M.S. Swaminathan Research Foundation Project Farm at Koriyamangalam village in Chidambaram District were organised. A one day workshop was organised at the Project Office for farmers rearing inland fishes and for those interested in the project. A total of twenty five farmers participated. Experts from Indian Bank and Fish Farmers Development Agency shared their experiences with the farmers. A video show on inland fish farming and a field trip to a nearby successful fish farm were organised.

Support Services

1. Group Organisation and Management

The feminisation of poverty is addressed primarily by empowering women through technological interventions (income and employment generation activities). Fostering group action has been one of the key strategies enabling access to infrastructure, capital and credit. During this year eight new women's groups have been initiated and activities expanded to four more villages.

An exposure programme was organised for MYRADA (an NGO in Dharmapuri district, Tamil Nadu), in September '96. Twenty-five of our women leaders visit-

ed various women's groups who have initiated a number of community development programmes. This has motivated the participants to play an important role in community development.

Seven women's groups who have completed one year evaluated their performance. They were helped to focus on self-development, development as a group, and their role in community development.

2. Savings and Credit Management

Savings and credit management activities have been continuing. There are now sixteen groups, with one hundred and sixty four members, as eight new groups have been formed.

The amount saved by each group and the total savings are indicated in Table 3.1. Credit operations amount to Rs. 1,04,500. 58 loans for consumption purposes and 31 for production have been sanctioned.

3. Environmental Sanitation

Several awareness programmes were conducted :

A programme on environmental sanitation was organised in Sivaranthagam village, with the help of the youth and the public. The focus was on the safe disposal of rain / sludge water through construction of drainage systems/soak-pits/safe disposal of human and animal night soil/garbage waste. Government departments and District Rural Development Agency (DRDA) were requested to take up this

issue under the community development programme. The villagers have suggested that the community could extend the manual labour for diverting the stagnant rain water to the nearest pond. The Villianur Block officials have been requested to take up the construction of economic model toilets. A project proposal on environment sanitation is being prepared.

Efforts are being taken to create an awareness of vermiculture among school children by availing household wastes like kitchen garbage and animal night soil.

The Association for Social Health - Pondicherry Branch, conducted an awareness campaign, which included an exhibition and counselling, on the ill effects of drugs and alcoholism, in Pillayarkuppam village.

A programme on vermiculture was held in collaboration with the State Environment Cell for their students (Teacher trainees) and staff.

An awareness programme and painting competition on "environmental sanitation package in rural areas" was conducted at Bharathiar Palkalaikoodam-College of Fine Arts in Pondicherry region. About seventy five students from the College participated in the programme. These paintings will be utilised for educating the people in the villages on the significance of environmental sanitation.

4. Vermicentre

The Vermicentre established at Pillayarkuppam village carried out its regular

Table 3.1 : Savings of the groups

Group	No.of Participants	Village	Amount (in Rupees)
Mushroom Group	10	SKM	20,112
Jasmine Group	10	SKM	14,164
Kitchen garden	11	SKM	15,372
Mushroom group -1	10	KZR	7,439
Mushroom group-2	10	KZR	200
Aqua culture Group	9	KZR	3,227
Goat group	9	KZR	8,916
Seed growers	10	KZR	1,000
Tailoring group	11	KZR	2,100
Mushroom group	13	MLM	1,040
Jasmine group	14	MLM	1,680
Dairy group	8	MM	1,220
Dairy group	9	PKM	4,196
Goat group	7	PKM	2,400
Sericulture group	10	PKM	7,814
Vegetable growers	13	PKM	17,900
Total	164		1,08,780

PKM - Pillayarkuppam , SKM - Sivaranthakam, MM - Melsathamangalam, MLM - Mangalam, KZR - Kizhur.

production of vermicompost from the locally available substrates like presumed and vegetable wastes, using earthworms. The integration of components such as rabbitry, poultry, apiary and inland fish rearing continued. Training for rural women and school children on vermicomposting was conducted periodically. As a result of the effort to produce vermicompost on a commercial basis for sustaining the centre, 2.5 tonnes of vermicompost was sold.

5. Biocentre

A biocentre is envisaged as a facilitating institution for testing and adapting new technologies, adaptation for demonstrations and interventions, training, providing support services and accessing information. Two biocentres are to be established, one in each of the two major agroecological zones in the project area, viz. the paddy-based lowland system and the garden-based upland system.

6. Farm Models

The development of farm models forms one of the important components of the Integrated Resource Management Systems. Identification of the farmers of different types of land holdings viz., marginal, small and big farmers, is being carried out to demonstrate models of different ecological conditions. A detailed questionnaire has been structured to study the farm as a whole, and the base line study of the participant farmers is being documented.

7. Marketing

Market study and support services for marketing are available for all the products.

Vegetables : The data base on the prices of principal vegetables prevailing in the open market and that offered by PAPSCO has been updated to enable forecasting of prices and to study the time-series analysis of prices.

Mushroom : New outlets for fresh mushrooms have been set up in Pondicherry. Billboards and leaflets were distributed in the supply outlets. Posters were also displayed. Recipe booklets were printed both in English and Tamil and distributed to the consumers. Mushroom packets of 10 gms are sold @ Rs.3 - 4.

Vermicompost : The vermicompost stall established along with Pondicherry Agroservice and Industries Corporation (PASIC) flower stall, at the Gandhi Thidal, Pondicherry, has proved very popular

with customers. Vermicompost worth Rs 3,500 was sold in a week during the flower show. It acted as a promotional stall and created a demand of 5 tonnes. Moreover, the periodical display of the stall in the Sunday Markets and at the Beach Road, has increased the demand slowly and steadily.

Demonstrations on vermicomposting at schools continued with permission from the environmental cell of the Education Department. Teaching aids such as flash cards and posters were printed to enhance effective demonstrations. The composting techniques are printed in leaflets, both in English and Tamil. The youth running the vermicentre acts as a sales person and also attends consultancies in installing pits in schools and in urban households.

Inland Fishes : The market support for the sale of fishes produced by the pisciculture participants of Kizhur village was carried out by hiring a van from the Pondicherry Fishermen Co-operative Marketing Federation. The women participants sold the fish directly to the consumers from a stall in the Fish market. They sold @ Rs.35-40 per kg to the consumers and @ Rs. 30 per kg to the wholesalers.

8. Market Database

The database on the production and marketing of various agricultural products such as paddy, groundnut, cotton, cumbu and chillies in Pondicherry region has been updated. The arrivals and the prices of various farm commodities at the Pondicherry Regulated Market have also been documented.

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Economic Analyses : The economic analysis of all the poverty alleviation programmes, Integrated Crop Management Trials, Hybrid Rice yield testing trials, and Paddy Seed Production trials were carried out seasonally and periodically. The farm and market input-output prices of the various agricultural products, wages and hire charges of various implements were documented seasonally.

Socio-economic Indicators : A detailed questionnaire on the farm and household profile of the participant was structured and the base line study of the individual participants is being carried out.

9. Linkage with Government and Financial Institutions

A training programme on tailoring, sponsored by the Women Development Corporation at Kizhur village, for ten landless women was inaugurated in November 1996. The training sessions were conducted for six months. The participants have organised themselves into a self-help group. The District Industries Centre (DIC) has been requested to start a coir rope making training unit at Mangalam/Keelsathamangalam and Melsathamangalam villages for landless women. Efforts are being made to start tailoring units in other villages. A number of participants who were trained are continuing with the activity. The model village programme, in collaboration with Indian Bank at Kizhur village, was able to form a Village Development Council (VDC) to implement a number of community programmes.

Entitlements data base : An entitlements database of various Government Schemes

(Plan /Non-Plan) has been designed, based on sex, age and programme. It is being translated into Tamil. Identification of a suitable Information Centre in a village is in progress.

Sub Programme Area 302

J.R.D. Tata Ecotechnology Centre

This Centre was established in April 1996 with the generous financial support of the Sir Dorabji Tata Trust. The programmes were formally inaugurated on 29th July, 1996, birthday of Bharat Ratna J. R. D. Tata. The major goal of the J.R.D. Tata Ecotechnology Centre is to seek answers to the following maladies of contemporary development pathways :

- environmental degradation
- potential adverse changes in climate and sea level
- endemic hunger and extensive human deprivation
- feminisation of poverty
- rapid expansion of human population, exceeding the supporting capacity of the eco system
- jobless economic growth

The overall mission of the J.R.D. Tata Ecotechnology Centre is hence to develop methods of promoting a *job-led* economic growth strategy, based on a pro-nature, pro-poor and pro-women orientation to technology development and dissemination.

The Centre concentrates on the development of ecotechnologies based on an appropriate blend of traditional technologies, ecological prudence, frontier technologies such as biotechnology, information, space and renewable energy technologies and market-driven management principles.

Therefore the alphabet 'E' in Ecotechnology also stands for ecology, economics, equity (gender and social), employment and energy.

The Centre undertakes the identification of ecotechnologies which are environmentally sustainable, economically viable, socially equitable, skilled employment intensive and energy efficient and promotes their field verification and testing. The emphasis is on agriculture, which includes crop and animal husbandry, fisheries, forestry and agro-forestry, post-harvest technology including processing and marketing and rural micro-enterprises. The aim is to enhance opportunities for both on-farm and non-farm employment.

The organisational chart of the centre has been described in the *Introduction*.

By treating the funds provided by the Sir Dorabji Tata Trust as a corpus, the interest from which is used for core staff and operations, and by seeking special project support for specific activities, the long term financial sustainability of the Centre has been assured.

Close interaction with the farming community reveals that technology management and adoption are the real problems.

Therefore the following methods have been formulated:

- *Adaptive participatory research - technology development and incubation*

This method focuses on evolving a new technology or refining an existing technology through factor-centred projects. Such an approach creates the base for interaction between scientists and user groups where the users evaluate the feasibility of the technology with the scientists.

- *Pioneer Projects*

Pioneer projects emphasise the integration of different technologies in a system and different systems into a development process for sustainable development. Pioneer projects make an attempt to understand the appropriate technology -mix in a development process.

Projects

1. Farm-level Biopesticide Production

Theme

One of the major problems of Integrated Pest Management is the supply of biopesticides. In order to tackle this problem, the project focused on the production of biopesticides at the farm and household levels, not only for their agricultural usage but also for the market.

Objectives

- Production of biopesticides at farm and household levels

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- Evaluating the efficiency of these biopesticides in pest management
- Training resource persons through a capacity building process to spread the concept and practices of biopesticide production and Integrated Pest Management.

Project Area

Vadugappatty near Periyakulam and Srirangapuram near Theni

Activities

The project focused on mass culturing of *Trochogramma* sp., mass production of *Helicoverpa* NPV (Nuclear Polyhedrosis Virus), and *Spodoptera* NPV and production of plant extracts. The production and the usage of *Trichogramma* pattern during 1996-97 were as follows:

<i>Quantity produced</i>	598.50 ml
<i>Quantity used for culture maintenance</i>	186.00 ml
<i>Quantity used for field release</i>	406.50 ml

The NPV helps in controlling the American bollworm. The farmers at Vadugappatty and Srirangapuram produced 700 LE of *H.armigera* NPV which was used in 1.5 ha. of cotton. Similarly, the production of *S.litura* NPV was around 650 LE and this was applied to nearly 2 ha.

The farmers showed a keen interest in plant extracts. Around 220 kg of neem based products were produced and applied

to nearly 8 ha. *Pongamia glabra* leaf extracts, *notchi* leaf extracts, *Ipomea* extracts and *omavalli* extracts were produced to the tune of 380 kg and these extracts were applied to nearly 14 ha.

The refinement in the production and training has helped in the reduction of chemical pesticides among the participating farmers. Data in Table 3.2 reflect the average reduction in chemical pesticides during summer and winter respectively.

30 farmers and landless labourers including women were involved in training and production. These participants are being trained to become resource persons for spreading the concept and practices of biopesticide production and usage among the farming community.

2. *Ecohorticulture Nursery and Training : Low-cost Mist Chambers*

Theme

Horticultural crops being the major consumers of chemical pesticides and fertilisers, a major project in training selected farmers in Kattupakkam and Kanchipuram blocks of Chengai-Anna district near Chennai was launched.

The project is expected to enhance the production and productivity of horticultural crops around the city of Chennai in an ecologically sustainable manner, protecting the quality of soil, water and air and help in meeting the growing urban demand for organic products.

Objectives

The objectives of the project are:

- to create a group of skilled personnel who would be in a position to train the farmers in the region in ecohorticulture
- to demonstrate the practice of ecohorticulture through an ecohorticultural nursery

Project Area

Kattupakkam and Kanchipuram blocks in Chengai-Anna district

Activities

75 participants were trained in various aspects of ecohorticulture and gave technical support to 62 satellite farms. Through the trained farmers, the project has distributed vegetable seeds and fruit seedlings for planting in nearly 105 acres. These seeds and seedlings have been produced by organic methods and during distribution of these seedlings the concept and the practices of ecohorticulture were defined to the farmers. The training programmes focused on vegetative propagation for fruit plants, organic cultivation of vegetables, preparation of organic pesticides, preparation of vermicompost and ordinary compost, demonstration of drip irrigation and demonstration of kitchen gardens.

As many households evinced a keen interest in kitchen gardens as a source of enhancing household income, the project focused on improving the economic viability

of backyard agriculture and low cost mist chamber.

The objectives of the project are :

- to study the potential of low cost mist chambers vis-à-vis various vegetables
- to evolve the technology and identify the economic, financial and managerial issues
- to develop a dissemination strategy with the help of farmers for self-replication process

Preliminary Tests

Preliminary testing of the low cost mist chamber was conducted. The chambers measured 5 m in length, 2.5 m in width and 2 m in height. The height of the chamber was fixed based on the growth of plants. The chamber was covered with High Density Polyethylene sheets (HDPE). A control plot of 5 m by 2 m was also established. The preliminary testing shows the following results (Table 3.3) in the case of chillies.

Low cost mist chamber has been able to produce more than two times the quantity of control plot without using any chemical fertilisers or pesticides. Also the quality of the vegetables in terms of colour and seeds is much better when compared to the chillies from the control plot. The other possible advantage may be that seasonal changes may not define the cropping pattern and hence there could be production throughout the year.

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Table 3.2 : Reduction in the use of chemical pesticides

Name of the target pest	Summer			Winter	
	Sucking Pest	Stem weevil	<i>H.armigera</i>	Sucking Pest	<i>H.armigera</i>
Name of chemical pesticide used in 1995	Methyl demelton	Carbofuron	Endosulfan	Methyl demelton	Endosulfan
Number of rounds used in 1995	8	4	14	8	10
Number of rounds used in 1996	2	-	5	4	5
Name of the biopesticide used in 1996	Neem products	Neem cake	Trichogramma 4cc/ac and NPV 200 LE and plant products	Neem products	Trichogramma 4cc/ac NPV 200 LE/ac
Number of rounds of biopesticides	3	2	3	4	3 (Trichogramma 4cc/ac) 2 (NPV 200 LE/ac)

The low cost mist chamber has the potential of developing backyard agriculture and evolving seed production as a cottage industry among the landless households. While the results are encouraging, the project has to develop scientific principles of management in relation to issues like pollination, carbondioxide, temperature, humidity, geometric designs, cost efficiency etc. Similarly the qualitative differences require more authentic scientific explanation. During 1997-98, the project will

study the mist chambers with appropriate scientific and statistical parameters. Twenty five farmers are observing and evaluating this project.

3. Pilot Project for Biopesticide Feedstock Model

Theme

Neem plays a major role in agriculture and industries. Pharmaceutical, pesticide

Table 3.3 : Growth and yield in the low-cost mist chamber

	Low-cost mist chamber	Control
Height in cm; (45 days after planting)	30	15
Average number of leaves per plant	25	8
Total Yield in kg	16	6
Consumption of water in ltrs per gm of chilli	0.525	0.533 *

* The calculation of water requirements is based on the amount of irrigated water in the mist chamber and in the control plot. This calculation has not considered the amount of consumption of rainwater in the control plot.

and soap industries have started creating a demand for neem products. At the village level, the farmers are not able to produce enough neem based biopesticides. Studies have shown that while India is losing Rs. 2,000 crores of neem seeds every year, users of neem have been complaining about lack of adequate supply of neem seeds and other neem products. These studies have observed that the major problem in neem is the high cost involved in collecting the neem seeds due to the scattered nature of the neem trees. Hence this project aims at developing an appropriate scale of production in wastelands which would help in better management, marketing and usage of neem seeds and neem products.

Objectives

- To plant quality seedlings of neem in public and private wastelands
- To develop appropriate usage pattern of neem products within the village and to establish market linkages through value addition

- To evolve village institutions to manage neem and neem related assets

The unique features of this project are:

- Introduction of tissue cultured neem seedlings with high *Azadirachtin* content
- Conservation of the existing neem trees including *Melia azadirach*
- Application of neem specific VAM (Vesicular-Arbuscular *Mycorrhiza*)
- Application of *Azospirillum*
- Use of *Vasambu (Acorous calamus)* to control die-back disease
- Introduction of neem based agro-forestry models :
 - Agri-silvi-horticulture (horse gram - neem - PKM variety drumstick)
 - Silvi-pastoral (neem-stylo-sorghum)
 - Agro-forestry (neem - sorghum - groundnut - pigeon pea)
 - Agro-forestry (neem on farm bunds)

Activities

Neem seedlings were planted in 20 ha of private lands and 11 ha of panchayat lands with people's participation. The survival rate was 80%. These saplings were mostly raised in twenty-one decentralised kisan nurseries. A mist chamber was used as a model nursery to raise neem and *pungam*. The growth of neem and *pungam* saplings within 3 months in the mist chamber is 15 to 22 cm more than the growth in the open field and the farmers are showing interest in the concept and practices of mist chambers.

Around three lakh *Agave* bulbs were grown in the ten decentralised kisan nurseries. Two *vettiver* nurseries were also formed. *Vetiver* was planted in 25 ha of land as vegetative bunding for arresting soil erosion.

Training for 100 farmers (55 men and 45 women) and for 30 officials was given under this project. The training covered the following aspects: Participatory Rural Appraisal (PRA), Self-Help Group formation (for officials alone), cultivation of neem, production of neem based pesticides, application of these pesticides to crops, soil sampling methods, preparation of enriched farmyard manure, application of micro-nutrients to crops and soil conservation methods.

A noteworthy trend in the project is people's participation. The following four groups emerged this year in the project village:

1. Neem Tree Growers' Welfare Society (members : 11 men)

2. Bharath Soil and Water Conservation Society (members: 20 women)
3. Indian Soil and Water Conservation Society (members: 20 men and women)
4. Tamil Annai Soil and Water Conservation Society (members: 20 SC women)

The project aims to strengthen these institutions through micro credit process.

4. *Defluoridation by Drumstick Seeds (Moringa oleifera)*

Theme

A substantial portion of the Indian population suffers from fluorosis. Fluorosis occurs due to the presence of abnormal levels of fluoride which enters into the human system and gets deposited in the skeletal system. The long term toxicity includes discoloration of teeth, leading to pitting and browning and crippling of legs technically called *genu valgum*. This could ultimately lead to bone cancer. Moreover fluorosis affects people only during the growth phase, thereby affecting the younger generation rather than the older.

In recent years, there has been an upsurge of interest globally in the use of plant products as a remedy to environmental contamination, although the practice is ages old. One such practice is the use of drumstick seeds for purifying drinking water, particularly turbid water. Traditionally people in rural areas all over the world

follow this method of purification, especially in African and South East Asian countries, including India.

Drumstick seeds have been identified as a possible alternative to aluminium sulphate, to purify drinking water from an excessive content of fluoride. This would be an ecofriendly and socially feasible rural technology for solving the problem of fluorosis.

Objectives

- Seed efficiency standardisation at different concentrations of fluoride in drinking water
- Preparation of implementation strategies and management plan at the field level
- Preparation of GIS maps on ground water fluoride levels at selected endemic areas for fluorosis and implementation of household level purification process

Activities

From laboratory based experiments it has been found that, while aluminium sulphate purifies 1760 - 1900 mg of fluoride/kg of alumina resin, the seed kernal of the drumstick plant purifies 1650 mg/ kg in drinking water. This means that a gram of kernal is needed to purify 1.6 parts per million (ppm) of fluoride, whereas the permissible limit of Indian Standards for fluoride in drinking water is 1 ppm.

The GIS map for Ennore, a suburb near Chennai which is affected with fluorosis,

has been prepared based on the data collected on the ground water as well as the water provided by the municipality. Similarly the GIS map for some of the endemic areas of fluorosis in Dharmapuri district is also being prepared. Preliminary water quality monitoring has been done and the result has to be validated with further sampling.

Screening for dental and skeletal fluorosis among school children in selected areas has been conducted. An introductory discussion was carried out in the villages to throw light on the prevailing extent of fluorosis.

Tests have to be conducted on the efficiency of the seed which is grown in the areas already affected with fluoride. This would give further impetus to the implementation of the concept, making it more viable and economically feasible.

5. Studies on the Microbial Composting of Green Leaves

Theme

This study aims to shorten the duration of composting for the green leaves of *Neem*, *Vitex*, *Ipomea*, *Glyricidia* and *Leucaena*, enhance the nitrogen content and ensure prolonged shelf life of compost.

Objectives

- Identification and selection of microbial species/ communities involved in the decomposition of green leaves

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- Mass multiplication of the most virulent microbial species/ communities
- Estimation of Carbon and Nitrogen
- Enhancing the nitrogen content as an alternative to nitrogen fertiliser by altering carbon : nitrogen ratio

Activities

The following trends have been observed:

On zero day, on the samples of all the five plant species, only phylloplane fungi were observed, a species of *Fusarium* being dominant. Actinomycetes were completely absent.

Species of *Trichoderma* and *Aspergillus* were observed from the 5th day onwards, most prevalently in *Ipomea*, whereas even at later stages they were absent in *Vitex*.

The number of colony forming units was high in *Ipomea* and *Leucaena* whereas *Vitex* showed fewer number of colonies.

Though the above information is inadequate to arrive at definite conclusions, the predominant occurrence of species *Trichoderma*, a cellulose degrading organism in the composting green leaves, is notable. The trends also indicate a possible microbial intervention for faster composting. During 1997-98, the project would focus on developing technological interventions for mass multiplication of *Trichoderma* species, particularly at the farm level.

6. Organisation of Seed Villages

Theme

Time and labour are the only assets which the rural households, particularly land-

less women, possess. Any development process would be successful only if the value of these assets is increased. Skill empowerment is an important intervention in development activities. This project involved developing a model in which non-governmental organisations could play a role in linking the various sectors.

Objectives

- To establish seed villages by making a formal link between farmers and the corporate sector in quality seed production
- To impart individual skill through adaptive participatory training in seed production, based on the market demand
- To improve employment potential in rural areas through such labour intensive programmes.

Project Area

Kannivadi Village in Oddanchatiram block of Dindigul Anna district

Activities

The following villages were identified for seed production in Hosur block :

- Kaput
- Kodyalam
- Chinna Madagondapally

During this period, attempts were made to initiate the project in the villages of Kodyalam and Kuppatty.

In spite of a concentrated effort by MSSRF and the seed industry, the concept of seed production did not pick up. There were two reasons for this situation. The farmers were not interested in growing OP varieties, since the margin of differences in the rate of return between selling as pure crop and selling as seeds is minimal. They wanted to get into hybrid seed production directly, bypassing the various stages of Competency-Based Training (CBT). The seed industries pointed out the risk in hybrid seed production without appropriate training since hybrid seed production involves higher costs and management. However the farmers were not prepared to go through OP production.

Training should have relevance to the working conditions and should lead to better productivity and income. Training women agricultural labourers in seed production without corresponding seed production activities in the surrounding farms does not fit with the objectives of the project.

Based on this lesson the seed industry and the project felt that another area should be tried simultaneously for seed production. The following conditions were looked into while selecting the area:

1. The distance from the market : the more distant and inaccessible the market, the better the potential as a seed village
2. The economic advantage of selling seeds
3. Climate and soil factors
4. The cultivable area should fall under

the category of semi-arid and dry area with good ground water facilities so that the margin of profit earned out of seed crop is worth the risk of opting for a change.

5. Seasonal land utilisation pattern: optimisation of present land use so that when converting to seed crop it will be more remunerative.

The following villages were selected in Oddanchatiram block for seed production:

- Kannivadi
- Palaniyur
- Kuralampatti
- Pudupatti
- Rasingapuram

On the basis of the above conditions, Kannivadi and its surrounding villages in Oddanchatram block near Dindigul were selected and the response was substantial. In the recognition of Prior Learning Process, it was found that most of the farmers in the region are aware of seed production. However, their knowledge on hybrid seed production is limited. Such a condition facilitated the introduction of hybrid seed production in a smooth manner.

Table 3.4 shows the validity of the hypothesis of accessibility in seed production. Within a period of three months more than 20 ha in Oddanchatiram region have been brought under hybrid seed production. It is to be mentioned here that the seed industry proceeds gradually in promoting hybrid seed production. Thus 20 ha of seed

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production has been a good start and once the economics of the hybrid seed production is established the area is bound to increase. On the other hand, the project is still focusing on the Hosur block and hopes to develop seed villages in the inaccessible and remote villages.

The training programmes and the linkage with the seed industry with assured market have resulted in substantial investment by the farmers on the concept and practices which were propagated by the project. During the first phase (January 1996 - July 1996) the project focused on seed production and during the second phase (August 1996 - March 1997), training of women (Table 3.5) and demonstrations took place.

During 1996-97, the project has established a training cum demonstration centre at Kannivadi village in 1.2 acres. It is a simple hall with a thatched roof. A permanent exhibition of various literature on seed production and market information has been established in this centre.

7. Integrated Intensive Farming Systems

Theme

Integrated Intensive Farming System (IIFS) stresses the inter-linkages within a farm. Primarily this is to show that conservation of biodiversity could mean profitable agriculture by ecologically integrating different ecosystems and their components.

Objectives

- To establish the viability of Integrated Intensive Farming System (IIFS) vis-à-vis economic viability, ecological efficiency
- To extend the idea of IIFS with different types of farmers
- To establish that biodiversity is a profitable agriculture

Project Area

Kuriamangalam and Kilamanakudi in South Arcot Vallalar district

Activities

During 1996-97 the project was shifted to Kuriamangalam and Kilamanakudi villages from the original site. These villages are predominantly paddy belts with heavy inputs of chemical fertilisers and pesticides. The project began through a mobilisation process in which farmers and landless labourers were involved. Participatory Adaptive Research and Demonstration plots were laid in two fields. By integrating components like irrigated rice along with fish and other crops in mixed or rotational practices, vegetables, fruit trees, poultry, livestock and apiary in appropriate combination, the model is trying to establish a high productivity level without compromising backyard agriculture. The focus is on stabilising soil and water management. The model includes rice-fish-poultry-duck linkages, tadpole-termite-vermicompost, biofencing, trap crop and integrated pest management and

Table 3.4 : Area (in ha.) under hybrid seed production (January 1996 - March 1997)

Crops	Area covered at Oddanchatiram	Area covered at Hosur
Sunflower	15.2	0.42
Open Pollinated Brinjal	2.0	1.0
Open pollinated Bhendi	-	1.0
Hybrid Brinjal	1.0	-
Hybrid Bhendi	1.0	-

water harvesting-aquaculture-critical water management during dry periods. IIFS also focuses on landless labourers through kitchen garden and backyard agriculture.

8. Development of Multimedia Database on Integrated Intensive Farming Systems

Theme

Multimedia offers not only an instrument for database but also acts as an extension tool. In a semi-literate society like India, multimedia provides scope for all sectors of the population to interact with database. In order to popularise the organic farming practices of farmers from various agro-climatic zones of Tamil Nadu, a project was conceived to develop a multimedia database in Tamil.

Objective

- Use of Multimedia database as an interactive communication tool for training farmers and extension personnel in integrated intensive farming systems.

Activities

At the end of 1995-96, 27 farmers who had successfully adopted IIFS from five broad agro-ecological zones as depicted in the Tamil treatise "Tholkaappiyam" were selected and documented as card profiles in the database. 7 of them were selected as representative farmers and a detailed database was developed.

In the second year of the project, from April 15, 1996 - April 15, 1997, the short term objectives were (a) to design a database which is user-friendly and (b) to prepare a training manual on IIFS.

In order to fulfil the above objectives, detailed case studies of representative farmers, complete with video, audio, photographs and details of farming, have been entered into the database. Two case studies have been completed. The training manual is under preparation and the designing of the database is complete.

In the third year of the project, training using the multimedia would be the major activity. As a forerunner to the training programmes to be held in the third year of the project, a workshop on IIFS was

Table 3.5 : Details of training

Women Trained	Training	Days
120	Sunflower hybridisation (This training included hybridisation process, Integrated Pest Management, seed extraction and general details)	9
76	Brinjal seed production	3
76	Seed extraction	2
17	General hybridisation techniques	5
50	Vegetative propagation	4
	No. of women training days	1745

held at Kanyakumari during the first week of March, 1997. The workshop was jointly organised with the Vivekananda Kendra, Kanyakumari. More than 90 participants attended the workshop.

**9. Technology Mission on
Aquaculture-Ecoaquaculture**

Theme

Agricultural activities in coastal regions do not give much emphasis to rain water harvesting since they get water at no cost through canal irrigation. These regions, which generally receive heavy showers, waste the major portion of the rain. Rain water harvesting in irrigated regions will not only help in better water use efficiency, but can also reduce the risk of excessive dependence on canal irrigation as well as ground water. This project is looking into the possibility of adding value to rain water harvesting through Ecoaquaculture.

Objectives

- To identify an ecological base for inland aquaculture and develop a suitable production model for semi-intensive and low-intensive freshwater aquaculture
- To integrate ecoaquaculture at the farm level, community level and household level
- To develop ecoaquaculture farms with proper orientation to class and gender issues
- To establish extrapolation domain through training and extension activities

Project Area

Keelamanakudi in South Arcot Vallalar District

Activities

Six ponds were dug to study low intensive freshwater ecoaquaculture. Rain wa-

ter was harvested to the extent of 4,000 m³ and prawns were stocked in these ponds. The project focused on soil-hydrology relationship, water retention capacity and water use efficiency under low intensive conditions. For defining the production model the project is focusing on understanding the optimisation level of different forms of feeds and different stocking density. The project is in the process of identifying ponds for semi-intensive freshwater ecoaquaculture.

Two community ponds were stocked with various varieties of fishes including prawns. Due to stock modulation, stocking density and feeding strategy, the community ponds have harvested the highest biomass of fish in the last ten years. The project has also developed strategies for involving landless women through backyard aquaculture. Central Institute of Freshwater Aquaculture (CIFA) is an active partner in the project.

10. Water Harvesting and Pulse Village

Theme

Pulses are a low-input, high-value crop, but pulse productivity is declining in Tamil Nadu. The agriculture sector has given only limited focus to improve the productivity and quality of pulses. This project is an attempt to optimise the rate of return from pulses per unit volume of water through water harvesting structures and water management practices. This project is also an example of the collaboration of scientific institutions, non-gov-

ernmental organisations, corporate sector and farmers. The concept for this project was evolved during a workshop organised by the Tata Trust in 1996 at Pune. The concept was further consolidated through an expert group which defined the broad strategies for the project. Focusing on water management and pulse production the expert team suggested a collaborative project with the corporate sector, scientific institutions and non-governmental organisations. The project identified SPEECH for Ramanathapuram and RENAISSANCE for Pudukottai as NGO partners. FICCI and SPIC represent the corporate sector.

Objectives

- To define the management systems for optimising the productivity of pulses through water harvesting and water management
- To develop an extension base for the self-replication of the management systems through farmers and non-governmental organisations.

Project Area

Kavadipatti in Ramanathapuram and Visalur in Pudukottai Districts.

Activities

85 acres of land, which had been fallow for the last two decades, were brought under the project. Participatory adaptive research and demonstration activities took place in the two villages. Rain water

harvesting structures such as farm ponds and recharge pits were established and nearly 7,000 cubic meters of water was harvested during the North East Monsoon. The introduction of quality seeds and usage of biofertilizers helped in high germination of more than 85%. The results have shown that the quality of the soil has improved substantially. A farmers' group is observing the progress of the project. During 1997-98, the project would focus on issues of productivity and cost efficiency.

Sub Programme Area 303

B.V. Rao Centre for Sustainable Food Security

As explained in the Introductory Chapter, the B.V. Rao Centre for Sustainable Food Security was established with an endowment grant made by the Venkateswara Group of Companies. Its major aim is to give operational content, particularly in the area of public policy, to the following definition of sustainable food security :

- that every individual has the *physical, economic, social, and environmental access* to a balanced diet that includes the necessary macro- and micro-nutrients, safe drinking water, sanitation, environmental hygiene, primary health care and education so as to lead a healthy and productive life.
- that food originates from efficient and environmentally benign production technologies that conserve and enhance

the natural resource base of crops, animal husbandry, forestry, inland and marine fisheries.

An organisational chart of this centre is given in the *Introduction*.

Hunger Free Area Programme

Freedom from hunger, disease and deprivation is the goal of Hunger Free Area Programme. A working paper was prepared in June '96, based on the following studies:

- a. A detailed macro study of Dharmapuri District
- b. A micro level analysis in 2 villages namely Pattukonampatty in Pappiredipatty block of Dharmapuri District and Nallaperumalpatty in Chellampatty block of Madurai district
- c. A detailed Gap analysis in 2 villages of Dharmapuri district namely Pudupatti and Etikuzhi.

The working paper was revised after receiving feedback and suggestions from professional economists and social scientists.

The strategies for ending hunger were proposed by MSSRF. They are as follows:

1. Socio-political empowerment of the poor
2. Security of livelihood
3. Enabling environment
4. Special interventions

5. Macro-economic policy
 - i) Asset reforms
 - ii) A new deal for the self-employed
6. Synergy and convergence of the development programmes.

The Honourable Chief Minister of Tamil Nadu announced in his Budget speech in July 1996, the initiation of a Hunger Free Area Programme in the State to end poverty-induced hunger. Following this announcement, the Department of Social Welfare and Nutritious Meal Programme of Government of Tamil Nadu, sponsored studies by 7 different Institutions/Universities including MSSRF for preparing operational blue prints for Hunger Free Area Programme in 7 blocks of the State, each representing different agro-ecological regions.

MSSRF suggested the following common protocol to each of the 7 collaborators:

- | | |
|-----------|---|
| Phase I | Gap and Constraint Analysis |
| Phase II | Spreading the Message and Strategic Planning |
| Phase III | Finalising the Action Plan |
| Phase IV | Launching the Action Plan towards a National Sustainable Food and Livelihood Security Act |

A detailed study was conducted in the Pennagaram Block of Dharmapuri District for initiating the Hunger Free Area Programme. Detailed Participatory Rural

Appraisal exercises were conducted in 2 villages namely Kodihalli and Donnakutahalli through interaction with the village Panchayat Presidents, Councillors and village community.

MSSRF reviewed the work done in the other blocks selected for the initiation of Hunger Free Area Programme in Tamil Nadu. A meeting with the Planning Commission Member, Finance Secretary, Planning and Development Secretary, Secretary and Director of Social Welfare Department was arranged to explain the progress of the study made in all the blocks.

A final study report of the Pennagaram Block comprising the in-depth study of the block, including the PRA exercises and gap analysis, was prepared. The studies in all the blocks reveal that the ultra poor (identified by using common generic criteria) constitute only 10-12% and the problem could be tackled very easily.

An action plan, considered the seven pillars of Hunger Free Area Programme, was prepared by MSSRF to help the ultra poor section of the population:

1. Identification of the ultra poor families by Gram Sabha
2. Information empowerment
3. Elimination of protein-calorie under-nutrition
4. Elimination of micro-nutrient deficiency induced hidden hunger
5. Improving biological absorption and

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retention of food through safe drinking water and sanitation

6. Strengthening rural livelihoods through a local level Hunger-Free Area Programme Consortium which can help to improve on-farm and non-farm employment through micro-level planning, micro-enterprises and micro-credit
7. Special attention to women and children

A monitoring card was designed to identify the household status and housing conditions of the ultra poor. An entitlement card was also designed to create awareness on various on-going programmes in their respective blocks.

For implementing the Hunger Free Area Programme in Tamil Nadu, implementation framework and implementation structures were formulated and sent to the Government. Detailed study reports of the six different blocks were obtained. The executive summaries of all the blocks were compiled and a Seven Point Action Plan was suggested.

Policy Research

As part of the policy research activities of the B. V. Rao Centre for Sustainable Food Security, the M. S. Swaminathan Research Foundation prepared a Programme Support Document for the UNDP - Government of India Food and Nutrition Security Programme. The major recommendations of the document are based on the following factors:

1. Stable, Sustainable Systems of Production of Food Crops, Livestock and Fisheries

Awareness of and government support to nutritious commodities other than cash crops can help increase their market value and consumption. Seeds can be made available by creating seed banks or developing Seed Villages. Replicable eco-technologies must be developed and disseminated, providing participatory control of the farmers in the whole process. The project 'Integrated Intensive Farming System' carried out by M.S.Swaminathan Research Foundation, is a useful case-study in point. *Attention must be on including the excluded in terms of areas, crops and farming systems.*

With the severe water crisis, both for domestic use and irrigation, in many parts of the country presently, and in the foreseeable future, the issue of water management calls for speedy and serious action. Support to non-governmental and government organisations to evolve participatory management of drinking water schemes like SEWA's *Pani Panchayats* is the answer to safe, clean drinking water so essential for nutrition security. Participatory irrigation and water-shed management, integrated river-basin management, action-oriented research, documentation, training and extension to propagate simple techniques like the "5% technology" or "irrigation grids", and conjunctive use of ground and surface water are the simple yet strategic interventions that can produce major productivity and equity impacts on the economy.

With the decreasing ratio of land and water to humankind, urban areas are the worst affected when the issue of sharing the natural resources arises. A solution is to create an "Urban green belt" in-between the rural and urban areas that will ease the pressure on prime farm land for urban expansion, and at the same time, reduce the losses incurred in storage and transportation.

2. Reliable, Safe, Economic Systems of Preservation, Processing, Storage, Distribution and Marketing

Providing workspace, credit and investment facilities, modern methods of packaging and linkages with institutional buyers will expedite the process of attaining food and nutrition security. The most wide-spread and popular distribution mechanism is the government's 'Public Distribution System' (PDS). However, some restructuring will make it more effective and efficient like linking PDS with anti-poverty programmes, targeting the commodities according to the consumption pattern and poverty level of the poor, improving the quality and increasing the variety and quantity of the commodities. In view of the rich diversity in socio-economic conditions prevailing in the country, multiple approaches will be needed. Hence mechanisms like Grain banks, Consumer stores run by '*bachat mandals*', and '*Shakti packet*' schemes can supplement the PDS.

3. Income Generation

The green revolution solved the problem of inadequate production of food three dec-

ades ago. The focus has hence shifted from availability to accessibility. Economic access to food can become a reality by increasing the rural employment opportunities in agro-based industries, cottage industries during the non-farming period, live-stock based business etc. Besides, there is a strong positive correlation between economic development and the declining trend in population growth. The government's project 'Small farmers' agribusiness consortium' is an attempt to offer value-added jobs and higher income to rural families by taking the benefits of modern agri-business to them. Similarly, the "Biovillage" project in Pondicherry, implemented by M.S.Swaminathan Research Foundation, Chennai, is an approach to generate multiple livelihood opportunities, while at the same time conserving the natural resource base.

4. Role of Corporate Sector in Enhancing Food and Nutrition Security

Farming is the single largest private sector enterprise in the world. Symbiotic social contracts between the corporate sector and the rural poor (e.g., seed-villages and agro-processing) are important for providing market oriented employment opportunities, capital for investment, value-addition to the farm produce including cultivation of wastelands and remunerative marketing. Besides, the dairy cooperatives of India illustrate the power of primary stakeholders in managing various enterprises. The corporate sector can also provide consultancy service to the farming community in developing profit-

able crop-mix and scientific cultivation techniques.

5. Empowerment of the People

The informal, unorganised economy employing as much as 92.5% of the workforce in India is the economic sphere of the poor. In order to distinguish this sector from the private or public sector, it has been named the "people's sector" developed by people's organisations - CBOs, co-operatives, NGOs. The concept of Sustainable Human Development as developed by the UNDP can be concretised within the "people's sector". The poor in all the anti-poverty programmes should be regarded as 'producers' and 'partners' and not as just beneficiaries. The Hunger Free Area Programme is an attempt in that direction.

The growing trend towards feminisation of poverty can be addressed through the technological and skill empowerment of women. As the family's food security is the first priority for most poor women, food security strategies should empower women to take a lead in planning, development and implementation of programmes.

There is, thus, a great need for decentralised governance to ensure participation of the people in the management of affairs affecting them not only in the process of decision making but also in planning and management of programmes of development. Panchayats and local self governments can thus play a crucial role in procurement, storage and marketing of agricultural produce, thereby ensuring food and nutrition security at the household level.

Technological empowerment of the rural poor is vital for achieving continuous and sustained improvements in the quality of rural life. Hence the concept of information villages, where the benefits of new technologies will be made known to the rural population by blending both the traditional (folk media, demonstrations) and recent (computers, remote sensing and telecommunication satellites) forms of communication.

6. Government of India's Agricultural Policy Resolution for the World Food Summit

This supports the interventions suggested in this paper for achieving food and nutrition security. Besides, there are various government programmes related to poverty alleviation, agricultural production and rural infrastructure development, targeted to the underprivileged sections of Indian society. They can have a much greater and speedier impact, if convergence and synergy can be generated among them by providing a horizontal dimension to the often vertically structured programmes.

Although the time-frame of five years is not adequate to accomplish the daunting task of ensuring food and nutrition security to every Indian, yet the collective will and efforts of the people as individuals, governmental and non-governmental organisations, private, public and people's sectors, and international organisations can achieve what is seemingly impossible. The individual strengths of these organisations may vary, but their collective strength is considerable.

From Poverty Alleviation to an Asset Building and Sustainable Human Development Approach

The document called for a paradigm shift in the approach to the design of poverty alleviation programmes. The present approach which refers to producers as *beneficiaries* has built-in seeds of *patronage*. The poor are poor because they have no assets - land, livestock, fishpond, trees or productive skills. *The only assets they possess are time and labour*. If the poor are to be helped in improving their livelihood security, there is need for adding economic value to their time and labour. This will be possible only if they acquire new skills and become skilled workers. The skills, in turn, should be market-driven. In the case of women who are often under-paid and over-worked, the strategy has to be based on reducing the number of hours of work and adding economic value to each hour of their work.

Thus, the assets to be built for the eradication of poverty are: market-driven skills and knowledge and technological empowerment. For purposes of fostering producer-oriented marketing, it will be necessary to promote the formation of enterprise-centred groups. Thus, it will be appropriate to redesignate poverty alleviation programmes as Asset Building and Sustainable Human Development Programmes. Such an orientation will help to promote a positive rather than a patronising approach in the design of poverty alleviation programmes.

Subprogramme Area 304 Biological Software and Sustainable Agriculture

Research Projects on Biopesticides and IPM in Progress

The R&D programmes in cotton, groundnut and soyabean IPM and various technology assessment and demonstration programmes as well as training programmes were conducted during the 1996-97 *kharif* and *rabi* seasons and 1997 summer season in different villages in Theni, Periyakulam and Bodi Panchayat Unions of the Vaigai Veeran Alagumuthu district in Tamil Nadu state. The research programmes were mainly focused on the production and use of biological control agents and botanical pesticides using mostly cheap and locally available resources. These biological inputs were integrated with the other components of IPM and field tested. The safety of the biopesticides to non-target organisms was evaluated. The build-up of resistance in the major pests to the commonly used insecticides was detected through bioassay studies and also by using black ants as bioindicators. Detailed weekly surveillance of pests and natural enemies was conducted in cotton and groundnut ecosystems, which formed the basis for IPM. Since many of the biological inputs are not available commercially, training programmes were organised to produce selected parasitoids, nuclear polyhedrosis viruses (NPV) and botanical pesticides in the farm households in two of the project

villages. Rural women, farm youth and farmers participated in the training programmes.

Cotton

Microbial Pesticides

Treatments of American bollworm, *Helicoverpa armigera* eggs with NPV, *Bacillus thuringiensis* (*B.t.*) and *Beauveria bassiana* resulted in 89.6-96.4% mortality of the resultant larvae compared to 95-100% in chemical treatments in the laboratory. NPV was superior to *B.t.* in the field resulting in 59.9% reduction in the neonate larval population. Sequential application of *B.t.* followed by NPV or NPV followed by *B.t.* at 24 h interval resulted in 100% mortality of IV instar larvae of *H. armigera* 96 h after inoculation. Contrarily, there was an apparent antagonism between *B.t.* and NPV of *S. litura*. The entomogenous fungus, *B. bassiana* or NPV or their combination resulted in significant mortality of the larvae and were on par with endosulfan. The bacterium containing entomophilic nematode, *Steinernema carpocapsae*, *B.t.* and NPV were tested against early, mid and late larval instars of *H. armigera*. Their combination treatments at half the recommended levels were found to inflict 77.6-100% mortality.

Pongamia glabra seed kernel extract (PSKE) (Tamil: *Pungam*) was found to be antagonistic with the fungus biopesticides, *B. bassiana* and *Metarrhizium anisopliae* against *S. litura*. NPV in combi-

nation with *Vitex negundo* (Tamil: *Notchi*) or neem seed kernel extract (NSKE) at higher doses resulted in 100% mortality of the pest.

The efficacy of a protozoan, *Vairimorpha necatrix*, NPV, *B.t.* and *B. bassiana* was tested individually and in combination. The biopesticides caused 77.7-100% mortality of *H. armigera* larvae compared to the insecticide. In the case of *S. litura* the combination treatments caused 66.7-100% mortality. Observations on the emergence of *S. litura* adults previously exposed in the fourth larval instar to the entomogenous fungi, *Nomuraea rileyi* and *B. bassiana* revealed reduced and delayed emergence besides malformation.

V. negundo 10% leaf extract in combination with the fungus biopesticide, *N. rileyi* at 1.65×10^7 spores/ml dosage inflicted 100% mortality of the leaf hopper. The combination treatment was also highly effective against the cotton aphids.

Parasitoids

Field efficacy of the egg parasitoid, *Trichogramma chilonis* was studied in parasitizing *H. armigera* eggs on cotton. The study indicated that the parasitoid at the dose of 4 cc/acre released in 160 bits/acre caused more than 75% reduction in egg population compared to the existing practice of using 20 bits of *Tricho* cards. The neonate larval population after release of parasitoids was very negligible.

Botanical Pesticides

Neem-based biopesticides, Neemgold and Neemazal at the doses 4.0 and 5.0 ml/l caused increased mortality of cotton leaf hoppers compared to the lower doses. Nearly 50% of the insects were killed within 24 hr after treatment.

Among the aqueous extracts of different plants possessing pesticide principles against cotton leaf caterpillar, *Spodoptera litura*, *V. negundo* 10% caused 60% mortality three days after treatment. *V. negundo purpureus* at 10% was better than the normal green type *V. negundo* as the cumulative mortality was more than 73.3%. This was on a par with *Ipomea carnea* (Tamil: *Neyveli kattamanakku*) 10% and *Calotropis gigantea* (Tamil: *Erukku*) 10% leaf extract treatments. NSKE 10% and neem oil emulsion 3% were the best of all inflicting total mortality (100%) of the caterpillar. Palmrosa oil at 1.5% caused highest mortality of *S. litura*. In another study PSKE inflicted 100% mortality of the larvae.

Freshly prepared plant extracts were sprayed on *H. armigera* eggs. Of the five materials, PSKE and NSKE at 5% resulted in less than 28% hatching compared to 52.5% in control and 41.3% in endosulfan treatment. The mortality of the neonate larvae was total in NSKE, PSKE, *Notchi* and *I. carnea* treatments. Among the other plant products, the pest was susceptible to *Argemone mexicana*, *Tribulus terrestris*, *Aristolochia bracteata*, *Bougainvillea* sp. and *Parkinsonia aculeata* treatments. *Coleus aromaticus* and *Prosopis juliflora*, though inferior to the above, in-

flicted 66.7-83.3% larval mortality. Among the non-edible oils, neem oil and *Madhuca* (Tamil: *Iluppai*) oil at 3% along with Teepol 0.01% were effective in reducing *H. armigera* larval population by 80%. There was synergism when *Pongamia* oil 2% was combined with *Madhuca* oil 1%, resulting in 100% mortality equivalent to endosulfan. Similar effects were also observed in the case of *S. litura* and leaf hopper, *Amrasca biguttula biguttula*.

Habitat Manipulation and Cultural Control

Evaluation of cowpea cultivars for identification of suitable genotype for integration with IPM components under habitat diversification programme revealed that the pre-release cultures CoVu 95 and CoVu 623 of TNAU had the highest number of nymphs of legume aphid, *Aphis craccivora* (44.8 and 36.4 nymphs /sq. cm of the leaf), which served as prey for predators. These cultivars are also suitable for mass multiplication of the aphid for enhancing predator population in the field or for laboratory culturing.

Organic manures with a reduced dose of synthetic fertilisers NPK 60:40:40 kg/ha reduced the infestation of sucking pests compared to the full dose of NPK 80:40:40 kg/ha. This was followed by two applications of Neemazal (1750 ml/ha) at 56 and 91 days, which effectively checked the build-up of the sucking pests. Distinct variations were observed in terms of plant girth and number of sympodials. The yield was the highest in NPK 60:40:40 kg/ha + gobar gas slurry treatment compared to NPK 80:40:40 kg/ha.

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Inclusion of *Azospirillum* biofertiliser, as seed treatment or soil application along with a reduced dose of synthetic fertilisers NPK 60:40:40 kg/ha also reduced the population of aphids and leaf hoppers. The ratio of the aphid to ladybird predator, *Cheilomenes sexmaculata* was found to be narrower in treatments involving both seed treatment and soil application of *Azospirillum* than in seed treatment alone or application of NPK alone at 80:40:40 kg/ha. Yield was higher in treatments involving seed treatment and soil application of *Azospirillum*.

The data on the cost of cultivation and the net income was gathered for the different seasons. It was found that the total cost of cultivation in the IPM areas was comparatively lower than that of the non-IPM areas. The net gain was also uniformly better compared to the non-IPM areas.

Groundnut

Microbial Pesticides

B.t. and *S. carpocapsae* alone in full doses or in combination in half the doses inflicted 88.9-100% mortality of groundnut leaf miner. In the field trial also, the biopesticides were found to be on par with insecticide. Similar results were obtained in the case of *H. armigera* and *S. litura*. The pest infestation in groundnut was very low excepting for *H. armigera* where the biopesticides gave good results.

Botanical Pesticides

Leaf miner larvae were found to be quite sensitive to NSKE, neem oil, PSKE, *Pon-*

gamia oil and *V. negundo* treatments in the laboratory. These treatments could reduce the leaf miner population in the field in 72 h equivalent to endosulfan. The groundnut leaf hoppers were checked most by *V. negundo* leaf extracts (95.8%) followed by NSKE (84.4%). *V. negundo*, *Ipomoea* and *Pongamia* extracts had ovicidal action and *V. negundo* had in addition larvicidal action. PSKE, NSKE, *Prosopis*, *Bougainvillea*, *C. aromaticus* and *T. terrestris* extracts showed considerable mortality of *H. armigera*. Neem, *Pongamia* and *Madhuca* oils alone and in combinations were able to cause 88.9-100% mortality of *S. litura* and *H. armigera* larvae.

Soyabean

Microbial Pesticides

NPV, *B.t.*, NSKE and neem oil which were statistically on par with chlorpyrifos caused 80-100% mortality of *H. armigera* on soyabean.

Maximum mortality of *S. litura* was seen with *B.t.* (59.9%) and NPV + PSKE combination (59.9%) followed by NPV alone (39.9%) on the third day after treatment. All the treatments showed 100% mortality by the seventh day.

Botanical Pesticides

The plant products PSKE, *V. negundo*, *A. mexicana*, *T. terrestris*, *A. bracteata* and *P. aculeata* caused 33.3-58.3% mortality of *H. armigera* at 72 h after treatment. It increased to 83.3-100% after a week of treatment. The leaf damage was also reduced by 34.9-69.2%. *Madhuca* 2% and

Pongamia 1% oil treatments inflicted 88.9% mortality of *S. litura* comparable to endosulfan. Their combination treatments at reduced doses were more effective at 72 h. All the treatments caused 100% mortality seven days after treatment.

Surveillance for Pests and Natural Enemies

Weekly surveillance was conducted in both cotton and groundnut and the populations of pests and defenders were assessed. The population on weed flora was also recorded. Better methods of monitoring were developed, using pheromone lures for lepidopterans and yellow sticky traps for three sucking pests.

Technology for Mass Production of *H. armigera* NPV

The NPV of the American cotton bollworm, *H. armigera*, is one of the most virulent baculoviruses available at present. Its continuous mass production, adopting cheap and efficient techniques, will be very valuable for the management of the pest. Laboratory and pilot scale production systems have already been developed in our earlier studies, though some of the techniques need refinement. Large scale commercial production technology would be necessary so that the biopesticide could be used extensively. At the same time there is need for simpler methods of production at the cottage level with a view to enable farmers and small entrepreneurs to produce and use it at low cost, without affecting the quality.

The semi-synthetic diet for the insect was modified for culturing the NPV cheaply. Chickpea flour could be substituted by maize or sorghum or groundnut cake powder to an extent of 25% without affecting the larval development. Cotton seed powder and cotton oil cake powder were not suitable. In another study some of the costly ingredients of the semisynthetic diet were reduced by half and the larval development studied. It was found that sorbic acid, ascorbic acid, methyl parahydroxy benzoate yeast, streptomycin sulphate, choline chloride and formaldehyde could be reduced by 50% without changing the levels of chickpea flour and agar agar for successfully rearing the different larval instars. Similar results were obtained with *S. litura*.

IPM Modelling

The cotton IPM model developed by Sundaramurthy (1990) has been accepted for adoption in many cotton growing states, where applicable. Based on our studies made in the past four seasons in Vaigai Veeran Alagumuthu district, the newer components have been included and the IPM model improved.

Reduction in use of Chemical Pesticides

The farm youth, women and farmers were trained in the production and use of biological control agents and botanical pesticides in their farm households. The products were used along with other IPM tactics. A comparison of the IPM effectiveness in the target village during 1996 sum-

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mer season with that of the previous year is given in Table 3.6.

Biosafety of Insect Pathogens and Botanicals

The fungus biopesticide *B. bassiana* caused 16-32% mortality of the coccinellid predatory grubs, *Cheilomenes sexmaculata* in 96 h in three dosages and was not safe to the predator. When *B.t.*, *H.a.* NPV and *S.l.* NPV were mixed with castor pollen and honey and fed to the adult green lacewing predator, *Chrysoperla carnea*, there was a mean mortality of 14.0-16.0% as against 14.0% in the untreated check. These biopesticides were found to be safe to this predator. In yet another experiment, the predator eggs were treated with plant products and it was found that PSKE reduced the hatching of eggs considerably. Again *Ipomea* plant extracts caused maximum mortality of 62.5% of the newly hatched out grubs from the treated eggs.

Toxicology and Biomonitoring of Pesticides

In the studies on monitoring insecticide resistance in cotton ecosystem, the aphids and leaf hoppers showed moderate resistance to dimethoate and phosphamidan. The spidermites showed a high level of resistance to almost all the chemicals tested. In the case of *H. armigera*, monocrotophos was found to be least toxic (11.1%) even 48 h after treatment. Endosulfan, triazophos, quinalphos and deltamethrin showed moderate levels of resistance.

In groundnut ecosystem monocrotophos, phosphamidan and chlorpyrifos were tested each at four doses on *H. armigera* larvae collected from groundnut fields. Contrary to the observations in cotton, the pest was highly susceptible to all the chemicals. However, higher doses resulted in higher mortality, indicating a certain amount of resistance. All the chemicals tested were not effective on the red spidermite.

The spidermite on soyabean showed only 14.4-31.1% mortality one day after treatment with five different pesticides. The pest showed resistance to phosalone, monocrotophos, acephate, methyl demeton and phosphamidan as they inflicted less than 55% mortality.

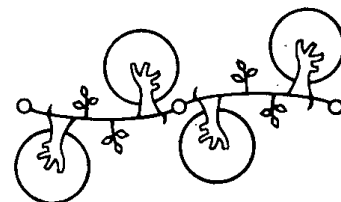
In an interesting study, a simple technique was developed using workers of black ant, *Camponotus compressus* as the bioindicator to assess the presence of insecticides in live *H. armigera* larvae. Ant mortality reached a maximum of 96% with a mean of 71.2% when the *H. armigera* larval homogenate from V-VI instar larvae was given as food to the ants. The mortality was less when the homogenate was prepared from the III-IV instars. The mortality of ants was much higher when *H. armigera* larvae collected from cotton were used and the least with those collected from groundnut from another village. The fire ant, *Monomorium indicum* was not a good candidate for biomonitoring of pesticide residues in the caterpillar.

Ecotechnology and Sustainable Agriculture

Table 3.6 : IPM trials

Names of target pests	Names of chemical pesticides used in 1995	No. of rounds used in 1995	No. of rounds used in 1996	Names of biopesticides used in 1996	No. of rounds of biopesticides used in 1996
Sucking pests	Methyl demeton	4-6 rounds	2 rounds	NSKE	3 rounds
Stem weevil	Carbofuron	2-4 rounds	—	Neem cake, NSKE	2 rounds
<i>H. armigera</i> , <i>Earias</i> sp.	Endosulfan/ Monocrofos/ Quinalphos/ Synthetic Pyrethroids	8-12 rounds	4 rounds	<i>Trichogramma</i> 4 cc/acre. NPV 200 LE /acre. Plant products.	

Programme Area 400



Reaching the Unreached

The focus of this programme area is women and children. Varied efforts were consolidated under the Resource Centre for Gender and Development, to be headed by the Uttara Devi Chair, while Voicing Silence, the women's theatre group, continued to help new voices to emerge. With advocacy for young children as its mandate, Children on the Agenda continued its efforts at networking, research, training and communication, the last with the support of the public broadcasting system.

401	Children on the Agenda (COTA)	99
402	Smt. Uttara Devi Chair / Resource Centre for Gender and Development	111
403	Voicing Silence	113

Sub Programme Area 401 Children on the Agenda (COTA)

The year 1996-97 was an extension period for COTA. The emphasis during the year was on consolidating the gains of the past three years by bringing out various products aimed at supporting the objective of strengthening child care services in Tamil Nadu. The project continued to carry out regular activities related to the following broad areas (Fig. 4.1):

- Networking and Advocacy
- Communication
- Training and Instructional Materials
- Research, Documentation and Dissemination

Networking

Project ACCESS has been functioning since 1992 as the Convenor of TN-FORCES (Tamil Nadu - Forum for Creche and Child Care Services), a network of NGOs, trade unions, women's associations, academic institutions and others initiated to lobby for improved child care services, especially for the young children of working women in the unorganised sector. The main activities of the network include advocacy, information sharing, capacity building, lobbying, strategising and carrying out joint activities. The network members, now numbering 73, meet every year to identify a new theme to add to those chosen in earlier years, to formulate strategies, and to form sub-groups to undertake activities related to the themes.

This year, the fifth year of TN FORCES, was in a sense a coming of age for the network, marked by the adoption of a charter outlining aims and objectives, and laying down guidelines for membership, structure and functioning. A flexible but functional structure of small groups has now emerged, indicating both the evolutionary process by which the network has developed and a democratic and participatory style of operation. Another significant event this year was the identification of the next Convenor. To sustain the network, it was felt that Convenorship should be held every three years in rotation by member institutions. The Department of Social Work, Loyola College, has agreed to act as Convenor from July 97 and function as the secretariat of the network.

The sub-groups met several times during the year to plan and carry out various activities. The output is indicated in Table 4.1. The activities showed continuity over a period of time, indicating that the members now have a considerable degree of clarity regarding their roles and are able to pursue them vigorously. Emphasis was laid on the development of communication materials, and on collaborative research, especially on media issues.

The sub-group on Preschool Education, formed last year, was active in voicing its concern to the Government about the present state of affairs in ECCE in the State, and has followed it up by running refresher training courses in four places for preschool teachers during the summer of 1997.

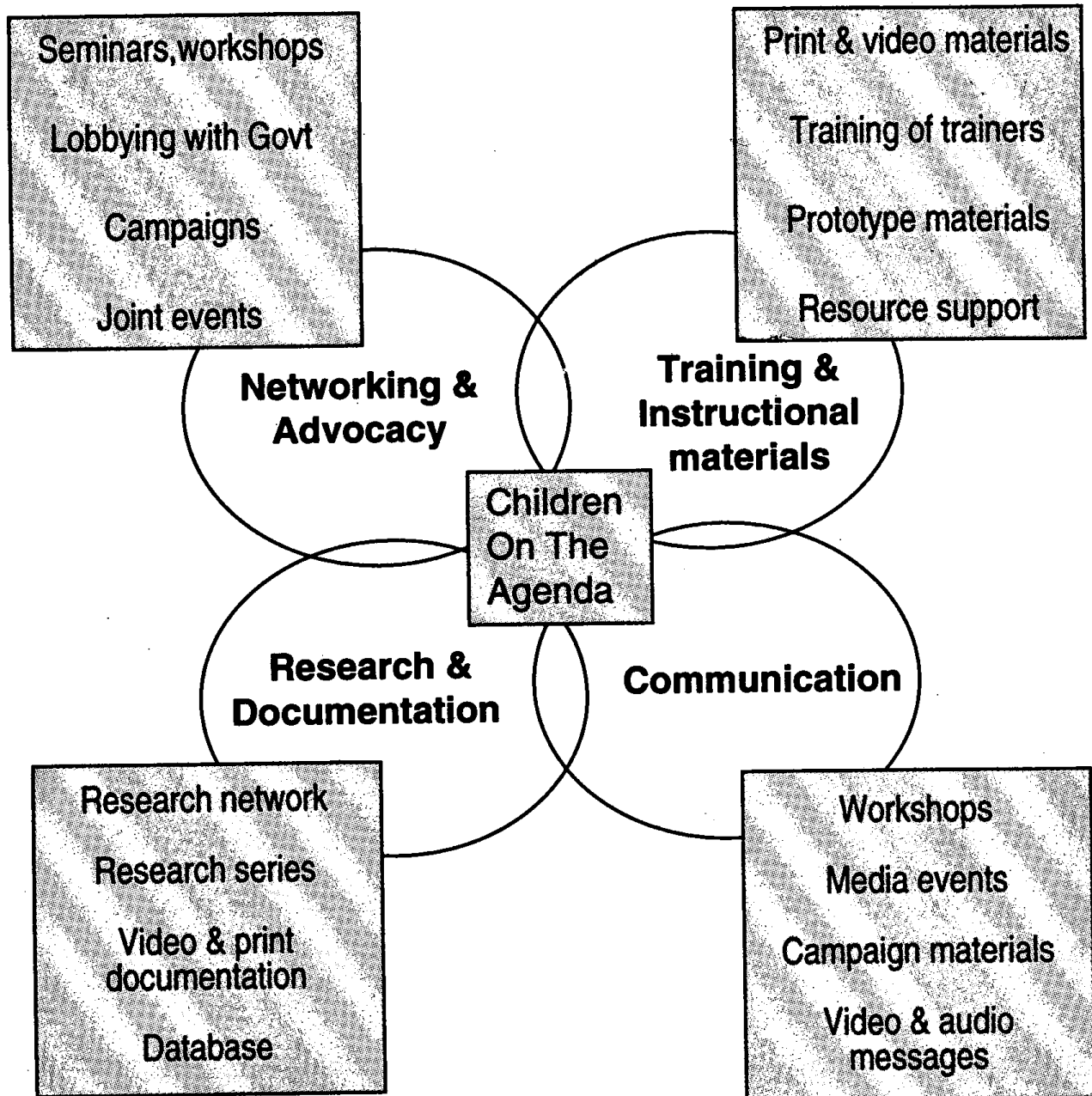


Fig. 4.1 : Children on the Agenda

Reaching the Unreached

Table 4.1 : Network activities

Month	Event / Location	Co-sponsor	Participants	Objectives	Output
July 96	Core Committee meeting, Chennai	TN FORCES	Core group members	To plan for a meeting with the Education Minister	A memorandum to the Education Minister on the regulation of pre-school education
July 96	Meeting with the State Finance Commission, Chennai	TN - FORCES	Members of sub-group on Decentralisation	To learn the thinking of the government on decentralisation of child care services	Preparation of a memorandum to be included in the report of SFC
July 96	Resource group meet	Southern Regional Network	Heads of institutions and resource persons in ECCE	To plan for the formation of a Resource group for training on ECCE	Four material development workshops planned
August 96	Talk on AIR in connection with Breastfeeding Day	TN-FORCES	Health subgroup members	To sensitise public on breastfeeding as a right of the child	Panel discussion broadcast by AIR
August 96	Five day Orientation Course	Organising Committee	Supervisors of creches and balwadis in NGO sector in Tamil Nadu	To improve capability of supervisors in order to strengthen child care services	30 participants from 15 institutions took part. A manual is being prepared
August 96	Meeting of the Southern Regional Network, Madurai	DATA, Madurai	Members of southern regional network	To finalise the proposal for a sustained campaign against the burden on the preschool child	Preparation and submission of proposal

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Table 4.1 Contd...

Month	Event / Location	Co-sponsor	Participants	Objectives	Output
Sept- ember 96	Teachers Day celebration	Organising Committee	125 child care workers from 20 NGOs in Chennai	To bring child care workers together to share their concerns, prepare learning aids and offer recreational activities	Decided to conduct similar programmes to improve self confidence and quality of teaching
Octo- ber 96	Core Committee Meeting, Chennai	TN-FORCES	Core Committee members	To plan change of Convenor TN-FORCES and 1996 Annual Meeting	Suggestions made for new Convenor and theme for 1997
Decem- ber 96	Annual Meeting, Chennai	TN-FORCES	Members	To review 1996 activities and plan for 1997 activities	Annual plan prepared - Convenor decided
March 97	Orientation for women panchayat members of Athur Panchayat, Gandhigram	Gandhigram Trust	Women panchayat members, from Athur block	To dialogue on issues related to women & children	Identification of possible courses of action on these issues at the local level, and action plan

The media sub-group prepared a report based on a study of the portrayal of women in Tamil cinema, which was widely distributed for advocacy. They also monitored the FM channel of All India Radio to see whether social advertisements, particularly those related to women and children, are aired according to prescribed norms, and are taking it up with the Director of AIR.

While continuing to work on the themes of the last three years, the network took up Decentralisation of Child Care Services as the theme for 1997. After meeting the Chairman of the State Finance Commission and submitting a memorandum on the need to decentralise child care services, the sub-group explored possible strategies for a campaign on decentralisation on the lines of the campaign against the burden on pre-school children. Generating awareness among the various stakeholders, particularly the elected members, was the suggested first step.

National FORCES

There was also active collaboration with National FORCES this year on several issues of common concern. Particular mention must be made of efforts at lobbying with the GOI for the rights of women and young children. Strong lobbying was attempted during the third quarter of 1996 for the inclusion of the maternity and child care rights of women labourers in the Agricultural Workers Bill. Members met the then Finance Minister in August 1996, to impress upon him the need for allocating more resources for child care. In January 1997, the Convenor, TN

FORCES participated in the National - level consultation jointly conducted by National FORCES and the National Commission for Women, which attempted to draw attention to the plight of young children and plead for the inclusion of child care services in the Minimum Needs Programme and larger allocations for the young child in the Ninth Plan.

Communication

Project support communication works with all the possible channels including radio, television, and print medium to create awareness on issues related to women and children. The range of products brought out for this purpose is given in Table 4.2. Functioning in the campaign mode against the *burden on the pre-school child* has generated a tremendous response, as documented by *Messages that move* - a report on the impact of the video spots on the theme, which are being regularly telecast by Doordarshan since January 1996. The diverse background of the respondents is indicative of the good reach of the spots. School children, parents, teachers, principals, school managements, scientists, lecturers, anganwadi workers, NGOs and grandparents are some of them. One key issue that has emerged is the dilemma of parents who know that the present system is hard on the child, yet feel it is necessary in the present competitive world. Some of the responses to the campaign are given below.

Some responses....

- A parent had taken his children from an "English medium" nursery back to the balwadi, after watching the spots.

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- A flood of enquiries about alternative schools was received from parents.
- Several school managements and many parents have shown interest in the play-way method.
- Requests have been received from school managements and NGOs for training in alternative methods of education.
- The medical profession has become a powerful ally in the campaign. Indian Academy of Paediatrics(IAP) - Tamil Nadu has taken as its theme for 1997 'Healthy primary and pre-primary education' and is organising a series of activities around the theme, bringing together the various stakeholders. IAP conducted a meeting in Erode in February called *Mazhalayar 97* and released a souvenir. Similar meetings have been held in Kumbakonam, Pondicherry and Neyveli.
- NCERT commended the media campaign and its impact at a national meet on advocacy for ECCE.
- An assurance from one MLA has been received regarding action on the Memorandum sent to the Education Minister and four MLAs.
- Articles have appeared in popular newspapers on the theme more often during the last year than at any other time.
- A cartoonist who was sensitised by the campaign brought out a full page of cartoons on the theme in *Dinamani Kadhir* (9 June 96).
- Doordarshan, Madras has telecast the *Villupattu Sumaiya? Suvaiya?* more than 5 times. In addition to these, *Indha Bharam Thevaiya?* (Dangerous Burden) and *Arivathil Anandam* (Learning Can be Fun) have been shown several times both on Doordarshan and Vijay TV.

Special Days

A key communication strategy this year was the use of 'special days' to create awareness on issues related to women and children. Articles, spots and talks emphasised the multiple roles of women and child care services in all media. *Imma*, the quarterly network newsletter, carried special supplements on Children's Day and on International Women's Day, suggesting ways of celebrating the event in line with TN- FORCES concerns.

A leading Tamil newspaper came forward to conduct a poetry competition on the theme of women's multiple roles on the eve of *International Women's Day*. Out of 2,000 entries received, the five prize winning poems were published in *Dinamani Magalir Malar* (special issue on women's day). Similarly a story competition was held in collaboration with *Kumkumam*, another popular Tamil magazine, which published the prize-winning stories successively in its next five editions. Of the five writers, three had attended the first writers' workshop held in April 96.

On Human Rights Day, five video spots on the theme of Gender Justice - Rights of Women and Children - were released by the Director of Doordarshan, Chennai

Kendra. The need to recognise the triple roles of women as workers, mothers and homemakers is emphasised in these spots which direct attention to the various ways in which family, employer, State and society can enable women and girls to enjoy their rights. These spots have so far been used by resource persons as discussion starters in more than 30 seminars/workshops, and have been shown in international conferences (on *Gender, Science and Development*), workshops, refresher courses for lecturers and other meetings. Doordarshan Kendra has started telecasting them from the last week of December 96 in addition to the spots already being telecast on 'Burden on the Preschool Child'.

An audio cassette containing songs on burdenless preschool education, *Enga Patta Kelunga*, was released on *Children's Day*, by the Minister for Social Welfare, Tamil Nadu. The Tamil version of *Balancing Multiple Roles* was also released on that day.

Popular Tamil magazines *Dinamani*, *Dinamani Pongal Malar*, *Theekathir*, *Vellimani*, *Kunkumam* brought out special issues related to women and children to sensitise the public and other concerned groups, while AIR broadcast a panel discussion on the theme. Many invitations have been received to speak on women's multiple roles and support services as a result of the sustained work on gender issues and on the burden theme.

Training

The year started with a one week residential course in May 1996 on Early Child-

hood Care and Education for child care workers and supervisors of Southern Regional Network (TN FORCES). The participating institutions have created an awareness among parents about the pressures on preschool children and the efficacy of the play-way method of teaching. As a result people in seven villages in Ramnad District have come forward to start balwadis and three have already been launched.

Balwadi teachers have prepared communication materials like *villupattu* and street plays on the themes of pressures on preschool children and child-centred methods of teaching, which have been well received by the public. A resource group consisting of trainers from the participating organisations has been formed for training support.

Trainers' Training

A six day course for the Lecturers of District Institute of Education and Training (DIET) and representatives of NGOs was held in June 1996 as the second and concluding part of the orientation to ECCE. The aims of the workshop were to focus on Child Development, practical training strategies for teachers at the preprimary and primary level and a concrete action plan for implementation. Subsequently,

- Each DIET has agreed to adopt 5 - 20 schools (classes I & II) to introduce practical implementation of the play-way and ECCE methods in early primary classes.
- Plans have been made to offer inservice and preservice training to teachers

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Table 4.2 : Products

Month	Name	Content	Audience	Output / Outcome
June 96	<i>Thirai Padangalil Pengal</i>	Study of the portrayal of women in Tamil cinema by media sub-group	Women's organisations, legislators, media, TN FORCES members	950 copies distributed
July 96	Memorandum on Preschool Education	Urging a separate directorate for preschools	Education Minister, Tamil Nadu	Submitted and discussed with Minister
July 96	Messages that Move	Audience feedback on <i>Burden on the Preschool Child spots</i>	Professionals, policy makers, and public	150 copies distributed
August 96	Memorandum on rights of women workers (Tamil & English)	Maternity benefits, child care services and equal pay for women agricultural labourers	Labour Ministry Gol, Labour Secretary, M.Ps, Trade Unions, Women's groups	Assurance from the Minister on consideration of these issues
November 96	<i>Enga Patta Kelunga</i>	Songs on Burden on Preschool Child	Teachers, school managements, professionals, parents / public	Children's Day release by Social Welfare Minister, Tamil Nadu; 174 cassettes distributed
December 96	Five video spots (Tamil)	Gender justice—women's and children's rights	Public, NGOs, women's groups, students etc.	Regularly shown on Doordarshan. Used in 30 meetings / discussions

Contd...

Table 4.2 Contd...

Month	Name	Content	Audience	Output / Outcome
November 96	<i>Yethanai Kaigal Pengalukku</i>	Study of child care strategies of women in unorganised sector	Govt. officials, NGOs, MLAs, professionals, women's groups, Panchayat members	200 copies distributed. Released on Children's Day by Minister for Social Welfare, Tamil Nadu
January 97	At What Cost?	Study on women's multiple roles and management of breastfeeding	NGO's, Govt. officials, policy makers, research network, women's groups, professionals	450 copies distributed
February 97	Decentralisation of child care services (Tamil & English)	Study materials on decentralisation of child care services	Panchayat members, NGO personnel, Councillors, women's groups	115 copies distributed
April 97	<i>Andrada porutkalum, seyalmurai kalviyum</i>	Activity - based learning through low-cost materials	ECCE trainers, teachers and schools	Just completed
May 97	<i>Annaikku Aadaravu</i>	A manual on training for empowering women to breastfeed	Health workers in NGOs and Govt. women's groups, hospitals	1000 copies each to health workers by VHAI, and TINP; 350 to Indian Academy of Pediatrics
June 97	Death by "Social Causes"	Female infanticide in Tamil Nadu	Research network, Govt. and NGOs, womens' groups	Just published; distribution ongoing

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of ECCE and orientation training on the goals, objectives, curriculum and methods of ECCE for HMs, DEOS, AEOS and principals of DIETS.

The training has elicited positive and practical reactions.

- Some of the DIET trainers conducted a three-day inservice training programme on the playway method of teaching and preparation of low-cost teaching materials for over 300 teachers of classes I & II.
- One-day orientation was given to the primary school HMs on minimum levels of learning, reducing dropouts etc.
- Some trainers have included ECCE as a separate subject in the training curriculum. Regular monitoring of schools and evaluation is also being done.

Instructional Materials

The first two phases of the soft toys project were completed successfully last year. Based on the findings of the evaluation study, the attempt to initiate production on a large scale for distribution in balwadis was begun. After discussion with the Director of Social Welfare, two training programmes (one at Chennai and one at Kancheepuram) on the preparation of soft toys were conducted for members of the tailoring societies identified by the Directorate. The proposal for mass production of these toys is under study.

The other important activity was video documentation of innovative classroom teaching. The areas chosen were creative

activities with low-cost/ no-cost materials, science experiences and sand, clay and water play for preschoolers. The main objective of these training videos is to show actual classroom situations, where some teachers have successfully used low cost strategies in making learning a pleasurable process for children. Four cassettes are being edited.

Research

The research component continued to address the gaps in information on issues related to the young child. The Research Series in 1996 initiated with the publication of *Balancing Multiple Roles* went on to the second in the series, *At What Cost?* in Jan 1997. It presents an analytical account of the findings of a study on the multiple roles of women and management of breastfeeding. The Tamil summary of the first has been published and widely distributed, while the Tamil version of the latter in the form of a training manual for health workers entitled *Annaikku Atharavu* (Empowering Women to Breast-feed) is just out.

Forthcoming titles in the research series are:

- *Death by 'Social Causes'* - a consolidated report on perceptions about female infanticide in Tamil Nadu and the responses of NGOs and Government on this issue
- *Watering the Neighbour's Plant* - a look at the perceptions of media on the issue of female infanticide in Tamil Nadu
- *Child Care Services in Tamil Nadu* -

Retrospect and Prospect – an analytical overview of existing services for the young child with some pointers for the future.

The fourth Research Network Meeting was held in Aug 1996, with the objective of critiquing the findings of the multicentric research study, 'Womens' multiple roles and management of breastfeeding', exchanging experiences and providing suggestions to improve the quality of research in the area of child care. It has been suggested that the focus for the next few years should be the needs of children below 2 years.

Resource Support

In tune with one of its important objectives, COTA provided resource support to a wide variety of activities related to issues concerning young children and women. The support, in response to demands from both the Government and the NGO sectors, was mainly in training, communication and information (database), which have now emerged as the core competencies of the project in addition to the personnel.

Training/ Workshops Support

This was in three forms :

- Designing and conducting training on request
- Functioning as resource persons in training programmes conducted by others
- Bringing together resource persons to further training

A one - week training programme on activity based education designed to suit local conditions as affirmed from a preliminary assessment was conducted in March '97 in Guwahati for DPEP personnel. Similarly, a workshop was conducted for ICDS functionaries in Orissa, to assess their training needs, based on which a training programme is to be formulated.

Another major training support activity undertaken was the designing and conduct of training programmes for elected women representatives of local bodies at Chennai and Gandhigram, in support of the TN-FORCES theme for 1997. The objective was to orient the elected representatives on issues concerning young children and women and to focus attention on action to be taken and the information/training support that they would need. Before conducting these training programmes, a national level brainstorming meet was held to understand the concept of decentralisation of child care services and to stimulate the processes of decentralisation. This contributed to a better understanding of a whole range of issues including finance and administration, monitoring, evaluation and community participation. The outcome is a process paper (under preparation), offering guidelines on the whole process of decentralisation of child care services.

The project staff participated as resource persons in several one-day workshops and training sessions organised by other institutions such as Avinashilingam Institute, Annamalai University, Bharatidasan University, NGOs and professional as-

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sociations. The themes were burdenless education and gender issues. Resource support was provided to a series of one-day advocacy meetings on burdenless education conducted by the Indian Academy of Paediatrics. Similarly, support was provided for the training programme for supervisors of creches, organised by TN-FORCES and the training organised by the southern region of the network. Resource persons from the Southern Region helped to prepare new games and examine locally available games for children and to utilise these resource materials to train ECCE teachers. Fifty games have been identified for use by teachers and compilation and editing is in progress. Two material development workshops were held to devise more creative activities to enrich and nourish the children's imagination.

A resource person from Calcutta was invited to conduct workshops on teaching aids based on low-cost / no-cost materials and to learn more about the innovative uses of indigenous crafts. Six institutions from Madras and one each from Madurai and Coimbatore participated. All the institutions have started using these techniques in the class room as well as in their ECCE training. Apart from this, the project has also supplied lists of resource persons from its database for training programmes to be conducted by other organisations - both NGOs and Government.

Communication Support

The project has also been providing communication support to others concerned

with the same issues. A booklet brought out by NCERT about the burden on the pre-school child was translated into Tamil and prepared, illustrated and made ready for printing. DTERT is expected to publish it. This would provide excellent advocacy material to reach parents and school managements. Another unique activity was the preparation of a collection of folk tales suitable for children collected/written by child care workers. After being critiqued and edited by a panel of experts it is now being published serially in the Newsletter of Tamil Nadu Integrated Nutrition Project, which reaches about 30,000 child care workers in Tamil Nadu.

A report on the campaign against the burden on the pre-school child and its impact was presented in a Seminar on *Role of Professional Organisations for Advocacy in ECE* conducted by NCERT in February 97. The strategy was appreciated and requests for assistance in similar activities have been received.

Communication support for a project of the Department of Social Welfare, Government of Tamil Nadu, called "Improved Services for 0 - 3 years children" in Nagapattinam was another major activity. As very young children must be reached at home, training imparted to mothers, family members, and elders, and creating public awareness especially among community leaders, assume great significance. Communication which can reach the people is essential to strengthen the informal support systems. To develop a wide range of communication materials a workshop was conducted in February

1997 for artists, mediapersons, folk performers and subject matter specialists as well as supervisors, trainers, teachers and mothers. Sixteen crucial messages were identified and worked into different forms like *villupattu*, folk songs, video spots, drama, puppet shows, radio play and visuals. Work is continuing with the involvement of both TINP and ICDS and the final products will be available later this year for dissemination.

Information Support (database)

The project continues to receive requests for information on resource materials, training, resource persons and technical support. On an average about 20 requests are received over the phone every month and over a hundred written requests have come in, asking for information about ACCESS publications and videos. Queries about alternative schools and preschool educational materials for improving the quality of schools or starting preschools are also being received.

To fulfil information needs a database that currently contains information on resource persons and alternative schools has been developed. The database on resource persons profiles 196 persons, and is being actively accessed by educational institutions / organisations all over Tamil Nadu for their training programmes and workshops. The database on alternative schools in Chennai and other districts of Tamil Nadu currently stands at 35.

Resource Material Support

A key area of strength has been the production and dissemination of resource

material on issues related to women and young children. The materials have been distributed to a wide variety of clientele including Govt. Departments, NGOs, training institutions, women's organisations, academic institutions, media, politicians, professionals, consultants, resource persons and others. Mailing lists according to the various constituencies have been developed over the years for the purpose of dissemination. A major portion of dissemination is based on requests.

**Sub Programme Area 402
Smt. Uttara Devi Chair /
Resource Centre for Gender
and Development**

The Smt. Uttara Devi Chair/Resource Centre for Gender and Development has been set up as an endowment by the family of the late Smt. Uttara Devi, wife of the late Dr.B.V.Rao, Founder-Chairman of Sri Venkateswara Hatcheries. The Chair/Resource Centre began functioning informally from October '96, and is to be formally inaugurated in September 1997. The Centre is expected to provide an interactive collaborative framework to include the gender dimension in all our efforts and help to develop a new interface between research and social intervention.

A Directory of academicians involved in Gender Studies in Tamil Nadu was considered essential to form a base for broad-based activities. The compilation is over and editing is in progress. This is the beginning of a data-base of persons involved in Gender Studies in Tamil Nadu.

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A national level brain-storming workshop on gender concerns, in varied areas such as Agricultural Technology, Biodiversity and Culture & Communication, which was originally planned, is now being conducted in stages. To begin with it was decided to concentrate on Biodiversity alone, and to participate in the preparation of the report on *Gender Dimensions in Biodiversity Management* being undertaken by the Foundation. The Centre was involved in the formulation of the report and in the workshop for finalising it in June 1997. Another national level workshop is planned for September '97, on the theme, *Gender and Development : The Research Action Interface*. A need to incorporate gender concerns in all the on-going projects of the Foundation was felt. An in-house seminar in December '96 and several informal discussions have been held, and a workshop for formulating a gender-sensitive plan of work in all projects was felt important.

A workshop on *Gender Dimensions in Community Livelihood Strategies* was organised at the Foundation by the staff of the Uttara Devi Chair for Gender and Development, taking advantage of the presence of those attending the national-level brainstorming session on *Gender Dimensions in Biodiversity Management in India* to conduct the in-house self-reflexive workshop.

The purpose was to assess the extent to which gender and other social dimensions have been incorporated in the three main projects at the Foundation which have a bearing on community livelihoods (i.e. Eco-Technology, Biovillages and Coastal

Wetlands Management), and to map out future directions. Besides in-house participants representing the three projects, several resource persons contributed to the discussions.

The objectives, scope, approach and strategies of the three projects were presented and queries relating to gender roles and relations and dynamics of the process were raised.

The discussions centred on :

- Definition of gender perspective;
- Attitude towards the community and towards women in the community fabric;
- Human issues and their relationship to questions of natural resources, technology, etc.
- Awareness, strategies and mechanisms to counter vested interests;
- Women's workload in relation to technological intervention;
- Women's access to and control over credit, resources and income;
- Withdrawal strategies of the projects and implications for continuity and impact.

There were also specific discussions concerning each project in particular.

Certain suggestions for the functioning of the Chair for Gender and Development emerged :

1. Formation of a Task Force to make sure that gender perceptions run in and through the projects of the Foundation;
2. Training programmes for gender awareness and sensitivity;
3. Input into evolving methodology to assess and evaluate *gender dimensions*.

Sub Programme Area 403

Voicing Silence

Voicing Silence entered its fifth year with the support of The Hunger Project and HIVOS. The activities included performances and productions, networking, training and using theatre as a resourceful research tool in drawing out women to express themselves.

Performances

a. *Pacha Mannu*

A street play in the interactive mode on the theme of female infanticide, this play was developed in November '95 and taken on a 50-show rural *jatha* in the summer of '96. An invitation was received to perform it in the colleges and villages within Manonmaniam Sundaranar University as part of an orientation programme on the status of women in India. In October 1996 *Pacha Mannu* was performed in eight places, covering the three districts of Tirunelveli, Nagercoil and Tuticorin. Though the play was essentially designed to be performed in areas where the practice of female infanticide/foeticide was recorded, it was found to be a useful educational tool to raise questions on women's awareness of their own value and self-estimation.

b. *Mauna-k-kuram*

This play, a challenge to patriarchal values and cast in classical form, was revived after a gap of almost two years for the National People's Theatre Festival organised in Chennai by Chennai Kalai Kuzhu

from 11-15 February, '97. *Mauna-k-kuram* was performed on February 13, 1997 at Kalaivanar Arangam and received wide acclaim in both the Tamil and English press. Invitations for performances are still being received.

c. *We Also Make Babies*

For the first time *Voicing Silence* tried its hand at a quasi-English production for the UNDP Asia - Pacific Women Scientists Meet on Women, Science & Technology held in Chennai in December '96. This playlet raised the concerns of a common woman regarding technological innovations, the economy and attitudes of the scientists. Set in an exaggerated parodic mode, it touched upon many sensitive issues and was later repeated for an in-house presentation. The show was, as usual, developed through collective discussions and improvisations. Participation of members from the other projects of the Foundation was a new dimension.

Networking

Kulavai '97: Workshop with Women Stage Artistes of Tamil Nadu.

Taking up where *Kulavai '96* left off, *Kulavai '97* was organised at the Tamil Nadu State level. For the first time, professional actresses in Tamil Nadu, from different genres and different parts of the State, came together to discuss both their lives and their professional careers. Five women from '*Isai Natakam*', eleven from '*Novels*', one from *Sabha Natakam* and five from experimental theatre in Madras par-

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ticipated in this workshop, along with members of *Voicing Silence*. A unique event was the all-women *terukoothu* performed by the women's troupe of Kattai Koothu Kalai Valarcci Munnetra Sangam, Kanchipuram. *Kulavai '97* was co-sponsored by Tamil Nadu Iyal, Isai, Nataka Manram, International Institute of Tamil Studies and Kattai Koothu Kalai Valarcci Munnetra Sangam. This workshop highlighted the contribution of women to the stage and also brought out some specific issues common to this community of women.

Theatre as a Research Tool

a. Workshop with Dalit Women

Working on the premise that differences among women ought not to be brushed aside, *Voicing Silence* has planned to have workshops with different communities of women, to enable them to express their concerns through theatre. Dr. M. Jeeva of Pondicherry School of Drama had been assigned the task of working with Dalit Women to evolve a play based on their experiences and expressions. A preliminary workshop was held in Cheranmahadevi in January '97 and a six-day workshop to produce the play was held in April 1997. The new play thus developed was first staged for a largely Dalit audience on April 14, 1997, and will form the repertoire of *Chemmani* troupe of Tirunelveli. It is a new phenomenon in the field of theatre to initiate, put together and produce a play based on the life-experiences of a specific community of people, providing support and respecting the autonomy of the group.

b. Productions

Two plays are in progress right now.

A translation into Tamil of Shaonli Mithra's well-known Bengali play on the life of Draupadi, *Nathabati Anathobat* which is being published by *Katha*, was produced as a joint effort of *Voicing Silence* and *Palkalai Arangam*.

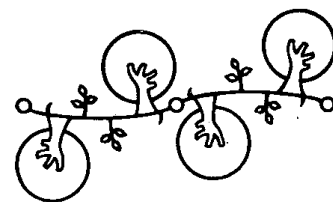
Work has begun on *Avvai*, one of the most famous women *Sangam* poets in Tamil. This play will attempt to introspect our notions of knowledge, youth and diplomacy by putting into question the common construction of *Avvai* in Tamil psyche as an old lady. The poet 'Inquilaab' is working on the text. For the first time *Sangam* poetry will find theatrical expression in Tamil.

Documentation

Kulavai, an hour long documentation of *Kulavai '96*, was directed by Mini Hari. 19 copies have been distributed. *Pacha Mannu*, a 20 minute documentary about the interactive process around the play *Pacha Mannu* in the field has also been directed by Mini Hari. There has been a steady demand for this film for educational purposes and 10 copies have been distributed.

An archival documentation, in both audio and video, on Women Stage Artistes of Tamil Nadu has been completed. The material is being shared with International Institute of Tamil Studies and Tamil Nadu Iyal, Isai, Nataka Manram, and is also available to other scholars.

Programme Area 500



Education, Communication, Training and Capacity Building

*U*nder this programme area, a wide range of training programmes, seminars and workshops were organised. The Annual inter-disciplinary dialogue was on the theme, "Building Partnerships for Sustainable Food and Livelihood Security". Databases, particularly the Farmers' Rights Information Service, were reorganised to promote improved access.

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Sub Programme Area 501 Training Programmes

Training Programmes in Biodiversity Management

The primary responsibility of conservation of biodiversity rests with the Government, but various community organisations and NGOs also play an important role in preserving this unique heritage. They function as vital catalysts at the community level and act as a link between official agencies and communities. To further this end, an NGO network was formed through Trainers' Training Programmes. So far, 5 programmes have been conducted in different NGO Centres and Institutions in Tamil Nadu and Kerala.

The Sixth Trainers' Training Programme

This programme was conducted at Arya Vaidya Sala, Kottakkal, Kerala from 8 - 12 November, 1996. Participants were selected from 33 NGO's operating in the state of Kerala. The major thrust was on conservation and sustainable utilisation of medicinal plants. The programme was inaugurated by Dr. M. S. Swaminathan and Dr. P. K. Warriar, Chief Physician and Managing Trustee, Arya Vaidya Sala. Dr. Swaminathan, while explaining the theme of this training programme to the participants, lauded the role of AVS in bridging the gap between conservation and utilisation, with the involvement of local people, in the sustainable harvest

of biological resources. He pointed out that our country is one of the 12 mega diversity countries. It has two hot spot areas namely, the North-Eastern Himalayan Region and Western Ghat Region. He discussed the various threats to biodiversity and mentioned the efforts taken during the Silent Valley conservation movement against the construction of a dam in the 1970's.

Dr. P. K. Warriar, in his Presidential Address, stressed the need for scientific utilisation of biological resources in a sustainable manner. Mr. T.M. Manoharan, CCF (Vigilance), Kerala enumerated the benefits of the diversity of biological resources to mankind and other living organisms and stressed the need for conservation.

The curriculum of the course was carefully formulated by experts and 21 subjects were selected, in keeping with the theme of medicinal plant conservation and the overall emphasis on biodiversity conservation. Several experts from universities, institutions and NGOs were invited to deliver lectures and conduct a participatory programme to bring home the concept of Biodiversity Conservation. The course was conducted in the vernacular language to make it meaningful and purposeful.

The participants were taken to Arya Vaidya Sala factory and subsequently to the medicinal plants farm at Kottapuram and Kanchirampuzha forest of Palakkad district. They were able to study the cultivation of medicinal plants in a large area, the cost benefit

ratio, identification and propagation of important medicinal plants and the need for establishing herbal gardens at the household level.

The participants were requested to send their proposals to conduct grass root level training programmes for women, school students and youth in their respective areas.

As a continuation of the programme, seven NGOs were selected to conduct a grass root level training programme and requested to send their proposals. Of these, the Society for Environmental Education in Kerala (SEEK), Edat, and the Centre for Overall Development, Kozhikode, were chosen to conduct the BDC Training Programme for rural women, youth, farmers and school students in their respective areas. Around 80 participants were exposed to traditional medicinal knowledge through the programmes.

The Seventh Trainers' Training Programme

The programme was conducted from 25 to 29 January 1997, at Krishi Vigyan Kendra, Gandhigram Rural Institute, Gandhigram, Tamil Nadu. Representatives of 32 NGO's from the southern districts of Tamil Nadu participated. Mr. S. John Joseph, Programme Director, explained the role of NGO's in biodiversity conservation and the necessity for conducting training programmes. Mr. Chandramoorthy, District Collector, Mannar Thirumalai District, delivered the keynote address on

biodiversity conservation and stressed the need for awareness of the importance of biodiversity among government officers.

The curriculum was similar to that of the earlier course. Field trips were conducted in the morning on two days, and one full day trip to Sirumalai forest was undertaken to enable the participants to learn, to identify plants and to introduce them to the concepts of biodiversity, plant species and their association, ethnobotany and tribal knowledge. A Sacred Grove deep inside the forest enabled the participants to realise its role in biodiversity conservation. Tests, including the production of a play, were used to assess the extent of comprehension and assimilation.

Grass Root-level Training Programme on Biological Diversity Conservation

Consequent to the Seventh Trainers' Training Programme, several proposals to conduct grass root level training programmes were received and 8 NGO proposals were selected for collaboration and support.

In the first schedule, four non-governmental organisations, namely: Institute for Development Exchange (INDEX), Thirumangalam, Madurai District; Institute for Youth and Development (IYD), T. Andipatti, Madurai District; Anthodaya, Palamedu, Madurai District; and Grama Reconstruction and Extension Trust, Natham, Dindugal Anna District, conducted grass root

level training programmes on Biological Diversity Conservation for rural women in collaboration with our Foundation during 18-30 April 1997. 160 women and 35 panchayat leaders participated in these training programmes.

Technology Resource Centre (TRC) for Training in Ecotechnologies

Strategy

The Technology Resource Centre (TRC) came into existence with the help of CAPART and aims at creating a corps of trainers who have participated in capacity building programmes in various dimensions of sustainable development. Capacity building believes in horizontal (farmer to farmer) transfer of knowledge which is vital for self-replication of various technologies and models. The entire process is based on the principles of interactive learning where new dissemination strategies for the deployment of new ideas are anticipated to evolve spontaneously.

Adaptive Participatory Research is a strategy which is used in developing ecotechnologies for sustainable development. It focuses on evolving ecotechnologies and helps in defining the framework for managing the technologies. Testing of input-accessibility (procurement of raw materials and inputs), market linkages, financial viability are some of the important aspects of Adaptive Participatory Research. The resource persons of TRCs evaluate the technologies through "learning by doing".

Thus training is the *core activity* in the TRC of MSSRF and is characterised by *interactive learning* and *learning by doing*.

Capacity building takes place through a specific process. Potential resource persons are identified in grass root non-governmental organisations. *Specific emphasis is given to representatives of farmers associations and farmers groups*. TRC adopts various methods (Table 5.1) after identifying a potential resource village where the technology may be relevant.

Table 5.1 : TRC methodology

Phase	Activities
Mobilisation	Socio-cultural activation, conscientization, understanding each other
Organisation	Identifying the organisation types, helping the communities to build organisations
Training	Interactive learning, Learning by doing
Technical Support	Making the technology work
System Management	Co-ordinating for extension, interlinking resource persons with various extension agencies

Education, Communication, Training and Capacity Building

Objectives

- to enhance the capacities of people through training of trainers belonging to government and non-governmental organisations and farmers associations
- to undertake participatory technology development and dissemination for the rural poor in various project areas
- to conduct need based adaptive research and development
- to develop and disseminate databases on ecological farming methods and on the intellectual property rights of tribal and rural women in the area of genetic conservation and enhancement

Resource Persons and Resource Villages

The focus is also on creating resource villages i.e. a set of resource persons for a specific theme from a specific village. Such an arrangement will not only help in better interaction among the resource persons, but also help in creating linkages with industries, universities and extension organisations. Information about resource persons would be made available to NGOs, Extension agencies, Government departments and other institutions which are involved in agriculture and rural development. The operational base for TRC is entire Tamil Nadu. However, it is also looking for opportunities to

extend its ideas in the adjoining regions such as Kerala and Karnataka.

A network among the resource persons is being developed. Such a network would help in effective participation in training programmes, demonstration and extension. Apart from the technologies and issues of sustainable development, the resource persons are also trained in communication. In addition to the three-week training programme, resource persons are expected to be a part of Participatory Adaptive Research projects for a period of one to three years.

Projects

The projects launched by the Centre (Table 5.2) offer the training grounds for the capacity building process. These projects are managed directly by the staff and help in developing a strong linkage between adaptive research and capacity building.

Integrated Pest Management

Theme

In India, 15 to 40% of crop losses are caused by pests, diseases and weeds. Integrated Pest Management (IPM) has been developed for major crops in India. Biopesticides, which play a major role in IPM, are always in short supply and farmers do not get them in time. Plant extracts from neem, *Vitex negundo* play a major role in IPM, and the production process of these biopesticides at the farm and at the household levels has been refined.

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Table 5.2 : *Projects launched by TRC*

Area of Training Programme	Adaptive Research Project
Integrated Pest Management	Farm-level Biopesticide Production
Biodiversity	Biopesticide Feed Stock Model- Neem Village
Biodiversity	Drumstick Seeds to Purify Drinking Water from Fluoride
Water Harvesting	Water Harvesting & Pulse Village Projects
Biodiversity	Integrated Intensive Farming System-Demonstration and Extension
Informatics	Multimedia packages in Tamil for sustainable agriculture

Resource Village

Vadugapatty village near Periakulam of Theni district. Tamil Nadu

Pre-training Phase

Every training programme is preceded by a pre-training phase, in which mobilization and organization of the community at the Resource Village take place. The traditional betel leaf cultivation and the traditional pest management systems were identified. An informal organizational structure was formed to implement the project.

Number

Twenty six farmers and representatives from farmers associations and one field officer of the Agriculture Department were the trainees.

Selection

TRC requested the village community of Vadugapatty to sponsor the prospective resource persons and the trainee farmers and the representatives of the farmers associations were selected on

the basis of the suggestions from the village community.

Training

An introductory session was organized at Vadugapatty for three days with scientists, farmers and representatives of the Agriculture Department. The pattern of interaction between the scientists and the participating farmers was designed during this session. Each participant was provided with the minimum infrastructure required for biopesticide production and given training for 21 days, at the end of which they were able to produce the biopesticides at the farm and household level.

Impact

Between July 1996 and January 1997, the trainee farmers produced the following biopesticides (Table 5.3) which were applied in the cotton fields.

Out of 100 acres of cotton fields which are under integrated pest management, nearly 52 acres are covered with farm-produced biopesticides.

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Table 5.3 : Biopesticides produced

Biopesticides	Application in cotton fields (in acres)
<i>Trichogramma spp.</i> ,	18
Plant Products	28.5
NPV	6

Future

The participants are still involved in the production of biopesticides and the project is probing the possibilities of market linkages for biopesticides which are produced at Vadugapatty.

Soil Health Management

In order to develop a base for seed production with a healthy soil management practice, a training programme for a set of farmers and NGOs was held. Table 5.4 has the salient features of this training programme.

Pre-training Phase

During this phase, the land-use pattern and practices of different types of farmers were analysed. Production of hybrid seeds was not practised in these villages before our intervention. The farmers were involved in producing gerkins (a variety of tiny cucumber) which was consuming very large quantities of chemicals and pesticides, but feared hybrid seed production as a technology involving large input of chemicals. These contradictions were pointed out in the pre-training phase. Discussion took place between TRC and *Uzhavar*

Table 5.4 : Soil health management training programme - features

Theme	Seed production with improved soil management
Parent Programme	Seed Village (SPA 302)
Resource Village	Kannivadi and surrounding villages (Oddanchatiram Block, Dindugal, Tamil Nadu)
Mode of selection of trainees	<i>Uzhavar Manram</i> (Farmers' Association) of Kannivadi selected the trainees
Number of trainees	23 farmers & 2 Village Officer representatives
Duration	21 days
Impact	In 50 acres urea application declined from 100 kg per acre to 25 kg per acre

Manram (Farmers' Association) of Kan-nivadi for defining the training packages. Gandhigram Rural Institute and its Krishi Vigyan Kendra also took part in defining the training package.

Training

The programme was conducted at Krishi Vigyan Kendra of Gandhigram Rural Institute. The training programme began with stressing the need for quality seed production. The participants were given training in various types of seed production and emphasis was placed on hybrid seeds. Market linkages and price were the major issues which were discussed during the programme. Soil health and biodiversity were the other important aspects covered under the training programme. It was decided that only less than an acre of land would be involved for each farmer in seed production, so as to ensure a minimum amount of agricultural biodiversity. It was also decided to focus on farm yard manure for fertilizers and to use integrated pest management practices in seed production. Various types of soil management including ploughing and crop rotation vis-à-vis seed production were discussed. The participants were involved in the "Seed Village" Project and training was given in the field. The participants went through the process of seed production and soil management and most of the training was conducted in the participant farmers' fields.

Impact

Nearly 50 acres of seed production have been brought under better soil management practices. Seed companies have been recommending 100 kg of urea per acre, whereas the farmers have been applying only 25 kg urea per acre and substituting the rest with organic manure. Similarly, chemical pesticides have been replaced with integrated pest management. Due to these practices, the cost of cultivation has been reduced considerably.

Ecohorticulture

As a part of the ecohorticulture project, low-cost mist chambers (using HDPE) which could help in developing backyard ecohorticulture (SPA302) have been developed (Table 5.5). The technology does not require chemical fertilizers or pesticides. A series of houses following backyard ecohorticulture would provide the economies of scale for market and prices. The TRC focused on the need for resource persons who could train the small farmers and landless women in construction and use of low cost mist chamber. The low-cost mist chamber has also the potential for bringing hybrid seed production to the backyard of landless households.

Pre-training Phase

An internal review of the ongoing ecohorticulture project provided the base. The field supervisors of the ecohorticulture project who were trained ear-

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Table 5.5 : Ecohorticulture programme - features

Theme	Construction and use of low cost, backyard chambers by women in landless households and small farmers
Parent Programme	Ecohorticulture (SPA 302)
Resource Village	Kattupakkam, Chengalpettu District
Mode of selection of trainees	Farmers - who were field supervisors in the early years of the project; Village Officers - based on their interest
Number of trainees	23 farmers and 2 Village Officers
Duration	21 days
Impact	2 participants have built their own mist chambers after the programme

lier in broad topics, were chosen for the training programme. The design for the training programme was defined. It was based on the concept, *training through evaluation*. In this design, the participants would regularly evaluate the performance of the mist chamber through adaptive participatory research. Thus, while the technology is being refined for field conditions, the project would have also contributed a set of resource persons who could spread the use of low cost mist chambers.

Training

The initial training was given at the Krishi Vigyan Kendra, Kattupakkam. During this programme, the need for backyard ecohorticulture was discussed. The problems of organic farming were analysed from the farmers, perspective. The concept of low cost mist chamber was introduced and is-

sues such as composting, concepts like UV-rays, bacteria, fungi, communication and extension were also discussed. The participants were trained in erection and management of mist chambers and developed an evaluation format for observing growth, soil health and water regime inside a mist chamber. The participants themselves laid a control plot for comparative purposes.

The following voluntary organisations are our collaborators: SEEYEMS at Acharapakkam, MERG at Gokulapuram, Kattupakkam and SEDS at Endhathur near Uthiramerur. TRC of MSSRF has helped in building a low cost mist chamber at TRC, Vivekananda Kendra, Kanyakumari.

Impact

The participants have acquired substantial knowledge of low cost mist chambers and have developed the skill

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for erecting the mist chambers. Two of the resource persons have already built their own mist chambers. During 1997-98, these resource persons would be utilized in the training programmes.

Water Harvesting

The project aims at proving the economic value of water harvesting, by linking the concept to pulse productivity (Table 5.6). It is envisaged that surface water harvesting and recharging the ground water through recharge pits would help to improve the productivity of pulses.

Pre-training Phase

Through participatory rural appraisal (PRA), the project staff requested the village community to sponsor farmers from the villages. This project is being

implemented by two voluntary organizations, RENAISSANCE in Pudukottai and SPEECH at Thiruchuli. These grassroot voluntary organizations interacted with the villagers and studied the traditional water harvesting practices. The needs of the villagers were also discussed. The training structure was designed through PRA.

Training

The initial training programme was for three days. During this phase, the broader concepts were discussed. Water harvesting structures, recharge pits, "low-input high-value crops", measurement of productivity in terms of per unit consumption of water were the main themes put forward in the programme. The participants were trained in their own fields and were guided in estimation of absorbing evaporation and seepage losses.

Table 5.6 : Water harvesting programme - features

Theme	Surface water harvesting and recharging ground water to improve productivity in pulse cultivation
Parent Programme	Pulse village (SPA 302)
Resource Village	Visalur (Pudukottai District) & Kavadiatti (Ramanathapuram District)
Mode of selection of trainees	Village Committees through PRA
Number of trainees	20 farmers and 2 representatives from the collaborating Village Officers
Duration	21 days
Impact	More than 80 acres of uncultivated land lying fallow for the past 15 years have been brought under cultivation

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Impact

More than 80 acres of uncultivated lands which have been lying fallow for the past 15 years have been brought under pulse production.

Biodiversity Conservation

Biodiversity is a very broad concept and any training without specific focus would have only limited impact. Hence it was felt that the training programme should focus on specific themes (Table 5.7).

Pre-training Phase

During this phase, TRC interacted with various NGOs in Tamil Nadu to identify their needs in terms of development perspectives in the subject of biodiversity. These interactions took place in various meetings organized by Universities, NGOs, and government departments. Three specific areas were identified for the purpose of training : agrobiodiversity in irrigated regions, agrobiodiversity in tribal regions and coastal biodiversity. During 1996, these activities and their locations were identified, and the training programme will be undertaken during 1997, in

which 80 participants will be trained as resource persons (20 persons as per 1996 programme and 60 persons as per 1997 programme).

The following projects would form the forum for capacity-building in biodiversity:

Neem Village Project at Pudupatty

This project emphasises the need for propagating neem from plus trees, various methods of propagation, usage of VAM and *Azospirillum* and advantage of scale in production.

Integrated Intensive Farming Systems at Chidambaram

This project is an attempt to show that agrobiodiversity is a profitable agriculture.

Informatics for Rural Development

Computers are still considered as urban phenomena, but computers and informatics have vast potential in the rural sector. Agriculture, forestry, fishery, etc., are complicated decision making processes which involve hundreds

Table 5.7 : Biodiversity conservation programme - features

Theme	(a) Need identification (b) Identification of suitable participants
Parent Programme	Neem Village project; Integrated Intensive Farming Systems project (both reported in SPA 302)

Table 5.8 : Informatics for rural development programme - features

Theme	Exposure to role of computers in rural development
Parent Programme	IPM

of dynamic variables. A user-friendly computer system can help in taking decisions for rural development. The project (Table 5.8) envisages the training of participants who will popularise the use of informatics in villages.

TRC is at present involved in developing a multimedia package in Tamil which will focus on Integrated Pest Management. This software package can be introduced only after field testing. TRC is also planning to bring out a computer database system for a crop production guide in Tamil before the end of this year and is probing the possibilities of translating the packages into Telugu and Kannada.

A Network of NGOs

The Centre is actively involved in networking activities. At the national level it has been involved in the network activities under the purview of Centre for Technology and Development, New Delhi. It is publishing Tamil and English newsletters for VOs and farmers associations.

A three-day workshop for VOs in Karnataka was organised between 20 and 22 January, 1997. Dr. Gangaia from CAPART, Hyderabad led the workshop. The workshop focused on devel-

oping sustainable projects at village levels. The workshop was organized in co-operation with TRC Vivekananda Kendra, Kanyakumari and the Vivekananda Kendra, Bangalore. Twenty six representatives of various VOs from various parts of Karnataka and Andhra Pradesh participated in the programme.

With the support of Government of Tamil Nadu, the TRC organised a workshop in which more than ninety farmers and VO representatives participated. During this workshop, the role of farmers as resource persons was discussed. Multimedia computer as an extension tool was also discussed. This workshop facilitated sharing of information between VOs and farmers.

Both workshops helped in developing a network among VOs and the TRC.

A perspective plan for organic farming was developed in collaboration with the Murugappa Chettiar Research Centre, Chennai; Vivekananda Kendra, Kanya Kumari; Centre for Indian Knowledge Systems, Chennai; and the Institute for Organic Farming & Rural Technologies, Pune. This plan was presented to CAPART to develop a plan of action for supporting organic farming all over India.

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The major partners in the interactive learning process of TRC of MSSRF are the following Voluntary Organizations (VOs) :

SPEECH from Thiruchuli, Kamara-
jar district, Tamil Nadu

RENAISSANCE from Pudukottai
district, Tamil Nadu

Gandigram Rural Institute

VIDIYAL from Rasingapuram, near
Bodi, Tamil Nadu

SEEAIMS from Chengalpettu Dis-
trict

Society for Social Forestry Research
& Development, Tamil Nadu.

Staff and representatives from the above institutions took part in the training programmes and adaptive research activities. In addition to the above institutions, TRC at MSSRF has been interacting with Murugappa Chettiar Research Centre, Chennai, Centre for Indian Knowledge Systems, Chennai, TRC, Vivekananda Kendra, KanyaKumari, Centre for Organic Farming and Rural Technologies, Pune.

The most important partners in the process are the farmers associations. The following associations are associated with TRC of MSSRF:

- *Uzhavar Manram* (Farmers Associ-
ation), Kannivadi
- *Vettilai Kodikarar Sangam* (Betel-
vine growers Association), Vaduga-
patty

- Cotton Growers Association, Sriran-
gapuram

These bodies are registered and they have tremendous potential in transferring new knowledge since the members are farmers and their activities are focused towards agriculture extension.

One of the most important achieve-
ments is the evolution of the following
local level institutions :

- Water-harvesting and Pulse Grow-
ers Associations, Kavadiipatti, Ram-
anathapuram
- Water-harvesting and Pulse Grow-
ers Associations, Visalur, Pudukot-
tai
- Neem-Tree Growers Association,
Pudupatti, Dharmapuri

These associations are being registered and will develop into sustainable and effective VOs.

In addition to the above activities, the staff participated in deliberations of institutions such as the Confederation of Indian Industries (CII) and stressed the role of the corporate sector in understanding the problems of alienation due to corporate farming. The plea is for contract farming in which farmers are not alienated from their lands.

Training Materials

The following materials have been pub-
lished in Tamil and distributed to re-
source persons :

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- i. *Farm-level Biopesticide Production*
- ii. *When Red-Gram Flowers*
- iii. *Posters on various methods of composting*
- iv. *Agrobiodiversity*

The network programme includes the English quarterly "Technology Centre - Newsletter" and a wall paper newsletter *Soozhiyal Nutpam* (Ecotechnology), a bimonthly in Tamil, which reaches nearly 1000 NGOs, farmers associations and government departments.

Sub Programme Area 502 Workshops and Conferences

The Foundation has always emphasised the use of scientific and thematic conferences and workshops as the preferred method to design or finalise action-research programmes. During 1996-97, nearly 70 days were devoted to local/national/international meetings, with the broad purpose of evolving scientifically clear, workable field projects. A number of seminars, featuring speakers from within the Founda-

tion, as well as distinguished visitors, were organised to provide exposure to emerging concerns and topics in areas where the Foundation has interest and expertise. Providing interface across disciplines towards improving comprehension of issues has been the principal concern of all the meetings.

World Science Academies Summit on Food Security (July 8-11, 1996)

The major goal of the Science Academies summit was to articulate the viewpoints of scientists on the issues of discussion at the World Food Summit organised by the FAO in November 1996. This meeting was co-sponsored by the National Academy of Agricultural Sciences of India, the Italian National Science Academy and the Third World Academy of Sciences, and financially supported by the Government of Italy, the FAO, the UNDP and the Encyclopaedia of Life Support Systems. Invited experts and representatives of 26 academies participated in the Summit, which was inaugurated by the Hon. Mr. Chaturanan Mishra, Minister for Agriculture, Government of India. Excerpts from the keynote addresses in the Summit are provided in the accompanying box.

World Science Academies Summit on Food Security Excerpts from Keynote Addresses

A.Z.M. Obaidullah Khan, Assistant Director-General, FAO

- Contextualized in the local ecosystem, community conservation facilitates continuous adaptation to changes, to both biotic and abiotic stresses, and most importantly, to farmer selection. The creator, custodian and end user of PGR is one.

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Elizabeth Dowdeswell, Executive Director, UNEP

- As military threats have subsided or disappeared, other threats, especially environmental ones, have emerged with greater clarity. It is thus possible to argue that environmental care is an essential component of national or international security.
- Agricultural productivity and ecosystem conservation need not be mutually exclusive goals. The methods and policies that we use to increase agricultural production in the critical years ahead, must also guarantee the long term viability of our ecosystems.

Ismail Serageldin, Chairman, CGIAR

- It is wrong to suggest that the North can grow all the additional food required. On the contrary, discussions in CGIAR have emphasised that the bulk of new production must occur in the South.
- In the 19th century, there were abolitionists who found slavery unconscionable and their moral outrage led to abolition of slavery. We need abolitionists of this century, of a new kind. We must be outraged at the fact that at least 750 million people go hungry every night, and that women suffer considerable inequity and poverty, and the beautiful environment, our Mother Earth, suffers great tragedies.

Adnan Badran, Deputy Director-General, UNESCO

- The achievements of India and China in the last two decades are a powerful sign of how the human mind can face these problems, and demonstrate why development of human resources in science is important in providing food self-sufficiency.

Y.K. Alagh, Union Minister of Planning, India

- Those inventions that have been handed down to us by our forefathers, are a part of our common heritage. We need to evolve a system which can prevent others from claiming property rights, and yet have the technologies freely available for our own people.

Chaturanan Mishra, Union Minister of Agriculture, India

- Achieving self-sufficiency has been the over-riding goal of India's agricultural development. The country has more than doubled the foodgrain production from the mid-sixties to 1995-96. However, due to an increasing population, India will have to add annually 6 million tonnes of foodgrains to sustain the present level of sufficiency.

Workshop on Biovillages for Biodiversity Conservation and Eco-development (August 18-20, 1996)

The UNESCO, the UNU and the Third World Academy of Sciences have been operating the programme "South-South cooperation for sustainable development in the humid tropics" since 1992. Under the auspices of this programme and with the support of UNESCO a special workshop was held for seeking a first hand experience of the biovillage programme and to explore its possible use in enhancing and sustaining the livelihood security of the human population living in the vicinity of the biosphere reserves.

The special workshop on "Biovillages for biodiversity conservation and development" had the broad goal of seeking a first-hand experience of the biovillage programme of the M.S. Swaminathan Research Foundation, and its possible use in enhancing and sustaining the livelihood security of the human population living in the vicinity of biosphere reserves. Prof. M.S. Swaminathan who made the opening remarks, pointed out *the importance of conservation and development as twin goals, and stressed the need for setting high priority for the creation of "eco-jobs" in the developing countries, as the best method of integrating conservation with development.* The biovillage programme is one approach to the creation of eco-jobs.

The workshop was attended by 9 international experts (from Brazil, China,

Colombia, Ghana, Madagascar, Malaysia, Mexico, Nigeria, Thailand) and 12 Indian participants. During the first day, staff members of the MSSRF presented the work of the Foundation with particular emphasis on the biovillage concept. The second day brought the UNESCO team to the biovillages in the Pondicherry Territory near Madras where the operational activities of the Foundation could be visited. The local population participated enthusiastically in the project.

On the third day, the international participants presented case studies of their respective countries with regard to the biovillage approach and biodiversity conservation alternatives in the humid tropics. South-South Co-operation was emphasised as being a very important tool for immediate exchange of information and know-how and for technology transfer.

Finally, a set of follow-up activities were decided upon :

- Joint study on land resource use and sacred groves (Ghana/India).
- Comparative study on traditional land use (Brazil/India).
- Exchange of technical staff for study on rice production (Madagascar/India).
- Information exchange on computer systems (UNAMAZ-SIAMAZ/MSSRF).
- Joint study on participation of local population in biodiversity conservation (Ghana, Nigeria, Mexico).

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- Project on eco-city (Brazil/China/India).
- Training in biodiversity conservation (Nigeria/Madagascar).
- Joint study on mangrove ecosystems (Madagascar/India).
- Hardware support for a biosphere reserve (Nigeria).
- International workshop on "Multiple resource and land use planning for ecodevelopment in biosphere reserves" (Xishuangbanna, China, November 1997).
- Project on mangroves in view of eco-aquaculture (MSSRF).
- Project on formulation of Nilgiri BR for international recognition (MSSRF/WWF-India/IIPA).

Women in S&T and S&T for Women (Meeting of the Resource Group of Women Scientists and Technologists in the Asia-Pacific Region : 17-19 December 1996)

The World Conference on Women (Beijing, 1995) drew attention to the growing feminisation of poverty and to the marginalisation of women in technical professions. The Foundation's emphasis on adding value to women's work through technological and information empowerment acquires fresh significance in this context. To develop an agenda for action both for enlarging the role of women in S&T and in harnessing S&T for women, the UNDP, the UNIFEM and the Foundation organised a three-day meeting of leading

women scientists and technologists in the Asia-Pacific. Dr. Nay Htun, Assistant Administrator of UNDP, who inaugurated the workshop, outlined a three-component approach that the deliberations would focus on : identification of S&T at the cutting edge that would increase the income of women in poor households with innovative systems of access; the appropriate combination of micro-enterprises and micro-credit; and, enabling access of women to information and technical expertise. Prof. M.S. Swaminathan pointed out that the emerging apartheid in gender terms is more cruel than the skin colour-based apartheid that is history. Dr. Saraswathi Menon of UNDP stressed the need for approaches which will have a multiple effect in terms of women's technological empowerment.

The participants who represented 12 countries and 3 International Organisations drew up an action plan for the "organisation of a regional network of women scientists and technologists to serve as a pool of experts to help women living in poverty". The group also identified information empowerment, skill empowerment, and economic empowerment as the three priority areas to fulfil the objectives of the network. Several pioneer projects were recommended, involving biotechnology, information technology, renewable energy and others. The Foundation, with the support of the Department of Biotechnology, Government of India, has launched the Women's Biotechnology Park as a pioneer project in India.

Securing the Future : National Consultation on Medicinal Plants (January 9-10, 1997)

The Foundation has been actively promoting the need for novel partnerships, or a new social contract between the conservers of medicinal plants, and those who derive economic benefit from their use. Only such a partnership can create an economic stake in conservation. Along these lines, the Foundation organised a 2-day national consultation with the support of the Union Ministry of Environment and Forests, New Delhi, and the Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore. 75 persons from the central and state governments, corporate sector, research institutions, academia and NGOs, besides active practitioners of Indian systems of medicine, participated in this consultation. Nearly all the participants represented their organisations at the highest level, such as that of director of a research institute, or an executive direc-

tor of a company, or a state Principal Chief Conservator of Forests. From the Union Government, officials from the Ministries of Environment and Forests, Agriculture, Biotechnology, and Health and Family Welfare attended the consultation, which was inaugurated by Mr. T.K.A. Nair, Union Secretary of Environment and Forests, who personally attended the consultation on both days.

The participants were divided into four groups, each dealing with a specific theme of the broad topic of conservation of medicinal plants. The consolidated recommendations have been forwarded to the Ministry of Environment and Forests for consideration as the basis for a future national policy on conservation of medicinal plants. (Some of the recommendations are highlighted in the box).

The Union Government's Secretary for Indian Systems of Medicine delivered the closing address.

National Consultation on Medicinal Plants

Salient Recommendations

- Development of organised cultivation of most species in demand of indigenous medicinal value of pharmaceutical importance based on the market value by involving local people. All those plants currently being collected and exported should be cultivated rather than collected from the wild.
- Forest Service in the country needs to be structured so that a sub-cadre on biodiversity conservation can be developed within the IFS.

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- A National Biodiversity Board with a sub commission on medicinal plants will help to co-ordinate activities in this area and promote an integrated *in-situ* and *ex-situ* conservation strategy. The present policy relating to the conservation of medicinal plants should be linked to the National Forest Policy.
- A National Level Bioprospecting Code for medicinal plant diversity based on ethics and equity for sharing the benefits is very important. Such a code will also help in the sustainable management of genetic resources of medicinal plants.
- Conservation of our unique genetic wealth in medicinal plants is a public responsibility. Efforts designed for public good should be supported from public funds. Industries and commercial enterprises based on medicinal plants should make contributions to promoting conservation. They should become partners in the vital task of saving plants for saving lives.
- Inadequate standards currently exist for identification and quality control of raw drugs. Department of ISM should take the initiative in collaboration with industry and CSIR to establish standards for priority plants that are currently used in formulations for domestic and export purposes.
- The JFM programmes should include augmenting the natural regeneration of native medicinal plant species and supplement them through nursery based planting where the local species have become endangered or extinct.
- A Working Group is to be formed on documenting non-codified knowledge.

Workshop on Training and Design of the Project "Empowerment of Grassroot Democratic Institutions in Micro-level Planning : Preparation of Socio-Demographic Charters" (28-30 January, 1997)

The Foundation identified the Socio-Demographic Charter as a critical planning tool at the grass root level. This concept has been included in the report of the Population Policy Committee, which awaits approval by the Parliament. As a step forward, the Population Council of India and the Foundation organised a workshop whose objectives were :

- to review and modify, where appropriate, the modules (prepared by the Foundation) for training the trainers of panchayati institution
- to develop training projects in the states of Karnataka, Tamil Nadu, Uttar Pradesh and West Bengal.

Given the fact that the membership of the Panchayat institutions is over a million all over the country, the training programmes must be sufficiently decentralised for ease of local adaptation. Following a comprehensive analysis of the available infrastructure for empowerment, the workshop participants rec-

ommended two types of training programmes : (a) a residential trainers' training programme and (b) a peripatetic training programme where small groups of trainers will move from village to village, interacting with the elected members. The participants came out with training proposals that have been submitted to the Population Foundation of India.

Inter-disciplinary Dialogue on Reaching the Unreached : Building Partnerships for Sustainable Food and Livelihood Security (February 3-6, 1997)

In the series of inter-disciplinary dialogues organised by the Foundation, the seventh was on the theme of partnerships. The broad objective of this dialogue was to identify methods for the development of broad-based coalitions or partnerships to realise the objectives of the World Food Summit (Rome, November 1996). The dialogue was financially supported by UNDP and NABARD, India, and programmatic support was extended by many of the Foundation's programmes, such as the Asian Ecotechnology Network, the TRC in Ecotechnology (SPA 302) and the BV Rao Centre (SPA 303).

The participants numbering 40, came from a variety of organisations and

backgrounds, reflecting our belief that the dialogue itself is a broadbased coalition. The participants included Mr. Ratan Tata (Chairman, Tata Sons), Ms. Susan Berresford (President, the Ford Foundation), Mr. Henri Carsalade (ADG, FAO), Mr. Ariyaratne (President, Sarvodaya Shramadana Movement of Sri Lanka), besides experts in agriculture, population policy, management and banking. A public forum was organised in collaboration with the Indian Institute of Technology, Chennai, to help the public and the student community of Madras to share the views of some of the renowned thinkers attending the dialogue. An important aspect of the dialogue was the presence of a number of activists and social workers from South Africa, who had participated in the popular movement to end apartheid.

Just as skin color-based apartheid could be ended through moral outrage and broad-based coalitions, endemic hunger can also be ended. This was the thrust of the action plan developed in the dialogue. The hunger-free area action plan that is premised on six key points (SPA 303) also proposes voluntary professional assistance (as emergency healthcare) as a component of addressing the challenge of endemic hunger.

**Dialogue on Building Partnerships
Excerpts from the inaugural addresses**

M.S. Swaminathan

- Mahatma Gandhi said that the first and foremost responsibility of independent India is to provide every citizen an opportunity to earn his/her daily bread.

Henri Carsalade, Assistant Director General, FAO

- FAO's attention will be focussed on the battle for food security. It will continue to provide direct support and assistance to member nations in support of national programmes and strategies and will strive to identify new partners, build new alliances and forge new linkages in order to ensure that the maximum number of actors can participate in the global struggle for food security.
- FAO is concerned about exploiting the dynamism, organisational capacity, know-how and investment capital of the private sector as one of its instruments for promoting agricultural and rural development.

Susan Berresford, President, the Ford Foundation

- The word 'partnership' reflects the recognition that people matter, that they must be heard. That awareness has grown in recent years. I think we see it in society all around the world in a variety of ways. I think we see it in the process of decentralising government from national levels to local levels.
- Bringing diverse individuals and institutions together in a common venture to strategise or to learn is an enormously time-consuming task. There are few short-cuts to developing trust among partners or in the inevitable trial-and-error experiences of launching new initiatives with new partners.

Besides conferences and workshops of national or international significance, many meetings were organised to mark special occasions, and to serve as brain storming sessions. The broad purpose of these meetings was to help the staff to acquire knowledge of critical front-line developments.

- The FICCI Roundtable on Role of Business in Development of Agriculture was held on August 22, 1996. The meeting was chaired by Shri. Deepak Banker, the immediate past president of FICCI. Twenty-five leading industrialists from the country participated in this meeting to discuss the possible contribution that the

corporate sector could make in turning agriculture into a viable and profitable enterprise. The FICCI-SPIC-MSSRF project on water harvesting was presented as an example of this approach.

- A seminar by Prof. Krishnaswami Aladi (University of Florida, USA) on the contemporary research along the lines of Srinivasa Ramanujan's mathematics was organised on December 30, 1996. This seminar was also the occasion for the launch of the *Ramanujan Journal*.
- A one-day meeting of the women corporators of the Corporation of Ma-

dras was organised on January 6, 1997 to help them acquire a glimpse of activities in information empowerment.

- Special lectures by distinguished visiting scientists were organised on various occasions. Dr. Mark Wright (Natural Resources Institute, UK) spoke on NRI activities in biodiversity conservation (January 20, 1997). Dr. Joseph Hulse (Canada) talked on the future dimensions of food security. Dr. David Quammen (USA) discussed his island theory of animal extinction on the Earth Day (April 22, 1997).
- The release of the book "Dying Wisdom" (by Anil Agarwal, Centre for Science & Environment, New Delhi) was marked by the organisation of an NGO Forum on "Traditional Water Harvesting Systems in Tamil Nadu" which was attended by 20 NGOs (May 6, 1997). Experts in hydraulics and members of corporate houses also participated in this meeting.
- A national-level workshop on gender issues in agrobiodiversity in the Indian context was organised on June 9-10, 1997. The purpose of this workshop was to gather comments on a draft document on the same topic from invited experts in the areas of biodiversity, development studies and gender studies. 25 experts from India and 2 from the FAO (which is compiling such studies worldwide) attended this workshop.

Sub Programme Area 503 Informatics and the CD-ROM Library

Information Technology (IT) is one of the five critical technologies for bringing about sustainable agricultural and rural development. The importance of knowledge and information-based interventions in conservation of biological diversity is increasingly realised because of new arrangements such as the WTA. The informatics centre and the CD-ROM library have been established to fulfil the purpose of making available data and tools of modern IT to promote development research, and to enable younger researchers to obtain reasonable benefits from exposure to methods and devices of modern IT.

The CD-ROM Library at the Foundation is one of the largest collections of CDs in the areas of applied biology and agricultural sciences. The CDs published by CAB International constitute the core of this collection. The current number of records accessible is over 4 million (as of May 1997). The Foundation has also acquired AGRIS database of FAO on CD-ROM starting from 1990. The World Development CD published by the World Bank, containing the World Development Reports upto 1994, has been acquired. The WRI and FAOSTAT databases have been updated.

This library is open to students and researchers located in India. There is no access fee or downloading charge. Time at the terminal is allotted in one-hour slots per individual. Queries are

accepted from remote locations through postal service. The number of individuals accessing this facility has nearly doubled since last year. On an average, 300 requests are cleared every quarter now. This facility has been used to support research on mapping the performance of agricultural research institutions in India (SPA 504).

The Informatics Centre which has designed the databases on mangrove ecosystems (MEIS), farmers' rights (FRIS) and ecological farming, continued with the redesigning of the MEIS and FRIS. The redesign approach is premised on improving the ease of distribution, search and access to data, using fast emerging developments in software applications. Further, use of multimedia technology with inexpensive software is stressed in all the design and development programmes.

MEIS : The Mangrove Ecosystems Information Service (MEIS) with its component databases of experts, bibliography, sites/ resources, taxonomy and visuals, has been fully redesigned with DELPHI 2. The principal advantage is the ease of distribution, requiring no additional software at the user's end. The other advantage is that it can be hosted on a World Wide Web (WWW) server for access all over the world. Updating of experts (630 in 62 countries) and bibliography components is continuing. A complete report on mangroves of Pichavaram (including maps and figures) is available as part of the bibliography database. The ongoing effort is to integrate GIS components

with MEIS. Further, the possibility of MEIS being made part of a global database on mangrove management is being explored with the International Society for Mangrove Ecosystems (ISME), Japan.

FRIS : A considerable amount of primary data has been added to the FRIS this year. Primary data has been generated on the tribals of Orissa and Andhra Pradesh. Secondary data from Census 1991 has been added to the anthropological and ethnobotanical information. Detailed information on use of 440 plants has been compiled with color photos and herbarium diagrams. The database on gene bank accessions at the Foundation (PA200) has been included in FRIS. Further, data on rare and endangered plants (20 species) and on rice varieties of Orissa (over 200 varieties) have been included. Video footage (about 600 minutes) generated from the field work has been edited and included in the section on the Malayali tribal families of Kolli Hills, Tamil Nadu.

The FRIS has been redesigned using HTML, the most widespread language of the internet. This will facilitate its distribution, when approved by the concerned advisory committee, on the World Wide Web.

Design of a Multimedia Database for the FARM Programme (FAO-Regional Office for Asia and the Pacific)

The FARM (Farmer-centred Resource Management) is a programme of the FAO, jointly implemented with UNDP and UNIDO in seven countries of Asia.

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The Foundation has been a participant in the FARM's biotechnology and biodiversity component. The coordinating office of the programme wanted to develop a multimedia database that enables technology to be understood and interpreted in the local context (of agroecological zone and the household). The informatics centre of the Foundation carried out the design of the FARM database as a consultancy project. The database has been designed using DELPHI 2.0, and can be distributed without copyright violations. There are features to incorporate audio, video graph (image) files. Updating of data can be carried out at the local nodes, without expert assistance. The FARM programme's coordinating office has accepted the product after testing and refinement. The data addition is in progress now. All the documentation, including an easy-to-use user's manual, have been provided.

Design of Web Site for ICRISAT

The informatics group of the Foundation designed and commissioned the World Wide Web site of ICRISAT, a CGIAR institution, in May 1997. The site has a graphical version for those with high-speed telephone lines. The text-only version will serve the purposes of those with low-speed lines. The site enables one to browse the list of publications, ICRISAT-in-print database, the annual report for the year 1996, besides administrative information. A French version is under preparation. Design updates will be provided by the Foundation. Along with sci-

entists of the corporate HRD division of the ICRISAT, the informatics centre has developed a pilot computer-based training module for management of diseases of groundnut. This model is being tested by the ICRISAT currently.

The staff of the informatics centre are involved in providing training to scientists in other institutions (e.g. ICRISAT) on the use of HTML. Recognising the growing importance of the web, the Foundation launched its "home page" in June 1996, and it has been updated in November '96. The updated home page now contains the sixth annual report of the Foundation and some of the conference documents, besides brief information on the facilities. The design was carried out by the informatics centre, using direct HTML coding. (The new home page under construction has features such as animation, or enlargement, based on JAVA language). Within the informatics centre, an "intranet" (local area network with protocols employed in the internet) has been set up to experiment with this novel method of sharing data and documents.

Sub Programme Area 504 Mapping Science in India through Analysis of Publications: Agriculture and Biology

There are two kinds of mapping knowledge. One, at the cognitive plane, helps the understanding of the structure of knowledge and the dynamics of the growth of scientific knowledge. The

other, external to the cognitive content of science, aims to describe the structure of the scientific enterprise. The first kind deals with knowledge per se and its basis is epistemological. The second kind of mapping is about scientific research and is to do with the organisation of science in a society or a nation or a region, and its basis is scientometrics. One key element of the second kind of mapping is publication and citation analysis.

India conducts a considerable volume of scientific research, and currently invests a little over 0.8% of her GDP on R&D. In terms of numbers of papers published, as seen from Science Citation Index 1995, India ranks twelfth in the world and accounts for about 2.7% of the world's publications. It will be useful to know the distribution of these papers by institution, by subfield, by journal, and so on. One will then be able to answer questions such as 'Who is doing what and where it is published'. Indeed such data should form the basis for science policy making, funding decisions, etc. But a comprehensive inventory of Indian publications is not readily available. It is for this reason, that we decided to make a detailed analysis of India's research publications in the life sciences and agriculture as seen from BIOSIS and CABI Abstracts, both known for their comprehensive coverage. To start with we covered one year of the databases, viz. 1992.

In the past three years, Arunachalam and coworkers have made similar anal-

yses of India's contribution to the literature of physics, materials science, mathematics, medicine, etc. using international databases such as INSPEC-Physics, Materials Science Citation Index, Mathsci, Medline and Science Citation Index. In general the methods developed earlier were used here. However, both CAB Abstracts and BIOSIS posed some additional problems with respect to standardization of bibliographic elements. These were sorted out with extreme care. We have gathered some interesting and useful results.

Both BIOSIS and CAB Abstracts have abstracted Indian papers from more towns and cities and a larger number of institutions than other databases. There were 9332 Indian papers from over 1230 institutions in CAB Abstracts 1992, published in 961 journals from about 50 countries. The corresponding figures for BIOSIS are 7445 papers from over 1080 addresses, published in 1094 journals from 48 countries. And unlike other fields, more than 52% of Indian papers in BIOSIS and about 75 % of papers in CAB Abstracts were published in Indian journals. Incidentally, these two databases also cover a larger number of Indian journals than other major international databases in S&T: 281 in CAB Abstracts and 105 in BIOSIS. The publications have been classified by institution, institution type, city and state, and subfield, and the journals used have been classified by country of publication and impact factor.

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- Sowmiya, R., M. Thirumalai and D. Tirouchelvame. 1996. *32nd Annual Rice Meet on Integrated Pest Management and Water Management TNAU*. Coimbatore. 15-18 April.
- Sowmiya, R. and D. Tirouchelvame. 1997. *Crop Resource Management Network Workshop*, Directorate of Rice Research, Hyderabad. 2-5 January.
- Subhashini, H.D. 1996. Fundamentals and application of statistics at environmental testing laboratory. Guest lecture in the training programme on *Operation and Management of Environmental Testing Laboratories*, Environmental Training Institute (ETI), TNPCB, Chennai. 19 September.
- Subhashini, H.D. 1997. Constituents of sewage and environmental Impact of sewage disposal and Sanitation in Unsewered areas. Guest lecture in the training programme on *NGO's role in dealing with Municipal waste*, ETI, TNPCB, Chennai. 2 July.
- Swaminathan, Mina. 1996. *Promoting the young child's development : challenges and opportunities in India*. National Workshop on Early Childhood Development. UNICEF and World Bank, New Delhi. 28-29 August.

Thiagarajan, A.R. 1996. *World Poultry Congress and International Poultry Exhibition* New Delhi. 2-8 September.

Vencatesan, Jayshree. 1996. *Consultation on the India Water sector Programme of the UNDP*, Dahod, Gujarat. 12-13 September.

Vencatesan, Jayshree. 1996. *Sub-committee Agri and Food Processing of the Confederation of Indian Industry (CII)*, Madras. 8 August – 12 October.

Awards/Honours

John Joseph, S. 1997. *Awarded B.P. Pal National Environment Fellowship*. Ministry of Environment & Forests, Government of India.

Narayan, L.R.A. 1996. *Sir Edward Dolezel Award* at the International Congress of the International Society of Photogrammetry and Remote Sensing at Vienna (Austria). 8-19 July.

Ravishankar, T. 1997. *The Young Scientist Award*. Sri Venkateswara University Tirupati and Medicina Alternativa, Sri Lanka during the 35th World Congress on Natural Medicines.

Swaminathan, M.S. 1997. *Highest award for International Cooperation on Environ-*

ment and Development, for outstanding contributions to the lofty cause of environmental protection and development, and for his signal accomplishments in the field of international cooperation, Government of China.

Swaminathan, M.S. 1997. *Ordre du Merite Agricole* created in 1883 to honour persons having rendered services of the highest quality to the cause of agriculture and its development and amelioration, Ministry of Agriculture, Government of France.

Swaminathan, M.S. 1997. *Dr. B. P. Pal Medal* for unique contributions to agricultural research and development, National Academy of Agricultural Sciences, India.

Videos

Gender Justice and Rights of Women and Children. 7-mins. Discussion Starters/ Video Spots. 1996.

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About the Foundation

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Programme Area 100 : Coastal Systems Research

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* *Left during the year*

The Foundation Staff

Mr. S. Paramasivam
Project Assistant

Dr. B.V. Rao Centre for Sustainable Food Security

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Distinguished Fellow and Project Leader

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Mr. K. Ramanathan
Liaison Officer

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Secretary

Ms. M. Hema
Research Associate

Ms. B. Sumathi
Secretarial Assistant

Ms. Anuradha *
Research Associate, Dharmapuri

Mr. Thamarai Selvan *
Research Associate, Dharmapuri

Ms. Aparna Ravi
Visiting Fellow

Programme Area 400 : Reaching the Unreached

Project ACCESS

Ms. Mina Swaminathan
Hon. Project Director

Mr. S. Raja Samuel
Project Coordinator

Ms. Rama Narayanan *
Research Fellow

Ms. R. Santhiya Maheswari
Project Associate

Ms. D. Radhika
Project Associate

Ms. I. Glory
Project Associate

Mr. Murali Shanmugavelan
Project Associate

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Secretary

Ms. E. Rajeshwari *
Secretary

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Administrative Assistant

Ms. G. Padmavathy
Administrative Assistant

Mr. S. Karthikeyan
Accountant

Ms. R. Jayashree
Accounts Assistant

Uttara Devi Resource Centre on Gender and Development

Dr. V. Padma
Senior Fellow

Ms. Srividya Natarajan
Fellow

Ms. J. Latha
Programme Assistant

Programme Area 500 : Education, Communication, Training and Capacity Building

Informatics Centre

Dr. V. Balaji
*Project Director and Coordinator
Asian Ecotechnology Network*

Prof. Subbiah Arunachalam
Distinguished Fellow

* Left during the year

Annual Report 1996-97

Mr. Michael Harley *
Advisor - Communication

Ms. Shahnaz Padamsee *
Communication Manager

Mr. S. Senthil Kumaran
Senior Research Fellow

Mr. K. Suresh
Research Fellow

Mr. C.V. Parthasarathy
Programmer

Mr. G. S. Sridhar*
Research Assistant

Ms. K. Uma Rani
Research Assistant

Mr. R. Ezhil Muthu
Research Fellow

Dr. Vijay R. Subbiah
Research Associate

Ms. V. Usha
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Library Services

Ms. Sylvia Snehalatha
Librarian

Ms. Annie Jenifer
Library Assistant

Mr. M . Kuppusamy
Assistant Librarian

Mr. R. K. Saravanan
Photographer

Distinguished Fellows (Over-all Advisors)

Dr. A. Sankaram

Dr. A. Venkataraman

* *Left during the year*

List of Donors

From 1st July '96 to 30th June '97

Core Contributions - Institutional

Department of Human Development and
Family Studies, *Baroda*

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Chennai

Gupta Foundation
Eluru

Maharashtra Hybrid Seeds Company
Limited, *Mumbai*

Rotary Club of Madras (East)
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Chennai

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Dr. P.V. Shenoi
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Staff Members of MSSRF
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Prof. M.S. Swaminathan
Chennai

Dr. U. Venkateswaralu
New Delhi

Mr. S. Viswanathan
Chennai

Core Contributions - International

Dr. John Herald
USA

Mr. Paul Terweel
The Netherlands

Sources of Project Support

Programme Area 100 : Coastal Systems Research

National

International

Norwegian Agency for Development
Cooperation (NORAD)
New Delhi.

India-Canada Environment Facility
New Delhi.

Programme Area 200 : Biodiversity and Biotechnology

National

International

Union Ministry of Environment &
Forests, New Delhi.

Swedish International Development
Cooperation Agency

World Wide Fund for Nature - India,
New Delhi.

Ministry of the Environment,
Government of United Kingdom.

Government of India,
Department of Biotechnology,
New Delhi

Deutsche Gesellschaft Fur
Technische Zusammenarbeit (GTZ)
Germany.

International Atomic Energy
Agency

John D. & Catherine T. MacArthur
Foundation, USA.

The Ministry of Foreign Affairs,
The Netherlands.

Global Environment Facility

International Plant Genetic Resources
Institute, Italy and the Government of Italy.

Programme Area 300 : Ecotechnology and Sustainable Agriculture

National

International

The Hunger Project - India,
Mumbai.

International Fund for Agricultural
Development (IFAD)

Sources of Project Support

Programme Area 300 : Ecotechnology and Sustainable Agriculture

National

Government of India,
Department of Biotechnology,
New Delhi.

Union Ministry of Rural Development,
Department of Wasteland Development,
New Delhi.

Council for Advancement of People's Action
and Rural Technology, New Delhi.

Indian Council of Agricultural Research,
New Delhi.

Federation of Indian Chambers of
Commerce and Industry, New Delhi and
Southern Petrochemicals Industries
Corporation.

Sir Dorabji Tata Trust,
Mumbai.

Directorate of Agriculture,
Government of Tamil Nadu, Chennai.

Venkateshwara Group, Pune.

Poultry Development and Promotion
Council, Pune.

Social Welfare & Nutritious Meal
Programme Department, Government of
Tamil Nadu, Chennai.

International

United Nations Educational Scientific and
Cultural Organisation (UNESCO)

United Nations Development Programme
(UNDP-New Delhi)

Food and Agriculture Organization of the
United Nations (FAO - New Delhi)

The Hunger Project-Japan & Sweden

Programme Area 400 : Reaching the Unreached

National

Aga Khan Foundation, New Delhi.

The Hunger Project - India, Mumbai.

Kasthuri & Sons Ltd., Chennai.

Union Ministry of Human Resources
Development,
New Delhi

Council for Advancement of People's Action
and Rural Technology, New Delhi.

Venkateshwara Group, Pune.

International

United Nations International Children's
Fund (UNICEF)

Humanistic Institute for Cooperation with
Developing Countries (HIVOS)
Bangalore.

Royal Danish Embassy, New Delhi

Bernard Vanleer Foundation,
The Netherlands.

Programme Area 500 : Education, Training and Communication

National

Sir Dorabji Tata Trust,
Mumbai.

Council for Advancement of People's Action
and Rural Technology,
New Delhi.

Government of India, Department of Ocean
Development, New Delhi.

Council for Scientific and Industrial
Research, New Delhi.

Union Ministry of Environment & Forests,
New Delhi.

Department of Scientific and Industrial
Research, New Delhi.

Population Foundation of India,
New Delhi.

International

Institute for International Economic
Cooperation and Development, Italy.

United Nations Development Programme
Encyclopedia of Life Support Systems, Abu
Dhabi, UAE.

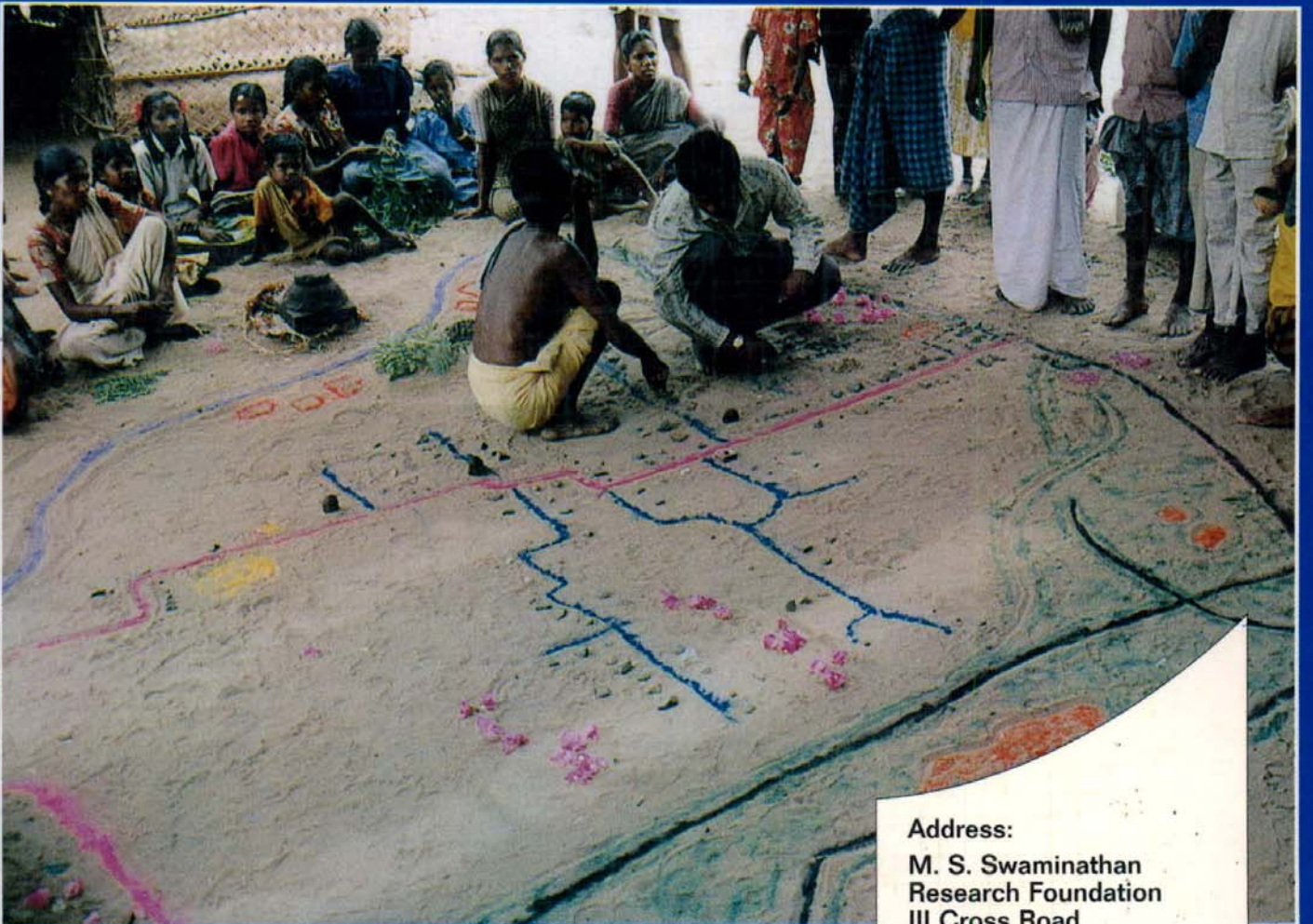
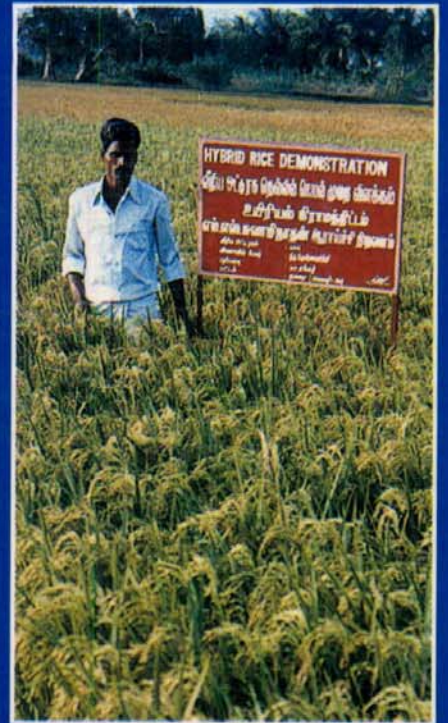
United Nations Educational, Scientific and
Cultural Organisation(UNESCO)

Food and Agriculture Organization of the
United Nations, Regional Office,
Thailand.(FAO-RAPA)

International Development Research Centre,
New Delhi.

Swiss Agency for Development Cooperation

International Crops Research Institute for
the Semi-Arid Tropics



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