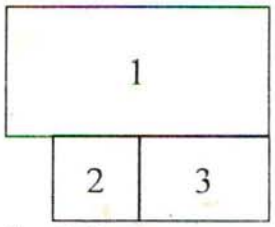
M. S. SWAMINATHAN RESEARCH FOUNDATION

1997-98
EIGHTH ANNUAL REPORT

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

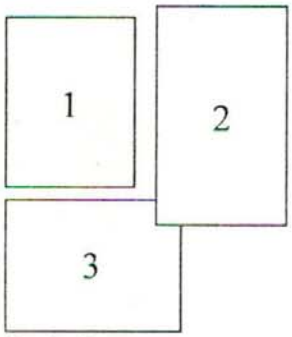


Front Cover

1 : Unsustainable commercial fisheries in the Gulf of Mannar region contribute to reduction in biological diversity :
a view of the crowded fisheries harbour in Tuticorin.

2 : Common jellyfish and seaweeds washed ashore near Mandapam in the Gulf of Mannar coast.

3 : Monitoring forest ecosystem health using lichens : *Parmotrema sanctae-angelii* (Lynge) Hale - a lichen dominating tree barks in well exposed forest sites, above 700 m altitude, in Siruvani hills (Western Ghats).



Back Cover

1 : Multiple burden borne by tribal women in the Kolli Hills region of Tamil Nadu.

2 : Irrigation of crops by women in Tamil Nadu, often a non-traditional role (*photo courtesy: N.Selvan*).

3 : A home genetic garden in Central Sri Lanka, raised by the women of the household.

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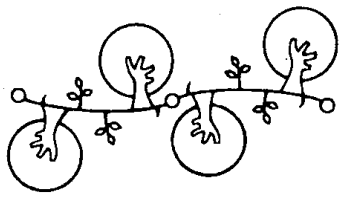

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Introduction

It was on 17 May 1988 that the M S Swaminathan Research Foundation (MSSRF) was registered in New Delhi as a non-profit Trust for the purpose of integrating the dimensions of environmental and social sustainability in research and education in the fields of agriculture and rural development. The first programmes were started in Chennai early in 1990 in a rented building. On 14 April 1993, the Foundation and its associated Centre for Research on Sustainable Agricultural and Rural Development moved into its own building constructed on land kindly provided on lease by the Government of Tamil Nadu in the Taramani Institutional Area. As a deliberate policy, it was decided that rather than have an experimental farm of its own, the Foundation would work with farm families in a participatory research mode. The research and training agenda encompass five major thrust areas, namely, Coastal Systems Research (CSR), Biodiversity and Biotechnology, Ecotechnology and Biovillages, Reaching the Unreached, and Education, Training, Communication and Networking. This 5-point programme has served as a blueprint to achieve the aim of scientific excellence and social relevance in research, demonstration and training. The dedicated and tireless efforts of the scientists and scholars of MSSRF led to the Foundation being chosen in 1996 as the first recipient of the Blue Planet Prize in Asia. A publication summarising the evolution of MSSRF during the period 1988-98 will be issued shortly.

Some of the significant developments during the period covered by the present Report (i.e., 1 July 1997 to 30 June 1998) are briefly highlighted here.

- The J R D Tata Ecotechnology Centre was strengthened in order to contribute through ecotechnologies and partnerships to the alleviation of poverty and the conservation and enhancement of natural resources. With generous support from the Tata Trusts and CAPART, a building has been constructed to intensify training, capacity building and networking activities. The new building will be dedicated to rural families by H E the President of India, Shri K R Narayanan on 29 July 1998, which marks the 94th birth anniversary of Bharat Ratna J R D Tata. The J R D Tata Ecotechnology Centre will house the Technology Resource Centre of CAPART as well as the coordinating unit of UNESCO's Asian Ecotechnology Network and will spearhead a movement for fostering job-led economic growth, based on a pro-nature, pro-poor and pro-women orientation to technology development and dissemination. The Centre promotes integrated attention to on-farm and non-farm employment and to precision farming techniques in order to maximise returns from units of land, water and energy. The Biovillage model is being developed as an example of ecotechnologies in action.
- The action research and policy advocacy programmes of the Dr B V Rao

Centre for Sustainable Food Security resulted in the launching of an integrated 7-point strategy for the total elimination of hunger by the Panchayats of Vembur and Nallur in the Vedasandur block of Dindigul district, Tamil Nadu. In this initiative, the Panchayats are actively supported by the Gandhigram Rural University, the B V Rao Centre and the concerned State Government Departments. Steps were also taken to end hidden hunger caused by micro-nutrient deficiencies in the Pennagaram block of Dharmapuri district of Tamil Nadu through the cultivation and consumption of appropriate vegetables and fruits. This project will be implemented by the Department of Horticulture/ Dharmapuri Development Corporation with financial support from FAO and technical support from MSSRF.

Particular attention will be paid to generating public policy support for eliminating nutritional anaemia among pregnant women so as to avoid denying opportunities to children for the full expression of their innate genetic potential for brain development because of low weight at birth. The generous assistance of the Bajaj Trusts in creating the position of Shri Ramkrishna Bajaj Fellow for Sustainable Food Security has been very helpful in accelerating progress towards the implementation of the Hunger Free Area Programme.

- With support from SPIC, FICCI and the Indian Overseas Bank and in collaboration with the NGOs *Speech* and *Renaissance,* the economic and ecological value of community water harvesting and watershed management were demonstrated in several villages in Pudukottai and Ramanathapuram districts of Tamil Nadu. The farmers adopting such group water harvesting practices grew pulse crops for use as both grain and seed. Such Pulses Villages demonstrate the wisdom of growing crops requiring less water and possessing high economic and nutritive value in areas of low rainfall.

- The Seed Village programme was further expanded to cover over 40 hectares in 10 villages in Dindigul district of Tamil Nadu. The major crops included in this programme are hybrid sunflower, hybrid cotton, hybrid and open-pollinated bhendi (okra) and open-pollinated bitter gourd. The farm families produce the seeds on the basis of a buy-back arrangement with Indo-American Hybrid Seed Company, Bangalore and Senthil Seeds, Tarapuram. The emphasis in seed village is to impart new skills to rural women in order to enhance income per hour of work.

- Based on the conviction that gender equity and justice are vital for social and economic progress, a Resource Centre in Gender and Development, dedicated to the memory of the late Smt Uttara Devi was established for mainstreaming gender considerations in all the programmes of MSSRF and for assisting other non-governmental as well as governmental organisations to do likewise. In collaboration with the National Commission for Women and FAO, this Centre organised studies and critical discussions on the skill empowerment of women in agriculture and on the gender dimensions of biodiversity

management in India, Sri Lanka and Maldives. The Centre also initiated studies in partnership with the V Gangadharan Smaraka Trust, Kollam, on the health profile of women engaged as labour in the cashew, coir and fish industries in the Kollam area of Kerala.

- Coastal systems research was strengthened, particularly with reference to coastal mangrove wetlands, in order to link in a mutually reinforcing manner the ecological security of coastal areas and the livelihood security of coastal communities. Such work, financially supported by the India-Canada Environment Facility, is currently in progress in the States of Tamil Nadu, Andhra Pradesh, Orissa and West Bengal. The project aims to foster sustainable management systems for coastal mangrove wetlands based on symbiotic partnerships between the Forest Department staff and the mangrove-forest dependant communities. Detailed floristic, hydrological and socio-economic surveys have been conducted in the mangrove forest areas. It was observed that increasing water salinity due to inadequate inflow of fresh water is an important cause of mangrove forest degradation.

- Work was initiated on the preparation of a project for the conservation of the Gulf of Mannar Biosphere Reserve, comprising 21 islands rich in biological wealth, through an integrated approach to regulation, education and social mobilisation. The pathway for social mobilisation for conserving the biosphere reserve is the generation of an economic stake in conservation. The Gulf of Mannar Marine Biosphere Management project is being prepared by MSSRF on behalf of the State Government of Tamil Nadu and the Union Ministry of Environment and Forests with support from the Global Environment Facility (GEF) through UNDP. This unique project will present a new vision for the management of biosphere reserves, hopefully leading to a paradigm shift in the basic approach to conservation, namely, replacing the prevailing regulatory approach of "protecting the biosphere reserve from adverse human impact" to one of "people protecting the biosphere reserve". The project involves not only direct steps to conserve biodiversity including coral reefs, sea grasses and mangroves and rare mammals like dugongs, but also steps to strengthen the livelihoods of the rural and urban families living in the area through the introduction of the Biovillage model of job-led economic growth opportunities. The Gulf of Mannar Marine Biosphere Reserve has the potential of becoming a world ecotourism centre, providing opportunities for nature and green health tourism. It will help to convert the following vision of UNESCO for the Biosphere Reserves of the New Millennium into reality :

  "Rather than forming islands in a world increasingly affected by severe human impacts, biosphere reserves can become theatres for reconciling people and nature. They can bring the knowledge of the past to the needs of the future."

  A study of priorities in the conservation of coastal biodiversity revealed that the Gulf of Kutchh in Gujarat urgently needs similar attention.

- The Coastal Systems Research programme was further extended during the year through a joint research project with the Bhabha Atomic Research Centre (BARC), financially supported by the Department of Atomic Energy. Under this joint programme, nuclear and biotechnology tools will be applied in areas such as the measurement and management of coastal salinity, improving biological nitrogen fixation, bioremediation of pollution problems, development of sustainable systems of coastal aquifer management and the establishment of Pulses and Groundnut Villages, using the seeds of the improved strains developed at BARC through mutation breeding. The project work is being initiated near Kalpakkam and Pichavaram.

- A significant step was taken to understand and define methods of implementing the following three aims of the Global Convention on Biological Diversity (CBD) at the micro level :

  - Conservation
  - Sustainable use
  - Equitable sharing of benefits

  In the field of conservation, the aim is to strengthen the continuum involving *in situ, in situ* on-farm and *ex situ* systems of conservation. For promoting sustainable use, methods of creating an economic stake in conservation are being standardised.

  Similarly, feasible methods of implementing the "prior informed consent", "access" and "benefit sharing" provisions of CBD are being standardised at the village level. Questions such as "Who owns biodiversity ?" "Who has the authority to give prior informed consent?" "Who should maintain the People's Biodiversity Register?" and "How to recognise and reward community contributions in contrast to those of individuals?" are being addressed. This project, supported by the Swiss Agency for Development and Cooperation, is in progress in the Jeypore tract of Orissa, Kolli Hills of Tamil Nadu and Wayanad district of Kerala. The data obtained and insights gained will be of value in implementing at the field level the provisions of the proposed Biodiversity Act, which is likely to be enacted soon by Parliament.

- Thanks to a generous endowment from the Maharashtra Hybrid Seeds Company Ltd (MAHYCO), a Chair in Biodiversity was established in the name of Shri B R Barwale, founder of MAHYCO. Under this Chair, several training programmes, including a summer course on Principles of Biodiversity Conservation and Sustainable Management, were organised. Also, young women and men in tribal and rural areas were trained to become members of a Community Agrobiodiversity Conservation Corps. The work on the mapping of biodiversity in the Great Nicobar Island was completed. Studies were initiated on the sustainable management of coral reef resources of Lakshadweep Islands.

- Work on strengthening the Mangrove Genetic Resources Conservation Centre at Pichavaram was continued and 14 species were planted. Vegetative propa-

gation techniques such as cutting, grafting and air-layering were standardised and 61,000 samples belonging to 13 species were transferred to the field.

- Studies on the salt tolerant wild rice species, *Porteresia coarctata,* using RFLP markers, revealed that *P. coarctata* is closely related to *Oryza australiensis.* Methods of using *P. coarctata,* a tetraploid with 2n=48 in rice breeding are being studied.

- Studies using molecular markers in genomic characterisation, genetic polymorphism and species relationships have helped in understanding phylogenetic and evolutionary trends in mangrove species. A gene involved in glycine betaine synthesis has been cloned from mangrove species. This has implications for genetic enhancement of salinity tolerance in coastal plant species.

- Indexing of beneficial organisms associated with legumes and non-legumes was carried out in selected sites in coastal regions of Tamil Nadu. Intra- and inter-population diversity is being documented using RAPD and RFLP profiles as well as routine biochemical assays among the various populations. Populations capable of withstanding stresses like salinity and pesticide residues have been isolated for understanding the mechanisms of their tolerance.

The ecosystem continuity of forest sites within Siruvani Hills has been studied through site specific ecological methodologies. Indicator lichen communities have been identified for near normal, semi-disturbed and disturbed sites. These will be tested and extended to similar areas in the forests of the Western Ghats.

- Efforts to bring the benefits of cyber space to rural women and men were intensified to meet the urgent needs of information and skill empowerment. For this purpose, Information Villages are being established where computer-aided information systems are operated by local women and men in Tamil. Providing demand-driven information is accorded priority. Information empowerment holds the key to getting the benefits of government programmes and new technologies to those who are being bypassed by both the regular extension services and the emerging information super highway. The first Information Village was inaugurated in February 1998 by Dr Ismail Serageldin, Chairman of the Consultative Group on International Agricultural Research, at Villianur village in the Union Territory of Pondicherry. A major aim of the Information Village programme is the training of a work force capable of developing and providing the value-added products and services required by the fast expanding information and knowledge based economy.

- In the area of child care, focus was shifted from project-related programmes to promotion of child rights by offering resource support to several groups. The communication strengths developed during the last four years are being found especially useful in reaching people in new ways and in channelling their energies.

Over the years, MSSRF has come to occupy a specific niche in the area of

environmentally sustainable and socially equitable development, namely, as a resource centre which can help not only to oppose unsustainable development but more importantly, to propose sustainable options. It is now being regarded as a technical resource centre by NGOs as well as State and Central Government agencies within India and by international organisations. It is serving as a Technology Resource Centre of CAPART. Thus, during the year under report, several important assignments were undertaken. Some of the reports prepared for different agencies are listed here.

- National Report on the Implementation of the Convention on Biological Diversity for the Ministry of Environment and Forests, Government of India.
- Report on Farmers' Rights in relation to the conservation of agrobiodiversity: Converting concept into action, prepared for FAO, Rome.
- Report on implementing the equity provisions of the Convention on Biological Diversity for the United Nations Environment Programme, Nairobi.
- Evaluation of the Advanced Centres of Research established in Agricultural Universities and ICAR institutes for FAO.
- Gender dimensions in biodiversity management in Sri Lanka and Maldives for FAO.
- Case studies on the performance and sustainability of intensified farming systems in the Biovillage area in Pondicherry and Krishna River Mangrove wetlands area in Andhra Pradesh for FAO.
- Creating a website and development of databases for the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad.
- Process and outcome documentation of the Early Childhood Development needs of urban disadvantaged areas undertaken for the National Institute of Urban Affairs and UNICEF.

In addition, individual staff members have assisted national and international organisations in several areas of science and public policy. Several training programmes were organised on behalf of CAPART. Some of these were on :

- Soil health management
- Vermiculture
- Water conservation and sustainable use
- Ecohorticulture
- Integrated Pest Management
- Biodiversity
- Informatics and database development

The strategy used for training comprises interactive learning and participatory reviews.

As in previous years, several national and international workshops and seminars were organised during the year. Among them mention may be made of -

- Asia-Pacific Workshop on Biosafety :Environmental Impact Analysis of Transgenic Plants in July 1997 in collaboration with the Animal and Plant Health Inspection Service (APHIS) of the US Department of Agriculture and Cornell University.

- SAARC Workshop on Coral Reefs in December 1997, in commemoration of 1997 being declared as the "Year of the Reef", in collaboration with the Ministry of External Affairs, Government of India, the Department of Ocean Development and the Bay of Bengal Programme of FAO.
- South and Southeast Asia Regional Workshop on Access to Genetic Resources and Traditional Knowledge in February 1998 in collaboration with the World Conservation Union (IUCN).

Several other workshops including one for Media representatives, were held under the auspices of UNESCO's Asian Ecotechnology Network. The work carried out under the UNESCO Chair in Ecotechnology included the rendering of policy advice on the launching of eco-regional technology missions in the N.E. states of India and in dry farming areas and in restructuring agricultural education.

The annual inter-disciplinary dialogue held in January 1998 was on the theme "Malthus and Mendel : Population, Science and Sustainable Food security". 1998 marks the bicentenary of the publication of Thomas Malthus' "Essay on the principle of population as it affects the future improvement of Society". The dialogue helped to review the emerging technological opportunities for increasing biological productivity per units of land, water, energy and time, to help face the challenge of having to produce more farm commodities under conditions of diminishing per capita availability of arable land and irrigation water, and expanding biotic and abiotic stresses.

A workshop on "The Technological Empowerment of Women in Agriculture", organised in collaboration with the National Commission for Women, in December 1997 helped to articulate the priorities in research and development for minimising drudgery, increasing output and eliminating health hazards in women-specific occupations. The participants recommended the initiation of pioneer projects in this area under the National Agricultural Technology Project (NATP) of ICAR.

As a part of the process of technological empowerment of women, steps were taken to organise a Women's Biotechnological Park near Chennai. Women entrepreneurs, who will begin the activities of the Park, were identified and two training programmes were organised for them-one in association with the FICCI Ladies Organisation in October 1997 and the other, with the Centre for Workforce Development, Education Development Center, USA and USAID (Global Bureau) in December 1997. The Women's Biotechnology Park, the first of its kind in Asia, is being technically and financially supported by the Government of Tamil Nadu and the Department of Biotechnology of the Government of India. The Tamil Nadu Industrial Development Corporation (TIDCO) will be the principal implementing agency. The Government of Tamil Nadu has provided 8 hectares of land for the Park at Kelambakkam near Chennai.

The Biovillage programme in Pondicherry intensified its efforts in skill empowerment of rural women and men in areas such as eco-aquaculture, animal husbandry, vermiculture, mushroom produc-

tion, fodder cultivation and hybrid rice evaluation. The methodology adopted in all such cases was learning by doing.

Infrastructure development for research, training and demonstration made further progress. The Pondicherry Administration generously provided land for establishing a Biocentre in Pillayarkuppam village. The Biocentre will be a community service centre and will be the home of the Biovillage Society. Creation of such institutional structures is part of a strategy designed to ensure the long term sustainability and replicability of the Biovillage programme, so that the Biovillage movement can continue with vigour and dynamism, when the present UNDP supported project ends in early 2000.

The infrastructure for the Community Biodiversity Centre at Kalpetta, Wayanad district, Kerala, was strengthened. Several training programmes were organised for tribal families, including one on mushroom production which was initiated with support from the Department of Biotechnology, Government of India.

Considerable progress was made in forging partnerships with the commercial sector, in order to foster symbiotic bonds between the primary producer and the agroprocessing industry. A programme for the revitalisation of the conservation traditions of tribal families in relation to minor millets and other vanishing food crops, through opening up marketing avenues for such nutritious grains, was started with support from the Hindustan Lever Limited. Also, a programme designed to impart value-addition to primary produce through linkages with the processing industry was initiated in collaboration with the Central Food Technology Research Institute in Mysore and the Food Links Initiative of the International Development Research Centre of Canada. All these projects have as their aim the promotion of the kind of commercialisation which will help to stimulate conservation and prevent genetic ercsion. Conservation and commercialisation can then become mutually reinforcing rather than remain antagonistic.

Partnership was also developed with the University of Bologna in Italy, the oldest University of Europe, under a programme sponsored by the Department of Science and Technology, Government of India and the Ministry of Foreign Affairs, Government of Italy. Under this collaborative research programme, mapping quantitative trait loci (QTL) in rice, improvement of nitrogen and water use efficiency and diversification of cropping systems will receive attention.

High priority continued to be accorded to the professional growth of staff members and scholars. Many of them were enabled to present their work at national and international seminars and workshops. Several senior scientists participated in policy-related meetings, particularly those relating to the Convention on Biological Diversity. Some served as members of international, national and state level committees dealing with sustainable development and conservation of natural resources. Several scholars are currently engaged in research leading to the Ph D degree of Madras and Anna Universities and Osmania University, Hyderabad.

The work described so far could not have been accomplished by an autonomous

non-governmental institution without the generous support of numerous donors - individual and institutional, national and international, governmental and inter-governmental. The various Departments of the Government of Tamil Nadu have been particularly supportive. Special thanks go to the Forest Departments of Tamil Nadu, Andhra Pradesh, Orissa and West Bengal for their total commitment and support to the coastal mangrove wetlands conservation programmes. Their generous assistance is acknowledged in the report.

Particular thanks are due to the Trustees of MSSRF and the eminent persons who are serving on various Committees for advice, support and encouragement. The Auditors, Messrs Brahmayya & Co., and in particular Mr N Srikrishna, have guided the Foundation in effective and proper financial management for which the Institution is very grateful.

Dr V Balaji served as the Principal Coordinator of the work relating to the preparation of this report. Dr Nandhini Iyengar served as the Consulting Editor. Mr N Ram and the staff of *Frontline* helped to design the cover. Our sincere thanks are due to all of them.

This report is being released on 29 July 1998 by Dr. Mu Karunanidhi, the Hon'ble Chief Minister of Tamil Nadu, on the occasion of the inauguration of the J R D Tata Ecotechnology Centre Building and the Women's Biotechnology Park by H E the President of India, Shri K R Narayanan. We are grateful to the Hon'ble Chief Minister for his support and encouragement right from 1989.

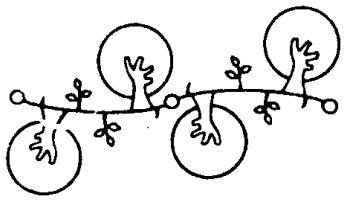
We would like to record our deep appreciation of the service of Mr A Venkat whose architectural genius guided the design of both the buildings of the Foundation. Both the buildings have been constructed by Mr M Balasubramani of Metro Constructions. Our sincere thanks go to him and to his staff.

Finally, our thanks go to the various Departments of the Government of Tamil Nadu and of the Chennai City Corporation for their assistance and support. The unstinted assistance of all neighbouring institutions, in particular the Institute of Mathematical Sciences, the Indian Institute of Technology, the Central Leather Research Institute and the Anna and Madras Universities helped the scientists and scholars of the Foundation to give of their best.

We are particularly happy that during this year the President of India conferred the Bharat Ratna, the highest honour the country confers on a civilian, on Dr M S Subbulakshmi and Shri C Subramaniam. Dr M S Subbulakshmi blessed us on the occasion of our moving into our building in April 1993 with her divine music, while Shri C Subramaniam has been the major source of inspiration and encouragement from the very inception of the Institution. We offer them our congratulations and seek their continued guidance.

Looking back over the past 10 years, the Trustees of MSSRF are happy that it has been possible to demonstrate how institutional synergies and partnerships with rural women and men can help to achieve the goals of food, education, health and work for all much earlier than is often considered feasible.

Programme Area 100



Coastal Systems Research

Nearly 30 percent of India's population live within 80 km of the shoreline, which extends to over 7500 km. With the coming into operation of the U.N. Convention on the Law of the Sea, the Exclusive Economic Zone (EEZ) available to India is nearly 2/3rd of the land surface. This programme area strives to link the ecological security of costal areas with the livelihood security of coastal communities in a mutually reinforcing manner. A programme was developed for saving the unique biological treasures of the Gulf of Mannar area for posterity, with assistance from the Global Environment Facility (GEF) and UNDP.

Sub Programme Area 101

Coastal Wetlands: Mangrove Conservation and Management

With the objective of enhancing national capacity and national action in the conservation and sustainable management of coastal mangrove wetlands, a project was launched by the Foundation in the year 1996. It is being financed by India-Canada Environment Facility for a period of 5 years and is operating in the East Coast of India in the States of Tamil Nadu, Andhra Pradesh, Orissa and West Bengal.

During the past two years, as envisaged in the Project Operations Plan, causes for the degradation of the mangroves and the potential for restoration in the six sites in the States of Tamil Nadu, Andhra Pradesh and Orissa have been identified through detailed surveys and studies. The activities carried out in each State, during the year under report, are detailed below.

101.1 Tamil Nadu

Selection of Demonstration Villages

In order to develop replicable models, 3 hamlets each in Pichavaram and Muthupet areas have been selected in the first phase. The selected hamlets and the occupation of the people are listed on Table 1.1.

According to the operations plan, the activities were taken up step by step. The support of the villagers has been mobilised by developing rapport with them. Participatory Rural Appraisal (PRA) exercises are being conducted to understand the existing socio-economic situation in the demonstration hamlets and the perceptions of the local people about their living standards, livelihood strategies, dependency on mangrove wetland and its resources. So far, PRA has been completed in MGR Nagar and Vadakku Pichavaram. In Killai Fishermen Colony of Pichavaram and Kovilanthoppu of Muthupet PRA is going on.

The major concerns of the residents of MGR Nagar and Vadakku Pichavaram as identified by the PRA and community based issue analysis are listed in Table 1.2.

Table 1.1 : *Hamlets selected for demonstration (Tamil Nadu)*

Pichavaram		Muthupet	
M.G.R. Nagar	- non traditional fisher communities	Veeran Kcil	- traditional fisher community
Vadakku Pichavaram	- farmers	Pettai South	- SC landless wage labourers
Killai Fisher Colony	- traditional fisher communities	Kovilanthoppu	- traditional fishers in the mangrove lagoon

Table 1.2 : *Major concerns identified by PRA*

MGR Nagar	Vadakku Pichavaram
- lack of community certificate	- rapidly declining income from crop lands due to soil fatigue and pests problems
- lack of crafts and gear for fishing	- uncertain income generation opportunities
- flooding of the hamlet	- poor livestock management system
- indebtedness	- indebtedness
- lack of firewood resources	- lack of permission to graze cattle and goats in mangroves
- lack of Balwadi	- lack of social and economic empowerment to women
- lack of legal entitlement for fishing	
- degradation of the mangrove wetland	
- lack of leisure, multiple roles and unlimited drudgery for women	

In order to develop indicators for the monitoring and evaluation of the projects as well as to statistically analyse the data on the socio-economic conditions of the people, baseline surveys, covering 100% of the households, are being conducted in the demonstration villages.

Group formation and baseline surveys have been completed in Vadakku Pichavaram. A General Body including one male and one female member of each family has been consitituted. This General Body has elected the Executive Committee which has a President, Vice-President, Secretary, Treasurer and executive members.

Formation of women's groups in the demonstration villages, to empower them economically and to provide micro credit, has been facilitated. In Vadakku Pichavaram hamlet 3 groups have been formed and these groups have already saved a total amount of Rs.18,000. In MGR Nagar also 2 groups have already been formed and the total saving is Rs.6000/-.

Biophysical Survey

Both in the Pichavaram and Muthupet mangroves biophysical survey was conducted with the objective of identifying physical causes for degradation and techniques for intervention to improve the biophysical conditions of the degraded areas. In both the mangrove wetlands this survey has been completed. The studies indicate that structural changes in the mangrove wetlands due to past management practices such as clear felling, reduction in the freshwater flow and reduction in the tidal water inflow are the main

causes for the degradation. These results are more or less similar to the observations made during the implementation of a small project earlier.

Geomorphological, Hydrological and Sedimentological Research

Research is being done on these aspects for restoration of the mangroves and for evolving a long-term management plan. Physical processes of the ocean result in the formation of sand bars near the mouth of the estuaries. They in turn reduce the inflow of tidal water into the mangroves, thereby creating unfavourable conditions for fish production as well as for the sustenance of the mangrove forest. To establish the causes for bar formation near the mouth of the estuary and also to identify the interventions that are necessary to keep it open, wave energy analysis was carried out for the Pichavaram coast, which has a well marked sand bar. Hydrodynamic parameters like tidal variation and current velocities were also measured at selected stations during both the monsoon and non-monsoon seasons and these parameters are to be used in the design and construction of canals for facilitating tidal flushing in the areas chosen for restoration. Models are also being developed to simulate the tidal circulation in the mangrove swamp and to prepare a long term management plan. Parameters like salinity and temperature variations in the estuarine waters were also measured and mapped for the mangrove sites at Tamil Nadu. Similar studies will be undertaken for the sites at Andhra Pradesh and Orissa

Training and Human Resource Development

During the year the following training programmes were conducted for the stakeholders :

1. Participatory Rural Appraisal - for the members of the local NGOs, namely Environmental Conservation Society, Muthupet; Village Welfare Society, Muthupet; Centre for Peace Action, Pichavaram. Both theoretical orientation and field training were given with the help of Krishi Vigyan Kendra, Gandhigram Rural University.

2. Mangrove ecology and restoration techniques for :

- Members of the local NGO, namely, Foundation for Ecological Research Advocacy and Learning, Pondicherry (This NGO is working with the Department of Agriculture, Government of Pondicherry in reviving the mangroves of Karaikal region)
- A batch of trainees led by Assistant Conservator of Forests, Forest Officers Training College, Coimbatore
- Forest Department staff of the Coringa Wildlife Sanctuary, Andhra Pradesh

3. Microplanning - for the field staff of the Pichavaram Forest Range, Tamil Nadu Forest Department.

To improve activities related to training and human resources development, materials and manuals on mangrove ecology, mangrove restoration and participatory techniques are being prepared.

101.2 Andhra Pradesh

Orientation and Preparation Workshops for the Stakeholders

On the basis of the information collected through Rapid Rural Appraisal, orientation and preparatory workshops were conducted for the following participants :

- Traditional and local leaders
- Rural Development and Panchayat Leaders
- Field staff of the Forest Department
- Staff of Fisheries Department
- Local NGOs
- School children

In these workshops and awareness programmes, the project was introduced to the participants in detail and the approach which has been developed for the implementation of the project was explained.

Apart from the above stakeholders, NABARD, Women and Children Welfare Officer, Rural Development Mandal Revenue Officer, various functionaries in the Panchayat Raj system and teachers in the local schools participated in the Land Based Alternatives activities and awareness programmes.

Awareness and Sensitisation

Godavari mangroves : A 16 mm film on cyclone damages in AP during 1977 and on the precautions to be taken during a cyclone was projected on International Nature Disaster Reduction day. More than 50 people participated in this meeting held at MSSRF Office with the help of Public Relations Office, Kakinada.

Krishna mangroves : A 16 mm film was projected in Deenadayalpuram (one of the demonstration hamlets) on environmental issues (forest) and alternate income generation activities, with the help of District Public Relations Office, Machilipatnam. During the PRA exercise the school children of Deendayalpuram staged a play on the importance of mangroves for mankind.

Selection of Demonstration Villages

In order to focus the efforts to develop replicable models 3 villages in Godavari and 2 villages in Krishna districts have been selected in the first phase to demonstrate the possibilities and potential of Participatory Management System for mangroves. The following criteria were used in the selection of demonstration villages : the village should

- have a large mangrove user community
- be socially and economically backward
- be willing to play an active role in mangrove conservation and management
- be willing to actively cooperate with the Forest Department
- be acceptable to the Forest Department

Other criteria such as proximity to mangroves and the presence of degraded

areas nearby, were also considered. During the selection of the demonstration hamlets, several informal meetings were held with the Forest Department, traditional leaders, village leaders, women and members of the various sections such as rich, poor and landless people. During these meetings details about the project and its approach were explained in detail. The demonstration villages selected in the Godavari and Krishna districts are listed in Table 1.3.

Activities in the Demonstration Villages

In all the selected hamlets support for the project has been mobilised by repeated interaction and group discussions with various sections of the people.

Table 1.3 : *Villages selected for demonstration*

Godavari		Krishna	
Metlapalam	- Fisherfolk & Farmers	Deenadayalpuram	- Farmers & Fisherfolk
Dindu	- Fisherfolk	Nakshatranagar	- Fisherfolk
Bhairavalanka	- Farmers & Fisherfolk		

Major concerns and Elements for Micro-planning

The major concerns of the residents of the demonstration villages are listed in Table 1.4.

Table 1.4 : *Major concerns in the demonstration villages*

Metlapalem	Dindu	Bhairavalanka
- Drinking water	- No cyclone shelter	- No school
- Grazing	- Water problem	
	- No medical facilities	- No medical facilities

Figure 1.1 : *IRS LISS-III False Colour Composite imagery of Krishna Delta shows the geomorphology and distribution of mangroves. Red colour indicates healthy mangrove areas and the grey/dark grey areas are degraded mangrove areas and mud flats.*

Table 1.5 : *Results of the surveys*

Region	Total no. of forest blocks covered for vegetation survey	Total area covered (ha)	% of barren area	Healthy mangroves	Degraded mangroves	Restorable area (ha)	Prawn farming encroachment area (ha)
Bhitarkanjka	11	6986.12	10-60 %	60-95 %	5-30%	621	
Mahanadi	11	6559.81	15-85%	40-80 %	20-60%	635	1898.24

Table 1.6 : *Factors responsible for degradation of mangroves*

Area	Bhitarkanika	Mahanadi
Primary factors	- encroachment for agriculture	- encroachment for agriculture
	- collection of fuelwood	- encroachment for aquaculture
	- collection of construction materials	- collection of fuelwood
		- bunding creeks
		- grazing
Secondary factors	- encroachment for aquaculture	- colonisation by terrestrial vegetation
	- colonisation by terestrial vegetation	
	- bank erosion	- bank erosion
	- bunding of creeks	- timber collection
	- damage by pest attack	- indiscriminate fishing
	- indiscriminate fishing	- silting of river mouth

Project activities

RRA was undertaken in 71 villages of Bhitarkanika and 20 villages of Mahanadi delta mangroves*. A format was designed to collect data for the survey. Several aspects like demography, infrastructure, occupation, income level, health, mangrove dependency and perceptions on mangrove forests were collected in detail for every village. The mangrove village interface aspect was tabulated and value indexing done to give a clear picture of the mangrove dependency by local communities (Table 1.7).

Index values are assigned as per the degree of degradation caused by the use of mangroves. The higher the index value, the greater the degradation caused.

Demonstration villages were identified in both the sites after visiting most of the villages in the area, holding discussions with the villagers, observing the situation and discussing with local Forest Department staff.

The four demonstration villages that have been selected are Kendarapatia, Kharanasi (Mahanadi-A), Santubi and Kajalpatia (Mahanadi-B).

Table 1.7 : *Mangrove dependency of villages*

Area	Bhitarkanika	Mahanadi
Total No. of villages covered under PRA	71	20
Mangrove dependency Index value		
1	11	0
2	3	2
1+2	11	1
1+2+3	25	15
2+3	4	2
1+3	4	0
No use	13	0

1 : degradation due to use as firewood, construction and thatching material

2 : degradation caused by grazing and timber harvesting

3 : degradation caused by encroachment for agriculture and settlements

* Site map given in Figure 1.3

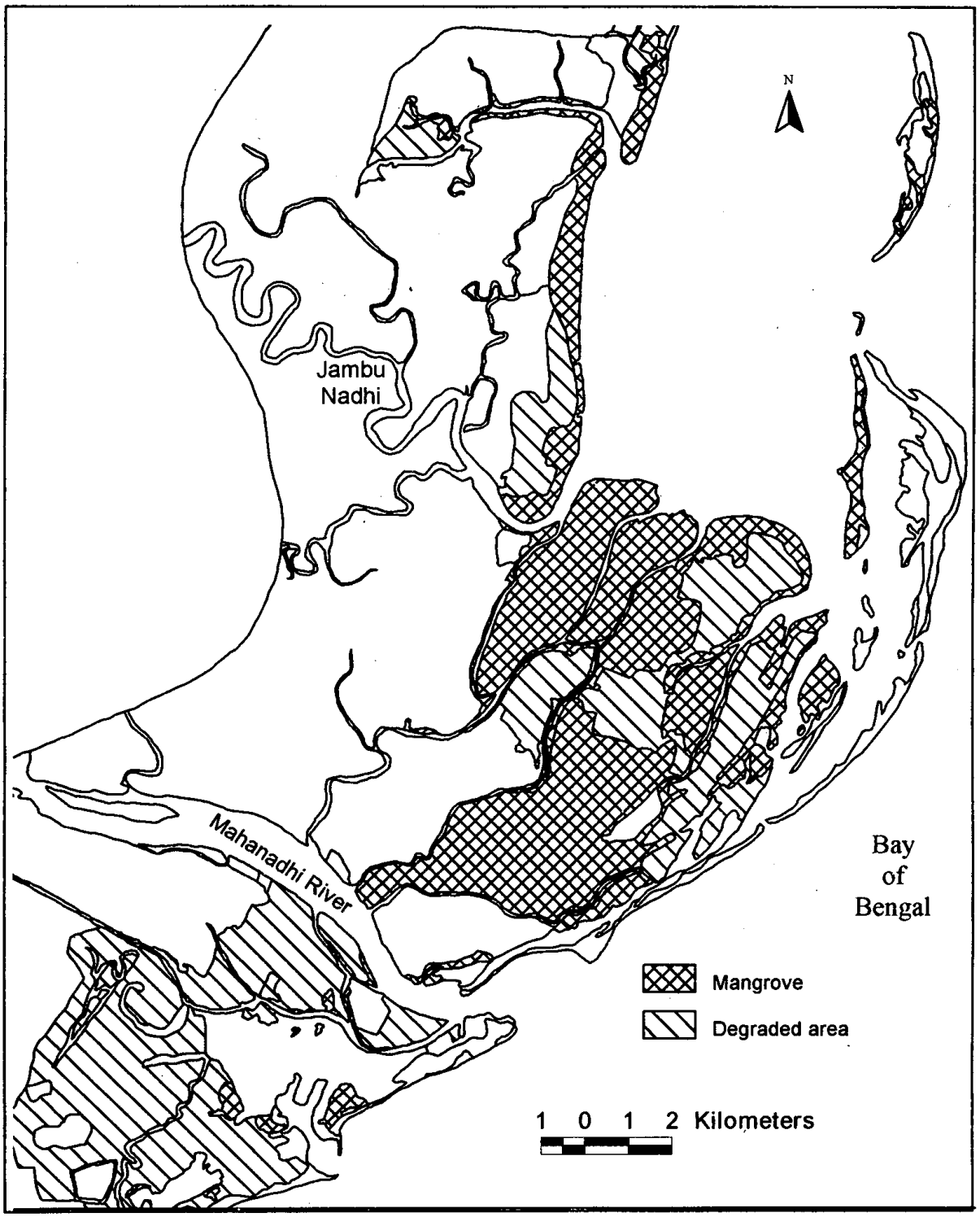


Figure 1.3 : *Mangrove areas in the Mahanadhi Delta.*

Rapport building and confidence creation was done through several visits to the demonstration villages, informal meetings with the villagers, conducting competitions in schools and discussions with Government officials.

PRA was conducted in one of the demonstration villages (Kendarapatia). The help of Environmental Research and Action (ERA, Bhubaneshwar) was taken to train the field staff and to help in conducting PRA.

Important issues/concerns that were highlighted during the PRA are as follows :

- Faulty alignment of embankment
- Saline water intrusion into agriculture land
- Lack of irrigation facility
- Inadequate educational facility in the village
- Adequate fuel wood not available
- Strained relationship with Forest Department field staff
- Damage to mangroves due to grazing by cattle of nearby villages
- High dependency of villagers on mangrove areas adjoining the village
- Lack of health facility
- Lack of Government support for village development activities

Immediately after PRA, the villagers were sensitised to the advantages of a unified effort in the village to tackle the issues identified during PRA. Afterwards, the villagers discussed these issues and arrived at the idea of group formations. The project field staff, after learning of this initiative from the community, discussed at length some successful case studies of groups taking up natural resource management and told them that for any group to succeed, the following are necessary :

- An agenda
- Norms for operation
- Accountability/co-operation of members.

The villagers finalised group composition and norms of functioning and selected leaders. It was decided to have three groups in the village, one men's group, one women's group and one representative group of men and women. The village has 38 households and one man and one woman from each household joined the respective groups.

Baseline survey was undertaken with 100% sampling in Kendarapatia village using a standard format that was developed by the core team of the project. The data collected on various aspects of the village (quantitative as well as qualitative) are being analysed.

The fishing operation in Bhitarkanika area was analysed. 43 villages were found to be engaged in subsistence fishing and 20 villages in commercial fishing (out of 331 village habitations inside the sanctuary). The crafts and gear used in this area are mostly traditional and local variations of nets are seen. Barricade fishing was found to be most damaging to the mangroves as it uses 150-200 mangrove poles, used as

net-fix, near stream banks, resulting in much trampling of young saplings, soil slush etc. Apart from this, use of nets with lower mesh size and fishing in banned areas also create problems. 36 varieties of commercially important fish/prawn species are found in this area.

101.4 West Bengal

Mangroves are a part of the Sundarbans Biosphere Reserve. West Bengal Forest Department has already introduced JFM system in those mangroves not covered by Sanctuaries and National Parks. However some project interventions may still be needed to strengthen restoration activities and the management system for these mangroves. A brief reconnaissance study was undertaken in the Sunderbans to get an idea of the status of mangroves. Work plan is to be prepared following which further activities will be undertaken.

Sub Programme Area 102

Conservation and Sustainable Management of the Gulf of Mannar Marine Biosphere Reserve

102.1 Gulf of Mannar Biosphere Reserve - Current Status

This Biosphere Reserve (BR) is one of the six "threatened protected areas" studied by the Foundation and collaborators in 1994. Based on these studies, the Foundation approached the Global Environment Facility (GEF) for possible support in conserving the biodiversity of this site. The site being assessed as one worthy of international support, the GEF offered to support a project for the preparation of plans for strengthening the management of the Gulf of Mannar BR. This project is implemented on behalf of the Union Ministry of Environment and Forests, with the support of the UNDP. The preparation phase lasting 10 months ends in August 1998.

102.2 Gulf of Mannar- A Biological Paradise

The Gulf of Mannar, with 3600 species of plants and animals, is one of the biologically richest coastal regions in all of mainland India.

The Krusadai Island, one of the 21 islands of the Reserve, besides harbouring unique endemic living fossil, *Balanoglossus (Ptychodera fluva)* that links vertebrates and invertebrates, also possesses representatives of every animal phyla known (except amphibians).

Besides coral, the Reserve is also rich in sea grasses and has the highest concentration of sea grass species along India's 7500 km coastline. The presence of extensive stretches of sea grass meadows makes the Gulf of Mannar unique in the region as they serve as the last refuge of the globally endangered marine mammal dugong *(Dugong dugong).* This area is also unique in harbouring all the 5 species of marine turtles. The reserve has extensive and diverse collections of crustaceans, echinoderms, molluscs, gastropods and fish.

Owing to the presence of diverse ecosystems such as coral reefs, sea grasses and mangroves, each complementing the other

and thus creating a complex dynamic system, the Gulf is one of the highly productive areas with an estimated average benthic gross production of 7.3g C/m^2 per day. Phytoplankton production in surface waters is 89-91 g C/m^3 per year.

The Gulf's biological significance and productivity have a direct bearing on the economic significance of the area as 20% of the marine fish production of Tamil Nadu is obtained from the Gulf of Mannar and the production of 14 tonnes per km^2 from the Gulf of Mannar is much higher than the national average of 9 tonnes per km^2.

102.3 Methodology

In this project preparation exercise, stakeholder participation has been retained as the key element. Different stakeholders, such as the Government departments, Scientific research institutions, local community-based organisations and the industries, participated in the project preparation programme through several consultations and workshops. Besides these, a task force to coordinate scientific and technical inputs and a steering committee comprising secretaries of relevant government departments and NGOs have been functional. Three NGOs, the Shaktha Society for Women, the Sucheta Kripalani Rural Development Trust and the Chevalier Roche Victoria Memorial Society carried out Rapid Rural Appraisals of the perception of local communities of the degradation of the Gulf BR and new opportunities available for improving their livelihoods while reducing dependence on the BR. The Society for Social Forestry R&D carried out a survey to assess the socio-economic conditions and degree of dependence of human communities on the resources of the Gulf BR.

Two international consultants advised the project on coastal conservation and incremental cost calculations. Prof. Graeme Kelleher, former chairman of the Great Barrier Reef Authority, Australia, served as the coastal conservation advisor. Dr.Jeffery Griffin gave a framework for the calculation of incremental costs of activities designed to strengthen the management of the Gulf BR. Ms.Jennifer Nichol served as the eco-tourism advisor and developed a framework for creating opportunities for eco-tourism in the Gulf region.

102.4 Threats

Extensive consultations with various stakeholder groups and analysis of data reveals the existence of the following threats:

- The conflict between artisanal fishing and commercial fisheries has resulted in the operation of trawlers very near the reef areas. This has led to large-scale exploitation of the basic stock, which has declined in significant measure. Over-fishing of holothuria has resulted in significant reduction of *H. scabra, H. spinifera* and *H. atra* and soon these species may become endangered.
- Large scale extraction of sea weed such as *Gracilaria, Turbinaria, Sargassum* and *Gelidiella,* to the extent of about 5000-7000 tonnes (dry weight) per year, has resulted in the removal of the base for the attachment of many species.

- Indiscriminate use of reefs since the 'sixties, at an estimated rate of 250 m^3 per day (for use as a source of calcium carbonate for building material) has led to reduction in reef areas in the southern part of the BR.
- Rapid industrialisation and consequent pollution from the factories and power plants situated along the BR shoreline have led to serious degradation of the area.

These threats to biodiversity are compounded by the prevalence of poverty among the communities settled around the reserve. Lack of basic amenities, resulting in civic pollution and the lack of alternative livelihood opportunities, tend to put further stress on the resources of the BR.

102.5 Action Plan

The action plan proposed is based, to a considerable extent, on the following statements of Prof.G.Kelleher:

- The Gulf of Mannar is a unique ecosystem. There are richer areas in terms of biodiversity in some relatively remote island groups (such as the Maldives and the Andaman and Nicobar Islands). However, these are very different ecosystems and Gulf of Mannar Biosphere Reserve represents probably the best opportunity to protect a significant area containing habitats that are centres of biodiversity adjacent to the sub-continent.
- The rate of degradation of the Gulf ecosystem recorded orally and in literature suggests that this project is almost certainly the last hope that such species will survive in the gulf.
- "Integration" is the key to the successful operation of the management plan proposed. It applies at all levels and in all contexts - ecological, economic, social, scientific and administrative. The resource base degradation is sought to be arrested through the integrated use and management of both the biophysical resources of the Reserves and the human resources.

Setting up an Effective Regime of Coastal Fisheries

The project will enable local stakeholders to develop more effective, traditional-style common property management regimes for what is known as an "open access" resource.

Developing Eco-preneurs: Provision of Alternative Livelihood / Income Options

Consultations with local stakeholders have revealed a ready willingness to abandon non-sustainable (and illegal) exploitation activities (coral mining, sea weed harvesting) if only alternatives were available. The project will assist in overcoming barriers to technology transfer and the existing expertise will be used in a consultative manner with local societies to develop the most appropriate options for eco-job creation. The project will enable local stakeholders to become eco-preneurs by providing them with technical and business development assistance. Women will be a particular focus of this component of the project.

107 — 126

GENERAL FUND & OTHER FUNDS

ENDOWMENT FUND

CURRENT LIABILITIES

Public Awareness

Project efforts will focus on imparting conservation values to communities, to alert them to the long-term welfare implications of biodiversity loss and ecologically exploitative development. A sophisticated, yet technologically and culturally appropriate, approach will be developed involving cultural leaders from this area.

Targeted Research, Monitoring and Evaluation (water quality, species, critical habitats, catch level)

One of the most important outputs/components of this project will be the establishment of a systematic, low-input, focussed monitoring and evaluation programme to support the conservation of biodiversity within the Biosphere Reserve. A programme will be developed utilising the capacities of existing institutions in a coordinated, systematic manner.

Low-input Enforcement Programme

The project will apply multi-level strategy to the development of an effective enforcement programme within the Biosphere Reserve. Any enforcement programme that is to be sustainable will need to rely heavily upon the development of "self-enforcement" mechanisms. While we have sufficient laws and policies governing the conservation and use of natural resources, there are some gaps in the legal arena that will be filled by the project to strengthen the enforcement capacity of existing institutions.

102.6 Management System

It is proposed to establish an integrated management programme for the Gulf of Mannar Marine Biosphere Reserve. More specifically, the new structure is of a "low-input" design that relies on the guidance of an overall Biosphere Reserve Trust comprising leading members of key stake-holder groups. The Trust will serve as the main "integrating mechanism" for discussing the multi-sectoral issues facing the Gulf. A strategic, targeted, monitoring and evaluation programme will provide decision-makers with the necessary support to take informed decisions. In addition, local communities will also play a key role with a new management programme being developed in a participatory manner and the new enforcement mechanisms being designed from the perspective of local stakeholders so as to make them as "self-enforcing" as possible. Public awareness will be taken seriously and a sophisticated, though technologically appropriate campaign, will be mounted to inform local people about the significance of the area in which they live.

Close collaboration will be the norm among the Fisheries Department, the Forestry Department, and local communities in on-the-ground management of the BR. The Fisheries Department will take a more proactive role in managing the fishery on a sustainable basis. Community-level organizations will be strengthened as part of a programme to develop a partnership between community-level fishing societies and the Fisheries Department. The Pollution Control Board will work closely with the Trust and the Fisheries and Forestry Departments to ensure a dynamic, ongoing monitoring and evaluation programme for water quality in the Biosphere Reserve.

In each of the selected villages located around the Biosphere, the community representative body called Village Marine Conservation Council (VMCC) will be established, which will be the micro-level planning and execution body for the project activities. The VMCC will also be responsible for resource regulation, benefit sharing, operation of micro-credit and community development activities.

Thus the proposed project involves a conceptual shift from biodiversity conservation to community focussed Biodiversity management, respect for cultural and social diversities and the need for security of livelihoods.

Sub Programme Area 103

Nuclear and Biotechnological Tools for Coastal Systems Research

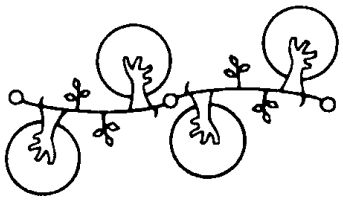
The coastal ecosystem suffers from the absence of integrated attention to conservation and development. Since these regions form a vital link between the terrestrial and aquatic ecosystems, their preservation is essential to maintain ecological balance and biodiversity. Despite their ecological and economic significance, the effect of current unsustainable resource use practices, evident both in the inland and coastal areas, have led to adverse anthropogenic pressures on the coastal ecosystem. Increasing soil erosion and water pollution, caused by intensive farming practices in the inland areas and transported through the river and canal systems, adversely affect the coastal system. Moreover, the sea water intrusion and attendant soil and water quality problems caused by ground water depletion have already started threatening the sustainability of the agricultural system in the Saurashtra region of Gujarat and Tanjavur region of Tamil Nadu. At the same time it is anticipated that by the year 2000, the human population living within 60 km of the shoreline will increase over 30 percent. Many of the world's poor are crowded in coastal areas and coastal resources are vital for their livelihood security. Above all the prospects of sea level rise, expected to be in the order of 8-29 cm due to global warming by 2025, necessitates concrete steps and immediate measures to ensure the sustainable management of the coastal agriecosystem.

Potential rise in the sea level due to global warming and other associated problems of increasing soil salinity and decreasing productivity in the coastal areas, are indeed a matter of concern to the Department of Atomic Energy (DAE) since a number of nuclear power plants of DAE are located in the coastal areas. Scientists at the Bhabha Atomic Research Centre (BARC) have used nuclear technology over the years in producing and developing certain crop varieties, through induced physical mutagenesis and biotechnological approaches. It is in this context that a joint programme has been initiated during the year for active collaboration between BARC and MSSRF to focus on an integrated R&D programme designed to strengthen the livelihood security of coastal families on an ecologically sustainable basis. It is, therefore, hoped that DAE's support to MSSRF and BARC's involvement in chosen areas, through in-

teraction with Biosciences and isotope groups of BARC and the participatory research approaches of MSSRF, will be highly rewarding. This partnership will help to enhance the scientific excellence and social relevance of projects designed to integrate conservation and developme-nt in a symbiotic manner in coastal areas.

This research programme would endeav-our to evolve a practical methodology for arresting natural resources degradation and alleviating rural poverty. The empha-sis of the joint research project would be to evolve varieties of crops with greater tolerance to salinity, enhancement of soil fertility and crop productivity while emphasising on the reclamation of saline soil along the coastal areas. It also in-tends to use radiotracer technology for monitoring the water quality parameters in the coastal aquifer. In addition, the project will lay emphasis on the popularisation and demonstration of the improved pulse crop varieties utilising the grass root level farmers' organisations such as seed villages developed by the Foundation(SPA 301 in this report).

Programme Area 200



Biodiversity and Biotechnology

Biodiversity is the feedstock of biotechnological enterprises. The aim of this programme area is to strengthen and revitalise the biodiversity conservation continuum, and develop partnership models which can help to achieve the goals of the Global Convention on Biological Diversity, namely, conservation, sustainable use and equitable sharing of benefits. Plans for the setting up of the first Women's Biotechnology Park in the country were finalised during the year.

Sub Programme Area 201

Conservation Traditions: Chronicling and Revitalisation

The traditional knowledge painstakingly acquired by tribal people over millennia through observation, experimentation, inference and inheritance has largely remained with them as "a hidden treasure". It is now likely to be lost as developmental activities near tribal areas are destroying their home and their way of life. It is therefore essential that the traditional knowledge of tribal people on utilization and conservation be documented for present and future use.

The main objectives of the programme are :

- to study the tribal-nature relationship in judicious utilization of biological resources
- to study and document the ethnobotanical prudence of tribal communities and to prepare an inventory of plant species used for food, fodder, fiber, medicine, etc.
- to study the conservation strategies adopted by the tribal communities to sustainably utilize biological resources for their sustenance
- to study traditional agricultural practices and the role of tribal women and men in the conservation of genetic material of traditional cultivars and wild genetic resources
- harmonising conservation and commercialization by creating an economic stake in conservation through symbiotic social contracts between the conservers and public and private sector industry

To work towards these objectives and to integrate all the ongoing activities in this area, a Technical Resource Centre for Implementation of the Equity Provisions of the Convention on Biological Diversity was constituted (SPA 205).

Based on the experience gained so far, activities in selected tribal areas in Tamil Nadu (Kolli Hills), Kerala (Wayanad) and Orissa were continued.

201.1 Chronicling of Conservation Practices in Kolli Hills

The project analysed the changes taking place in conservation practices, vis-à-vis the socio-economic changes, using anthropological tools. The framework which has evolved from this study, has become the guideline for the various development projects of the Foundation at Kolli Hills.

Using the methods of participatory observation, interviews and discussion, a team of social and agricultural scientists studied the cognitive world of Kolli Hills. For interpretative model, the study analyzed the indigenous knowledge of environmental phenomena, technical theory and associated practice. The interpretations were discussed with the community and their opinions were sought. The cognitive model emerged from the historical development as perceived by the community, myths, folklore and folksongs. The inter-

pretation was carried out using secondary data such as historical and archaeological evidences, reflections in Tamil literature and other research materials.

lent in Kolli Hills. It studied the agrobiodiversity vis-à-vis the socio-cultural background and identified conservation as an important survival strategy.

Table 2.1 : *Ecosystems, manipulation and resource status: three-phased model*

Ecosystems	Status	Manipulation	Resource Status	Activities
Pristine ecosystem	Subordinate	Appropriation with minimal manipulation	All resources undomesticated	Food-collection hunting, fishing
Partially altered ecosystems	Subordinate	Periodic manipulation	Partial domestication of resources	Fixed field agriculture, horticulture, shifting cultivation. Elementary animal husbandry
Artificial ecosystems	Dominant	Only maintained through constant human intervention	Almost total domestication of food resources	All advanced cultivation, industrialism

The project made an attempt to study the issues of biodiversity and conservation in an historical perspective through a three-phased model (Table 2.1).

The history of Kolli Hills shows that prior to Malayalis, Vedars or Vettuvars (hunters) were the predominant group in the region. The invasion and the settlement by Malayalis is a crucial point in the ecological history of Kolli Hills, after which the pristine ecosystem must have changed to partially altered ecosystems. Malayalis brought agriculture to Kolli Hills, which led to periodic manipulation with partial domestication of resources.

The project chronicled the various conservation practices of the Malayalis. It focussed specifically on minor millets and identified the various land races prevalent in Kolli Hills. It studied the agrobiodiversity vis-à-vis the socio-cultural background and identified conservation as an important survival strategy.

According to the study, any measure to strengthen biodiversity in Kolli Hills should focus on the economic stake in conservation rather than on the cultural or ideological principles. Using this framework the Foundation has launched two projects, which are attempting to develop models for creating an economic stake in conservation (details in SPA 206 and SPA 303 in this Report).

201.2 Saving Endangered Plant Species and Chronicling Conservation Traditions in Wayanad, Kerala

The Community Agrobiodiversity Centre, Wayanad, has been concentrating largely on reviving the agrobiodiversity conservation traditions in a village panchayat named Kottathara. The Centre is involving people from all walks of life like NGOs, activists, school children, village

youth, popular entertainers and other leaders in the movement of conservation and better management of biodiversity. This year importance was given to using the formal education system, comprising both school children and teachers, to increase awareness about biodiversity. Representatives of rural communities participated in all the activities, imparting training in identification and utilization of plant species, and helped them to understand and appreciate the value of biological resources, especially that of medicinal and little known nutritious species. The local youth were made aware of the need for conservation and sustainable utilization of biological diversity for their overall and personal development. The project "Field Verification, Demonstration and Training in the use of Medicinal Plants" was completed successfully during the year. Under this Project ten medicinal plant species have been studied in detail at the field level and their usage documented in the local health care system (Table 2.2). Farmers and housewives were encouraged to domesticate some of these species.

Major Achievements

1. A minimum of 300 people were involved in various activities of the Centre and were trained in the conservation of agrobiodiversity, including medicinal plants.
2. A green health kit of four plants, along with the know-how of their cultivation and uses, was distributed to a large number of people in the district and in adjoining regions.
3. The Agrobiodiversity Conservation Corps continued their conservation and revitalization efforts. The selected youth and scientists of the Foundation have together formed an Agrobiodiversity Conservation Team (ABCT) to provide an ethno-agriculture driven farm extension service to the farm families. This team is helping the people to formulate practical modalities in revitalizing the conservation traditions.

A collection of native varieties of pepper is being maintained in CABC's farm. The important ones are *Ayimpirian, Karimkotta, Karimunda, Kalluvalli, Cherukodi, Uthirankotta, Kuthiravali, Arakkulam munda* and *Valankotta.* Local banana varieties have also been collected and maintained. A Community Vegetable Garden has been developed in the farm by using traditional seed varieties collected from the farmers.

Table 2.2 : *Species selected for the study on medicinal plants*

Species	Family	Taxonomic Description	Distribution
Adhatoda beddomei	Acanthaceae	Evergreen shrubs. Leaves lanceate. Flowers white in axillary heads. Fruit a clavoid capsule. Seeds compressed.	Endemic to South Travancore.
Aristolochia indica	Aristolochiaceae	Twiners with long slightly tuberous roots. Leaves simple, alternate, lanceate. Flowers greenish purple in axillary cymes; perianth pitcher shaped.	India, Sri Lanka, Nepal and Bangladesh

Table 2.2. contd...

Name	Family	Taxonomic Description	Distribution
Bacopa monnieri	Scrophulariaceae	Succulent herbs; rooting at nodes. Leaves simple, opposite, obovate-oblong. Flowers pale violet, axillary, solitary, stamens included; ovules many on axile placenta.	Paleotropical
Baliospermum solanifolium	Euphorbiaceae	Undershrubs. Leaves oblong-lanceate. Flowers monecious, pale yellow. The fruit is a 3-lobed capsule with mottled seeds and oily endosperm.	India, Sri Lanka
Centella asiatica	Apiaceae	Runners. Leaves orbicular; clustered on a short shoot at each node. Flowers small, cream coloured.	Throughout India and Sri Lanka
Nilgirianthus ciliatus	Acanthaceae	Gregarious shrubs. Leaves simple, opposite, elliptic-acuminate, crenulate. Flowers pale rose in short spikes; corolla base cylindric, upper part campanulate, spreading; stamens didynamous; ovary 2 celled with 2 ovules in each; capsule clavate.	Common in Western Ghats in evergreen forests upto 4000 feet.
Justicia gendarussa	Acanthaceae	Shrubs. Leaves oblong lanceolate, gradually tapering at both ends; spikes terminal; lanceolate; Stamens 2, Ovary 2 mm. Style puberulous.	Sri Lanka, India, Malaysia, China and Philippines.
Acorus calamus	Araceae	Herbs. Rhizome aromatic. Spathe leaf like. Flowers densely arranged.on the spadix. Ovary with stigma sessile, punctate; fruiting very rare.	Tropics
Rhaphidophora pertusa	Araceae	Large Climbers. Leaves distichous; petioles with a withering sheath. Lamina ovate to sub orbicular-acute, unequal sided, simple to perforate to pinnately lobed. Spathe convolute, oblong, acuminate, spadix shortly stipitate.	South India and Sri Lanka.
Datura metel	Solanaceae	Subshrubs. Leaves long elliptic to angulate, base unequally truncate, margin frequently lobed, rarely entire. Flowers pale purple or white; Fruits with blunt spines.	Mexico to South America, West Indies; North Africa and India.

Saving Endangered Plant Species

A survey of threatened and endangered plant species is being conducted. About 31 endangered species of flowering plants are reported from the Wayanad region (Table **2**.3). Threatened species like *Syzygium travancoricum, Ceropegia elegans, Salacia beddomei, Humboldtia brunonis, Ochlandra beddomei, Vigna vexillata, Capparis rheedii, Cynometra travancorica* and *Aristolochia tagala,* were collected during the year. For the first time *Syzygium travancoricum* has been collected in fruits. Wayanad is the only record for its fruiting ever since it was collected by Bourdillon in 1896 from Kulathupuzha. Four populations of this species were identified in and around the heart of Kalpetta town, Wayanad. During earlier studies this species had been located in Tamil Nadu at Gudalur and in five localities in Kerala-Kodumon (Pathanamthitta Dt.), Asramam and Kulathupuzha (Kollam) and from a few sacred groves of Kannur and Tellicherry. This is the first report of this species from a new locality - Wayanad district. This study emphasises the need for intensive field studies to learn the correct distribution of all the known threatened species. Many other interesting plant species have been collected and maintained live at the CABC farm. Several protected species and their sites were identified and their related value and motivation studied.

Table 2.3 : *The endangered flowering plants found in Wayanad*

Botanical Name	Family
Meteoromyrtus wynaadensis	Myrtaceae
Sonerila wynaadensis	Melastomaceae
Hedyotis wynaadensis	Rubiaceae
Impatiens dendricola	Balsaminaceae
Aglaia canarensis	Meliaceae
Salacia beddomei	Hippocrateriaceae
Humboldtia laurifolia	Caesalpininaceae
Memecylon lawsoni	Memecylaceae
Lagerstroemia thomsonii	Lythraceae
Hedyotis stocksii	Rubiaceae
Ixora lawsoni	Rubiaceae

Table 2.3. contd...

Botanical Name	Family
Ixora monticola	Rubiaceae
Ophiorrhiza micrantha	Rubiaceae
Centrantherum mayurii	Asteraceae
Senecio kundaicus	Asteraceae
Symplocos candolleana	Symplocaceae
Brachystelma rangacharii	Asclepiadaceae
Oianthus beddomei	Asclepiadaceae
Adenosma malabaricum	Scrophulariaceae
Stenosiphonium setosum	Acanthaceae
Premna glaberrima	Verbenaceae
Plectranthus rivularis	Lamiaceae
Hydrobryum jhonsonii	Podostemaceae
Litsea mysorensis	Lauraceae
Acampe congesta	Orchidaceae
Cirrhopetalum aureum	Orchidaceae
Dendrobium haemoglossum	Orchidaceae
Ipsea malabarica	Orchidaceae
Peristylus brachyphyllus	Orchidaceae
Arisaema auriculata	Araceae
Ochalandra beddomei	Poaceae

A survey of threatened and endangered plant species in the district is under way with the help of the youth. Species like *Osmunda regalis, Kammettia caryophyllata, Myristica malabarica, Coscinium fenestratum, Lagenandra meeboldii, Quisqualis malabarica, Arenga wighti, Gnetum edule, Sarcostigma klenii* were collected. The inventory for lost crops of the district was begun. Initial studies in paddy show that at least twenty varieties have disappeared completely from the district.

Preparation of Herbarium and ex-situ Gardens

Plant species that are locally important are being collected for record. A total of 235 herbarium specimens have been prepared so far. The important ones are listed in Table 2.4. A medicinal plant garden is maintained in CABC's farm. There are now about 150 plants of various life forms and medicinal uses. A trial cultivation of a few species has been started on the farm.

Table 2.4 : *The importatant herbarium specimens prepared (Wayanad)*

Species	Family
Cissus repens	Vitaceae
Polygonum flaccidum	Polygonaceae
Artanema sasamoides	Scrophulariaceae
Vitex negundo	Verbinaceae
Stephania japonica	Menispermaceae
Pimpinella heyneana	Umbelliferae
Dysophylla auricularia	Labiatae
Epithema carnosum	Gesnariaceae
Elaeocarpus sp.	Elaeocarpaceae
Desmodium cephalotes	Leguminosae
Vigna vexillata	Leguminosae
Cissus discolor	Vitaceae
Naravelia zeylanica	Rununculaceae
Melothria perpusilla	Cucurbitaceae
Dioscorea oppositifolia	Dioscoriacea
Piper hymenophyllum	Piperacea
Dunbaria heynei	Leguminosae
Crotalaria laevigata	Leguminosae
Scleria tessellata	Cyperaceae
Acorus calamus	Araceae

Table 2.4. contd...

Species	Family
Syzygium travancoricum	Myrtaceae
Salacia beddomei	Hippocrateriaceae
Capparis rheedii	Capparaceae
Humboldtia trijuga	Caesalpininaceae
Litsea wightiana var. tomentosa	Lauraceae
Luisia teretifolia	Orchidaceae
Flacourtia ramontchi	Flacourtiaceae
Leucas ciliata	Lamiaceae
Trichosanthes nervifolia	Cucurbitaceae
Polyalthia coffeoides	Annonaceae
Embelia ribes	Myrsinaceae
Ixora elongata	Rubiaceae
Artabotrys zeylanicus	Annonaceae
Pavetta brunonis	Rubiaceae
Premna villosa	Verbenaceae
Nervilia aragoana	Orchidaceae
Dillenia indica	Dilleniaceae
Crotalaria micans	Fabaceae
Trichilia connaroides	Meliaceae
Pterospermum suberifolium	Sterculiaceae

201.3 Orissa

Seven (Kandhamal, Keonjhar, Koraput, Malkangiri, Mayurbhanj, Nabarangpur and Rayagada) of the thirty districts of the State were selected because of heavy concentration of tribal populations in these districts. The tribes inhabiting these districts and contacted for this project are Bara Bhuiyan, Bathudi, Bathuli Bhatra, Bhumia, Bhuiyan, Banda, Gadaba, Gond, Halva, Juang, Kandha, Kolha, Koya, Kutia Kandha, Langia Saora, Munda, Pahadi Bhuiyan, Paroja, Sana Paroja, Santal, Saunti, Sabara and Thaura Bhumija. Within these districts, 57 out of 93 blocks

were covered. Altogether, 36 general informers and 204 traditional healthcare practitioners (who have no formal education or training in any system of medicine) were contacted and information on the usage of 346 plant species was collected.

It was noted that these tribal people make extensive and intensive use of the plant species of their surroundings for their food, fuel, house construction, cattle feed, medicine and for ceremonial and religious purposes. The various uses of the plants are shown in Tables 2.5 - 2.8.

Table 2.5 : *Plants commonly used to cure specific diseases (Orissa)*

Local Names	Botanical Names	Parts Used	Diseases
Ankula	*Alangium salvifolium*	Root	Dog-bite
Bhuinlimba	*Andrographis paniculata*	Whole plant	Skin diseases
Hadasankhali	*Cissus quadrangularis*	Whole plant	Bone fracture
Basanga	*Justicia adhatoda*	Leaf	Cold; fever
Gangasiuli	*Nyctanthes arbor-tristis*	Leaf	Malaria
Pasaruni	*Paederia foetida*	Leaf	Rheumatism
Dhataki	*Woodfordia fruticosa*	Flower	Menstrual disorder

Table 2.6 : *Plants of common use (Orissa)*

Local Names	Botanical Names	Parts Used	Purpose
Ambada	*Spondias pinnata*	Fruit	Edible
Mahula	*Madhuca longifolia*	Seed	Fodder
Kamalagundi	*Mallotus philippinensis*	Seed	Dye
Kusuma	*Schleichera oleosa*	Seed	Hair oil
Sumo	*Eulaliopsis binata*	Whole plant	Broom
Khajuri	*Phoenix sylvestris*	Leaf	Mat
Siali	*Bauhinia vahlii*	Bark	Rope

Table 2.7 : *Species used as contraceptive by different tribes (Orissa)*

Local Names	Botanical Names	Parts Used	User Tribe
Kaincha	*Abrus precatorius*	Seed	Paroja
Limba	*Azadirachta indica*	Seed	Kandha
Akanabindhi	*Cissampelos pareira*	Leaf	Kolha
Dudura	*Datura stramonium*	Root	Santal
Lajakuli	*Mimosa pudica*	Leaf	Halva
Chitaparu	*Plumbago zeylanica*	Root	Kandha
Jada	*Ricinus communis*	Seed	Kandha

Table 2.8 : *Different species of Dioscorea used as food by different tribes (Orissa)*

Local Names	Botanical Names	Parts Used	User Tribe
Patikanda	*D. bulbifera*	Tuber	Koya
Sembikanda	*D. belophylla*	Tuber	Kandha
Banakandamula	*D. hamiltonii*	Tuber	Paroja
Darakanda	*D. hispida*	Tuber	Bhumia
Bhatakanda	*D. oppositifolia*	Tuber	Kutia Kandha
Chirenda	*D. pentaphylla*	Tuber	Halva
Mithakanda	*D. wallichii*	Tuber	Bonda

Sub Programme Area 202

Gender and Biodiversity Management

In continuation of the study on "Gender Dimensions in Biodiversity Management : India" which was conducted last year, FAO assigned MSSRF to prepare reports on Gender Dimension in Agrobiodiversity Management in Sri Lanka and Republic of Maldives. The highlights of the studies are presented.

202.1 Maldives

The Republic of Maldives comprises some 1,200 coral islands. Each island is protected by a house reef that surrounds the island.

As a result of being a small population widely dispersed over several islands, the Maldivians have developed a socio-cultural pattern of a close-knit homogenous community, with fishing as the main occupation. The well-defined division of labour prevalent even today involves men going into the seas for tuna fishing the whole day and women tending the home, caring for the children and producing food and articles for their subsistence. There are two major constraints that influence women's ability to participate in diverse economic activities in Maldives: the need to look after the family which in Maldives is more demanding on account of a larger (average of 7.2) family size; and curtailment of mobility imposed by geography. Under the prevailing conditions, women are seen to run small establishments as eating houses, shops, tailoring units etc. in addition to running a household, home gardens and small agricultural plots. The development of resorts on uninhabited islands (on just 20% of land area) is an example of trying to convert commercial tourism into eco-tourism. It appears that sea-based activities are male-centred and land-based activities are female-centred. Intra-island trade is dominated by women. The nature of the terrain as well as child care and home keeping responsibilities have led to women attending to work nearer their homes. Thus, over time, men and women have developed distinct roles in biodiversity management. It is however only their integrated work that leads to the conservation of terrestrial and marine biodiversity.

It appears that in Maldives women depend on an environment rich in diversity to ensure household survival, especially in times of crises. Recognising the importance of diversity, women have become "curators" of diversity and strive hard to maintain it.

Agriculture is practised for self sustenance by individuals. Traditionally chillies were planted for commercial gains, and the other crops were for home consumption. Horticultural crops are also grown for commercial purposes in the agricultural plots. Another method of crop production followed by the people of Maldives is the home gardens. In Maldives both men and women have a good knowledge of the natural resources available to them on land and the skills used to extract the resources are varied. Women have de-

veloped skills that balance the interwoven ecosystem of forests, farms, home gardens and livestock.

At the time of field study a manager specified that he needed the talents of women during harvesting, selection of seeds, toddy tasting and in fish processing. In the islands, there is exchange of seed material between families, usually at the time of fruit selection. The farmers complain of pests, poor productivity and poor viability of seeds. Table 2.9 summarises some of the activities where women, men and children are involved.

Table 2.9 : *Gender based activities in agriculture (Maldives)*

Activity	Male	Female	Child
a. *Pre-harvest*			
Selection of plot		+	
Clearing of the plot	+	+	+
Burning of the dried waste		+	
Fencing against salt laden winds		+	
Digging a well	+		
Land preparation		+	
Crop decision		+	
Nursery preparation		+	
Watering the plants		+	+
Mulching with leaves	+	+	
Weed removal and pest control		+	
b. *Harvesting*	+	+	+
c. *Post-harvest*			
Transport of harvest	+	+	
Sorting for seed		+	
Sale within island		+	
Sale to Male'	+		
Seed storage		+	

202.2 Sri Lanka

The objective of the project was to prepare a case study of community participation in agro biodiversity management, particularly the role played by women. Since a large majority of the population had lived in rural areas and had been variously engaged in agricultural activities and enterprises related to the available natural resources, the main thrust of the study was to ascertain the gender specific roles in agrobiodiversity management. The focus was on sharing of responsibility, gender specific roles, division of labour, freedom of decision making, educational opportunities, control of natural and fiscal resources and avenues open for participation in the administrative and statutory bodies at various levels.

The physiography of Sri Lanka is marked by three distinct peneplains, ranging from high mountains and hills to low lands and coastal plains. The high mountains control the pattern of rainfall distribution of the south-west and northeast monsoon seasons. Except for the central and south -west regions, the country receives only the northeast monsoon. This feature has divided the country into wet and dry zones. Over 100 rivers radiate from the central highlands. The tropical climate and variety of land forms and soil types have provided a wide range of agro-ecological zones. In conformity with geographical resources, the sharply contrasting vegetation cover varies from evergreen tropical forests to xeric scrub forest. Different forest types harbour a rich diversity of flora, fauna and wildlife of high economic value. Extensive wetlands and coastal plains have provided varied aqua-fauna also of high economic value. This wide range of available natural resources, physiography and climate has set the stage for different agricultural practices.

In Sri Lanka, 75% of the land area falls under low-country dry zone. There are two major agricultural seasons corresponding with the southwest monsoon and north-east monsoon, called 'Yala' and 'Maha' seasons respectively.

Over the years four agricultural systems have evolved in Sri Lanka:

1. Rice in the lowlands of wet and dry zones cover an area of 780,000 ha.
2. (i) *Chena* cultivation (slash and burn) is found in high land area of wet and dry zones.

   (ii) Vegetables (roots and tuber crops) cover 110,000 ha. distributed all over the country.
3. Plantation crops such as tea, rubber, coconut, coffee, cocoa etc. distributed in appropriate agroclimatic zones, cover 772,000 ha.
4. Home gardens covering an area of 0.5 to 1.00 acre form an integral part of the landholding of a farm family. There are nearly 1.3 million home gardens distributed all over the country.

About 1.8 million families are involved in different agricultural practices, contributing 20% to the GNP and providing empl-oyment to 75% of the labour force. Nearly 64% of the landholdings are around 0.8 ha.

The Gender Roles

In the overall agroecological framework

and in specific agricultural practice, the gender roles were more or less determined by the following factors:

1. Ethnicity : Among tribal societies, female members enjoyed equal partnership, held positions of responsibility, decision making and social freedom. Since the human control over natural phenomena was limited, there was a constant backdrop of insecurity, especially in food-nutritional requirements. The decisions of crop combinations were taken by the housewife. This was found to be a common practice among the Yaksha tribe in north central Sri Lanka.

However, in other ethnic groups of Sinhala and Tamils, the female members played comparatively subdued roles.

2. Specific Agricultural Practices : In the lowlands of wet and dry zones, the rice paddies offered less opportunities for the female members to participate in decision-making. Women played a few supportive roles in carrying food, arranging for labour and harvesting.

The paddy-cum-banana in low lands and paddy-cum-tea /rubber/coconut, also had limited participation for women. The marketing of the crop was done by the male members. The operative elements of picking, tapping and transport were part of an organized activity, involving hired labour and outside agencies. The women became more involved in household activities and taking care of the children. In the low dry zone, irrigated paddy in lowlands and chena cultivation in the high lands, offer a division of labour, with the female members playing a key role in the slash and burn cultivation. The selection of crops and area for specific crops were decided by female members. The male members played a supportive role and added significantly to the wealth of the family. The role of female members however, gradually declined. In the present study a corelation was seen between the family income and the relative importance of gender roles. With high annual income drawn from paddy-banana, paddy-tea, paddy-coconut, the male members were more or less the decision makers. If money was held in bank accounts, it was always in the husband's name. The women were relegated to household work, taking care of the home garden or running a "boutique" (general purpose shop).

3. Education : The literacy rate among the farm families was found to be high. It varied from 8th grade to advanced level school education. The elderly couples (50 plus) were educated upto lower levels. In one tribal village, the people of elderly age groups were not educated, except in a few families.

In the age group of school-going children, every child was educated or being educated. There were a number of families where the wife was more educated than the husband. This was the case with many girl children. A sizeable number had technical and employment-oriented education. In educating the children, no discrimination was observed on the basis of gender. Such a trend in educational attainments has the potential for making a significant contribution to agro-biodiversity management. In the empowerment of women, education has been an important intervening variable.

Sub Programme Area 203

B R Barwale Chair in Biodiversity

The B R Barwale Chair in Biodiversity was established on 1 September, 1997 and formally inaugurated on 15 December, 1997 by Shri C. Subramaniam. The mandate of the Chair includes organising research on linkages between biodiversity, sustainable agriculture and food security and the strengthening of livelihood security of communities, especially those living near Protected Areas so that they can develop an economic stake in conservation. To achieve these broad goals the activities under the Chair have been designed as follows :

- Research leading to identifying and strengthening the correlates of biodiversity, gender, sustainable agriculture and food security
- Strengthening the knowledge base and role of local communities in sustainable agriculture, food and livelihood security
- Creating a forum of sensitized and trained individuals for the sustainable management of biodiversity and for providing a platform for identifying issues relevant to policy changes.

203.1 Correlates of Biodiversity, Sustainable Agriculture and Food Security

There are three ongoing projects towards this end.

Tagging Sea Turtles in Orissa

This NORAD - sponsored study, is in its final year and is being co-ordinated by the B R Barwale Chair. This project, jointly undertaken by Wildlife Institute of India, Dehra Dun and MSSRF, has analysed the impact of fishing trawlers in the sea on the Olive Ridley turtles that arrive to lay eggs in selected beaches. The impact has been rather heavy this year and the available field estimates have placed the number of dead turtles washed to the shore at 15,000.

Tagging adult turtles has been going on in 5 sites viz., Gahirmatha, Chinchiri, mouths of rivers Devi and Rushikulya and Chilka lake. During the year under report an overall decline in the number of turtles that laid eggs has been observed. The first batch of 80 females arrived for laying in the Rushikulya beach on 22 March, 1998. Another 8000 arrived on 24 March. During this time 3000 females were tagged, of which 46 had tags placed on them last year. 562 mating pairs were tagged in the sea. Of the dead turtles examined, 300 carried tags placed on them last year.

The Wildlife Institute of India has prepared a training manual on identification, tagging, enumeration and monitoring of turtles that arrive to lay in the beaches of Orissa. Training programmes have also been conducted amongst local villagers to create an awareness of the magnitude of the conflict between fishing and conservation of sea turtles. There are volunteers who now serve as 'turtle watchers' during the nights of mass nesting along the beaches.

Sustainable Management of Coral Reef Resources in Lakshadweep

Preliminary investigations on the biodiversity of coral reefs (especially fish) in the Lakshadweep Islands have been initiated. Tuna fishery is the prime occupation of the islanders. Traditionally, the fishermen using pole and line mode of fishing have used more than 10 species of locally available coral reef fish as baits to catch tuna. Since the population dynamics and the sustained harvest of the bait fishes in the reefs are vital to tuna fishery and hence the food and livelihood security of the islanders, ecological studies on the bait fish have been started.

Integrating Gender in Conservation

Research has also been initiated on understanding the gender components in biodiversity knowledge, perceptions, attitudes and practices. Methodology for field investigation of these differences in a variety of ecosystems is being tested for validation.

203.2 Strengthening the Knowledge-base and Role of Local Communities

The Agrobiodiversity Conservation Corps Programme supported by the Netherlands Ministry of Foreign Affairs has provided the ground for strengthening the knowledge base and role of local communities in selected areas of Tamil Nadu (Kolli Hills, Erimalai), Kerala (Kalpetta, adjacent to the Wayanad Wildlife Sanctuary), Orissa (Jagatjori, outside the Bhitarkanika Wildlife Sanctuary) and Lakshadweep (Kavaratti, including the coral reef). The volunteers who were identified during the programme have been trained through a number of workshops on documenting, identifying and locally conserving agrobiodiversity in their respective landscapes. Practical exercises and demonstrations have been provided periodically to the volunteers. Workshops have also been organised in Kolli Hills, Erimalai and Jagatjori to impart training skills through a variety of folk media such as drawings, riddles, drama and song. The trained volunteers have been active in disseminating the message of conservation to fellow villagers and those in the neighbouring areas.

Since the programme envisages training a fresh batch of volunteers in each area every year, a fresh batch of volunteers have been included in Kolli Hills, Erimalai, Jagatjori and Kavaratti. These volunteers were identified through open invitation and through a series of tests to assess perceptions, aptitudes, skills and willingness to participate in the programme.

203.3 Creating a Forum for Sustainable Management of Biodiversity

In order to establish a forum for sustainable management of biodiversity local groups consisting of the Agrobiodiversity Conservation Corps are being set up in each of the above landscapes. As a support system to sustain the local groups and their activities local agrobiodiversity funds are being established. The first such fund supports 20 volunteers in the Kolli Hills under the group name 'Agrobiodiversity Conservation Corps of Kolli Hills'. This fund consists of voluntary contributions made by the Corps and is deposited in a local bank. The fund is operated by a set of 3 elected members of the Corps,

strictly for purposes of conservation of agrobiodiversity and information dissemination.

The B R Barwale Chair offered the 'First Summer Course on Principles of Biodiversity Conservation and Sustainable Management' in March-April 1998. The course covered the following topics through lectures, slide/video shows and a field visit :

- Biodiversity - genes, species, ecosystems, landscapes
- Biological communities - keystone species, indicator species
- Managing populations and communities
- Protected areas
- Human ecosystem interactions
- Agro-ecosystems
- Managing marine ecosystems
- Sustainability in practice

The summer course was aimed at creating greater awareness in urban societies. Forty participants varying from graduate students to lawyers and retired servicemen, attended the course. The major outcome of the course is the setting up of the 'Chennai Biodiversity Forum' by the participants. The committed activities of the Forum are :

- To spread awareness about the need for biodiversity conservation among the citizens in general and students in particular
- To generate data, as needed, on biodiversity indicators, human-ecosystem interactions and consequences, bioindicator species, ecological dynamics and other aspects that are perceived to be of significance
- To identify possible areas of conflict that could surface in implementing suitable steps to facilitate biodiversity conservation and sustainable management
- To identify issues affecting India's interests in so far as International Conventions and Agreements are concerned and the possible means to resolve such issues.

203.4 Biodiversity Consultancies

The Chairholder was granted a Young Scientist Lecturership by the Centre for Science and Technology of NAM and other Developing Countries. Under the Award and on invitation by the Ministry of Science and Technology, Bangladesh, Prof. R J Ranjit Daniels visited Bangladesh in February 1998 and prepared a report on the status of biodiversity conservation in the country through rapid assessment. The report has identified vehicular pollution (in Dhaka City), pollution of air by brick kilns, intensive agriculture and inland aquaculture as major threats to biodiversity. The report recommends immediate efforts to restore the dipterocarp forests in the Chittagong Tracts.

The Ministry of Environment and Forests, Government of India in October 1997 commissioned MSSRF to prepare a report titled 'Implementation of Article 6 of the Convention on Biological Diversity: National Report'. The Draft report prepared under the coordination of the Chair has been submitted to MoEF for consid-

eration. The report details the following:

- Biodiversity conservation in India: from local traditions to fortified national policies
- Conservation and sustainable use of biological diversity in India - cornerstones
- Conservation and sustainable use policy
- Access to bioresources, benefit sharing and incentives
- Integrating biodiversity concerns in sectoral programmes
- India and CBD: implementation of Article 6

The Chairholder has been involved in the editorial and peer review process of the UNEP sponsored book "Cultural and Spiritual Values of Biodiversity'. This c. 700 page book edited by Darrell A. Posey, is scheduled to be released during the celebration of the 50th Anniversary of the Declaration of Human Rights by UN. The highlights of the document are :

- the inextricable link between culture and nature
- language of diversity
- voices of the earth—indigenous peoples voicing their feelings of biodiversity
- traditional agriculture and soil management
- ethical, moral and religious concerns
- rights and resources

Sub Programme Area 204

Special Study : B P Pal National Environment Fellowship

The B P Pal National Environment Fellowship on Biodiversity was awarded to Mr. S. John Joseph, leader of Community Biodiversity programme of the Foundation in June 1997.

Survey of literature and collection of secondary data on socioeconomic problems of villages depending on the biomass resources of Sirumalai Hill Forest, resulting in degradation have been completed. The study is still continuing.

The study has brought to light significant information which has been collated and marshalled under the following broad headings :

- Early forest history
- Population & environment
- Forest policies
- Changes in land use & land holding status
- Trees on farmlands
- Deforestation

Chronicling of forest policies in Tamil Nadu over 150 years revealed information which was incorporated in an article.

Evaluation of Development of National Parks and Sanctuaries

The Foundation has been nominated by the Ministry of Environment and Forests

to evaluate Centrally Sponsored Schemes (CSS) for the Development of National Parks and Sanctuaries.

The following four Parks and Sanctuaries were allotted in the South Zone for this purpose :

(i) Indira Gandhi Wildlife Sanctuary / National Park

(ii) Parambikulam Sanctuary

(iii) Bhadra Wildlife Sanctuary

(iv) Nagarhole National Park

This centrally sponsored scheme has been under implementation since 1973 and substantial assistance has been provided to various national parks and sanctuaries in the country for development of infrastructure, habitat, wildlife studies, communication services, protection measures etc.

Evaluation of Indira Gandhi Wildlife Sanctuary and Parambikulam Wildlife Sanctuary was taken up on the following broad terms of reference :

- Develop a conceptual framework consisting of specific indicators, covering various ecological and other relevant parameters to evaluate the impact of the scheme and to finalise the same in consultation with the Ministry.
- Visit the selected national parks/sanctuaries to collect all relevant information and data and carry out an assessment of the field situation on the basis of the agreed conceptual framework.
- Analyse the data gathered through interviews with local staff and other concerned people and evaluate the impact of the assistance provided under the scheme against each of the identified performance indicators.
- Make appropriate recommendations for changes, if any, in the scheme.

Field evaluation was taken up after designing a questionnaire to meet all the points and aspects to be addressed as per objectives and terms of evaluation.

The data collected was refined and improved by field visits to Topslip and Parambikulam Wildlife Sanctuary. Observations and perceptions were discussed with the respective Wildlife Wardens and Chief Wildlife Wardens and the evaluation report was finalised with specific recommendations.

Recommendations

- Need for remedying inadequate communication network
- Motivational training and incentives to be provided to field staff
- Research and monitoring component to be strengthened
- The tremendous deleterious tourism pressure is to be mitigated
- There is a possibility of extending the sanctuary to adjoining forest division
- There is a need for several short term studies on various aspects of wildlife biology and conservation. Provision for this may be made and scientists, scholars and University Professors and Fellows may be encouraged to take up such studies

- The fund flow arrangement to the sanctuary under CSS needs to be examined. Funds should be arranged to reach management at the beginning of the year rather than the end of the year.
- All buildings and additional area with Parambikulam Project Authority and Electricity Board not being used should revert to sanctuary management authority to have a check on unauthorized activities and control inflow and settlement of outsiders.

Sub Programme Area 205

Technical Resource Center for the Implementation of the Equity Provisions of the Convention on Biological Diversity

205.1 Community Gene Bank

In the Community Gene Bank, established in 1994, the seed materials collected from various tribal and rural communities are preserved. Through the community based biodiversity programme, the emphasis is currently on collections from selected hot spot biodiversity rich areas of Tamil Nadu, Orissa and Kerala.

The characteristic features of this community gene bank are that it acts as a reference centre by holding the indigenous germplasm along with the passport data collected from the field, and it serves as a back-up storehouse of the seed material collected from tribal and rural farming communities on the basis of returning these seed material whenever required by them. NGOs working on these aspects interact with the Foundation by collecting and depositing the seed material from their locality.

679 accessions of seed samples have been collected so far. Collections comprise landraces, traditional cultivars, rare, endangered and medicinal plant seeds (Table 2.10). At the seed processing lab, seed materials are being tested for germination and moisture content and undergo proper cleaning prior to storage in the medium term cold storage. During the storage period, viability of the seed material is tested. Maintenance of hard copy of relevant information is periodically done. Very strong and effective linking of information with the existing data of FRIS is being carried out with the help of the informatics group.

Accession MSSR000404 was taken up for protein identification studies by the Foundation and this is under way. The 19 new Gene Bank accessions collected this year have been deposited with National Bureau of Plant Genetic Resources (NBPGR) for long term storage. 39 accessions collected in the year 1995 showed low germination percentage at the time of storage and this was informed to the field scientists. They have collected the same accessions again in June 1997 and the collections have been deposited in the Gene Bank. In March 1998, the Foundation undertook a five year collaborative work with NBPGR and its regional stations in the collection, multiplication and characterisation of seeds as a part of the National Agriculture Technology Project (NATP). This collaboration will increase

the number of accessions in the Community Gene Bank.

The project on participatory plant breeding which is to be implemented, will also enhance the collection. The Gene Bank Accessions would also be used in the breeding Programme.

Table 2.10 : *Gene Bank Accessions (June 1997 - May 1998)*

Accession Number	Cultivar/Variety	Collection Source
MSSR000726	Manyadongar	Orissa
MSSR000727	Bariadhan	- do -
MSSR000728	Bhatasakil	- do -
MSSR000729	Tulasibas	- do -
MSSR000730	Mandiadhan	- do -
MSSR000731	Gurji dhan	- do -
MSSR000732	Baiganamangi	- do -
MSSR000733	Merlodhan	- do -
MSSR000734	Ratanchudi	- do -
MSSR000735	Laisari dhan	- do -
MSSR000736	Khuji koiliari	- do -
MSSR000737	Ghadi kabri	- do -
MSSR000738	Lochia	- do -
MSSR000739	Sorusardhan	- do -
MSSR000740	Kandulkathi	- do -
MSSR000741	Kandulkathi (Podeiguda)	- do -
MSSR000742	Bhatagunda	- do -
MSSR000743	Badasopur	- do -
MSSR000744	Kerandi	- do -
MSSR000745	Atmashitala	- do -

Table 2.10. contd...

Accession Number	Cultivar/Variety	Collection Source
MSSR000746	Matiachudi	Orissa
MSSR000747	Jeeri kanhei	- do -
MSSR000748	Kudeiphula	- do -
MSSR000749	Dadhmani	- do -
MSSR000750	Mamidhan	- do -
MSSR000751	Kalamohara	- do -
MSSR000752	Haldiropa	- do -
MSSR000753	Laisiri	- do -
MSSR000754	Barkoli	- do -
MSSR000755	Bhaludhan	- do -
MSSR000756	Mahulakunchi	- do -
MSSR000757	Singhpuri	- do -
MSSR000758	Gandhirisopur	- do -
MSSR000759	Haldichudi	- do -
MSSR000760	Baramashi	- do -
MSSR000761	Dahanaprasada	- do -
MSSR000762	Gothia	- do -
MSSR000763	Bandikujidhan	- do -
MSSR000764	Sapurichudi	- do -
MSSR000765	Bodamangi	- do -
MSSR000766	Basumati	- do -
MSSR000767	Dhobkuji	- do -
MSSR000768	Makara dhan	- do -
MSSR000769	Sana kadala	- do -
MSSR000770	Bada lochi	- do -

Table 2.10. contd...

Accession Number	Cultivar/Variety	Collection Source
MSSR000774	Avarai	Namakkal, Salem
MSSR000775	Thinai	Coimbatore
MSSR000776	Kullan samai	Coimbatore
MSSR000777	Kullan samai	Coimbatore
MSSR000778	Kar samai	Coimbatore
MSSR000779	Kullan samai	Coimbatore
MSSR000780	Kar varagu	Coimbatore
MSSR000781	Kar samai	Coimbatore
MSSR000782	Kar samai	Coimbatore
MSSR000783	Kar samai	Coimbatore
MSSR000784	Kola samai	Coimbatore
MSSR000785	Samai	Coimbatore
MSSR000786	Samai	Coimbatore
MSSR000787	Varagu	Coimbatore
MSSR000788	Samai	Coimbatore
MSSR000789	Mosan thinai	Coimbatore
MSSR000791	Ragi	Coimbatore
MSSR000791	Samai	Coimbatore
MSSR000792	Varagu	Coimbatore
MSSR000793	Ragi	Coimbatore

205.2 Community Herbarium

The Community Herbarium serves not only as a local reference centre but also as a checklist for the identification of landraces, traditional cultivars, rare, endangered and medicinal plant species. It concentrates on the endangered species that are listed in the "Red Data Book of Indian Plants". Currently *Phaeanthus malabaricus, Capparis rheedi, Euonymus serratifolius, Crotalaria longipes, C. clavata,* and *Indigofera constricta* listed in the Red Data Book are available in the Community Herbarium. As of now there are 100 voucher specimens fully identified which belong to 45 families. Accession Register is being maintained.

205.3 Databases

As part of the activities of the TRC, an information service called the Farmers' Rights Information Service (FRIS) has been operational since 1996. The FRIS contains various database components, brief accounts of which are provided below.

Issues in Agrobiodiversity

This section contains a detailed introduction to policy and technical issues in recognition and reward of informal innovations that have contributed to the conservation of agrobiodiversity. Videos of statements on the issue from various institutions and agencies, such as FAO, the CGIAR and the Association of Indian Seed Industry are included.

Ethnographic Information

Original studies on major tribal groups of Tamil Nadu, Andhra Pradesh and Orissa are included. Their cultural practices are given coverage. Video clips are available along with photos.

Plant Information

Taxonomic and citation data for each of the plants used by the tribal families in the areas above are available along with herbarium diagrams. About 600 plants are included.

Gene Bank Information

Comprehensive data, including passport data for over 300 varieties of rice gathered from Orissa, along with photos of the conserver families, are included.

Continuous data processing is taking place with respect to the following information:

- Endangered plant species of economic value
- Case studies relating to gender and agrobiodiversity (India: Arunachal Pradesh, Mizoram; Sri Lanka; Maldives).

This multimedia database has been designed using HyperText Markup Language (HTML), the language/ protocol used on the Internet, to ensure ease of dissemination. Training programmes on the use of FRIS and HTML have been conducted (details in SPA 501 in this report). Suitable redesign to improve interactivity is taking place.

Sub Programme Area 206

Conservation and Utilization of Minor Millets

One of the important projects launched by J R D Tata Ecotechnology Centre during 1997-98 is the project on conservation and utilization of minor millets.

The minor millets include a diverse range of cereal species growing in an equally broad range of environments. The eight small millet crops are : finger millet *(Eleusine coracana)*, foxtail millet *(Setaria italica)*, proso millet *(Panicum miliaceum)*, barnyard millet *(Echinochloa colona)* kodo millet *(Paspalum scrobiculatum)*, little millet *(Panicum milliare)*, teff *(Eragrotis tef)* and fonio *(Digitaria* spp). Although total global production of minor millets is many times less than that of

the three major cereals, wheat, rice and maize, the minor millets are used as major food staples in many tribal and rural areas. Ragi *(Eleusine coracana)*, Thinai *(Setaria italica)*, Samai *(Panicum miliare)*, Varagu *(Paspalum scrobiculatum)*, barnyard millet *(Echinochloa colona)* and Panivaragu *(Panicum miliaceum)* are some of the minor millets grown in Southern India. Minor millets have better micro nutrient potentials. For instance, finger millet has 189 times more of calcium, and 175 times more of iron, when compared to rice.

The production and consumption of minor millets is decreasing, due to decline in biodiversity, changing diet patterns and non-availability.

The present study focusses on the revitalisation of on-farm conservation traditions of tribal and rural families. Hence, a two-pronged strategy is being adopted : biodiversity conservation through cultivation of minor millets and increasing the demand for minor millets through integrating them with regular diets at commercial, semi-commercial and household levels. Thus the project operates with the objective of creating an economic stake in conservation by developing sustainable utilisation for improving nutrition security and by linking them with markets.

The production and productivity aspects of minor millets are being studied through Participatory Adaptive Research at Kolli Hills in Namakkal district of Tamil Nadu. This predominantly small millet production area is now facing a threat from tapioca and many farmers are switching from subsistence based cultivation of minor millets to commercial based tapioca. This has affected not only the biodiversity, but has also resulted in heavy soil erosion in the region. By demonstrating the economic viability of minor millets, the project will attempt to popularise the improved cultivation of minor millets. Since *in-situ* conservation is essential for the conservation of crop genetic resources, efforts in this direction will be given priority. Specific emphasis will be given for the participation of women. A demonstration site has been established at Kolli Hills.

Simultaneously, the project is also undertaking studies for integrating minor millets in regular diets through appropriate food processing methods. The processing is focussing on a system that will not change the appearance or taste, cause any deterioration of nutrients, or involve changes in beliefs or practices.

During 1997-98 minor millet samples were collected from Kolli Hills, identified and labeled. An experiment was designed to assess the palatability of these millet samples. The experiment consisted of making chapaties with varying proportions of millets in combination with wheat flour. 10 subjects were selected from within the Foundation for this purpose. During the period of the experiment the subjects tasted the chapatis and filled in an evaluation form with variables such as taste, appearance, texture, aroma. The results of the experiments are being analysed.

The project made an attempt to bake bread with one of the land races of *Panicum miliare* called Sadan samai found in Kolli Hills. The study was done using the facilities of a local bakery. In the study 250 gms of Sadan samai (25%)

Table 2.11 : *Fungal species and population density in different breads* (Cfu/100g fresh weight)

Bread	Fungal species	Cfu
Minor millet bread	White mycelium	1
Bread with the brand name	*Aspergillus niger*	14
	A. flavipes	8
	Penicillium	8
	Others (white mycelium)	5
White bread from the bakery	*Penicillium*	18
	A. niger	6
	A. flavipes	2
	Others (white mycelium)	3

was combined with 750 g refined wheat flour (75%) in order to bake bread. These different breads were then observed for their shelf life. Two controls were present during the study - white bread (from the same bakery) and a bread with a brand name. 6 slices from each loaf were placed in containers to form 3 replicates at room temperature (R1, R2, R3) and 3 replicates at refrigerated temperatures (F1, F2, F3). The bread samples were then incubated for 5 days Observations of fungal infestation were made (Table 2.11).

This study indicates a longer shelf life for the bread with minor millets.

The minor millets are being analysed for their nutrient content, particularly micronutrients. Various land races of *Panicum miliare* from Kolli Hills and Dharmapuri and an improved variety from Tamil Nadu Agricultural University were analysed for their nutrient contents as shown in the Table 2.12.

Table 2.12 : *Nutritive values of Panicum miliare**

S.no	P.miliare / Parameters	S1	S2	S3	SD	P8	P9	P10	P11	PiS	CO3
1.	IRON	11.5	27.0	15.7	12.9	12.2	17.4	8.3	21.5	19.7	14.6
2.	ZINC	3.8	3.9	2.6	3.8	4.0	5.9	2.2	3.0	2.1	2.9
3.	CALCIUM	30.0	30.0	16.0	24.0	24.0	23.0	16.0	24.0	16.0	23.0

* Elements expressed in mg/100g

Table 2.12 contd...

S.no	*P.miliare* / Parameters	S1	S2	S3	SD	P8	P9	P10	P11	PiS	CO3
4.	PHOSPHO-RUS	0.13	0.11	0.11	0.16	0.09	0.07	0.05	0.10	0.12	0.15
5.	COPPER	1.79	1.02	0.89	0.49	2.83	6.11	0.34	0.5	0.19	0.42
6.	SODIUM	12.6	16.7	13.0	11.8	8.0	11.7	7.3	8.8	8.1	14.2
7.	VITAMIN A – IU/gm	5.85	5.70	5.21	6.10	5.15	5.0	6.20	5.61	5.52	5.71
8.	VITAMIN B – (B1 & B2)	0.04	0.05	0.05	0.06	0.04	0.04	0.04	0.05	0.04	0.04
9.	CRUDE PROTEIN	10.38	8.34	10.21	8.20	10.06	13.18	10.18	9.00	7.24	7.00
10.	CARBOHY-DRATES %	77.47	79.03	76.71	78.25	77.64	73.79	77.76	77.47	79.86	81.90
11.	LIPID (CRUDE FAT)	1.16	2.03	2.02	2.17	1.45	1.44	0.88	2.05	1.62	0.71
12.	ENERGY kcal/gm	343	348	347	346	385	342	340	345	343	342

S1 – Kattavetti samai

S2 – Perum samai

S3 – Thirikula samai

SD – Sadan samai from Dharmapuri

P8 – Vella perum samai

P9 – Mallia samai

P10 – Kotapatti samai

P11 – Sadan samai from Kolli Hills

PiS – Pillu samai

CO3 – Improved variety released by Tamil Nadu Agricultural University

The significance of the variations in protein, lipids and micronutrients such as iron and calcium are being analysed.

The project is also characterizing the various traditional varieties collected from Kolli Hills and other areas, using DNA analysis. Preliminary studies on the genetic composition and diversity in 10 different land races of *Panicum miliare* (samai), collected from the Kolli Hills, were carried out using proteins and DNA markers. No marked differences were observed in the soluble protein fractions in the analysed samples. Random Amplification of Polymorphic DNA (RAPD) analysis using 11 random primers in these genotypes showed exceedingly high level uniformity, with 98.05 per cent of loci (101 out of 103) being present in all the samples. In fact, the 96 loci revealed using 10 random primers across the samples were all monomorphic. Only one primer showed polymorphism with respect to only one genotype. Further studies including greater number of genotypes from a wider distribution range are being taken up to provide information about the distribution of genetic variation among these genotypes following the domestication and cultivation of this species. The low level genetic variability, high level of variations in certain nutrients and micronutrient content and high degree of morphological variations (as described by the people of Kolli Hills) are the interesting issues which would be further probed. These issues are vital for creating an economic stake in the conservation of minor millets.

The project is involved in a mobilization phase at Kolli Hills. More than thirty men and women from different villages meet regularly to discuss the progress of the project. The changing food habits among the people in Kolli Hills have been documented. A field demonstration and training centre has been built at Kolli Hills where the traditional varieties would be grown for further studies.

Sub Programme Area 207

Molecular Mapping and Genetic Enhancement

This subprogramme addresses two major concerns, namely genetic erosion due to the loss of biodiversity and decreasing agricultural productivity. Particular emphasis has been placed on the coastal ecosystem that suffers from the twin problems of low productivity and uncertain yield and constitutes an important part of the natural resource base of our country. Growing population pressure, increasing soil erosion and water pollution caused by intensive farm practices, sea water intrusion and attendant soil and water quality problems caused by ground water depletion have imposed various forms of stresses on the coastal ecosystem. This subprogramme concentrates on genetic diversity and species relationship among Indian mangrove species, using molecular marker technology as a prelude to conservation. Isolation and characterization of stress induced genes from mangrove species are being undertaken with a view to identify genetic material offering tolerance/ resistance to various abiotic stresses, particularly coastal salinity.

Molecular Marker Assisted Genetic Indexing of Coastal Agrobiodiversity

For many reasons, both physical and technical, investigations pertaining to the genetic characterization, composition and diversity in the taxa occupying the coastal estuarine ecosystem had not been undertaken earlier. This programme is designed to take up such investigations. As described in earlier reports, molecular marker based analysis for genetic indexing of the most predominant mangrove vegetation occurring in the estuarine regions along the Indian coastline have been initiated. Substantial progress has been made in the studies related to the analysis of the nature and extent of genetic diversity at intra- and inter population and intra- and inter-specific levels, species relationship and phylogenetic trends in a number of mangrove species, in addition to standardizing protocols for molecular analysis in this group of plant species. These studies have provided sufficient insight into the genetic characterization, species identification and the pattern of genetic variation and evolutionary differentiation in 28 mangrove species using various molecular marker systems.

Species Relationship in Mangroves: DNA from pooled leaf samples of 11 true major mangroves, 3 true minor mangroves, 2 mangrove associates, 2 mangrove parasites, 3 terrestrial and 1 cultivated species were isolated. In total, 198 Random Amplified Polymorphic DNAs (RAPDs) and 180 Restriction Fragment Length Polymorphism (RFLP) loci were scored using 10 primers and 14 enzyme-probe combinations respectively. Polymorphism observed for these markers revealed a high degree of genetic diversity in mangroves at inter-specific or inter-generic level. A dendrogram constructed after pooling both RAPD and RFLP data using similarity index was analysed for genome relationship among these species. All the major mangroves except *Nypa fruticans* (Arecaceae) were clustered into one group. All the species under the tribe Rhizophorae formed a sub-cluster, to which *Xylocarpus granatum* was found to be the closest species.

Detailed studies have also been initiated in three species of *Heretiera*, three species of *Xylocarpus* and three species of the genus *Sonneratia* to account for intra- and inter- specific genetic diversity and relationship between these species. Major emphasis, during the year, was placed on analysis of the variation in the organellar genomes of various mangrove species.

Organellar DNA Polymorphism: Evolutionarily conserved chloroplast DNA (cpDNA) regions, trnS-psbC and rbcL from 120 individuals of 24 mangrove and mangrove associate species which were PCR amplified and restriction digested with Hae III. PCR-RFLP analysis of trnS-psbC region, revealed 18 classes of restriction banding pattern in agarose gel electrophoresis and provided molecular evidence for species diversity in mangrove floral component. Intra-generic variation occurred in three genera viz. *Rhizophora, Avicennia* and *Suaeda*. Species-specific restriction patterns were found in the genera *Rhizophora* and *Suaeda*. A natural hybrid belonging to the genus *Rhizophora* was also analysed, and restriction patterns were the same as the hypothised ancestral maternal species of

the hybrid. PCR-RFLP analysis of rbcL gene region was less differentiating. However, it showed 13 different classes of restriction patterns and revealed the usefulness of these investigations in genome analysis at a higher taxonomic level. In both cpDNA regions intra-specific variation was not detected.

Mitochondrial (Mt)-DNA polymorphism in 10 species belonging to the family Rhizophoraceae have been studied using 8 restriction enzymes and 10 different mitochondria specific probes. These studies have provided substantial information on the nature of species diversity and genetic differentiation among the species belonging to the family.

Isolation and Characterisation of Salt Tolerant Genes

The genetic enhancement component of the subprogramme aims at identifying genetic material offering tolerance/ resistance to various forms of abiotic stress particularly coastal salinity and exploring possible ways to transfer these resistance characters to crop species of importance in coastal regions. It intends to develop practical pre-breeding material for the use of grass-root level breeders for developing plant varieties capable of withstanding stress conditions.

The approach followed in this programme has been to identify inducible proteins expressed upon salt stress and isolation of stress tolerant/ resistant clones from the cDNA libraries. Based on the genetic relationship, obtained from the molecular marker analysis, three mangrove species have been selected as target species for construction of cDNA libraries and isolation of potential genes. These include a salt excreting species *Avicennia marina,* a salt excluding species *Bruguiera gymnorhiza* and a monocot species *Porteresia coarctata.* cDNA libraries have been constructed from these three species after salt treatment of varying duration and concentration. The libraries are being screened for known stress induced genes using heterologous probes. Presently, indepth studies on two pathways leading to the synthesis and accumulation of osmoprotectants i.e. Betaine and Proline are being undertaken. Screening of the libraries with heterlogous probes such as Betaine Aldehyde dehydrogenase (BADH) from spinach, Choline monooxidase (CMO) from sugarbeet, Pyrroline-5-carboxylate synthatase (P5CS) and Pyrroline-5-carboxylate reductase (P5CR) from *Arabidopsis thaliana,* are being currently undertaken. Some of the significant results obtained are as follows:

- A BADH clone of 1.8 kb length has been identified. End sequencing showed considerable homology to known BADH and ADH sequences. Complete sequencing of this clone has been carried out after subcloning.
- A full length gene homologous to the 40S ribosomal protein S6 of human and rats has been identified.
- Pyrroline-5-carboxylate synthatase clone have been identified both from *Avicennia marina* and *Porteresia coarctata.* Subcloning and sequencing of these clones are being carried out.
- Isolation of a 0.7 kb clone through complementation studies with *E. coli* mutants NM 81 and EP 432, showed homology to Alkane-1-monooxidase of

Pseudomonas olivarans and induced cytochrome P450.

Screening of the cDNA libraries for other stress induced genes, raising antibodies and studying the expression pattern of BADH, northern hybridization to study the mRNA expression pattern, construction of vector and transformation to a suitable crop species are being planned. In addition, sequencing and characterisation of promising clones of both practical and academic significance are being pursued with the aim of isolating hit clones.

Sub Programme Area 208

Monitoring Ecosystem Health Using Microbial Diversity

The choice of microbial diversity as a tool for biomonitoring stems from the fact that, in spite of their vital role in the function and maintenance of the Earth's ecosystems and biosphere, they have been the neglected rivets of the ecosystem. In all conservation programmes they are rarely mentioned or only on the fringes of such programmes.

Microbial diversity (bacterial diversity), both at the functional and physiological level with special reference to beneficial organisms and microbially mediated processes (enzymatic activity) in soil and lichens, is being used as a tool to monitor the health of the coastal agri-ecosystem and forest disturbance in the forest ecosystem of the Western Ghats. For the sake of clarity the results obtained are being described under two heads i.e. Agri-ecosystem and Western Ghats.

208.1 Microbial Diversity in Coastal Agri-ecosystems

The interactions that occur between the soil biota, plant roots and physical and chemical properties of the soil are of major importance to plant productivity. The diversity of the micro-organisms in the soil/root ecosystems and their activity play a tremendous role in sustainable plant productivity. In modern agricultural practices the activity of the soil biota has been largely marginalised by the use of agro-chemicals such as pesticides, which suppress damaging organisms or which, through application of chemical fertilisers bypass nutrient cycles. In spite of the significant roles they play, there is considerable lacunae on base line data. The major focus of this subprogramme is to understand the diversity of the beneficial organisms associated with the farm sites along the coastal region and to harness them as indicators of soil health at functional /community level.

The approach has been to select farm sites close to the coastline which reflect the stresses of this area (salinity, farming practices like excess of pesticide application, and other chemicals which get leached because of the industries present around these areas which let out effluents into the water bodies). Four sites have been selected along 75 km of the coast. The sites have soils which range from low (site 1 & 2), moderate (site 3) and strong salinity (site 4, Table 2.13). The organic carbon also varies from low to moderate and the soils are predominantly sandy loam. All the crops cultivated in this region, including legumes and non-legumes, were taken into

Table 2.13 : *Characteristics of the selected study sites (Agri-Ecosystems) along the Eastern Coast of Tamil Nadu (11°00'N to 12°00'N, 79°45'E)*

Site Profiles	T.S. Pettai (Site - 1)	Periandikuzhi (Site - 2)	Poondiankuppam (Site - 3)	Nanamedu (Site - 4)
From Shore	1.35 km	1.5 km	1.35 km	0.75 km
Texture	loam/clay	sandy	loam/clay	sandy loam
pH	6.3-7.9	6.1-7.6	6.6-7.8	6.2-8.0
Chlorides %	0.05	0.06	0.092	0.55
	weakly	weakly	moderately	strongly
	salinised	salinised	salinised	salinised
Org. C %	0.14-0.58	0.17-0.44	0.22-0.44	0.23-0.56
	low-medium	low-medium	low-medium	low-medium
Irrigation	canal	manual	borewell	borewell
Crops	Groundnut	Brinjal	Cotton	Groundnut
	M.Millets	C.Beans	Groundnut	Cotton
	Paddy	Groundnut	M.Millets	Onion
	Sesame	Casuarina	Paddy	Ragi
	Eucalyptus			
	Snake Gourd			

account to study the pattern of spatial and temporal distribution of the beneficial micro-organisms.

Realising the vastness of the complete bacterial diversity per se the focus of the present study aims at being more realistic in that the focus is more on the diversity of the beneficial organisms associated with the nitrogen guild (both free and associative and symbiotic), phosphate solubilisers and the *Pseudomonas* sp (in the light of the versatile nature of this group of organisms). Soil enzymes as indicators of soil health are also being used. Data sheets have also been developed.

Monthly documentation of the various parameters is being carried out. The consolidated data collected so far reveals that activity is more than double in the rhizosphere when compared to the non-rhizospere soils. The microbial activity including enzyme activity is very good when manure is used. Populations of beneficial organisms associated have been isolated for studying the physiological and genetic variability (both intra-and inter) that might have been brought about by

the farming practices and physico-chemical properties of the soil. *Pseudomonas* sp. have been found to dominate the rhizosphere of cotton and onion soils. Initial characterisation of the isolates reveal that most of them belong to the fluorescent group. Populations of *Rhizobium* sp., *Azospirllum* sp., *Acetobacter* sp. and *Azotobacter* sp. in association with the various crops have also been isolated.

The available data is being used to bring out both the intra- and inter-site variations in relation to the diversity and soil health. Observations are an average of four replicates and the samples were obtained from pooling sub-samples from the sites (got by taking the top 5 cm of soil). Data sheets of the isolates recovered are being maintained simultaneously. This data will be used for developing indicators of productivity/pollution.

The isolates both at intra- and inter-population level are being analysed for their efficiency and characterised using AP20, MIDI and molecular tools. Salt tolerant isolates, associated and endophytic diazotrophs, especially in non-legumes, will be analysed. Emphasis will also be given to assessment of the functional diversity of the beneficial organisms (as mentioned earlier). Simultaneous assessments for their tolerance towards stress will also be quantified.

208.2 Monitoring Forest Ecosystem Health Using Lichen Diversity

The variations in the distribution pattern of lichens (symbiotic association between a fungi and an alga or a cyanobacterium) depending upon the micro level changes in the mesohabitat conditions (viz. light intensity, substrate pH, texture, moisture, surface temperature etc.) are used to identify forest sites with long ecological continuity/ disturbance. The development of lichen biomonitoring methodologies for unexplored sites must be site specific, so as to place the results obtained through these studies on a scientific base. The ecosystem health must also be quantified through other ecological methodologies. The combination of both the data will be useful in identifying indicator lichen communities easily.

The major focus of this sub-programme is to develop an impeccable ecological methodology to use lichens and their communities as biomonitors, to identify and monitor the health of forest ecosystems within the Siruvani Hills (Western Ghats). This area is considered to be one of the mega biodiversity areas- a hot spot. These hills serve as the home of a variety of plants of medicinal importance, birds and animals. The river systems originate from here. The hill slopes here are still well-preserved.

The ecological methodology followed in the studies include

- both the physical and biological monitoring methods
- classification of forest sites on the basis of existing vegetation type, along with the altitude prior to data collection
- use of ecological methods to quantify the physical features of the forests to prepare a composite index to indicate the health of the ecosystem (This index serves as background material to superimpose the lichen data and to

elucidate the indicator lichen communities)

- confining lichen sampling to 1.5 - 2 m on the tree trunks from the ground level to make this study more practical and user friendly (Thus sampling from canopy and other inaccessible areas of the tree is being avoided).

A total number of fifteen quadrats were laid down at various locations within Siruvani Hills and all the data listed in the data sheet were quantified. The data and the lichen specimens collected are being catalogued and maintained. Preliminary analysis shows that the genus *Porina* is predominant in near normal ecosystems, while Lichen genus *Parmelia* is dominant in disturbed sites.

It is planned to lay out more quadrats at various locations within the hill range and data on forest continuity and lichens will be quantified and analysed. Later the indicator lichen species/communities will be elucidated and presented in the form of an illustrative chart to test, train and adopt local communities, students and foresters in ecosystem conservation using Lichens as biomonitors.

Sub Programme Area 209

Conservation and Bioprospecting of Endangered, Medicinal and Mangrove Plant Species

Integrated conservation methods should be based on calculated interweaving of multiple conservation methods like insights into the species biology and population genetics to know the actual mechanism of endemism followed by propagation through asexual (vegetative and tissue culture techniques) and sexual reproduction. Bioprospecting, to add value to the biodiversity, is one more dimension of conservation biology that is gaining importance.

Studies on Endangered / Medicinal Plants

The research on endangered/medicinal plants aims at studying the genetic variability in the natural populations, their propagation through asexual reproduction (micropropagation/vegetative propagation), reintroduction in their natural habitat and bioprospecting. Micropropagation protocols were developed for about 15 species of endangered and medicinal plant species and they were successfully reintroduced in their natural habitat.

During the current year the available genetic variation in wild for *Syzygium travancoricum* was scored through RAPD and microsatellite markers for two different populations. Both inter- and intra-population variations were scored and initial observation shows a very narrow genetic diversity between these populations. A few more populations are being included for further studies.

Micropropagation protocols have been standardized in *Aegle marmelos, Piper barberi* and *Syzygium travancoricum*. Indirect organogenesis through leaf callus was standardized in *Curculigo orchioides* and axillary bud break and shoot multipli-

cation was standardized in *Tridax procumbens, Capparis zeylanica.* RAPDs and microsatellite markers were used to screen the genetic fidelity of tissue culture raised plants by different *in-vitro* methods in *Piper barberi.* As high as 95% similarity was seen between the mother plant and plants from different stages of multiplication.

Bioprospecting research involves the extraction, identification and characterization of bioactive compounds with antimicrobial properties from plant species such as *Capparis zeylanica* and *Salacia chinensis.* Extractions of the collected plant materials were done using suitable methods. Bioassays of the extracts were done against plant and human pathogens by filter disc method and spore germination tests.

The crude extracts of the above mentioned plants are effective against pathogens like *Candida albicans, Aspergillus terreus.* Fractionation of the crude extract was done by chromatography techniques and two fractions exhibit considerable activity against these pathogens. Efforts to identify a similar class of compounds in other plant systems are underway. Further fractionation, purification, identification and characterization of the bioactive principle are being done.

Studies on Mangroves and their Associates

The work on the mangroves involves their genetic enhancement using biotechnological and classical breeding approaches as well as identifying genes for fertility in an otherwise sterile interspecific hybrid of *Rhizophora.* The research on the mangrove associate *P. coarctata* involves determination of its relatedness to *Oryza* species and identifying the genes/gene products (proteins) responsible for salt tolerance.

Forest tree breeding consists of the following two steps viz., phenotypic selection of individual plus tree followed by establishment of the selected plus trees in the seed orchards for the production of improved seed which can be used for high quality plantation. During the current year superior trees were selected using morphological (vegetative and reproductive) and physiological markers and they have been multiplied using micropropagation, vegetative propagation and seed propagation techniques whichever has been appropriate. Several species of mangroves have been successfully multiplied in this fashion and reintroduced in the natural habitat both for conservation and afforestration.

Several vegetative and reproductive characters have been scored for several mangrove species. 10 to 15 populations with twenty random trees from each population were scored in all the species for various morphological, physiological and reproductive characters and a critical minimum value, which constitutes the average of all the individuals across several populations, was given for each trait. Individuals performing above the average limit for 75% of characters were tagged as the plus trees.

During the current year propagation of some more species through rooting of stem cuttings was standardized in *Amoora cucullata, Avicennia marina, Cerbera manghas, Derris trifoliata, Dalbergia*

spinosa, Heritiera fomes, Intsia bijuga, Xylocarpus granatum and *Xylocarpus mekongensis,* whereas rooting of propagule cuttings was standardized in several members of the Rhizophoraceae viz., *Bruguiera cylindrica, Bruguiera gymnorhiza, Ceriops decandra, Kandelia candel, Rhizophora apiculata, Rhizophora* hybrid and *Rhizophora mucronata.*

Air layering experiments were conducted between October'97 and April'98 during and just after the monsoon and after the flowering season for two years. Successful air layering protocols were established for *Heritiera fomes, Heritiera littoralis, Lumnitzera racemosa, Sonneratia apetala, Xylocarpus granatum, Xylocarpus mekongensis* and *Xylocarpus moluccensis*

Micropropagation protocol, using uninodal segments, was established in *P. coarctata.* Axillary shoot initiation and multiplication was achieved in WP medium supplemented with BA (0.5 – 2.0ppm) and KN (0.25 – 2.0ppm). Rooting was achieved in half concentration of the basal medium supplemented with 0.5ppm IBA. Axillary bud break and elongation of the axillary bud have been standardized in *Amoora cucullata, Xylocarpus granatum.* All the three species are responding in woody plant medium supplemented with various concentrations and combinations of BA, Kinetin and 2ip. Experiments are underway for confirmation of multiplication and rooting experiments.

The mangroves and their associated plant species propagated through various means (seeds, rooting of cutting, air layering and micropropagation) were introduced in the Mangrove Genetic Resources Center at Pichavaram and Muthupet during 1996 and 1998 with the twin objectives of accelerating the reclamation of newly formed mudflats along the inter tidal areas of mangroves and maintaining the species diversity of Indian mangroves. Currently MGRCC has the following species: *Amoora cucullata, Bruguiera gymnorhiza, Cerbera manghas, Heritiera fomes, Heritiera littoralis, Intsia bijuga, Kandelia candel, Sonneratia apetala, Xylocarpus moluccensis, Xylocarpus granatum, Rhizophora stylosa, Bruguiera gymnorhiza, Nypa fruticans, Intsia bijuga, Heritiera fomes, Heritiera littoralis, Xylocarpus mekongensis, Xylocarpus moluccensis, Xylocarpus granatum, Cerbera manghas, Cerbera odollam, Acanthus ilicifolius, Aegiceras corniculatum, Avicennia marina, Avicennia officinalis, Bruguiera cylindrica, Ceriops decandra, Derris trifoliata, Dalbergia spinosa, Excoecaria agallocha, Lumnitzera racemosa, Rhizophora apiculata, Rhizophora hybrid, Rhizophora mucronata, Sonneratia apetala, Xylocarpus mekongensis, Avicennia reinformis, Bruguiera parviflora* and *Bruguiera sexangula.*

The MGRCC will be the source for the seed material for future plantations and will also be used to check the heritability of the plus tree characteristics on the basis of which these have been selected.

In addition to the above studies controlled pollination experiments were conducted between *R. apiculata* and *R.mucronata* to exploit the heterosis of the F1 hybrid. Reciprocal crosses have been attempted with various treatments to overcome the pre- and post- fertilization barriers. Interspecific hybrid was produced

when *R. mucronata* was used as the female parent and *R. apiculata* was used as the male parent. Treatment of the stigmatic head with 10ppm GA3 was found to be good to overcome the prefertilization barriers. However the growth of the embryo in the interspecific hybrid is very slow and experiments are underway to stimulate the growth of embryo through embryo rescue technique.

Studies on P. coarctata

The genetic relationship between *P. coarctata* and wild rice species was determined using molecular markers like AFLP and RAPD. The closest relative of *P. coarctata* based on the genetic distance was *Oryza australiensis.*

Changes in protein profiles induced by salt stress were investigated both in *P. coarctata* and callus cultures in rice.Two predominant polypeptides with apparent mol. wt of 70 KD and 32 KD respectively were induced under salt stress at 10% ASW treatment in *P. coarctata.* The 32 KD protein also appeared in the tested rice lines, both *in vitro* and *in vivo* though they differ in their relative level of salt tolerance. This represents the possibility of a generalized component of the response mechanism to osmotic stress in both *P. coarctata* and *Oryza sativa.*

Sub Programme Area 210

Science and Technology for Women: Women's Biotechnology Park

A resource group of women scientists and technologists of the Asia-Pacific region, (sponsored by UNDP and MSSRF), met at Chennai, India from 17-19 December 1996, to mobilise science and technology for women.

The proposed activity of establishing a Women's Biotechnology Park arises out of these deliberations. Business and technology incubators such as biotechnology parks could help in identifying opportunities for indigenising biotechnology in food processing and other related agro-processing activities, where women have been traditionally strong.Other areas are medical biotechnology like diagnostics, which could help in health related issues, especially in girl children and women, support technology transfer including provision of credit, managerial and organisational infrastructure and support for quality control and dissemination of technology, finances etc. The Park would primarily act as an interface between educational/research institutions on the one hand and industrial units on the other. It would help in providing support to promote equal access and control for women over resources, including land, water, fuel resource, common property resources, credit and technology. It would also help in identifying business opportunities for women in urban areas through feasibility studies using the criteria of value addition and market demand. With this kind of back up it would enable women to take part in productive work in the proposed Park. These women in turn would provide opportunities for rural women.

The Department of Biotechnology (DBT), Govt. of India, requested MSSRF to prepare a concept paper in February 1997. Based on this the Foundation was requested to prepare a feasibility report in

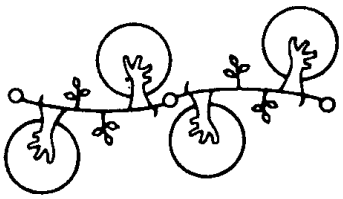
March 1997 for the proposed activity. Having conceptualised it, it was decided to set up the first Biotech Park for Women in Chennai. Advertisements were placed in leading newspapers calling for interested women entrepreneurs. More than 200 applications were received. A questionnaire was designed to get a feedback on the background of the applicants and what they expected from the Park in terms of technical and financial inputs and this excercise was completed by June 1997.

At the same time two panels were set up, viz., the technology identification panel and the business panel. The former identified the technologies which could be chosen by the women and the business panel studied the viability options and prepared preliminary project profiles for the technological options identified by the former panel. This was completed by June 1997. The State Govt. identified the Tamil Nadu Industrial Development Corporation (TIDCO) as the nodal agency.

At the first task force meeting on developmental programmes for women constituted by the DBT, the proposal submitted by MSSRF to set up the first Biotech Park for Women in Chennai was accepted in principle. Later, the Core group members who could play a role in the proposed activity were identified. Several meetings were held with various members of the institutions to sensitise them on the concept. In July 1997 the land was identified by TIDCO and recommended to the State Government. Between October and November 1997, a training programme was held for the probable women entrepreneurs and is detailed under the training programmes conducted at MSSRF (SPA 501)

The Chief Minister in his budget speech delivered on 27 March 1998 announced the decision of the Government of Tamil Nadu to establish a Women's Biotechnology Park at Kelambakkam, near Chennai. 20 acres of land has been allotted for this. TIDCO and the DBT were identified as the principal partners in this venture. In April 1998 TIDCO was formally requested to be the implementors of the project. Industrial and Technical Consultancy Organisation of Tamil Nadu (ITCOT) was identified as the consultants to prepare the first Detailed Project Report (DPR). The proposed Park is to be registered as a company. The major role of this Company will be the promotion of a progressive business, environment for women, and pristine natural environment apart from helping in technology incubation and transfer, capacity building and market linkages. The Company will have a Governing Board consisting of representatives of women entrepreneurs, State Govt and DBT. The Park will be supported by both a Technical Resource group and financial institutions. The former will be formed by a consortium of industries, R&D institutions and organisations to serve as friends of the Park as identified in the core group mentioned earlier. This Park has been identified by the Govt. of India as one of the activities during the Golden Jubilee year and it is being registered as Golden Jubilee Women Biotechnology Park Ltd. The Foundation Stone for this Park is being laid by H E the President of India on July 29, 1998.

Programme Area 300



Ecotechnology and Sustainable Agriculture

This programme concentrates on providing and spreading sustainable solutions to two of the major contemporary challenges : pervasive rural poverty and increasing damage to environmental capital stocks. The emphasis is on the generation of eco-jobs and the training of eco-entrepreneurs.

Sub Programme Area 301

J R D Tata Ecotechnology Centre

The mission of J R D Tata Ecotechnology Centre is to evolve methodologies for operationalising sustainable development in the field of agriculture and rural development. The centre undertakes participatory research and its projects are implemented in selected villages to test a specific aspect of development intervention. This aspect is evaluated in terms of ecological viability, economic feasibility and social acceptability. In this process attempts are made to develop grassroot institutions. The ongoing projects are listed in Table 3.1

Table 3.1 : *Projects undertaken by J R D Tata Ecotechnology Centre*

Project	Focus	Project Description
Seed village	Seed	Adding value to the time and labour of rural poor through skill empowerment. Production of quality seeds and market linkages
Low cost mist chamber	Seed	Hybrid seed production using low cost mist chambers by the rural landless labourers and urban poor
Farm level biopesticide production	Biopesticide	Refining the production process of *Trichogramma,* NPV and plant products at farm and village level
Improving phosphorous content in organic manure	Organic phosphorus	Using *Cassia auriculata* and *Trichoderma,* improving the phosphorus content in manure
Moringa oliefera (drumsticks) for purifying drinking water	Drinking water and phytoremedies	Using the seeds of *Moringa oliefera,* purification of drinking water from fluoride and prevention of flourosis
Eco-aquaculture	Prawn and water	Using rain water harvesting for prawn production
Neem village	Wasteland development	Neem as an intervention in wasteland development using technologies such as tissue culture and VAM
Pulse village	Pulses	Improving the productivity of pulses through water harvesting and appropriate watering schedules and management practices
Conservation and utilization of minor millets	Minor millets	Studying the various varieties of minor millets for food fortification and thereby creating an economic stake. Improving the productivity of minor millets

Table 3.1. contd...

Project	Focus	Project Description
Integrated Intensive Farming system	Integrated farming system	Creating linkages within farm. Less off-farm input. Maximising the productivity of crops per unit of soil and water.
Multimedia package on Integrated Pest Management	Computer aided extension	Using multimedia systems, user friendly package for farmers on IPM
Technology Resource Centre	Capacity building	Capacity building and formation of grassroot institutions for transfer of knowledge and interactive learning

The project on *Conservation and utilization of minor millets* has been described in SPA 206 and the details of the CAPART *Technology Resource Centre* are given under SPA 304 of this report.

Highlights of the Activities

- Conducted nearly 14,000 trainee days through the Technology Resource Centre and the projects of JRD Tata Ecotechnology Centre, resulting in more than 500 acres of land under sustainable agriculture.
- Identified that the seeds of perennial *Moringa oliefera* (drumstick) are better in absorbing the fluoride in drinking water and that the seeds grown in the fluoride contaminated regions are not efficient in absorbing the fluoride
- Found that *Trichoderma* and *Cassia auriculata* have the potential of increasing phosphorous in manure
- Observed that the differences in the varieties of pest, *Helicoverpa armigera* (American Bullworm) may be one of the reasons for lack of control over its culturing at lab for NPV
- Demonstrated that the technologies such as tissue culture and VAM could be useful in wasteland development
- Established that hybrid seed production could be done using more of organic inputs
- Produced 3.4 tonnes of Ponni variety of paddy per ha under organic conditions
- Cultured 0.5 tonnes of *Macrobrachium rosenbergii* per hectare in a period of 7 months, using rain water
- Developed process of mushroom production using banana leaves
- Designed a user-friendly multimedia computer package on IPM in Tamil for farmers and agricultural labourers
- Observed that the family labourers dominate sustainable agriculture such as integrated intensive farming system. Similarly, when the agricultural operations demand specific skills such as hybridisation, the family labour tends

to take the place of hired labour. Such a process creates additional demand on the female labourers of the family

During 1998-99, the above issues would be consolidated and the various socio-economic dimensions of such interventions would be identified.

301.1 Seed Village: Promoting Partnerships between Private Sector Seed Industry and Rural Women in the Organisation of Seed Villages

The seed industry is regarded as a "sun rise" industry because of its potential for increasing rural income and employment. The industry offers a potential for value addition to the time (the working hours) of the women belonging to poor households. Besides improving the livelihood security of the rural poor, it will provide elite planting materials to the farming community. Hence the project on "social contract between the corporate sector and rural poor", is being taken up with the following objectives :

- To link farm families with private and public sector seed companies, in order to provide them the benefit of scale in seed production and marketing
- To train unskilled women labourers in production of quality seeds and planting materials
- To improve the capacities of the farm women in seed processing and packaging.

The project is being implemented at Kannivadi Village in Dindigul district of Tamil Nadu. Training was provided in various aspects of seed production.

The project has been focussing on 75 growers for seed production. However, 110 farmers have taken up seed production in various crops. In addition to the above area, the project is also conducting yield trials for various crops in 3.5 acres of farmland.

The project is at present studying the impact of the intervention in terms of economics, social and gender issues.

Some of the farmers have shown very good results and they surpass the estimated yields of the seed company. Interestingly, these results have been achieved by replacing a major portion of chemical fertilisers and pesticides with farmyard manure and biopesticides as shown in Table 3.2.

Table 3.2 : *Sustainable management of farm inputs among selected growers*

Farmer's Name / Details	Gnanasoundari	Pulavendran	Kalaiselvan	Kalaiselvan
Crop	Open Pollinated Bhendi	Sun flower	Hybrid Bhendi	Cotton
Area in cents	30	50	50	40

Table 3.2. contd...

Farmer's Name / Details	Gnanasoundari	Pulavendran	Kalaiselvan	Kalaiselvan
Actual yield in kg per acre	460	246	158	492
Estimated maximum yield by seed company, in kg per acre	250	200	150	400
Recommended NPK by the seed company	60:40:40	80:40:40	80:40:40	60:20:20
Actual usage by the farmer	20 kg urea and FYM	20 kg urea and FYM	50:20:20 and FYM	20 kg urea and FYM
Recommended pest management by the seed company	5 chemical sprays	6 chemical sprays	8 chemical sprays	20 chemical sprays
Actual usage by the farmer	5 neem sprays and 2 chemical sprays	5 neem sprays and 1 chemical spray	5 neem sprays and 3 chemical sprays	15 neem sprays and 5 chemical sprays

The studies have indicated that the higher rate of productivity and returns among some of the farmers were due to careful planning of fertilisers and pesticides, intensive management with family labour and precision in timing in terms of planting, hybridisation and harvesting. Most of the farmers involved in the project are small and marginal farmers without any irrigation facilities.

In terms of labour absorption, the estimates of the seed industry for the absorption of female labour is given in Table 3.3.

Table 3.3 : *Absorption of female labour*

Crop	Seed Production/ Women employment per acre	Crop production/Women employment per acre
Sunflower	60	15
Brinjal	800	175
Bhendi	1200	240
Tomato	1200	240
Cotton	50	15

During the last two years attention was focussed on sunflower seed prodution. Very few farmers were given bhendi, brinjal and tomato since the cultivation requires substantial experience. Among the agricultural women labourers trained in the project nearly 30% can be categorised as family labourers.

It has been found that on average, a trained agricultural woman labourer involved in seed production earns Rs.100 per month more than other landless women labourers during the season. Another advantage for seed producing landless women labourers is that they get the additional income in less time.

The project has identified two issues for further studies: the additional burden of exchange labour and the displacement of hired labour, particularly landless women labourers. The family labourers who were hitherto involved in "use value" activities (household chores) have been brought into the "exchange value" system. A careful analysis of time budgeting between trained labourers and non-trained labourers during the peak agricultural season shows that the trained labourers get more free time than the non-trained labourers.

The project has also initiated a self-sustaining institutional process at the village level. The project is organising the farmers and labourers into associations. The first association " Reddiyarchatiram Seed Growers Association" was formed during January 1998. Another Association is being formed for women at Velankannipuram for producing vegetatively propagated fruit seedlings. Women from six Women's Association are involved in training labourers in seed production technologies.

On 29 December 1997, the project organised "Seed Producers' Day" at Kannivadi. Nearly 400 women agricultural labourers and farmers attended the meeting. Mr. Jag Pal Singh of CAPART, New Delhi and Dr.Paran Gowda of Vivekananda Kendra, Kanyakumari attended the meeting. Its Chief Training Officers and staff represented Krishi Vigyan Kendra. As a part of the programme, ten industries exhibited their bio-products such as organic fertilisers, biopesticides etc. One of the farmers under CAPART-Technology Resource Centre has started marketing bio-pesticides in the region and he also exhibited his products.

During the function, the project requested the participants to discuss the withdrawal strategy of the Foundation during 1998-99 and suggest the measures for a self-sustaining system of training and market linkages operating within the farming community. The participants after an intensive group discussion presented their views:

- Farmers and agricultural labourers can take up the system of training, information and market linkages.
- Farmers' Associations should focus on emerging as seed industry for the region.
- M.S.Swaminathan Research Foundation can withdraw, but support the grassroot institutions for another three to five years before complete withdrawal. A gradual withdrawal has been recommended instead of sudden pullout.
- The Foundation should train the Associations in project management and link them with funding agencies such as CAPART and financial institutions.

301.2 Low Cost Mist Chambers

The project, launched last year, continued the study of low cost mist chambers. Four types of huts measuring 5 x 3 x 3m were designed and tested. These types are :

- roof and sides covered with nylon net
- roof and sides covered with High Density Polyethylene Sheet (HDPE)
- roof and sides covered with HDPE sheet until the vegetative stage and removed during the reproductive stage.
- roof covered with HDPE sheet and side covered with nylon net.
- Open field conditions served as control.

Bhendi, brinjal, radish, and capsicum were selected as experimental crops. Organic cultivation methods were followed. Twenty-five farmers and landless labourers in and around Kattupakkam village, Kancheepuram district, observed the progress of the project regularly.

Nursery beds were made in partially shaded conditions. The seeds germinated in 6-10 days and the seedlings were transplanted after 25 days. The main trial plots were tilled three times and farmyard manure was applied as recommended by the Soil Test Laboratory. The brinjal seedlings were transplanted at a distance of 60 x 60cm. Bhendi seeds were sown at the ridges with a distance of 30 x 30cm. Radish seeds were sown at the ridges with a distance of 15 x 15cm. Capsicum seedlings were transplanted at a distance of 30 x 30cm.

Water was applied during the vegetative stage of the plants through hose lining, constructed in the side of the hut for even distribution. During the reproductive stage water was applied through hoses at the base of the plants to prevent damage to the flowers of the experimental plants. Neem oil was sprayed once a week to prevent pests. The fruits of capsicum and brinjal were harvested once a week and bhendi every 2 days.

Data regarding various parameters has been collected and is being analysed. The physical parameters such as soil nutri-

ents (Nitrogen, Phosphorous and Potassium) and environmental factors (Temperature, Relative Humidity), water use efficiency of the chambers and the control plot and the biological parameters are being regularly evaluated. Ten plants have been randomly selected inside the greenhouse and from the open field and variables such as plant height, number of leaves, flowers, fruits, pest attack, natural enemies, leaf area and yield are being studied.

The highest yield was recorded in 'fully covered HDPE' chambers and 'in chambers fully covered with nylon nets'. The results show a statistically significant yield rate. Analyses are being carried out to study the significant relationship in physical and biological parameters. Once an appropriate chamber is identified, the project would focus on producing hybrid seeds inside the mist chamber.

Among the four crops, analysis has been completed for bhendi *(Abelmoschus esculentus).* The impact of the various types of mist chambers on yield has been given in Table 3.4.

Table 3.4 : *Various types of mist chamber and yield of bhendi*

Treatments	Bhendi yield in g per m²
Fully covered with nylon net	518.33
Fully covered with HDPE sheet	493.78
Fully covered with HDPE sheet but fully opened during reproductive stage	542.89
Roof covered with HDPE and sides covered with nylon net	475.98
Open field condition-control	333.66

301.3 Farm Level Biopesticide Production

It is a recognised fact that Integrated Pest Management (IPM) is vital for sustainable agriculture. However, IPM has not made a rapid stride in the agricultural sector due to reasons such as lack of adequate supply of biopesticides for farmers, transport problems and minimal shelf life. Hence this project focusses on refining the technologies of biopesticide production at the farm level.

Three types of biopesticides were studied: 1) Culturing of *Trichogramma* 2) Production of Nuclear Polyhedrosis Virus (NPV) and 3) Appropriate Plant Product. The experiences of 1996-97 showed that in *Trichogramma,* emphasis should be given to Corcyra egg production. *Corcyra* eggs have demand in the organized sectors and farmers can sell the excess to

the industries. This can help in developing entrepreneurs for sustainable agriculture (Eco-preneurs) at the village level.

Nearly 2000cc of *Corcyra* eggs were produced at Srirangapuram village. Participating villagers were requested to observe the production and marketing process, before taking up the production on their own. The parasitation rate varied from 25% to 70%. Detailed study indicated that the fluctuation in the parasitation rate was mainly due to limited control over temperature and improper feed practices. During 1998-99, these conditions would be set right and a standardised production process at the village level developed.

During 1996-97, the production of NPV at the village level was affected by the inability to culture *Helicoverpa armigera* to a required amount. Hence, during 1997-98 the project focussed on studying the culturing of *Helicoverpa armigera,* before taking up the NPV production at the village level. The project felt that the species differentiation within *Helicoverpa armigera* may be one of the reasons for problems in continuous culture of the insects.

During 1997-98, binomics of *H. armigera* was studied at the laboratory. The insects were collected from the wild and cultured in the laboratory.

It was observed during the laboratory studies that *Helicoverpa* collected from various host plants like maize, cotton, sunflower, pigeonpea, bhendi *(Abelmoschus esculentus),* sorghum, when reared together failed to ovipost but when reared individually had oviposition. This has to be further studied during 1998-99.

In addition to the morphological studies the project is also conducting DNA studies with isolation of DNA from *Helicoverpa* collected from different host plants. The genomic DNA was extracted from the third generation of *Helicoverpa* larvae showing pink, black, green and straw colour variations following the SDS method with little modifications. The initial study showed variation in the genetic pattern of larvae even within colours. Further studies are planned in all the generations in terms of colour of the larvae and host plants. The DNA studies would help in understanding the species status which in turn would facilitate the culturing of *Helicoverpa armigera* for NPV production at village level.

301.4 Enhancement of Phosphorus Content in Compost by Microbial Intervention and Amending *Cassia* Species

It is well known that phosphate is the most limiting nutrient in the tropical agro ecosystem. Microorganisms present in the soil can solubilize and mobilize soil phosphates. For instance, phosphobacteria *(Bacillus megatherium* and B. *polymixa)* and VAM fungi (*Glomus* spp., *Gigaspora* spp.) play a significant role in enhancing phosphorus availability to plants.

The nature of the soil in most parts of Tamil Nadu is alfisols, antisols,utisols, oxisols and incepitols, and they have a

greater capacity to fix soil phosphorus as insoluble phosphates. This leads to phosphorus hunger and thus there is a great need to introduce these microbes for solubilizing and mobilizing phosphorus into the plant systems. This project is an attempt to develop a package for organic fertilizer with appropriate level of phosphorus. The project is aimed at identifying the appropriate combinations of two microbes *Trichoderma* and *Pleurotus* with *Cassia* spp. in decomposting the garbage.

Based on this observation attention was focussed on *Cassia* spp. In the present study, the flowers of *Cassia* spp. namely *Cassia alata, C. auriculata, C. occidentalis* and *C. seamii* were collected from different parts of Tamil Nadu and analysed for phosphorus content. Among the species tested *C. auriculata* (avaram) showed a higher content than other species. Hence various population of *C. auriculata* were analysed and the project is attempting to quantify the phosphorus content.

For enhancing phosphorus content in the compost, initially garbage (urban waste collected from single source) was treated with different microbes as mentioned in Table 3.5.

Table 3.5 : *Analysis of compost under various treatments*

Treatment	Microbial population		Fungi Cfu x 10^1 / gm dry wt	CN Ratio	P µg / dry wt
	Bacteria Cfu x 10^3 / gm dry wt	Actinomycetes Cfu x 10^2 / gm dry wt			
Garbage (G) + *Trichoderma* (T) + Earthworms (W)	123*a*	5*a*	55*a*	10:1*a*	25*a*
G+*Pleurotus* (Pl)+W	50*b*	2*b*	33*b*	12:1*b*	12*b*
G+T+Pl+W	36*c*	3*b*	15*c*	12:1*b*	10*b*
G+W	14*d*	-	8*d*	35:1*c*	3*c*
G (Control)	4*e*	-	4*c*	50:1*d*	2*c*

Each value is mean of triplicate

Means within a column sharing different letters differ significantly (P<0.05) by DMRT

Bacteria (Total Heterotrophic Count-THC) showed four different colony types, (i.e., dull white, small round, regular; dull white rhizodial; yellowish, small round regular; greenish, very small round) among which dull white were predominant. In all the treatments, GTW showed nearly 90 %.

Among the treatments, GTW, GPlW and GTPlW showed only few colonies of Actinomycetes. They belong to two groups and other treatments did not show any colonies.

GTW had high population of fungi with diverse groups belonging to genera, *Trichoderma, Aspergillus, Pencillium, Fusarium, Curvularia.* GTPlW had a sterile white mycelium in addition to the above genera whereas GW and control had few colonies.

Of the five treatments GTW decomposed very fast and had higher C:N ratio and P content compared to controls and GW. The experiment indicated the possible role of *Trichoderma* in enhancing nutrient content particularly phosphorus and microbial population. Thus, *Trichoderma* shows the potential of improving the soil nutrient, particularly phosphorus. The inhibiting role of *Pleurotus* is also an interesting dimension which needs to be studied further.

Based on the above results *Trichoderma* will be introduced for composting which will be amended with *Cassia auriculata.* Further, rhizosphere soil charaterestic (i.e., for phospho bacteria and VAM) will be analysed for *C. auriculata.*

301.5 Test of Drumstick Seeds *(Moringa oleifera)* for Defluoridation Efficiency

The study aims to assess the defluoridation efficiency of different species of *Moringa* and evaluate the efficiency of the seeds that are already grown in fluoride contaminated areas. The experiment showed that perennial varieties are better in absorbing the fluoride. Four groups of water samples, each with a different concentration of fluoride, were treated with a gram of kernel. The results are given in Table 3.6.

Table 3.6 : *Deflouridation efficiency of different varieties of Moringa*

Groups	Fluoride removed by one gram of kernel/l			
	Group 1 - 10 ppm	*Group 2 - 25 ppm*	*Group 3 - 50 ppm*	*Group 4 - 100 ppm*
Perennial *(M. oleifera)*	- 01.38	- 07.6	- 11.56	- 10.24
Annual – PKM	- 1.02	- 3.8	- 5.4	- 6.1
Wild *(M. concanensis)*	- 1.27	- 6.0	- 10.3	- 10.3
Perennial *(M. oleifera)* - Fluoride affected	+ 0.43	+ 6.3	+ 3.74	+ 12.0
Annual - PKM - Fluoride affected	+ 0.43	+ 0.75	+ 3.74	+ 9.29

Table 3.6. contd...

Groups	Fluoride removed by one gram of kernel/l			
	Group 1 - 10 ppm	*Group 2 - 25 ppm*	*Group 3 - 50 ppm*	*Group 4 - 100 ppm*
Perennial *(M. oleifera)* - Fluoride affected & Oil removed	+ 0.57	+ 0.8	+ 3.35	+ 10.9
Strychnos potatorum	+ 0.03	- 0.02	+ 0.02	0
Ocimum basilicum	0	- 0.1	- 0.02	- 0.05

The defluoridation efficiency of perennial and wild species is found to be considerable and they are comparable with alum and the process is found to be concentration-dependent (Figure 3.1). The seeds of perennial and PKM varieties from fluoride-affected areas are not capable of removing fluoride but only in adding to

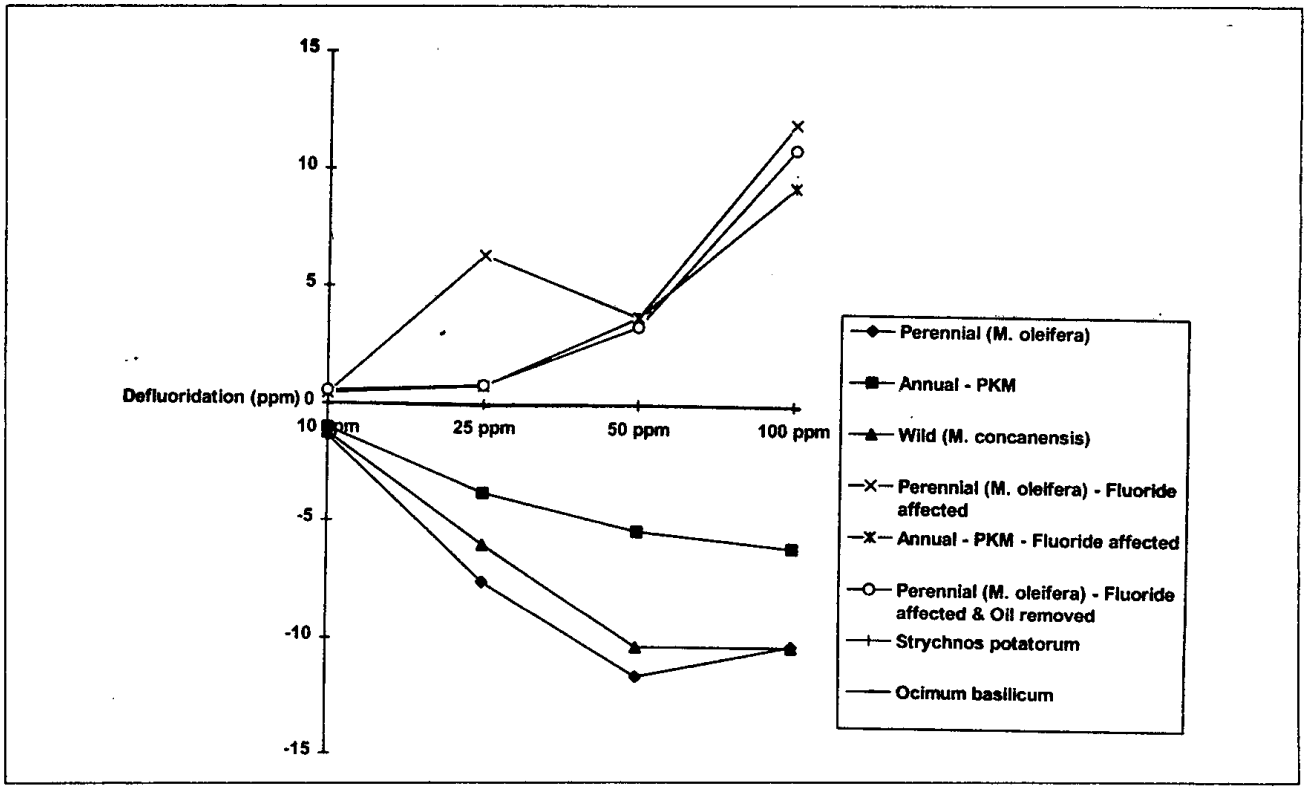


Figure 3.1 : *Defluoridation Efficiency of Different Seed Kernels*

the fluoride concentration. Even the oil-removed (browned at 100°C for 3 days) seeds collected from fluoride affected area, Ennore, do not have de-fluoridating potential. The seeds were deoiled to confirm the activity of the oil in defluoridation and it was found to be of no interference with defluoridation. Other parameters, such as turbidity, temperature, pH, conductivity and total dissolved solids (TDS) have also been analysed simultaneously during the study.

The seeds are a good source of calcium, which implies that there is a possibility of calcium absorbing the fluoride during the treatment. A correlation between the calcium and magnesium levels of the seeds and fluoride removal was found. Besides, a new glycoside, Moringyne, has been isolated from seeds and its structure has already been elucidated (*Compend. Indian Med. Plants.* Vol.3, Rastogi & Mehrotra, PID, New Delhi, 1990, p. 483). The high electronegativity of fluoride ions allow it to interact with both organic and inorganic components of any system. Therefore it needs further study to establish whether the new glycoside has anything to do with the defluoridation. At the same time, the kinetics of the defluoridation has to be studied. Recently, it was found, during the field visit to Pithalaipatti, Dindigul district, that *Terminalia chebula* has the potential to remove dental lesions induced by fluoride contamination of drinking water. This again has significant relevance since the dental lesions have been considered to be irreversible and if the study on its efficacy in clearing the dental lesions is evidenced it would be of practical use to the local people.

301.6 Eco-aquaculture

During the last decade coastal aqua-culture has been facing opposition on environmental issues. The judiciary has restricted the activities of coastal aquaculture. Inland aquaculture has also been facing criticism in terms of water use efficiency and unsustainable practices.

Keeping these issues in view, the J R D Tata Ecotechnology Centre has been studying the principles of environmental friendly fresh water eco-aquaculture. In a research-cum-demonstration plot at Keelamanakudi in the coastal area of Chidambaram, the project has been attempting to develop a production model for *Macrobrachium rosenbergii* using harvested rainwater. During 1997-98, 4000 m^3 of rain water was harvested. The fingerlings were in the nursery for 74 days and in the grow out ponds for 91 days. Thus the total number of culture days was 165 and these culture days were determined by the water losses in the pond due to evaporation, seepage and percolation.

The total production was 230 kg of *Macrobrachium rosenbergii* in 165 days. Thus the productivity of 575 kg per ha has been achieved under a zero water exchange system, without any facilities such as aerators. The project is trying to develop interventions for solving dissolved oxygen depletion and organic loads. During 1998-99 the project would look for increasing the number of days of culturing by altering the structures of the pond which would reduce the water losses. The economic viability is also being studied and the indications are that

ecoaquaculture may be possible only under low intensive conditions.

The project studied the algal species and identified a feeding regime for a shrimp larval rearing tank with a stocking density of million seeds.

In addition to the above activities the project introduced backyard ornamental fish breeding. This activity has been envisaged to understand the possibilities of enhancing the income of poor landless women through backyard fish breeding enterprises. The programme includes breeding of Indian major carps, catfish and ornamental fishes. As an initiation phase, to introduce the technology for ornamental fish breeding in the backyards of the dwellings, the rural women were trained in the breeding cum culture of ornamental fish.

The strategy is participatory research in which learning takes place through actual experiences in ornamental fish breeding. 30 poor households in Keelamanakudi came forward to join the programme. Sexually matured sword tail fishes of the family *Poecilidae* were bred interspecifically in three cement tanks in a male-female ratio of 1:3. The fecundity rate was 25-50.

The growth rate, fecundity rate, feed intake, mortality, hatching rate, water exchange rate and the time involvement of the women in the management measures are recorded in the data sheet. The phases listed below are followed in operationalising the project. They are: mobilisation, organisation, technology introduction & incubation, technical support and systems management. Training includes subjects such as breeding of livebearers, identifying and transferring the young ones, feeding schedule, artificial feed preparation, water exchange and method, aeration need, health measures and data logging.

So far, marketing has taken place 13 times in 12 months duration and each woman has got an average of Rs. 300 - 350 per sale. Production cost is a minimum of 8 % since external labour is not involved.

The project is also studying other possible conflicts such as livestock management and fish culture and the economic and financial viability of such intervention. The workload of women is also being assessed vis-a-vis the intervention.

301.7 Neem Village: Pilot Biopesticide Feedstock Model for Wasteland Development

Experiences in wasteland development show that such developments should be related to other natural resource management aspects of the villages such as agriculture, animal husbandry, soil and water management and forestry. This project is an attempt to link wasteland development with biopesticide production.

Neem *(Azadirachta indica)* is described as the wonder tree of this century. Its usage in biopesticide production, pharmaceuticals and in soap industries has been increasing rapidly. In spite of the demand, the supply of neem seeds has always been fluctuating causing many neem-based industries to work far below their installed capacity.

This project is based on the assumption

that the appropriate scale of production would optimise the usage of neem, particularly in biopesticide, and help in building a proper relationship between demand and supply. Such a scale of production, when further linked to wasteland development, would lead to a viable natural resource management. With these assumptions the project began during 1994-95.

The Department of Wastelands Development, Government of India supported this project between April 1995 and March 1998.

During the three years, 20,000 neem seedlings have been planted in 100 ha of wastelands (80 ha of degraded lands of farmers and 20 ha of village panchayat land). Emphasis was laid on quality seedlings which were obtained from selected phenotypes in the region. The local seedlings also included *Melia* varieties. The project made a pioneering effort in planting tissue cultured neem plantlets supplied through the support of The Society for Social Forestry Research and Development. Table 3.7 shows the characteristics of the tree from which the tissue-cultured plantlets were produced.

During the tissue culture, shoot tips were collected from the above tree and were used as explants. 4000 tissue cultured plantlets were planted in this village. The project also introduced Vesicular Arbuscular Mycorrhizae (VAM) specific neem. This VAM was introduced for the first time on a large-scale with the support of Society for Social Forestry Research and Development and Tamil Nadu Agricultural University (TNAU). The VAM was developed after identifying the distribution pattern of VAM spores in various parts of Tamil Nadu. *Glomus* spp.

Table 3.7 : *Characteristics of the parent tree*

Tree (natural or planted)	Natural
Age	46 years
Oil Content % (Seed basis)	28.58
Oil Content % (Kernel Basis)	48.57
Azadarachtin Value	0.40
Seed Quantity	82 kgs
Fruit Weight	650 per Kg
Seed Weight	4 seeds per gm
Dry weight	4100 per kg
Crown Depth	19.54 m
Crown Width	13.05 m

were the most common in different soil samples. The VAM fungi colonisation in roots of neem were collected from different parts and selection of VAM fungus for neem seedlings under unsterilized soil conditions were made. *Glomus fasciculatum* (isolated at TNAU) showed maximum impact in a nursery experiment in terms of shoot length, root length, dry weight, VAM colonisation and nitrogen, phosphorus and potassium uptake.

VAM was applied to 9000 seedlings in the nursery as well as in the plantations at Pudupatty. For soil conservation nearly 300,000 agave bulbils were planted in 11 ha of panchayat wastelands.

The survival rate of the tissue-cultured plants is 61% whereas the survival rate among the regular seedlings is around 75%. Table **3**.8 describes the substantial variation in the growth rates of these plants.

Though the survival rate of the tissue cultured neem is lower than that of the local seedlings, the growth performance of these seedlings is substantial. In particular, tissue cultured neem with VAM application have performed well.

One of the important aspects of the project is the mobilization and participation of the villagers in the project. Nearly 300 households are members of six groups and these groups are involved in managing the project. In addition, these groups have become self-help groups with credit and lending agro-infrastructures as their major activities. The total annual turnover among these groups is more than Rs. one lakh and this indicates the sustainability of group action in the village. The intensive training and interaction have resulted in nearly 40% of the total agricultural land in the village using neem based pesticides. During the three year period the project created a direct employment of nearly 13,000 person days in which 48% of the job days labour went to women. However, the project focussed on creating a sustainable employment generation. With the 15,000 trees of neem, it is possible to envisage value addition process in the village. Collection of neem seeds (probably to the tune of 400 tonnes

Table 3.8 : *Comparative growth of neem planted at Pudupatty*

Trees	Planted during 1995-96		Planted during 1996-97	
	Average Height in cm	*Average Girth in cm*	*Average Height in cm*	*Average Girth in cm*
Tissue Cultured Neem seedlings with VAM application	216.0	8.0	49.0	4.6
Tissue cultured neem seedlings without VAM	49.0	3.1	40.0	2.5
Local Seedlings without VAM	43.0	2.7	35.0	2.5

per annum) value addition process, and market transaction process would help in creating a sustainable employment process within a decade.

301.8 Pulse Village

In order to develop models for improved productivity of pulses a project was launched at Pudukkottai and Ramanathapuram in June 1996. The project focussed on life-saving watering practices with the help of water harvested in the farm ponds and improving the productivity not only in physical and economic terms but also in terms of productivity per unit of water. It also focussed on other management practices such as integrated nutrient and pest management. During 1996, 60 acres in Ramanthapuram and 29 acres in Pudukkottai were taken for intensive participatory research. In this study 28 farmers from the two districts participated.

Based on the experiences of 1996-97 the project adopted a different strategy during 1997-98. In addition to water harvesting, minor irrigation was introduced in which collective farming was emphasised. At Sivagamipuram of Pudukkottai 15 farmers with 25 acres of permanent fallow lands came together for collective farming. Through their Association they bought a piece of land and dug a common well with the support of the project. These lands had not been under cultivation for the last two decades. During July-October 1997, these farmers planted black gram and with hardly 157 mm of rainfall their productivity was very low. During December 1997-April 1998 cropping, the farmers used only life saving irrigation from the well under a collective system and improved their productivity as shown in Table 3.9.

Table 3.9 : *Increase in productivity due to irrigation*

Name of the farmer	Area under black gram during 1998 in acres	Productivity kg per ha during 1997	Productivity in kg per ha during 1998	Productivity increase between 1997 and 1998 (approx)
M. Periaswamy	1.5	31.5	400	12 times
V. Murugesan	1	40.0	400	10 times
V. Marutharaj	2	20	345	17 times
K. Rengaswamy	1	150	425	2.8 times
N. Paulraj	2	37.5	337.5	9 times
M. Saravanam	1.5	28.5	471.5	17 times
R. Subramanian	2	50	300	6 times
R. Chinnaraj	1.5	62.5	350	6 times
K. Thangaraj	2	62.5	325	5 times
S. Rengaraj	2	60	312.5	5 times
R. Subbia	2	50	300.0	6 times

While the productivity has increased considerably, it is yet to reach the productivity figures of national level demonstrations and university experiments. During 1998-99, the project would aim at a productivity level of 800 kg per ha under life saving irrigation condition.

While the project supported the farmer with the seed the farmer paid for land development and other management costs. At Kavadipatti in Ramanathapuram 22 farmers owning 36 acres of land are involved in a similar exercise. At Pudukkottai, nearly 150 farmers have taken up pulse production for the first time and the project gave them technical support. With life saving irrigation, most of these farmers have achieved productivity ranging from 300 to 500 kg per ha.

301.9 Integrated Intensive Farming System (IIFS) : Demonstration and Documentation

The Centre has been documenting the practices of farmers who have been following the principles of IIFS. It is also involved in demonstrating the concept of IIFS in a model farm at Keelamanakudi, near Chidambaram. More than 12 different activities are taking place in one acre of land and these activities are linked to each other. More than 25 farmers and land less labourers of Keelamanakudi village are working with the project staff in analysing the economic efficiency, ecological viability and social feasibility of the model. Though the project started in 1996, the activities were consolidated only during 1997. During the first year, the model tested paddy, fish, mushroom, red gram, black gram, horticultural crops like bhendi, snake gourd, banana, greens etc. Livestock such as goats, rabbits, and ducks have been integrated as a part of the agricultural system. The project is studying the viability of the linkages between these activities in terms of an input-output model.

The economic viability is also being assessed. During 1997-98, the model showed a productivity of 1.06 tonnes per acre whereas the productivity in the village was between 1 to 1.7 tonnes. However, in terms of paddy varieties, Ponni showed a productivity of 1.4 tonnes per acre, whereas the other varieties such as CO43 and Ponmani showed a productivity of less than one tonne. Ponni shows potentials for high productivity under organic input conditions. Being a long duration variety, it is able to adapt to organic farming conditions much better than the other varieties. The paddy produced in the IIFS plot had much lower input cost (Rs. 2600 per acre during 1997 compared to Rs. 3,900-4,000 per acre of other farmers). Without using chemical fertilizers and pesticides, the paddy production was achieved solely with the help of *Sesbania rostrata* as green manure. This has been done for the first time in the village and there has been a good response among the farmers. Productivity in other crops is also being studied. Paddy and banana have been contributing to the mushroom production and the wastes of mushroom are being used as fish feed and animal feed. The economics of these activities are being worked out and the project would help to develop a model for sustainable agriculture.

Due to certain difficulties in analysis, data could not be obtained for soil status during 1997. After the harvest of paddy and black gram, data on soil was obtained from the model plot and two control plots which use chemical fertilizers and pesticides (one within 500 m radius and the other within 1 km radius). Differences in soil quality are seen clearly though it is difficult to claim that the differences are solely due to the management practices. However, the project would observe the plots for another three years after which it would be possible to give a picture of the soil dynamics due to management practices. The higher rate of organic carbon and bulk density in the IIFS plot are some of the interesting observations in this analysis. (Table 3.10).

Table 3.10 : *Differences in soil status of the IIFS and other plots*

Particulars	IIFS Plot	Control Plot 1 (500 m radius from IIFS plot)	Control Plot 2 (1 km radius from IIFS plot)
pH (soil reaction)	8.33	8.22	8.33
Total Soluble Salts (EC) mmhos / cm	1.25	1.35	0.34
Available Nitrogen (kg / acre)	68.60	65.80	70.00
Available Phosphorus (kg / acre)	14.10	9.20	5.20
Available Potassium (kg / acre)	181.00	116.00	121.00
Organic Carbon (%)	0.6140	0.3052	0.0898
Total Nitrogen (%)	0.098	0.056	0.084
Ammonical Nitrogen (%)	0.0025	0.0014	0.0015
Nitrate Nitrogen	0.00098	0.00070	0.00084
Exchangeable Cations present (meq.100gm soil)			
Calcium	22.00	14.40	14.20
Magnesium	14.60	13.60	8.20
Sodium	3.21	3.30	2.39
Potassium	0.50	0.29	0.28
C.E.C (meq / 100gm soil)	43.00	28.80	21.20

Table 3.10. contd...

Particulars	IIFS Plot	Control Plot 1 (500 m radius from IIFS plot)	Control Plot 2 (1 km radius from IIFS plot)
Grain size Distribution			
<0.002mm (Clay) %	51.83	38.10	24.40
0.002 – 0.02mm (Silt) %	21.48	30.83	21.40
>0.02m (Sand) %	23.53	25.85	54.20
Textural Classification	Clay	Clay Loam	Sand Clay Loam
Bulk Density	1.09	1.16	1.28
Particle Density	1.85	1.92	2.08
Maximum Water Holding Capacity	52.54	40.39	33.15
Porosity (%)	55.98	50.87	44.26
Volume Expansion (%)	17.45	13.10	11.85
Calcium Carbonate Status	Effervescence	Effervescence	Effervescence

The documentation of IIFS farmers has shown the economic viability of such practices. Mr. Ganesan at Adiannamalai village in Thiruvannamalai district has been following practices. That are similar to the concept of IIFS. The activities of this farmer were compared with his neighbouring farmer who also possesses the same amount of land with more or less similar soil type. While Mr. Ganesan was following organic farming with crop rotation and linkages, the neighbouring farmer was following conventional paddy cultivation with heavy inputs. The differences between these two farmers are given in Table 3.11.

Table 3.11 : *Comparison of IIFS and conventional farming*

	Integrated Intensive Farming System	Conventional Farming System
Labour absorption		
Family Male Labour days for 4.5 acres	399	62
Family Female Labour days for 4.5 acres	357	48
Hired Male labour days for 4.5 acres	29	139

Table 3.2. contd...

	Integrated Intensive Farming System	Conventional Farming System
Hired Female labour days for 4.5 acres	397	983
Input Intensity (proportion of material cost to the total cost)	0.11	0.81
Cost-benefit ratio (including the opportunity cost of the family labour)	1.54	1.36

The differences in the type of employment and differences in resource-intensity are the factors which characterise IIFS. The fact that IIFS consumes more family labour and less hired labour is an interesting issue, which requires further probing. The dependence on the family labour has been shown in many case studies including in our demonstration at Keelamanakudi. The studies have also indicated a trend in which women tend to spend more time in agriculture production and household chores/activities when compared to the women in other types of farms. Thus, a sustainable agriculture model, which focusses more on family labour and demands more time of women, needs to be studied further. During 1998-99, the project will study a these issues.

The study also showed that the IIFS farmer was able to get a productivity of nearly 5.25 tonnes of paddy per ha during 1997-98. The main field was fertilised with 3 tonnes of farmyard manure (FYM) and about 2 tonnes of green leaf manure with the leaves of *Glyricidia* sp., *Sesbania sp. Chloroxylon screteria, Dodonaea aungustifolia, Terenna asiatica, Erthroxylon nimogynons, Anozysus latifolia, Indigofera tinctoria, Holaerhena pubescens* etc. The soil turns black which indicates that the leaves are well decomposed and the field is ploughed.

The Centre is studying the science behind this fertilisation process. These green leaf manure plants have some common characteristics such as profuse branching, production of shoots, twigs and leaves. The young leaves are generally used and they decompose quickly. They are generally not preferred by cattle and also may contain alkaloids due to which they keep off the pests and may be antifungus and antibacterial in nature. Species such as *Terenna asiatica* and *Holaerhena pubescens* have high phosphorus and potash content. During 1998-99, the various dimensions of these species as fertilisers and pest controllers will be studied. Such an attempt is an example of blending traditional wisdom with frontier science.

301.10 Integrated Pest Management Multimedia Package

The centre envisaged a concept of providing information to farmers through com-

puters. This requires a computer package which should be handled by the farmer. Thus, the Integrated Pest Management (IPM)-Paddy Multimedia package evolved and has been developed to serve semi-literate farmers.

The IPM-Paddy Multimedia Package has information only on the pests that attack paddy crop. The package gives an option to select a pest from available pest pictures being displayed one by one. Once the user selects a picture, its name, damages caused by it, economic threshold value and control measures are given by issuing the 'proceed' command. Also when a common IPM tool is related to a control measure, an option is given to the user to explain the IPM tool.

This software uses:

- Pictures – for pest identification, damages caused by the pest, etc.
- Audio – for giving all information related to a pest
- Video – explaining the IPM tool

This package is created using Borland Delphi 3.0 (WIN 95 version). This package would be generalised for other crops in the future. Once this package is completed, it would be distributed to various extension agencies.

Sub Programme Area 302

Biovillages

The project is currently being supported by the United Nations Development Programe (UNDP) in 19 villages spread over 3700 ha with a population of 25,000. The significant developments during the reporting period are :

1. The land for the construction of the Biocenter (1 ha) at Pillayarkuppam village was licensed to the Foundation by the Government of Pondicherry.

2. The trials on Integrated Crop Management were extended to Sorapet, Vambupet and Sullipet villages.

3. CORH I Rice Hybrid developed at Tamil Nadu Agriculture University (TNAU) was selected for seed multiplication after field testing in consecutive seasons.

4. The Government of Pondicherry also leased two new community ponds for a period of five years in Poraiyur and Vambupet villages to the Foundation for Community aquaculture for the resource poor. The present community aquaculture pond at Kizhur village was leased to the Foundation for an additional term of five years.

5. Some of the enterprises like floriculture and fodder production were able to create an impact in both the project area and in the neighbouring villages.

6. A number of institutional linkages were established with financial agencies, NGOs and various Departments of the Government of Pondicherry.

7. The Village Development Council (VDC) at Kizhur secured the First Prize at the National Bank for Agricultural Rural Development (NABARD) evaluation.

The Foundation also received a letter of appreciation from NABARD.

8. In Sivaranthakam village the leaders of women's groups were able to help in the formation of six new women's groups for savings and credit.

On-Farm Research & Demonstration

Hybrid Seed Testing and Demonstrations: Rice hybrids received from companies and Research Institutes were tested for yield superiority over the best local check variety. Among the various hybrids tested, CORH 1 (TNAU hybrid) and 6201 (ProAgro hybrid) were found to be high yielding with 22-23 per cent more than the check variety. They were also tested for their cooking quality and market preference; CORH 1 was found to be on par with medium slender varieties and 6201 with very little market preference. The project has initiated seed production of CORH 1 rice hybrid in one of the villages by obtaining the parental materials (male sterile and restorer lines) from Tamil Nadu Agricultural University to supply seeds to interested farmers.

Certified Seed Production : It was decided to initiate seed production of locally adopted groundnut variety (VRI 2) to meet the local seed demand. In the first phase, to understand the potentials and problems, seed production was initiated in a small way in the fields of five farmers. Of the five farmers, only one was able to supply groundnut seeds to PASIC while the other farmers retained the seeds for their own use. It is planned to continue the seed production. The seed production for paddy is being shifted to the upland cluster of villages from Kizhur village.

New paddy varieties viz., ASD 20, ASD 19 and J18 and groundnut varietes viz., ALR 1, ALR 2 and CO 2 were yield tested over the local check varieties. The yield of these varieties will be further validated in the forthcoming seasons.

Yield Testing of Cotton Hybrid : NHH 44, a cotton hybrid, was received from SIMA Cotton Development and Research Foundation, Coimbatore, Tamil Nadu, for yield testing over the local check variety LRA 5166. The kapas yield was 2.5 quintal (20.8 q/ha) from an area of 1200 sqm, which was 39 per cent more than the check variety.

Integrated Crop Management (ICM) Trials : The paddy trials for *Kuruvai* 97 (May – Aug '97) were conducted in Agaram and Kizhur villages. The yield increase ranged from 8-12 per cent. Need based use of inorganic fertilizer and pesticides resulted in the reduction of cost by Rs 815, thereby increasing net income in the range of 7-10 per cent. The paddy trials in the *Samba* 97 (Sept – Dec 97) season faced problems of lodging due to monsoon rains. The yield was on par with the control and treatment plot. In this season chlorophyll meter SPAD 502 and leaf color chart (LCC) trials were carried out in Kizhur and Mangalam. The sugarcane trials were carried out in 2 villages viz., Kizhur and Agaram. Along with the sugarcane crop, sunflower was raised as a border crop to get an additional income.

From Dec '97 to Jan '98 cotton, groundnut, sugarcane and tapioca sowing was

undertaken. The paddy trials for the season *Navarai* 98 (Jan – April '98) were held in three villages. Chlorophyll meter SPAD 502 and controlled release nitrogen (CRN) trials are being carried out in Sembiampalayam village. In the groundnut trials, the treatment plot showed an increased yield over the control plot to the tune of 15 per cent and also as a trap crop.

The water management practices followed by the farmers were studied for crops such as paddy, sugarcane, tapioca, groundnut and cotton. The trials were extended to the upland cluster (Sorapet and Vambupet villages). It was found that it requires about 6500 litres of water to produce one kg of paddy grain in the wet upland areas whereas it is 4300 litres in the low wetland areas for the *Navarai* and *Kuruvai* seasons.

During *Kuruvai* 97 season the major pests found in the rice crop were brown plant hopper, leaf folder and stem borer. Neem seed kernal extract 5% and neemd based use of pesticides were recommended against these. Among the diseases sheath blight incidence was more in the trial plots.

Farm Machinery : Drum seeder trials were taken in Mangalam and Agaram villages. The results show that in direct seeding the yield of paddy is increased by 600 kg/ha.

The low cost Vietnamese model SRR – 1 dryer was demonstrated in Sorapet, Agaram and Pillayarkuppam villages. The demonstration was held for drying groundnut. The equipment was also used for winnowing paddy in Pillayarkuppam village.

TNAU model *chulah* was introduced and demonstrated to the aquaculture and mushroom production enterprises participants in Kizhur village. Any type of fuel can be used in this stove. Simultaneously, the Vietnamese model rice husk stove was also demonstrated in the villages.

Treadle pumps for drawing water from shallow wells and channels were introduced and demonstrated in Agaram village to a group of 12 farmers. The pump has a capacity to discharge water at the rate of 180 litres per minute. At present it is used for irrigating small lands where vegetables are cultivated.

New farm implements such as groundnut stripper, groundnut decorticator, seed drill, cultivator, weeder and puddler, brought from Andhra Pradesh Agricultural University, are under process of testing in the villages.

Enterprises for Enhancing Livelihood Security

Mushroom Production by Rural Women : Oyster mushroom production for the rural poor was extended to Uruvaiyar village where eleven participants are involved. In Mangalam village an additional thirteen participants were selected. Sixty-eight women are now involved in the production of mushrooms. The 'three tier' hanging system for prodcution has been successful. The production for the reporting year is 537 kg and the income is around Rs. 21,480/-.

The spawn was successfully grown on rice chaff, which is a major breakthrough; it has also resulted in cost reduction. The

spawn lab is being run successfully by an educated unemployed youth in Kizhur village. The number of spawn produced during the year is 1610.

Goat Rearing : It had been proposed that pure-bred Tellicherry male goats be given to traditional goat rearers in the villages. The objective is to upgrade the local goats and fetch more income for the participants.

During the reporting year thirteen traditional goat rearers in seven villages were identified and male goats supplied to them. This has resulted in about sixty cross-bred kids valued at Rs. 35,000/-. Three goat rearers were given female pure bred Tellicherry goats as well to obtain pure Tellicherry offspring to make this enterprise viable and sustainable.

Dairying : Ten landless women in Pillayarkuppam village and seven small and marginal farm women in Melsathamangalam village are continuing the activity successfully. This programme has been extended to Ramanathapuram village where eighteen participants have been selected for aid under the Mehata Committee. The participants were taken to nearby farms for training in animal health care and fodder production.

Poultry Enterprise : Three units of 100 layer birds (day old chicks) were obtained from the Department of Animal Husbandry, Government of Pondicherry, as part of the Government Programme on layerbirds in Sellipet and Vambupet villages. The birds were given free of cost with a small amount for initial feed requirement. The cost of sheds and healthcare is borne by the participants. Three participants in Melsathamangalam, Kizhsathamangalam, and Sivaranthakam villages have each taken up a unit. So far six production cycles have been completed in Melsathamangalam village, four in Sivaranthakam and two in Kizhsathamangalam village.

Fodder Plots for Small and Marginal Farmers : Fodder production picked up momentum owing to the acceptance by the farmers and the collaboration with the village milk cooperatives of PONLAIT (Pondicherry Cooperative Milk Producers Union Ltd). A total number of 127 fodder plots of three different categories were established in 12 villages. As a replication, 15 plots of area 0.9 ha were laid out in neighbouring villages like Thirukanchi, Sembiapalayam, Chinnamudaliarchavady (Auroville) and Chellancherry (Tamilnadu). The three categories of fodder plots are individual fodder plots, demonstration fodder plots and commercial fodder plants.

Floriculture : The fourteen small and marginal farms established last year started yielding flowers which fetched an average income of Rs. 300/- to 500/- per month in the flowering season .This programme has been extended to other villages where more than seventy-five participants have been identified and gardens are being established. Some of the participants have also taken up Crossandra flower cultivation as an inter crop.

The Mushroom-growers Association in Kizhur village took up crossandra cultivation as an additional source of income. The plants were damaged by rains in December 97. Thereafter the production stopped. The individual participants who

have taken up cultivation of Crossandra are able to get an income of Rs 250 to 750 per month during the flowering season. During the reporting period more than fifty Crossandra gardens have been established in other villages.

Homestead Nutrition Garden : Many floriculture and vegetable farmers benefited from the Government-sponsored Minikit Programme organised by the Department of Agriculture. The minikit consists of vegetable seeds and pesticides.

Access to Common Property Resources

Aquaculture in Community Ponds : The nine landless women participants in Kizhur village were able to successfully harvest about 720 kg of fresh water fishes of various varieties, which fetched them a gross income of Rs. 22,500/- and a net income of Rs. 17,200/-. The pond was restocked with 3000 fingerlings of various carp in appropriate proportion by the participants. The new batch of participants were given *in-situ* training in feed and pond management. The Villianur Commune Panchayat has extended the lease of the fish pond for another five years. Two new community ponds at Poraiyur and Vambupet were leased to the project.

A three day training programme was organised from 18.6.97 to 20.6.97 for all the 18 participants. A one day training programme was also organised for the participants at the Integrated Intensive Farming System Project of the Foundation (IIFS) at Koriyamangalam village, Tamil Nadu.

Support Services

Group Organisation and Management : Three new activity based groups were organised, making a total of 19 groups in April 1998. Periodical training programmes were organised for the benefit of the group members. An exposure visit was organised to Association for Community Development (ACD), an NGO in Villupuram district. Seventeen women's groups in the Biovillage Project participated and were trained in group management, savings and credit. In Sivaranthagam village, six new women's groups were formed with the help of the group leaders, (self evolved) and are functioning effectively. The Village Development Council (VDC) functioning in Kizhur village has been awarded the first prize by NABARD for 1997-98 for efficient management of the council. The Foundation also received a letter of appreciation from NABARD for its excellence in implementing the Vikas Volunteer Vahini (VVV) programme in Pondicherry region.

Savings and Credit Management : Savings and credit management activities have been continuing. The performance of many of the groups as on March 1998 has been found to be satisfactory.

Environmental Sanitation : For safe disposal of stagnant water around the public water taps, construction of platforms and soak pits around the two water taps in Pudunagar in Mangalam village was completed. About fifty families in this area are thus benefited. Similarly construction of soak pits around the 5 public water taps in Sivaranthagam village has been completed. This programme benefits about one hundred and fifty families.

Seven houses were chosen for construction of soak pits near their drinking wa-

ter taps and drains in Sivaranthagam village. The construction was completed with the Foundation contributing 60% of the cost in the form of materials and the individual households bearing 40% as the cost of labour and the supply of sand.

Five low cost sanitary twin pit toilets were constructed in Mangalam village with contributions from the Government (70%) MSSRF (25%)/participant (5%). This program benefited five families.

An exhibition on environmental sanitation was conducted at the Govt. High School, Mangalam village, for the students to mark the occasion of World Environment Day (5th June). More than 400 students and the general public were benefited by this exhibition.

To mark the occasion of the Golden Jubilee year of Indian Independence, All India Radio broadcast "Health for All" slogans in Tamil couplets for 10 days in August 1997 for the Foundation.

Vermicentre : The vermicentre established at Pillayarkuppam village carried out its regular production of vermicompost from the locally available substrates. The vermicentre became independent with the withdrawal of support to the youth operating the centre. The centre sold vermicompost worth Rs.22,000 last year and became sel-freliant.

Biocentre : Biocentre is envisaged as a facilitating institution for the testing and adapting of new technologies for demonstration and intervention, rendering training, providing support services and accessing information. The Government of Pondicherry has licensed the Government *poromboke* land (1 ha) to the Foundation for the establishment of the Biocentre at Pillayarkuppam village. A proposal was submitted to the Japanese Consulate for funding the construction of the Biocentre building. In collaboration with the Centre for Scientific Research, Auroville and the Pondicherry Agro Service Industrial Centre (PASIC) the Biocentre building was designed and the blue print is ready. A number of participatory meetings were conducted with the villagers and the staff for the establishment of the Biocentre.

Farm models : The development of farm models forms one of the important components of the Integrated Resource Management Systems. The data on crops, livestock, irrigation and labour input were collected from the 10 selected farms and monitored.

Marketing : Market study and support services for marketing were made available for all the products.

New market segmentation for marketing fresh Oyster mushrooms in Pondicherry with special concentration on Brindavanam and Venkata Nagar colonies was undertaken. The sale of mushrooms within the village has increased owing to the increasing awareness on mushroom consumption among the villagers.

A feasibility study was undertaken in the neighbouring state of Andhra Pradesh and Namakkal district of Tamil Nadu to estimate the viability of establishing broiler and layer units in the biovillages. Based on the study a report on establishing "Small Farmer's Rural Poultry Estate" was submitted.

The market support for the sale of fishes produced by the pisciculture women participants of Kizhur village was carried out by hiring a van from the Pondicherry State Fishermen's Co-operative Marketing Federation (FISCO). A site near the fish market at Nellithope was identified as the potential market for directly marketing the composite inland fishes. The women participants were trained in marketing so as to become independent. Around 725 kg of composite fishes were marketed in five harvest intervals with a price range of Rs.30-35 per kg.

The groundnut seed producers of Sorapet village were linked with PASIC (Pondicherry Agroservice and Industries Corporation). A minimum procurement price of Rs.15 per kg was announced before the start of the season. Some of the seed producers sold their seeds through PASIC.

Market database : The database on the production and marketing of various agricultural products such as paddy, groundnut, cotton, cumbu and chilies in Pondicherry region has been updated. The arrivals and the prices of various farm commodities at the Pondicherry Regulated Market and the database on the prices of principal vegetables prevailing in the open market and offered by PAPSCO (Pondicherry Agrofood Products, Food and Civil Supplies Corporation) have also been documented.

The sale of spawn produced by the project to support the mushroom project participants and for private mushroom producers in Pondicherry was documented.

Economic Analyses

The economic analysis of all the poverty alleviation programmes, ICM trials, hybrid rice, cotton, groundnut and paddy yield testing trials, paddy and groundnut seed production trials were carried out seasonally and periodically.

Participant Household/Farm Profile : A detailed documentation on the farm and household profile of the participants is being carried out.

Linkage with Government and Financial Institutions : Training in tailoring was given to twelve women in Kizhur village with the assistance of the Women's Development Corporation. They received certificates of proficiency in tailoring from the Government and two women received a loan from the Bank/Women Development Corporation for the purchase of new tailoring machines. The other women will be getting their loan/subsidy for purchase of tailoring machines in due course.

Information Empowerment programme : Information Scheme Booklet in Tamil was compiled and published in June and December 1997. These booklets will be used as a reference guide for providing adequate information to the public about their entitlements from the government. Wherever possible these scheme booklets were distributed to individuals and the public at large.

Sub Programme Area 303

B V Rao Centre for Sustainable Food Security

The B V Rao Centre for Sustainable Food Security was established with an endow-

ment grant made by the Venkateswara Group of Companies. The concept of sustainable food security has been expanded to include not only accessibility to food in addition to its availability, but also its absorption and retention by the body. The issue, therefore, is a composite of the technological problem of increasing production and productivity; the socio-economic dimensions of increasing family income and livelihood opportunities; and a whole range of health, hygiene and sanitation related parameters. The Centre concentrates on the following areas:

- Strengthening food security by widening the food basket
- Promoting integrated attention to food availability, economic and social access and biological absorption at the level of individuals
- Expansion of the economic base for accessibility of food by diversification of agriculture, encompassing traditional and non-traditional crops and crop-livestock integration
- Primary processing of food (including horticultural crops) of economic and nutritional significance
- Tackling the problem of malnutrition and silent hunger induced by the deficiencies of micronutrients, especially iron, iodine and vitamin A
- Development of implementation methodology and strategy including structural and policy framework, for achieving freedom from hunger

The details of these activities, undertaken in collaboration with other organisations, are given below.

303.1 Tamil Nadu Council for Sustainable Livelihoods

The Tamil Nadu Council for Sustainable Livelihoods is a voluntary movement which was established in 1990 soon after the UNICEF Child Summit. The Tamil Nadu Council is supported by the Hunger Project, India with the purpose of helping the State to achieve the threshold essential for a Healthy and Productive Life for All, through strategic planning and action.

During the year, the Council met twice and reviewed the progress of several of its ongoing programmes, engaged in strengthening rural livelihoods, particularly that of resource-poor women, such as eradication of hidden hunger caused by micro nutrient deficiency; operationalisation of the Hunger Free Area Programme and creation of an enabling environment for the elimination of hunger. These programmes converge in an all-pervasive activity that requires technical and policy support with inputs from biophysical scientists, sociologists, administrators and policy makers.

303.2 Hunger Free Area Programme

The Government's declared policy on National Agenda for Governance states : 'We will ensure food security for all, create a hunger-free India in the next five years and reform and improve the Public Distribution System so as to serve the poorest of the poor in rural and urban areas'.

The detailed study undertaken in seven blocks of Tamil Nadu enabled the Centre to prepare an operational strategy to strengthen the declaration of the Govern-

ment. The following seven-point action plan was developed to help the ultra-poor section of the population:

- Identification of the ultra-poor suffering from under and malnutrition by the respective gramsabhas
- Information empowerment on on-going Government programmes disaggregated by age and gender and the distribution of household Entitlement Cards
- Eliminating protein-calorie undernutrition through the targeted public distribution system
- Elimination of silent hunger caused by the deficiency of micro-nutrients like iron, iodine and vitamin A
- Improving the biological absorption and retention of food through the provision of safe drinking water, improved sanitation and environmental hygiene
- Strengthening rural and urban livelihoods of families below the poverty line through market-driven micro enterprises supported by micro credit
- Ensuring that the special programmes designed for women and children reach them.

The Gandhigram Rural University is undertaking the integrated field testing of this seven-point Action Plan in two panchayats in the Vedasandur block, covering a population of about 12,000. The essential feature of the project is its design as a peoples' project which will function through self-help and implementation at the Panchayat level.

The strategy includes PRA at the village level, baseline survey, evaluation of training needs, identification and overcoming Protein Calorie Malnutrition, elimination of silent hunger through food diversification and ensuring proper hygiene and sanitation that will permit effective absorption of food.

The activities of the project will be co-ordinated through a Project Advisory Committee, which will discuss policy issues and strategies besides mobilising resources for the project. The progress of the project will be critically reviewed and monitored by a Steering Committee with joint membership of the village panchayats and the implementing institution. MSSRF will provide the necessary technical backup and support.

303.3 Elimination of Micronutrient Malnutrition

Micronutrient malnutrition, particularly of vitamin A, iodine and iron, is widespread in the State of Tamil Nadu, affecting the health, welfare and productivity of the population. Elimination of this hidden hunger is an integral part of the seven point action plan of the Hunger Free Area Programme.

A pilot project for elimination of micronutrient malnutrition in the Pennagaram Block of Dharmapuri district is being initiated with the support of FAO. This pilot project, implemented by the Tamil Nadu State Government, will cover 15 panchayats.

The project is designed to set up a methodology for eliminating micronutrient malnutrition through the food -based approach, by increased production and con-

sumption of fruits and vegetables. The process will generate income-augmenting activities all along the line-cultivation, processing, preservation and marketing. The overall aim of the project is to provide an integrated and practical community-based contribution to the Government of Tamil Nadu's policy and programmes to improve the nutritional status of the ultra-poor with special focus on elimination of micronutrient malnutrition.

303.4 Strengthening Rural Livelihoods through Agro-industries

In the chain of events that occur between the farm gate and the consumer, the farmer is subjected to fluctuations and vagaries of the market and in the process makes the least profit. Enhancing the value of the produce at the level of the farmers has often been suggested as the most viable strategy to overcome this constraint. It is therefore important that the economic benefits of agro-processing and agri-business are taken to resource poor families. The growing trend towards urban expansion will provide opportunities for promoting village clusters producing fruits, vegetables, flowers, milk, eggs and processed food for towns and cities. The advantages of scale enjoyed by the large agri-business enterprises in production and marketing operations can be brought to the poor through co-operatives or other appropriate institutional and management structures controlled by the primary stakeholders. These mechanisms however have to be supported by appropriate technical and institutional structures which offer local access to technology, markets and credit/financial inputs.

Symbiotic social contracts between the corporate sector and the rural poor are important for improving not only the skills of the rural poor but also providing them with market-oriented employment opportunities. A significant advantage of such contracts is the availability of alternate livelihood options within the community. Apart from the aforesaid economic benefits, these interventions also have the social benefit of arresting inequal income distribution and migration.

This project entitled 'Strengthening Rural Livelihoods through Agro-industries with specific reference to Tribal and Rural Women' is a collaborative project conducted jointly by MSSRF and CFTRI and supported by the Foodlinks Initiative of the IDRC. The major objectives of the project are to identify, study and develop post-harvest and processing procedures suited to the market needs; develop enterprises and community organisations through test marketing, training and capacity building; facilitate social mobilisation and forward planning for replication and expansion after identification of the market, the niche and the needs through a process of dialogue with private companies to characterise the products.

Data on the following aspects has been collected: social and demographic profile; agrobiodiversity; crops and cropping patterns; identification of horticultural crops that are suitable for agro-processing and value addition. It has also been established that pineapple and banana are the main horticultural crops that require technological intervention for processing and value addition.

The project has commenced operations in two areas viz. Kolli Hills and the Union Territory of Pondicherry. Initial findings are given in Table 3.12.

Table 3.12 : *Initial data collected*

Product	Problems	Opportunity
Fruits and Vegetables	Lack of formal market structures - leading to distress selling and poor pricing	Identification of local and urban markets, channels and systems of delivery
	Substantial level of wastage due to improper handling - 10% at the level of the farmer alone	Reduced spoilage by harvesting crops at optimum maturity: care in handling in the field, on farms and during transport
	Poor sourcing potential due to lack of technological interventions/ backup services	Development of products for identified local markets, and primary processing for second ary processing by larger food industries
	Existing facilities for value addition not tailored to meet the market demands	Training and development of rural and tribal women and men in agri-business, technology and marketing management
Poultry Feed	Local capacities unexplored and unused. Price of commercial feed very high thereby making backyard poultry non profitable to rural communities	Utilisation of local surplus crops and industrial by -products in compounded poultry feed for small - scale local producers
	Much of the local resources, especially by-products remain unused	Development of a rural poultry feed industry

Sub Programme Area 304

CAPART Technology Resource Centre

The Technology Resource Centre (TRC), one of the nation-wide centres supported by CAPART, focuses on capacity building among farmers, various other sections of the rural community, voluntary organisations and government departments, with specific reference to sustainable agriculture and rural development. It also helps to evolve grassroot level institutions which would play a major role in sustainable development.

The objectives of the TRC are

- To evolve a set of resource persons and resource villages in different parts of Tamil Nadu
- To establish grass root voluntary organisations which would spread the message of sustained development through horizontal transfer of knowledge
- To create a network among the resource persons and grassroot voluntary organisations to share their knowledge and adopt sustainable practices in agriculture and rural development

The specific objectives for the period 1996-99 are to train farmers, representatives of voluntary organizations and government departments in the fields of biodiversity, soil conservation, water management, Integrated Pest Management, Informatics and Eco-horticulture.

TRC follows a well defined framework based on the following observations :

- Training is a one-way process. Transfer of technology through training alone may not prove to be sustainable in the long run.
- Capacity building, which goes far beyond the trainer-trainee relationship, is interactive learning. It is a two-way process.
- Capacity building is achieved through learning by doing and the participants have to go through the actual experiences for a sufficiently long time and evaluate their experiences in their socio-cultural context.
- Technology is not a mere artefact or tool. It has to be placed in the socio-cultural context of the community.
- The emphasis is on knowledge-intensive technology, which does not require any service support or patents. It can be developed by every user group with its own resources to create forward-backward linkages within the economy.

The practice at TRC is to select a specific theme in a field in which the JRD Tata Ecotechnology Centre has some preliminary experience, develop a hypothesis on the basis of these experiences, choose a village, which would be an appropriate place for refining the experiences, develop a field hypothesis with the participating rural community and study the intervention with the rural community. The community sponsors twenty to thirty persons who would interact with the project for two to three years. The method of interaction varies according to the level of research, as seen in Table 3.13

Table 3.13 : *Methods of interaction and results*

Status of Knowledge	Status of Interaction	Technology Resource Centre's Role	New knowledge
Definite, fully proven	Extension. Linkages. User groups practise the new knowledge at their own cost.	Training, institution-building	Extension threshold
Proved elsewhere but not fully tested in the user situation	Extension, demonstration, users requested to test the new knowledge and user groups and MSSRF to share the cost.	Training, institution-building, technology. "Profit You Share-Loss We Bear" approach. Profit used for institution building	Technology in socio-cultural, economic and resource context
Has not been fully proved	The participants review and evaluate	Testing of the technology at its own cost. Training the participants in review and evaluation of the new intervention	Evolution of technology a specific context

The process of new intervention consists of the following stages : mobilisation, organization, technology incubation and development, systems management and withdrawal.

During 1997-98, TRC interacted with NGOs such as Renaissance at Pudukottai, SPEECH at Ramanathapuram, Vidiyal at Bodi, Gandhigram at Dindigul and Women's Association of India, Chennai. It brought out 6 issues of the Tamil wallposter newletter called "Soozhiyal Nutpam". It conducted two workshops on behalf of CAPART. The training programmes conducted by the TRC are listed in Table 3.14.

Table 3.14 : *Training programmes conducted by TRC*

Area	No. of Trainee days	Focus
Soil health management	1260	quality seeds, horticulture
Ecohorticulture	1151	low cost mist chambers
Water harvesting	1260	pulse production in dry, rainfed agriculture
Integrated pest management	1260	corcyra production and plant products
Biodiversity conservation	1970	neem, integrated intensive farming, agro-biodiversity

A team of farmers with officers from Bangladesh Agriculture Department visited various project sites of MSSRF for a period of ten days. Four students of forestry from North-Eastern Institute of Science and Technology have undergone training with J R D Tata Ecotecnology Centre.

Sub Programme Area 305

Asian Ecotechnology Network

The Asian region, which was the most dynamic region of the world in terms of economic growth until very recently, is also the region where job opportunities are not commensurate with economic growth. This region is also the home of many important models of development. To provide a forum for exchange of information and experience among promoters and practitioners of such models, the Asian Ecotechnology Network was launched in February 1996. This network functions in association with the UNESCO-Cousteau Chair in Ecotechnology.

The activities taken up by the AEN during this year included organisation of workshops, meetings, publications and launching an information service on the World Wide Web.

Workshop on Curriculum Development (27-28 November 1998; Chennai)

The need for a dynamic curriculum design cannot be overstated in the context of ecotechnology that requires a continuous process of capacity-building to enable the blending of traditional technologies and frontline technology developments. The UNESCO-Cousteau Chairs in other parts of the world pay particular attention to this issue at the university level. The AEN-sponsored workshop brought together senior academicians, university administrators and experts in the application of advanced technology to rural areas. Four sessions, on contents of a new curriculum, ecology and environment issues, technology and teacher training were held. The need in the immediate future is for two training-modules for short-term use. The first module is for village leaders and rural community-based organisations. A forerunner of this module is available in the village-level socio-demographic charters prepared by the MSSRF. The second module, to be prepared afresh, is for use at the level of professional/engineering institutions (the IITs/IIMs, for example) and administrators' training academies. Other recommendations include setting up of resource centres that link information and expertise available in the universities through the University Grants Commission and the Ministry of Environment & Forests.

Workshop for Policy Makers (29 November 1997; Chennai)

This workshop focused on the need to sensitise the policy makers to the concerns of pollution/conservation and development. Lack of knowledge or appreciation of ecotechnologies has led to situations where jobs have been lost because of pollution. Several examples can be cited from India, such as the ban on coastal aquaculture, or on tanneries. Professional

technologists participating in this workshop highlighted the existence and availability of relevant technologies off-the-shelf, particularly in power generation, pro energy conservation, leather goods production etc. The participants who were senior civil servants pointed out that the gap in knowledge between technology practitioners and professional administrators was enormous, often leading to increased pollution load. The participants recommended that more than senior policy the AEN should focus on the grass-root politician for sensitizing and capacity-building.

Asian Regional Workshop on the role of Media in Ecotechnology Development (5 - 6 April 1998; Chennai - organised in collaboration with the Asian Media Information and Communication Centre, Singapore) :

The role of media in increasing environmental awareness is widely acknowledged. The AEN organised a workshop for media practitioners to review the role of media in environmental matters and to evole a broad coalition between them and experts in ecotechnology. Leading media representatives and experts from the Philippines, Malaysia, Thailand, Japan, Singapore and Sri Lanka, besides India, attended the workshop. It emerged that time-proved access to authentic sources of information is critical for media participation in the promotion of environmental awareness.It was recommended that a media resources centre be established as part of the activities of AEN at a sub-regional level (South Asia) to access valid information on ecotechnology.

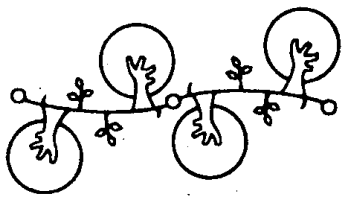
Asian Ecotechnology Information Service (AEIS)

The AEIS is a service based on the World Wide Web. This service provides access to information on curriculum development, eco-marketing and ISO 14000, among others.

Handbook on Eco-jobs

This publication (also available on CD-ROM) is an attempt to compile detailed case studies on processes and products that can lead to the generation of economically viable and ecologically sustainable jobs. Examples include eco-tourism, production of goods from bamboo, non-polluting tanning of leather etc.

Programme Area 400



Reaching the Unreached

The various activities of Project ACCESS related to childcare are being consolidated to offer resource support in areas like communication, for strengthening joint action for child rights. The Uttara Devi Chair in Gender and Development has been working to develop expertise on gender issues especially in agriculture and biodiversity and to internalise the gender dimension across all projects. Giving women a voice through cultural expression continues to be the concern of Voicing Silence.

Sub Programme Area 401

Project ACCESS

Project ACCESS strives to address issues related to young children (particularly those in disadvantaged environments) and women working in the informal sector. The approach is through advocacy and campaign processes, supported by documentation, communication and training, with a view to improving policies and practices. During the year, the main activities were carried out under the project entitled "Children on the Agenda" which formally came to an end in December 1997, and the project "Operation Resource Support" which was initiated in January 1998.

A new area of action which emerged was related to support for child rights spelled out in the Convention on the Rights of the Child (CRC) with special reference to the female child's right to survive and the threats posed to the development of the young child in urban slums by the 'non-child-friendly' environment

In addition the staff of Project ACCESS provided resource support by participating in several other activities of the Foundation, chiefly as resource persons and facilitators in group discussions, and by providing a media-liaison interface. Help has been rendered in arranging press conferences, preparing press notes, placing articles in the print medium, and facilitating meetings / trainings organised by other projects.

401.1 Children on the Agenda

In the concluding phase, networking, research and documentation, communication and training were the key components, with emphasis on completing ongoing activities and products and planning for the second phase.

Networking

The project had in 1993 initiated and facilitated the activities of Tamil Nadu Forum for Crèche and Child Care Services (TN-FORCES), a network of NGOs, trade unions, women's associations, academic institutions and others, set up to lobby for improved child care services, especially for young children of working women in the unorganised sector. The network, with 73 organisations as members, takes up activities such as advocacy, information sharing, capacity building, lobbying and carrying out joint activities through issue based sub-groups.

The project continued its regular network support functions such as conducting meetings and providing resource support to network members (Table 4.1). The sub-group on pre-school education met to discuss the possibility of conducting summer refresher courses and decided to hold a methodology workshop for trainers. The media sub-group was active in consolidating the entry made into AIR by following it up with submission of short scripts containing messages for broadcast on issues related to women and children. The southern regional group was helped to finalise the proposal on a sustained campaign for activity-based education in the southern districts of Tamil Nadu. The core committee met a couple of times

Table 4.1 : *List of key activities (May - December 97)*

Month	Event	Participants	Objectives	Output
May	Communication Workshop in collaboration with TINP	TINP personnel, communication experts, resource persons	To prepare communication materials on the development of the young child (0-3 yrs)	Communication materials in audio, video, folk-media and song format
June	Orientation to Women Councillors of Tambaram and Alandur Municipalities	Councillors, Council President, resource persons	To dialogue on issues related to women and children	Identification of the possible courses of action at the local level
July	Meeting on Bill for National Commission for Children	Core Committee members of TN-Forces	To suggest possible changes in the Bill	Changes and additions presented to the National FORCES for further consolidation
August	Steering Committee Meeting on research	Committee members	To finalise proposal and tools for a study on the impact of pre-school education	Proposal finalised and submitted to Govt., tools refined
September	Teachers' Day celebration	Child care workers, NGO personnel, Govt. officials, resource persons	To release the videos on activity-based education as a training tool for child care workers	Reinforcement of the importance of child care workers and the need for training and support
October	Media sub-group meeting*	Sub-group members	To generate audio messages from the video-spots on gender	Meeting with the Station Director AIR and submission of the audio messages

Table 4.1. contd...

Month	Event	Participants	Objectives	Output
November	Pre-school sub-group meeting*	Sub-group members	To plan for the summer refresher course and the preparatory training methodology workshop	Curriculum finalised and dates fixed for the workshop
November	Core Committee Meeting*	CoreCommittee members	To plan for the Annual General Body meeting of TN-FORCES	Sub-group activities reviewed
December	Annual General Body meeting of TN-FORCES*	Members of the network	To report on activities in 1997 and to plan for 1998	Sub-groups reorganised and plan of action prepared

* Conducted jointly with TN-FORCES

to take important decisions. One was on the Bill for National Commission for Children proposed to be introduced in the winter session of Parliament. Suggestions for improvement of the Bill were generated and sent to National FORCES for consolidated submission to the Govt. The experiences gained in initiating and running the network, particularly the importance of democratic processes and thematic emphasis, were shared in the National Consultation of FORCES at New Delhi in September 1997.

The key activity in this phase was the smooth transfer of the network to the next convenor, the Dept. of Social Work, Loyola College, which came forward to host the network for the next three years. The process of transfer involved working with the new convenor on aspects such as setting priorities, planning, conducting meetings and working with partners. Orienting the new co-ordinator of the network secretariat and initiating her into the activities ensured a smooth transition. It was observed that with the support provided, the new convenor was able to launch a series of activities without loss of time, vigorously and with great involvement and excellent understanding of the process. A meeting was also held to finalise recommendations regarding the needs of women in the unorganised sector. They were subsequently submitted to the Govt.- instituted Kolappan Committee which has been set up for looking into the problems of labourers. At the Annual General Body meeting held in December, the sub-groups were reorganised to work towards emerging needs. Two new groups - Legislation and Mother & Child Health were formed.

Communication

This component of the project provides communication support to advocacy activities apart from the core activity of creating and consolidating space in the media for issues related to women and children. The production of *Thayum Seyum* - an audio cassette containing songs on the development of the young child - was a key activity during this phase. This was the product of a workshop held in May 97, to create and refine communication materials containing messages on the development of the young child. Presented with captivating music by an eminent musician, the songs emphasise the need for adequate stimulation for the growing child and the support needed by mothers to care for very young children. The messages generated in the earlier workshop also led to the production of four video-spots on the same theme, which are now being regularly telecast by the State television network.

Another significant activity was reaching messages on the development of the young child and the burden on the pre-school child to about 350 paediatricians in Tamil Nadu through audio cassettes (*Enga Patta Kelunga* and *Thayum Seyum*) sponsored and distributed by Citadel Pharmaceuticals. The objective of this strategy was to reach parents through the doctors, as their advice is generally taken seriously. Each participant was provided with a copy of the manual on support for breastfeeding.

The last in the series of orientations held for elected members of local bodies was for women councillors of the Alandur and Tambaram municipalities. The earlier ones were held in Chennai, Gandhigram and Alwarkurichi in Thirunelveli. The objective of these orientations was to familiarise the elected members with important issues related to women and children. As in the other cases, the councillors, while agreeing that these are crucial issues, were still not clear about what powers they had to tackle such issues. It was also found that they had to deal with more fundamental problems such as lack of respect and making their voices heard. This programme along with the earlier orientations, provided insights into the perceptions and priorities of women councillors, based on which the approach has been modified. A set of handouts on the status of women, education, environment, health and child care services was prepared to support the orientation process. These along with the other inputs are being consolidated in the form of a training manual on child care services.

Advocacy was also carried out by participating in workshops and conferences organised by others. The multiple roles of women, support services for women in the unorganised sector, empowering women to breastfeed, burden on pre-school children, aspects of child care services, panchayati raj and child care and innovations in ECCE were the important issues addressed during these presentations. A wide cross-section of people including academicians, students, NGO personnel, health professionals, teachers, school managements, trainers, and Govt. officials were reached through these advocacy meetings.

Training and Instructional Materials

This component of the project provides demand-based training support for trainers of both Govt. and NGOs, primarily in ECD, in addition to producing need - based instructional materials. The focus this year was on developing and producing instructional materials.

A major activity was the completion of a set of four short video films on activity - based education. Focussing on the use of locally available and low-cost materials in child care centres, the films present a variety of activities that could be easily adopted or adapted by child care workers. The first in the series, completed last year, focusses on the use of natural materials like sand, water and clay for learning activities. The second film shows how children can use easily available materials such as pebbles, sticks, leaves, matchboxes, newspaper etc. for learning activities. The third is on teaching aids prepared out of locally available materials while the fourth in the series is a unique film on science learning experiences for the pre-school level. All the four films demonstrate cost-effective learning activities that could be carried out in both rural and urban areas and in all types of child care centres. The strength of these films lies in the fact that the child care workers who appear in them carry out these activities as a part of their normal routine. These films are primarily intended to be used for training purposes.

Shades of Nature, a booklet on the use of colours made from natural materials, was also produced this year. This booklet presents the method by which primary and secondary colours can be prepared from vegetable as well as inorganic matter. There are virtually no colouring activities in most child care centres, as artificial colouring materials are either expensive or not available. This booklet is intended to encourage teachers to take up colouring activities by suggesting ways for them to produce the colours themselves in quantities sufficient for all the children in the centre.

Research and Documentation

The research activities of the project are focussed on compiling information on various issues, to be used as tools for advocacy. This year three more studies were added to the research series produced by the project. "Death by Social Causes" presented an overview of the problem of female infanticide in Tamil Nadu, based on secondary sources of information, with particular emphasis on the responses of the Govt. and NGOs to the problem. "Watering the Neighbour's Plant" focussed on the media responses to the problem of female infanticide in Tamil Nadu. The study analysed the portrayal of the problem by different media, apart from taking a critical look at media response and its impact on the problem. These two publications formed the basis of the efforts to develop a network in regions around Salem and Madurai, for the purpose of sharing and implementing strategies to tackle the problem of female infanticide.

The third research publication this year was on child care services in Tamil Nadu. Entitled "Services that Matter", this report takes a comprehensive look at the existing child care services and identifies areas that need attention. The report gives insight into the dynamics behind

the implementation of these services and the problems faced by them.

An important activity this year was a meeting of the Steering Committee to finalise the methodology and tools for a study on the impact of ECE on child learning. This study is aimed at finding the outcomes of various models of ECE and comparing their strengths and weaknesses. The proposal prepared at this meeting is being submitted to possible sources of funding. To canvas Government support for such a study, a committee member from Oxford University made a presentation to senior officials of the State Government on the impact of preschool education as found by various studies around the globe.

Database

The project also caters regularly to demands for information on various issues tackled by it. On an average, half a dozen requests are received every week. Most of the queries are related to available resource materials on ECCE and multiple roles of women. There is also much demand for training on these issues as well as alternatives such as schools that practise activity - based education. The project has also provided contact with resource persons working on these issues.

Dissemination

The materials produced by the project have been widely disseminated (see Table 4.2). Category-wise mailing lists have been developed to facilitate this. Kits containing materials have been given to legislators, Govt. officials, union representatives, media executives, writers, NGO heads, leaders of political parties, professionals such as doctors, lawyers, social workers, research/academic institutions, donors, UN agencies, and documentation centres. The most widely disseminated product was *Annaikku Adaravu* - a manual on empowering women to breastfeed. This year 2000 copies were ordered by UNICEF for the Directorate of Public Health and 100 by the Directorate of Social Welfare, while 2,500 had been distributed earlier through Tamil Nadu Integrated Nutrition Project (TINP), Voluntary Health Association, Tamil Nadu (VHA-TN) and Indian Academy of Paediatrics (IAP). *Imma* the newsletter of TN-FORCES was also a regular channel for dissemination of news about network activities, products and other information. About 400 copies of each issue are sent out.

Postscript

Keeping the objectives in view, the project has striven to make an impact on the welfare of the young child in Tamil Nadu. While the process of advocacy and the expected attitudinal changes take their own time, there have been some remarkable achievements within the period of report. The most important is the awareness and interest created among NGOs on issues related to the young child. This has been a major achievement of the networking process, apart from the actual impact it has had on changing ground situations. The project addressed the significant aspect of the training needs of the Government and a few NGOs on ECCE. A wide array of products for advocacy, communication and training were generated and distributed. Above all, replicable strategies for successful advocacy campaigns, networking and communication have been tried, tested and fine-

tuned. There are no quick results as far as impact on policy is concerned. A few landmark changes in legislation and executive decisions of the Government on these issues have been achieved. More details are available in a detailed process documentation of the project. Several issues which came up during the course of the project are being addressed by the next project called "Operation Resource Support".

Table 4.2 : *Products (June - December 97)*

Month	Name	Content	Audience	Output / Outcome
June	Death by Social Causes (English)	Perceptions and responses to female infanticide in Tamil Nadu	Academicians, journalists, NGO personnel, media, authors, women's groups	500 copies distributed - translated into Tamil
June	Science Experiences - Video film (Tamil)	Use of day to day environment to teach science in a simple way to young children	Balwadi/AWW, pre-primary school teachers, supervisors and others involved in ECCE training	30 copies distributed
July	Lowcost Materials for Young Children - video film (Tamil)	Activities using materials locally avaialble in the environment	Balwadi/AWW, primary school teachers, supervisors and others involved in ECCE training	30 copies distributed
August	Let's Teach Like This! - video film (Tamil)	Constructing teaching aids using locally available low-cost materials	Balwadi/AWW, pre-primary school teachers, supervisors and others involved in ECCE training	30 copies distributed
August	Shades of Nature-booklet (English & Tamil)	Preparing colours for use in the Balwadi, using locally available materials	Balwadi/AWW, pre-primary school teachers, supervisors and others involved in ECCE training	200 copies distributed
August	Watering the Neighbour's Plant (English)	Media perspectives on female infanticide in Tamil Nadu	Media personnel, authors, academicians, journalists, NGO personnel	250 copies distributed

Table 4.2 contd...

Month	Name	Content	Audience	Output / Outcome
August	*Thayum Seyum* audio cassette (Tamil)	Songs on the development of the young child	General public, paediatricians professionals, NGOs,	500 copies distributed
August	Four video spots on the development of the young child (Tamil)	Messages on the importance of stimulation for young children (0-3 yrs)	General Public, NGOs, women's groups, students, doctors etc.	Shown on Doordarshan and used as discussion starters
September	Services that Matter (English)	An overview of child care services in Tamil Nadu	NGOs, Academicians, students, Govt. officials	300 copies distributed

401.2 Project Operation Resource Support

This project, as the name suggests, focusses on providing resource support to action aimed at a wide range of issues related to the young child, because at the end of the earlier project entitled "Children on the Agenda", it was felt that consolidating the impact was essential.

Mission

This project aims to explore, raise, address and support the following issues of child care with a gender perspective

- Quality of child care services offered by both NGOs and Government
- Linkage between women's multiple roles and child care as a support service
- Discrimination against the girl child at all age–levels
- People's participation and alternative structures for child care services
- Care and development of children belonging to the most vulnerable age group(0-2 yrs)
- Needs of young children in urban disadvantaged environments

Objectives

The goals of the project are :

- To strengthen the capacity of existing institutions working in these areas both Government and voluntary, through training and development of training modules
- To develop communication materials to support advocacy, training and capacity building
- To undertake research on selected child care issues of immediate priority, the findings of which could be used for advocacy and policy formulation
- To maintain and develop a database on the issues of child care

The Process

The project is oriented towards meeting the demand arising from various sectors such as Government, media, NGOs, academics, professionals, panchayat members etc. (Figure 4.1). The objectives are to be reached through three inter-linked strategies – communication, training and research. The core methodologies would be production and dissemination of resource materials, and activities such as meetings and workshops.

These would lead to a better understanding of the issues by the various stakeholders and fulfil the demand for capacity building arising out of the process.

Training would focus on developing and undertaking programmes of orientation, sensitisation and capacity building for different specialised groups in addition to developing appropriate training materials, modules, resource materials, learning-teaching aids etc. in both the print and electronic media. Communication activities would focus on production of resource materials in print, video and audio forms to support sensitisation and capacity building activities, capturing space in the media and communicating messages through the various media, apart from activities such as panel discussions, seminars, competitions, special issues in popular magazines, debate through newspapers etc. Research would consist of developing an empirical database and insights regarding child care that would be useful inputs for policy, planning and programming. The following topics have been identified for research:

- Development and validation of tools for assessment of quality of ECCE in different types of child care situations and contexts
- Cost benefit studies of different programmes of child care
- Child rearing practices and growth and development of young children

A Technical Advisory Committee consisting of experts and important stakeholders would as usual guide the project. The Committee met in March 98 and provided several valuable suggestions to fine-tune the activities. A sizeable part of the time was spent in preparing work plans for the whole year. The following section presents the activities carried out from January to May 1998.

Building up Capabilities

Activities under this broad area of work started with a workshop on Training Methodology with ECCE as the focus, in January, for participants from NGO training institutions. This was held with the objective of preparing the participants to run the summer refresher course in ECE, and train a core group of experienced ECCE professional trainers in ECE in Tamil Nadu. The participants were introduced to experiential methods and participatory training in a theoretical perspective with many opportunities for practical sessions. A key input was teaching strategies which can be used as substitutes in situations where practical work with children is not feasible. Particular attention was directed to analyzing the process from the trainer's viewpoint, 'mirroring' exercises and the processes of shared learning. An important out-come of the workshop is a group of trainers skilled in methodology,

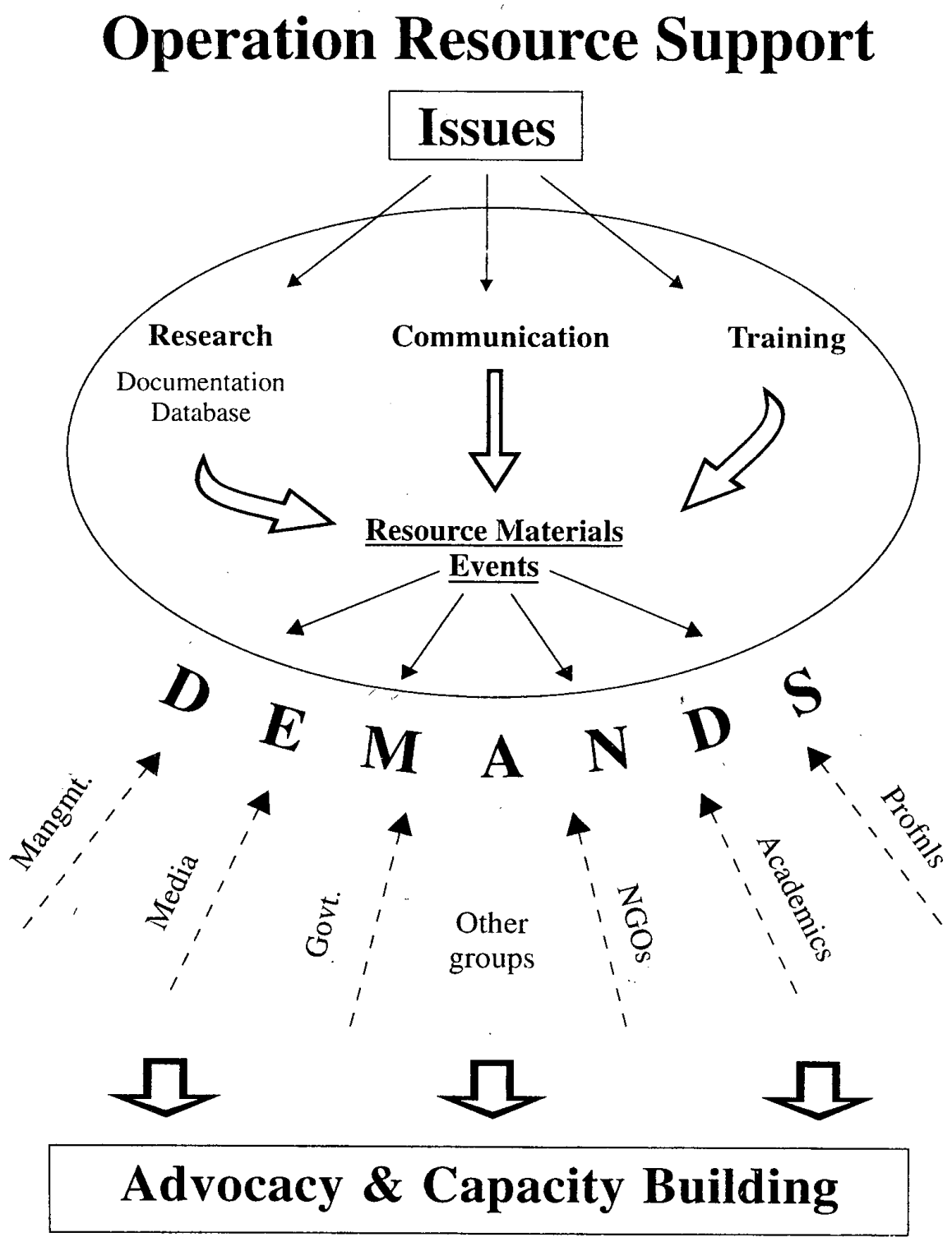

Operation Resource Support
Issues
Research
Documentation
Database
Communication
Training
Resource Materials
Events
D E M A N D S
Mangmt.
Media
Govt.
Other
groups
NGOs
Academics
Profnls
Advocacy & Capacity Building

Figure 4.1

while another is the formulation of different models of ECE training curriculum that could suit different training needs. An in-service training programme, spread over one year and starting with a two-week orientation, has already been launched in Neyveli, based on one of the models prepared.

In continuation of last year's efforts at promoting the use of low-cost soft dolls in Government -run child care centres, a training programme was conducted in February for master cutters of the Government -run tailoring societies with the collaboration of the Department of Social Welfare. The objective was to equip the societies to produce low-cost soft dolls out of the scrap material abundantly available with them, and supply them to child care centres in their district. It is expected that the Government would shortly place orders for these dolls.

As a result of the sustained campaign for activity-based education over the last two years several stakeholders have realised the importance of the issue and have started to act on it. The District Institutes for Education and Training under the Directorate of Education, Research and Training initiated a series of orientation programmes for school teachers and managements all over the State, on the importance of burden-less education. The project facilitated the orientations held in Chennai in March. The project staff planned the sessions, and handled three key sessions. Similarly, an NGO is being helped to plan a major conference on ECCE.

Messages that Move

The strategic importance of involving paediatricians as major associates in working with issues related to young children has long been felt. Efforts to reach them have already been made through Citadel Pharmaceuticals, whose marketing executives regularly meet paediatricians all over the State.Two audio cassettes containing songs on activity based education and development of the young child and a manual on empowering women to breastfeed have been disseminated to the paediatricians through these executives. In April 98, a meeting was held with all the marketing executives of the company, to consolidate earlier achievements and to explore the next course of action. It was a unique experience to understand the thinking of the corporate sector on these issues and to gauge the level to which they would commit themselves to work for these issues. It was suggested that posters and information pamphlets would be more effective and could be easily used by the paediatricians. The company has come forward to sponsor the posters and distribute them to paediatricians for dissemination.

In continuation of the work in preparing and producing communication materials on the development of the young child (0-3 yrs), a major communication workshop is being planned to prepare communication material for the different media and consolidate them in the form of a module. A proposal has been prepared for conducting the workshop in collaboration with the Communication and Training Centre of the Tamil Nadu Integrated Nutrition Project.

Action has also been initiated to conduct a photo contest in collaboration with *Dinamani*, a leading Tamil daily, on 'Women

workers in Agriculture' in connection with May Day. The objective is to focus attention on the needs of women agricultural workers such as maternity benefits, support for breastfeeding and the need for child care support. An article highlighting these issues was also published in the same vernacular daily on May 1.

Research Priorities

Preliminary work has been initiated on the three studies proposed to be taken up during the project period. The proposal for the study on the "Impact of ECE on Children's Learning" has been prepared and submitted to the Dept. of Education, Ministry of Human Resource Development, for possible collaboration. The primary objective of the study is to determine the extent to which the prevailing models of child care influence children's learning and to identify factors unique to various models that contribute to their respective effectiveness.

Similarly for the study on "Cost-benefit Analysis of Different Models of ECE", a preliminary note has been prepared, raising several questions regarding costing. It is being circulated among experts for their opinion. The objective of this study is to explore ways of costing inputs that go into child care services and the benefits that accrue and compare within and between the existing models of child care in the State.

Regarding the third study, "Caregiving Behaviour and its Relationship to the Growth and Development of Infants in Slums of Chennai", the Advisory Group met in April, and has helped to refine the objectives and methodology. This study will look into the variables that influence caregiving behaviour, relationship between caregiving practices and the growth and development of infants, support services available to the mothers for child care along with programme options that enhance the capacity of families and empower mothers to improve existing care practices and to create a more conducive environment for the optimal development of the young child. The first phase, a cross-sectional study of 250 mother-infant dyads in slums will begin in June. The second phase would consist of an in-depth study of selected cases.

Support to TN-FORCES

The project staff were actively involved in offering support to the Secretariat of TN-FORCES in many of its key activities. An important contribution was the project's inputs into a proposed intervention in some slums of Chennai City for very young children, with the collaboration of NGOs and the Slum Clearance Board. An orientation was provided to NGO personnel and the officials of the Board on the needs of young children and their mothers. This was followed by preparation of a tool for a need-assessment study in the slums for which an orientation was also provided to NGO personnel. Apart from this, support was provided in terms of planning for sub-group meetings, identifying issues and resource persons and refining memorandums.

401.3 Resource support for Child Rights

Tackling Female Infanticide

The Foundation has been addressing the issue of female infanticide through devel-

oping and promoting communication strategies and documentation. In 1996, *Pacha mannu*, a street-play on the theme was produced and performed in over 40 places all over Tamil Nadu. In 1997, two research reports entitled "Death by Social Causes" and "Watering the Neighbour's Plant", were published and widely disseminated. The reports probe the various dimensions of the problem and the responses of the media, Government and NGOs. It has been found that the crux of the problem is one of attitude rather than the other obvious factors often cited as causes. Hence communication strategies would be more fundamental in tackling attitudes, with large-scale campaigning as the core strategy. It was felt that a network of NGOs working on these issues would be in a stronger position to initiate sustained campaigning and to share strategies to bring about attitudinal changes, rather than sporadic and isolated activities. With the objective of facilitating the formation of such a network, a meeting was held in December 97, at Madurai, in collaboration with Indian Council for Child Welfare - Tamil Nadu (ICCW– TN) for senior representatives of NGOs concerned with the issue of female infanticide in Salem and Madurai regions.

About 30 persons representing 20 organisations participated in the meeting. To begin with, the participants were helped to focus on the attitudes that indirectly precipitate the problem and to take a fresh look at the strategies they currently adopt. After discussing current communication efforts, the key role of effective communication, campaigning and networking was emphasised by resource persons. At the end of the meeting, participants came up with possible short term and long-term goals and decided to network among themselves. "Alternatives for India Development" and ICCW-TN came forward to organise the follow-up meetings in the Salem and Madurai districts respectively.

The two follow-up meetings were held in April, to consolidate progress made at the earlier larger meeting and prepare a tentative plan for networking. About 60 per cent of those invited participated in these meetings. There were a few doubts and questions regarding networking, which had to be clarified before the participants settled down to prepare a plan of action. The plan consisted of meetings to share strategies, inter-agency collaboration and large-scale joint activities focussing on communication with various groups in the community. The constituents have now decided to hold meetings once in three months on a cost-sharing basis and initiate inter-agency collaboration to begin with.

A dialogue with other agencies at a wider level is being planned in June to consolidate the regional plans and explore possibilities of expanding them with the collaboration of other partners. A workshop on communication is also planned with the intention of developing and preparing some materials in different media.

Towards a Child-Friendly Urban Environment

In response to a request from the National Institute for Urban Affairs, a process documentation on the ECD (Early Childhood Development) needs of the urban disadvantaged young child (0-6 years)

and responses to the need was undertaken in seven major cities of India, four of them metropolitan and three Class I cities. The study, which was designed and carried out by a panel of specialists, used qualitative methods on a carefully drawn sample, and was coordinated by Mina Swaminathan, who also undertook the study at Trivandrum.

The findings for Trivandrum showed that as far as coverage of ECD needs was concerned, it was excellent in certain respects (mainly relating to maternal and child health services) but inadequate in both quantity and quality in relation to aspects like preschool education, day-care services and maternity entitlements. An outstanding feature was the involvement and contribution to child care of CDS (Community Development Society) an autonomous self-help organisation of poor women, which is supported by the Municipal authority. Besides identifying gaps between needs and services, the study examined the quality of services and factors influencing them; vertical and horizontal linkages with an impact on quality; and issues of resource mobilisation and sustainability. The conclusions, presented in a SWOT analysis, summarising strengths, weaknesses, opportunities and threats, helped to crystallise the recommendations.

The process of advocacy and follow-up has been started with a workshop in Trivandrum, the objectives of which were to provide feedback to the informants and stakeholders and to initiate the process of participatory planning by them as well as to establish some procedures for that purpose. Among the out-comes of the meeting was a proposal to set up an Advisory Committee on Child Care to help improve the quality of services and look into problems at the field level. A second meeting is expected to follow soon to take the planning process a step further and begin to institutionalise it. It is also expected that similar initiatives will be taken in the other six cities (Ahmedabad, Amritsar, Bangalore, Kanpur, Nasik and Patna). A national-level policy workshop to evolve new strategies to meet the needs of the most disadvantaged children of all, those in the urban slums, is expected to take place later in the year.

Sub Programme Area 402

Uttara Devi Chair/Resource Centre in Gender and Development

The Chair/Resource Centre, also referred to as GENDEAVOUR, was initiated late in 1996 with a generous endowment grant for the Venkateswara Group. The centre has the following two major objectives:

- To promote the incorporation of gender issues and the idea of gender equity in research and action related to development, with special emphasis on rural and agricultural development; and
- To encourage, maintain and develop gender perspectives in all the activities and programmes undertaken by the Foundation.

Inauguration

The formal inauguration was held on 22 September, 1997, the birth anniversary of

Smt. Uttara Devi Rao, to honour her memory. Smt. anuradha Desai, Chairperson of the Venkateswara Group was the chief guest. To focus attention on the mandate of the Centre, a Panel Discussion on the theme of "Gender and Development : the Research-Action Interface" was held and three distinguished scholars participated in it. Sumi Krishna spoke on "Integrating a Gender Perspective into Environmental Projects", Govind Kelkar on "Gender and Land Rights" and Narayan Banerjee on "Economic Empowerment of Women : the Bankura Experience". This was followed by the second in the series of workshops on Community Livelihood Strategies, in which the three Resource Persons took part. In the course of the next few days, each of the Resource Persons visited one of the project sites and interacted with all the field staff there, thus carrying the insights drawn from their experience directly to the field and promoting the research-action interface at the field level.

In October, the Programme Advisory Committee of the Centre met for the first time, to consider and help draw up the plan of action for the coming year. The areas of action prioritised were:

- in research, special emphasis on women in agriculture, using both qualitative and quantitative methods, supplemented by case studies or micro-profiles of women in various farming systems;
- a gender profile of Tamil Nadu, including studies of gender differences in communication, modes of discourse, and women's perceptions of issues, using the cultural group as a focal point;
- developing a documentation centre in both the print and electronic media;
- working with Women's Studies Centres to develop curriculum / methodology and programming ;
- gender orientation and training for officials and NGOs at all levels, and advocacy;
- development of resource and training materials, especially for elected women members in Panchayati Raj institutions, grassroots workers, and government officials; and
- strengthening of existing work such as advocacy for support services and the theatre group.

Workshop

In December, a national workshop on "Technological Empowerment of Women in Agriculture", co-sponsored by the National Commission for Women, was held. Details will be found in Sub-Programme Area 504.

Research Themes

Two research studies have been taken up this year. The first, entitled "Panchayati Raj and Women's Participation : a stock-taking" is sponsored by the National Commission for Women and coordinated by the Centre for Development Studies and Action, New Delhi and is part of a study being undertaken in five States. The study is an in-depth investigation of the attitudes, political awareness, role perceptions, experiences, problems and self-image of about 100 elected women members in two districts of Tamil Nadu, Tiruvallur

and Pudukottai, which were selected because both have elected women Chairpersons at the District and other levels and because they are divergent in other respects. The field investigation has been completed and the report is expected to be ready by July 1998. This would prove useful in assessing training needs and methods and will, among other things help in the preparation of training modules.

The second study, co-sponsored by the V. Gangadharan Smaraka Trust in Kerala, is to document the total health profile of women in Kollam district, most of whom are engaged in the traditional industries of cashew, coir and shrimp processing, with their related health hazards. The aim of the study, which is being designed in collaboration with Health Action by People (HAP) in Kerala and carried out by them, is to develop a carefully researched report, documented in both print and audio-visual media, on the issues that might arise, assess the views of the stake-holders, and develop a package including technological, educational and legislative measures leading to improved health. The study is to be completed by the end of 1998 so that the policy and advocacy workshop can be held early in 1999.

Database

The data base on academics in gender studies in Tamil Nadu now extends to 30 persons. A data base on gender –specific information about Tamil Nadu is being built up, with gender-disaggregated data on topics such a geographic and demographic indicators, fertility and health status, migration, education, employment, housing, agriculture, politics, media and other subjects. The data base will be accessible to scholars on request, and will be updated from time to time. Based on this information, a series of papers on different aspects of the situation, which will contribute towards a "gender profile" of Tamil Nadu, is being prepared.

Advocacy

There have been several opportunities in the course of the year to make presentations at various gatherings on gender issues. The emphasis has been on issues with which the Foundation has always been concerned, such as providing visibility to women's multiple roles and the need for support services to meet women's practical gender needs. This advocacy has continued in various forums — of policy makers, officials, legislators, activists, unions, grassroots workers, panchayat members and women at all levels.

Internalisation Process

The second major mandate of the Centre is the internalisation of the gender dimension in all Foundation projects and activities. This process was initiated with the setting up of the Gender Task Force in July 1997 as an inter-project group for sharing information and exchanging ideas, documenting progress, developing research tools and indicators, planning training and mobilising external resource expertise. Since the Task Force was an outcome of the first workshop on Community Livelihood Strategies, held in June 1997, at first the members were drawn only from the three main projects of the Foundation concerned with field-level social interventions, but gradually other projects have begun to participate, and

the group now extends to all the projects in the Foundation.

The Task Force has been instrumental in helping each project team to plan and carry out a series of gender sensitisation workshops and interactions with Resource Persons tailored to the needs of each group in order to strengthen the project staff's abilities to handle gender issues more sensitively and efficiently. Thus, for example, in Biovillages, a series of interactions with Resource Persons has enabled the team to develop tools to analyse and document problems in areas like involvement of women in natural resource management, evaluation of some of the micro-enterprises, assessment of women's work load and women's perceptions of drudgery at both the agricultural and household level, moving from "women-only" thrift and enterprise groups to mixed groups, and structuring and management of the Biovillage Society and Biocentre. The workshops were also helpful in enabling the staff to learn methods of process training and evaluation and of validating their own field observations by reference to the group.

Gender Sensitisation

For the Ecotechnology team, and members of the Task Force, a special two-day workshop was conducted by Ranjani Krishnamurthy, a gender specialist, on gender analysis of projects. This workshop has helped the team to take a fresh look at all the projects in the JRD Tata Centre and to rework and restrategise some of them, and to widen the scope of documentation to include gender issues. Field staff have already started using some of the tools for data collection and gender specialists are being involved in participatory evaluation exercises in some other cases.

As the next step in gender training, two members of the Task Force participated in a two-week workshop organised by FAO at Bangkok on the SEAGA (Socio Economic and Gender Analysis) approach. Following this exposure, two brief orientation pogrammes have already been conducted, one for Dalit women and another for forest officials, and a two-day orientation workshop for officials of the FARM (Farmer-centred Agricultural Resource Management) site is planned. Two members of the Task Force were involved in planning and carrying out the PRA and socio-economic studies of communities in the Gulf of Mannar areas in order to include gender issues in the GEF- funded project preparation exercise for the Gulf of Mannar Biosphere (SPA 102).

For the Coastal Wetlands Management project, an initial sensitisation workshop on methods of working with communities is being followed by PRA exercises, and preparations for micro-planning. Several women's credit and thrift groups have been launched and this has led to the identification of a need for further training for the staff in carrying the work to the next step.

In the Agrobiodiversity Conservation Corps programme, main-streaming gender as a component of research and training has been initiated at project sites in Kolli Hills and Erimalai. Using a range of tools such as art forms and field observations, the gender components in knowledge, perceptions, attitudes and practices relating to biodiversity are being studied

and efforts are being made to understand and overcome barriers to women's participation as agents of change in conservation of biodiversity.

Members of the Gender Task Force also act as resource persons, facilitators for discussions, and rappoteurs when needed, thus providing significant backstopping and support to all projects. The evolution of the Task Force and its extension to all projects thus represents an important step in the internalisation of the gender dimension in all areas of work.

Sub Programme Area 403

Voicing Silence

Voicing Silence went into a period of creative hibernation for the greater part of the year under review, due to the absence from the country of its Director "Mangai", who spent eight months at the Tisch School of Arts, New York University, as Fulbright Scholar engaged in post-doctoral work on the theme of "Gender, Ethnicity and Theatre".

Production in Progress

The first steps were taken towards producing *Avvai*, a play on one of the most famous Tamil woman poets. A dramatised reading, including musical rendering of the songs, of the draft script by the poet " Inquilaab" was held before a small invited audience of Tamil scholars and theatre persons in June 1997, followed by a lively discussion. The purpose of this exercise was to get feedback from different points of view about the approach of the play, which challenges the stereotypes surrounding the mythologised figure of Avvai, as well as the theatrical devices used in the attempt. The feedback is being utilised by the scriptwriter to prepare a revised draft, and the play, which is targeted at students of Tamil literature and university audiences, is likely to go into rehearsal in June and performances to start by July this year.

Publication

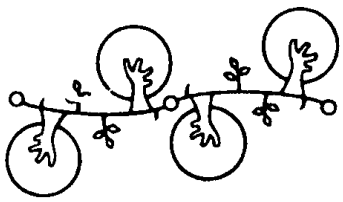
An English translation of *Pacha Mannu*, alternating prose and poetry, has been prepared and is being readied for publication. The book is expected to include not only the text, but also guidelines and production notes, and a long introduction documenting the entire process of research, collective creation, performance in *jatha* mode, and audience interaction which is the rationale behind this effort in interactive street theatre. The video documentation is already being used for educational purposes. The research study undertaken last year on 30 women stage artists of Tamil Nadu, representing different theatrical genres, was published by the International Institute of Tamil Studies.

Documentation

The archival video documentation of women stage artists of Tamil Nadu, undertaken in connection with *Kulavai'97*, has been completed and sub-titled in English. 8 copies have already been distributed on request to research institutions and art museums. The videos "Pacha

Mannu" and "Kulavai 97", both directed by Mini Hari, were screened at the 5th International Video Documentary Festival held in Mumbai in March '98, the first in the Competition Section and the second in the Information Section. Both attracted interest, and there continues to be a slow but steady demand for them. The video "Pacha Mannu" was also used by "Mangai" in several presentations to theatre groups and students in the U.S, and 8 copies have been distributed there.

Programme Area 500



Education, Communication, Training and Capacity Building

Under this Programme Area, a wide variety of training programmes, workshops and conferences were organised. This year's annual dialogue was on the theme "Malthus and Mendel" to assess the issue of food security in the 200th year of publication of Thomas Malthus' well-known essay on population. The Information Villages Project was launched.

Sub Programme Area 501

Training Programmes

Biotechnology Workshop for Women Entrepreneurs (13 October - 7 November, 1997)

Biotechnology workshop was conducted in collaboration with the FICCI - Ladies' Organisation (FLO), Hanns Seidel Foundation, Germany, and Department of Biotechnology (DBT). The workshop was inaugurated by Prof. M.S. Swaminathan and the presidential address was given by Mr. P.C. Cyriac, Secretary, Department of Industries, Govt. of Tamil Nadu. Ms. Usha Krishna, President of FLO and Dr. Amit Biswas, Advisor, DBT also took part. About 40 midcareer women attended this workshop. Lectures relating to entrepreneurship development, identification of business opportunities and product-selection, production management, inventory control and quality control were given. Financial management and various schemes available with Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD) and other institutions were explained in addition to procedures relating to setting up a Small Scale Industry (SSI) unit, market survey and preparation of the project report. During the last week, the emphasis was on biotech options and the pros and cons of starting out in this field. The resource persons highlighted the various aspects of each technology with specific reference to ag-biotech, medical and food biote-chnology. This activity was initiated as a part of the Technical Resource Centre backup for the proposed Biotechnology Park for Women in Chennai, an initiative resulting from the deliberations by the women scientists and technologists of the Asia-Pacific region meet in December '96.

Women's Technological Empowerment and Sustainable Development: Replicable Models (8 - 10 December, 1997)

The Foundation along with the Education Development Center (EDC), Centre for Workforce Development, USAID and the Centre for Vocational Education in Chennai, organized a three-day workshop on "Women's Technological Empowerment and Sustainable Development". The primary goal of this workshop was to focus attention on programmes and methodologies which reduce the hours of labour of the most impoverished and vulnerable women, and which add value to the work they do for themselves, their families, and their communities. The intended outcomes included:

- Highlighting pioneer projects which focus on Women's Technological Empowerment for Sustainable Development, and helping NGOs to understand the necessity of ecologically sustainable programmes
- Developing guidelines for replicating the highlighted projects-such as the Biovillage, Bharatiya Yuva Shakti Trust (BYST) and the Working Women's Forum; learning about the role that microcredit plays in such programmes

- Focussing attention through the global media and the internet on programmes and methodologies highlighted in the workshop, and using them as a springboard to start a global conversation on the topic.

Over eighty people from the five States of Tamil Nadu, Andhra Pradesh, Orissa, Kerala and Karnataka participated in the workshop. There were also participants from Bangladesh. During the morning sessions there were panel discussions in which experts in the field spoke about their experiences in developing some of the most successful workforce development programmes for women and youth. The afternoons were set aside mainly for interactive working group sessions. The participants were divided into two working groups, one for the State of Tamil Nadu and the other for participants from the neighbouring states.

During the working group sessions the participants were led through a vision and commitment exercise to develop a personal vision for themselves as committed individuals, as well as a vision for them collectively as a group. This exercise was led by highly trained facilitators who helped the participants to develop a collective vision for the workshop and their future work. The group vision created at the workshop was "Today's dream is tomorrow's reality. We make hope happen." Participants also created action plans with milestones. At the end of the workshop all the participants shared their personal commitment and their action plan for the three months following the workshop.

The workshop far exceeded its goal of stimulating a conversation among Indian NGOs on women's technological empowerment and sustainable development. It helped to align a large and diverse audience around a vision of "what is possible" if each individual is committed to help in creating opportunities for women to develop the skills and knowledge they need for sustainable livelihoods. It created a group of committed individuals to give life to that vision and to exercise a strong voice for the future of their region.

The local sponsors - the MSSRF, and Centre for Vocational Education, Chennai, are in communication with the participants to track their performance. The participants were asked to respond to a survey on their accomplishments and also requested to outline the milestones for the next three months. As per the response from the participants, some have formed small groups to develop credit unions and these groups are also involved in conducting training programmes. The local sponsors may host a completion workshop at the end of 1998 so that all the participants will have an opportunity to assess how they have converted their vision into action.

National-level Hands-on Training Programme on Conservation of Biodiversity and Molecular Markers (7 - 23 December, 1997)

Conservation of biodiversity is always seen as a science of ecology and environment. The role of biotechnology in augmenting conservation efforts is poorly understood. The role of molecular markers in under-

standing genetic diversity is necessary not only to conserve elite germplasm but also to address issues of on-farm conservation and its role in maintaining agro-biodiversity and genetic heterogeneity.

A two-week hands-on training programme was conducted by MSSRF with financial support from the Department of Biotechnology, Government of India, on the above topic. Sixteen candidates drawn from various parts of India were taught conservation techniques including vegetative propagation, micropropagation and molecular techniques like DNA isolation, Probe preparation, Restriction Fragment Length Polymorphism (RFLP) analysis, Polymerase Chain Reaction and Random Amplified Polymorphic DNA (RAPD) analysis. Training was also given on field techniques like quadrant making, scoring, etc. Data analysis on individual experiments was also taught. The course was appreciated both by DBT and the participants as fostering new linkages in the conservation of biodiversity using molecular markers.

Training Workshops on the Use of Electronic Databases

Three workshops-cum-training programmes were held during this year, on multimedia database and Web publishing with reference to biodiversity conservation. The aims of these training programmes were to give an exposure for NGOs to multimedia databases and aquaint them with the creation of such databases, by giving them hands-on-training. The first training programme was held at Cuttack on 22 and 23 April 1998. fifteen individuals representing NGOs from seven districts of Orissa attended.This training programme discussed the importance of documenting traditional knowledge, the role of computers in inventory and rapid retrieval. Databases created by the Foundation such as the Farmers' Rights Information Service (FRIS) were demonstrated. The design aspects of these databases and details on how each page was created were discussed.The trainees then created brief documents with Hyper-Text Markup Language (HTML).

The second training programme was held at Krishi Vigyan Kendra, Gandhigram, during 26-27 May 1998. Both the NGOs and farmers who are collaborating with the Foundation on the Seed Villages Project at Kannivadi (SPA 301 in this report) participated in it, making a total of 29. Issues of information gathering, verification, documenting and dissemination using computers were discussed. A separate hands-on-training on HTML was given to the KVK staff.

The third workshop was held at Chennai on 17 and 18 June 1998. There were 24 participants representing several NGOs. The concept of forming a network among the participating NGOs was discussed, whereby some common standards for databases might be evolved to facilitate exchange of data and information. An action plan to compile details of available databases on biological diversity has been developed.

Sub Programme Area 502

The Information Village Project

The importance of the use of modern information and communication technologies (ICT) in promoting sustainable agriculture and rural development has been emphasised by the Foundation for long. The annual dialogue in 1992 was on the theme of "Information Technology : Reaching the Unreached." Out of this dialogue emerged the concept of the information village. This is envisaged as a situation where input of knowledge makes a positive difference in advancing rural livelihood security. The role of modern ICT here is in the ease with which information held in many different locations can be accessed, re-formatted or value-added to suit the local needs and disseminated.

This project, implemented in collabaration with IDRC, Canada, is located in the Pondicherry region. It is designed to complement the activities carried out under the Biovillage Project (SPA 302) and utilises the advantages generated from that project, such as group mobilisation, more accurate identification of the ultra-poor, etc. The project has an operational centre (meant for value-addition to generic data) at Villianur, which is the headquarters of the Villianur Commune. This is where the "last-mileposts" in development administration, such as the BDO's office, are located. Telephone facility is available here, including access to internet through VSNL. From this central location, it is proposed to extend the wireless network for data and voice communication to six village information shops, each serving a couple of hamlets. Kizhur, Mangalam and Pillayarkuppam villages are being connected in the first phase, i.e. by July 1998. The Villianur centre was formally inaugurated by Dr. Ismail Serageldin, Chairman of the Consultative Group on International Agricultural Research (CGIAR) on 1 February 1998.

In order to arrive at a reasonably clear picture of the state of existing communication habits and channels in the rural areas, especially among the poorer households, a detailed survey covering 10% of the resident families in the proposed area of coverage is being carried out since April 1998. About 320 households will be covered by July 1998. From an analysis of the available data, certain trends emerge.

- The predominant sources of information are the local (petty) shopkeeper, the market place, and the (agri) input supplier. A very considerable amount of information transaction takes place between the rural poor households and this also acts as a primary source of information. In other words, the information channels start and terminate within the supra-locality.
- Reach of electronic media, especially television, is reasonably high when one considers the prevalence of poverty in the villages surveyed (Table 5.1).
- There is widespread perception that channels of development information available to the public, such as the AO or the BDO, are not very effective,

because the information flow through these channels does not correspond to material/benefit flow which should be the result.

Thus, the information shops at the hamlets need to complement the existing local channels of information to gain credibility, and then go beyond to provide value-added information. This is necessary to ensure that the system is demand-driven.

To provide adequate contents to the network, several databases have been designed. A database called *Thittangal* (in Tamil) provides details on all the public entitlements (available through welfare programmes of the Government). Another database contains data on families in 19 villages (area of project coverage) which are below the official poverty-line i.e.having an income less than Rs 12,000 per annum. The data on biophysical endowments of each village, compiled by the staff of the Biovillages Project, has also been developed into a database for public access.

Table 5.1 : *Reach of Cable Television in rural areas of Pondicherry*

Village	Number of Telephones		TV sets (ones with cable connection)	Total Number of Families	Families below Poverty Line
	Public	Private			
Sorapet	1	3	300 (150)	626	264
Vambupet	1	Nil	100 (10)	160	118
Sellipet	2	Nil	110 (50)	424	313
Thondamanatham	2	2	50 (50)	472	51
Ramanathapuram	2	2	50 (50)	356	50
Pillayarkuppam	1	1	75 (50)	421	54
Olaivaikkal	1	Nil	15 (0)	106	12
Oussudu	1	Nil	25 (0)	444	5
Uruvaiyaru	1	4	50 (50)	531	45
Mangalam	4	1	75 (30)	569	268
Kizhur	2	3	30 (30)	400	120

Details as of June 1998.

Sub Programme Area 503

Databases : Design and Dissemination

The Informatics Centre, which has designed three databases, namely, the Mangrove Ecosystem Information Service (MEIS), the Farmers' Rights Information Service (FRIS) and the Ecological Farmers of India, focussed on the databases FRIS and MEIS during this year. In addition, consultancy jobs for ICRISAT for designing their web site and two multimedia packages were carried out during the year (details in SPA 605). The web site of the Foundation (www.mssrf.org.) was updated and maintained, while two more databases were added to our site. The URLs (web addresses) are :

- **www.mssfr.org/aeis** (details in SPA 305)
- **www.mssrf.org.sg/webfris**

The latter URL is hosted with the help of PAN-Asia, an activity of IDRC, and provides access to FRIS.

Following the worldwide trend in the increased use of the Hyper-Text Markup Language (HTML) and Java, we have decided to use these two languages and associated techniques for the design of all our databases, to enable easy access from different platforms. The FRIS, designed using HTML, is being redesigned to included dynamic HTML features and search techniques based on Java and VB Script (details of the contents of FRIS are provided in SPA 205). The MEIS is being similarly redesigned and is now part of the GLOMIS (Global Mangrove Information Service) which is an activity of the International Society for Mangrove Ecosystems (ISME).

Besides design of databases, attention was paid to their dissemination.Three interactive sessions were organised in Cuttack, Gandhigram and Chennai to enable field workers and scientists from other NGOs to learn the use of HTML through an analysis of FRIS (details provided in SPA 501 in this report).

Sub Programme Area 504

Workshops and Conferences

Asia-Pacific Workshop on Biosafety: Environmental Impact Analysis of Transgenic Plants (21 - 22 July, 1997)

With the spectacular growth of the biotechnology industry, primarily in the West, over the last decade, emerging market trends offer greater promise for the development, deployment and commercialization of genetically modified plants in developing countries, particularly in the Asia-Pacific region. Lack of proper evaluation guidelines, safety regulations, trained personnel and public safety perceptions have been major limitations in the cultivation and commercialization of the transgenic crops in this region. In order to discuss issues of environmental safety and evolve a common regulatory framework for transgenic plants, this workshop was organised in

collaboration with the Department of Biotechnology, Govt. of India, Animal and Plant Health Inspection Service (APHIS), USDA and Cornell University, USA.

The workshop was inaugrated by Hon' Prof. Saifuddin Soz, Minister for Environment and Forests, Govt. of India. The Government of Tamil Nadu was represented by the Minister for Environment, Mr. N.K.K. Periasamy. The workshop was attended by 82 participants from 16 countries, representing regulatory authorities, scientific personnel, media representatives, non-governmental organisations, private sector representatives and representatives from the Convention of Biological Diversity (CBD) Secretariat. The participants were provided hands-on experience to conduct biosafety reviews and prepare environmental risk assessment based on the best scientific knowledge and experience. The participants urged the political and scientific leaders, the people and mass media of the countries of the region to promote accelerated efforts in mobilising the tools of biotechnology and genetic engineering for improving productivity, profitability, stability and sustainability of the major cropping systems of this region; and to take due care to eliminate unacceptable risks with reference to human and animal health security as well as basic life support systems through an effective biosafety and risk assessment and management mechanism established in accordance with articles 19(3) and 8(g) of the legally binding CBD.

Panel discussions on institutional framework, private biotechnology companies, public perceptions of biotechnology and the role of mass media, brought out several pertinent issues related to the safety of biotechnology products. It was suggested that technology should be judged on its merit and not according to who has created it, be it multinationals, academics, or public-funded institutions. Another issue that was discussed was the extent of proprietary rights to information on the grounds of public safety, public good, and environmental safety. The decision to use technology has to be subjected to rigorous analysis within a national framework. Adequate biosafety regulations which meet with public approval would be the ultimate test for the science and research system, for governance and government agencies, and for business and commercial interests. If commercialised biotechnology is released on grounds that have passed the test of public good, environmental safety, food security and socioeconomic security, biotechnology will be a tool that makes life better. (The detailed recommendations of the workshop have been published by the Foundation).

National Workshop on Technological Empowerment of Women in Agriculture (3 - 4 December, 1997)

This workshop, co-sponsored by the National Commission for Women, had the following objectives :

- Reduction of drudgery of women in agriculture
- Value addition/income enhancement of women's labour
- Elimination of health hazards to women in agriculture and agro-based industries

Participants included academics from agricultural, rural and women's universities, research institutions, officials from Central and State Governments, women's organisations and voluntary agencies working in the field. The two-day workshop resulted in recommendations dealing with research priorities on women's multiple roles in agriculture; breaking gender barriers in technology development and dissemination; suggestions for policy and legislation relating to social security, occupational health hazards and access to resources, as well as structures and procedures to implement them, and to include gender audit in evaluation; and special funds for women-specific programmes related to technology. A major outcome is the setting up of a Task Force by the National Commission for Women with the involvement of ICAR, to develop the proposals in depth within a fixed time-frame.

SAARC Workshop on the Conservation and Sustainable Management of Coral Reefs (Co-sponsored by the FAO/Bay of Bengal Programme, 15 - 17 December, 1997)

Coral reefs have been described as the marine equivalent of rain forests because of their rich biological diversity. Recent estimates reveal that nearly 95% of the world's coral reefs have been damaged by overfishing, dynamiting, pollution or poisoning. Reef check carried out at 300 sites in the Caribbean, the Red Sea and the Indo-Pacific Region during early 1997 indicated that fish and shell-fish that were once common on reefs are getting decimated gradually. The year 1997 was therefore declared as the year of the reef to focus public and political attention on issues relating to conservation and sustainable management of coral reefs.

The workshop, which had partici pants from Australia, Sri Lanka, India, Bangladesh and Pakistan, was inaugurated by Dr. A.E. Muthunayagam, Secretary to Government of India, Department of Ocean Development, while Prof. Graeme Kelleher, former Chairman, Great Barrier Reef Authority, Australia, delivered the keynote address. A total of 21 papers, including 6 from India, were presented.

The participants were divided into 3 working groups to discuss sustainable use and equitable sharing, local governance of reef resources and habitats and reef research and monitoring management. Ms. Amarjit Ahuja, Joint Secretary, Ministry of Environment & Forests, Government of India, chaired the concluding session, and observed that the combined recommendations would be useful in the development of a policy statement to be submitted to the Ministry.

Department of Atomic Energy Symposium on Induced Mutations and Molecular Techniques in Improving Crop Productivity and Quality (21 - 23 January, 1998)

Induced mutations, both physical and chemical, have been profitably utilised over in the development of different crop varieties with improved agronomic and other traits. Advances in molecular techniques in recent years have contributed immensely to the understanding of gene function, regulations and mechanism of

action governing the expression of desired characters. This DAE-sponsored symposium was inaugurated by Dr. R. Chidambaram, Chairman, Atomic Energy Commission. It provided a platform for scientists and researchers, both young and old, working in the field of crop improvement and plant molecular biology to assess the progress we have made and what could be done in the future to increase crop productivity and quality. Forty-nine research papers were presented on the themes of induced mutations and molecular techniques for quality improvement, increased productivity, genetic resource characterisation and genetic manipulations, highlighting the current trends in the field of research. The participants of the symposium urged the Board of Research in Nuclear Sciences (BRNS), Department of Atomic Energy, to initiate concerted effort on collaborative research on some targeted species, so that some visible impact could be made. It was suggested that BRNS should initiate a time-bound and coordinated research programme on genetic improvement of pulse crop species.

Inter-disciplinary Dialogue on Malthus and Mendel : Population, Science and Sustainable Food Security (28 - 31 January, 1998)

The year 1998 marks the 200th year of the publication of the wellknown eassay on population by T.R. Malthus. The Dialog '98 was organised to consider the issues of population growth and food security in the near future. In the background note for the Dialogue, Prof. M.S. Swaminathan pointed out that.

"Inspite of a 6-fold increase in human population since 1798, there is enough food on the market today for all who have the requisite purchasing power. The average life span of human beings has gone up considerably all over the world. While the death rates are dropping rapidly, birth rates have not shown a commensurate decline in most developing countries. Consequently, the human population will increase by another billion during the next 11-12 years."

"The Inter-disciplinary Dialogue will address such issues in order to promote a new paradigm of farm research rooted in the principles of ecology, economics, social and gender equity and employment generation."

The following specific questions were addressed:

- How can the 1996 FAO World Food Summit goals be achieved sooner?
- How can the tools of frontier science and technology, such as biotechnology and information, space, renewable energy and management technologies, be converted into powerful instruments for fostering a job-led economic growth strategy which can minimise human deprivation and optimise opportunities for children being born for happiness and not just for existence?
- How can agricultural and biotechnological research supported by public funds for public good and similar research supported by the private sector become mutually reinforcing, so that, irrespective of their individual strengths, the collective strength of public and private sector R & D institutions becomes considerable?

- What are the changes needed in research programmes for achieving an internalisation of considerations of ecology and gender and social equity in technology development and dissemination?

- What are the changes needed in the structure and strategies of national and international agricultural research centres to achieve the twin goals of poverty eradication and natural resources conservation?

The significance of the topic was reflected in the diversity of the participants in the dialogue. Bharat Ratna C. Subramaniam presided over the inauguration, while Dr. Ismail Serageldin, Senior Vice-President of World Bank, and Chairman of CGIAR, delivered the inaugural address.The topics discussed included frontline developments in molecular biology and the role of institutions (e.g. public/private R&D, educational and media) in taking new technologies to farm families. The speakers included several eminent scientists and world leaders on environmental issues such as Prof. Norman Myers (UK), Prof. Klaus Leisinger (Switzerland), Dr. Andrew Bennett (UK), Dr. Adele Simmons (MacArthur Foundation, USA), Prof. Marc van Montagu (Belgium) amongst others. Several senior members of the National Academy of Agricultural Sciences of India participated actively in the Dialogue, the proceedings of which are expected to be released by October this year.

South and Southeast Asia Regional Workshop on Access to Genetic Resources and Traditional Knowledge (22 - 25 February, 1998)

This workshop was held in colloboration with the World Conservation Union (ICUN).

The objectives of the Convention on Biological Diversity include three major goals: conservation of biodiversity; sustainable use of biodiversity; and equitable sharing of the benefits arising out of such use.

Many of the Articles of the CBD are relevant to the discussion on access to genetic resources, sustainable use, benefit sharing and traditional knowledge, including: Articles 1 (Objectives); 8(j) (Sharing of Benefits with Indigenous Communities); 10 (Sustainable Use of Biodiversity); 11 (Incentive Measures); 12 (Research and Training); 14 (Impact Assessment); 15 (Access to Genetic Resources); 16 (Technology Transfer); 17 (Exchange of Information); 18 (Technical and Scientific Cooperation); 19 (Biotechnology); 20 (Financial Resources); and 21 (Financial Mechanism).

Paragraph 7 of Decision III/5 of the 3rd Conference of Parties (CoP) to the CBD at Buenos Aires, Argentina in 1996 "requests the Secretariat of the Convention and the Global Environment Facility to collaborate for preparing, for consideration by the CoP at its Fourth meeting, a proposal on the means to address fair and equitable sharing of benefits arising out of genetic resources including assistance to developing country partners".

This workshop was held to assist participating countries to prepare for the forthcoming discussions on access issues. The workshop had three key objectives:

- to familiarise CBD Focal Points (and others) with the access and benefit sharing provisions of the Convention
- to catalyse participatory national planning processes to implement the access and benefit sharing provisions of the CBD, by sharing experiences from within and outside the region
- to identify common regional trends, issues and concerns relating to the implementation of the CBD's access and benefit sharing provisions in South and Southeast Asia.

The workshop was structured around a case study format, and particular emphasis was placed on learning from legislative and regulatory experiences.

After three days of discussions and deliberations, a consolidated Agenda for Action-From Chennai (Madras) to Bratislava - was drawn up, encompassing the workshop's major discussion points, commonalities and recommendations.

The main recommendations that were put forward include :

- Members to CBD must provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof.
- There is a need for a global trade and transactions order – "TRIPS PLUS" – where "Plus" refers to equity and ethics in IPR claims.
- There is an urgency to introduce steps such as codes of conduct for academic researchers and commercial entrepreneurs for benefit sharing purposes and Prior Informed Consent (PIC).
- An integrated package of legislative and non-legislative mechanisms to ensure benefit sharing is necessary.
- Wider stake-holder participation is necessary in the drawing-up of national laws and regulations relating to the implementation of the Convention on Biological Diversity (CBD).

Sub Programme Area 505

Mapping Science in India through Analysis of Publications : Agriculture and Biology

The preliminary work on this project, which began last year, was restricted to analysing data for one year from two databases, viz. BIOSIS and *CAB Abstracts.* It has now been extended. Currently we are at an advanced stage of processing data on publications from India indexed in five years of *CAB Abstracts* (1990-94) and three years of BIOSIS (1992-1994). The final reports on India's contribution to the world literature of agriculture and biology are expected to be ready before the end of the year.

The year under review saw the publication of three papers from our exercise on mapping science. The first, on the relevance of medical research carried out in India based on an analysis of *Medline,* appeared in *Current Science,* 25 June 1997. The same issue carried an editorial by Prof. P Balaram and a commentary by Prof. M S Valiathan. The paper formed the basis of news stories in *Science, Science Now, Nature, British Medical*

Journal and the Indian media. It also attracted the attention of a wide cross-section of the academic and science policy communities both in India and elsewhere. The second paper, on India's contribution to the literature of science as seen from four years of *Science Citation Index,* appeared in *Current Science,* dated 10 March 1998. This was also noticed by the Indian media and *Nature.* The third paper, again on medical research in India, this time based on *Science Citation Index* data, appeared in the *National Medical Journal of India,* in its issue dated Jan-Feb 1998. Prof. Samiran Nundy wrote an editorial on it.

In addition to working on the project on mapping science, Prof. Arunachalam was invited to contribute to the GKD97 conference on the implications of Internet for scholarly communication in the developing world. His note was picked up by several lists on the net and formed the basis of some lively debates.

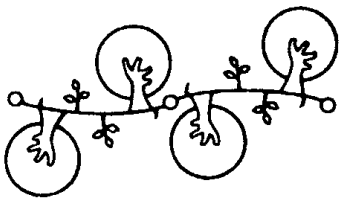
Sub Programme Area 506

Library & Information Services

The Library and Information Services unit has two components : a conventional, printed documents library, and a CD-ROM library. The print library is located in a hall named after the late Mr. S. Bhoothalingam. The library has a specialised collection of books, journals and reports, relating to various topics in sustainable agriculture and rural development. The base collection of books is approximately 5000, of which 30% relate to agricultural sciences and biological diversity. About 120 professional journals are received on a regular basis. Besides staff, about 900 users from other institutions consulted the library holdings. The collection includes 151 video titles, and efforts are on to create a collection of 35-mm slides.

The CD-ROM library has a collection that includes the entire range of CAB-CDs produced by the CAB International based in Oxford, UK. This collection starts from the year 1972 and is updated to April 1998. (The Forestry CD in this collection starts from 1939). The AGRIS-CD collection (published by the FAO) is updated upto 1997. The recent addition to databases on CD-ROM is the *Biophysics and Biochemistry Citation Index* (published by ISI, USA), covering 1991-1997. Together, these collections offer access to about 4 million records. Besides these, the World Development Report (WDR) is available on CD-ROM. FAO's FAOSTAT is available up to 1997 (data : 1996). *Encyclopaedia Brittannica* 97-CD is also available in this collection. During 1998, internet access, especially access to World Wide Web, will be introduced in the library.

Programme Area 600



Special Projects

MSSRF is invited from time to time to provide consultancy services by national and international organisations. These services involve preparing analytical reports in specific areas as well as rendering assistance in informatics. Brief information on such projects undertaken during this year are given in this section.

Sub Programme Area 601

Farmers' Rights : From Concept to Implementation

The concept of "Farmers' Rights" was evolved by the International Commission on Plant Genetic Resources of FAO for stressing the need to recognise and reward the contributions of farm families to the conservation and enhancement of agrobiodiversity. At the request of FAO, a detailed report was prepared on the methods of implementing this concept at the field level. The rights of farmers can be grouped into two major categories - those of individuals and those of communities. Individual farmers can seek plant variety protection on the same lines as breeders. Special procedures are however necessary where the recognition and reward will have to go to entire communities.

The procedure suggested involves seeking information from breeders on the pedigrees of the new varieties, indicating the parents which have contributed the genetic traits critical to the success of the new strain. Based on this information, the approximate location of the donor germplasm can be identified. The communities responsible for identifying and conserving the concerned genetic material can be rewarded from the Community Gene Fund, to be established by Governments under national plant variety protection and farmers' rights acts. Provision for recognising and rewarding farmers' contributions has been made in the draft Act prepared by M S S R F for consideration by the Government of India.

Sub Programme Area 602

A Conceptual Framework for Promoting Benefit Sharing in the Area of Conservation and Use of Plant Genetic Resources

The need for internationally agreed methodologies for giving effect to the equity provisions of the Convention on Biological Diversity (CBD) is now widely recognised. The issue of benefit sharing has received considerable attention during the last 14 years.

Article 15 of CBD recognises that "States have sovereign rights over their own biological resources". It also recognises "the close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources, and the desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations and practices relevant to the conservation of biological diversity and the sustainable use of its components". Implementation of the above provisions of CBD will require both material and information transfer agreements within and among nations, which incorporate provisions for prior informed consent and equity in benefit sharing between the primary conservers and those utilising their knowl-

edge and material in plant breeding, genetic engineering, pharmaceutical and other biological enterprises. National Access Legislation should therefore clearly establish that obtaining samples of biological or genetic materials from areas within national jurisdiction for purposes of research, commercial or industrial application is prohibited without Prior Informed Consent (PIC) and reaching Mutually Agreed Terms (MTAs). No further time should be lost in ending the present unethical situation where such primary conservers live in poverty, while those who utilise their knowledge and the products of their *in situ* on-farm conservation culture become prosperous. This paper indicates several feasible approaches for sharing benefits with local communities and for implementing the equity provisions of CBD. It is gratifying that several developing countries in South America, Africa and Asia are in the process of institutionalising benefit sharing procedures in legal measures relating to CBD. Experience in operating such legislation will lead to the refinement of benefit sharing procedures by the beginning of the new millennium. This will then provide the basis for the adoption of an agreed protocol on benefit sharing by the Conference of Parties to CBD.

Sub Programme Area 603

Evaluation of UNDP / FAO Supported Project on Higher Education in Agriculture

An impact evaluation of UNDP/FAO support to the development of higher education and agricultural research in the country was taken up by the Foundation. Twenty-one institutions received UNDP financial assistance in 28 subject matter areas. Fifteen institutions received UNDP assistance to develop one area of specialization. Three others received assistance in two areas, two in three areas and, one institution in four areas of specializatiion.

The Impact Study has indicated that the operation of the Advanced Centres after the project period was encouraging. A number of suggestions for sustaining the project activities at a high level were made.

The ICAR should take up the further strengthening of the Advance Centres during the Ninth Plan under the World Bank funded National Agricultural Technology Project (NATP), which should include components of additional infrastructure, advanced training in areas of specialization and collaboration with centres of excellence in other countries.

In future, a withdrawal strategy in relation to external funding should be built into the project design, so that the long term sustainability of the project is taken into consideration at the very beginning.

The Advanced Centres could serve as windows into the emerging trends in global agricultural science, and help to mobilise the tools of frontier science and technology for solving the field problems faced by small and marginal farm families. They should help to promote precision agriculture leading simultaneously to an increase in productivity and decrease in the cost of production.

The ICAR should be requested to allocate Rs. 50 crores for these Centres as recommended by the Dr. M.S. Swaminathan Committee on the Agricultural Education System.

These Centres should also take the initiative in developing plans to raise funds to ensure their sustainability. A number of potential sources are indicated below :

- Developing a sponsored research and consultancy service
- Undertaking capacity building activities with the help of national and international donors
- Joint activities with International Agricultural Research Centres in the region
- Development of training programmes for scientists and technicians nationally and, where opportune, for research staff from abroad. These may be on a cost-plus basis, funded either by the country or countries concerned, or through a bilateral donor contributing to a training programme, e.g., under TCDC. The Centres which have already reached this stage should bring out brochures indicating the programmes available and circulate them to international funding agencies like FAO.

The sustainability of these centres hinges on measures taken by these institutions in evolving adequate arrangements for the following:

- Continuous monitoring of the quality and relevance of the research programmes and evaluation of the scientists in these specialised Centres so that their productivity remains at a high level
- Continuous upgrading of knowledge of the teachers at the post-graduate Centres, through trainers' training programmes
- Making these Centres of excellence conduits to solve field level problems which have been defying solution in spite of the repeated attempts by grassroot level researchers

The ICAR/SAU should take the opportunity to obtain the necessary funds from the NATP, to be implemented during the IX Plan.

In order to help these Centres to ensure that their research, training and education extension programmes attain high levels of scientific excellence and social relevance, it will be useful if ICAR sets up a Frontier Science and Technology Committee, comprising the heads of all the Advanced Centres and a few eminent scientists from India and abroad. The scientists from abroad can convey their suggestions through the electronic mail system. A representative of FAO may be included in such a Committee.

Sub Programme Area 604

Biodiversity Conservation Prioritisation

The Biodiversity Conservation Prioritisation Project (BCPP) aims at promoting

Table 6.1 : *Activities of the 3 workshops*

Date	18 November 1996	9 May 1997	14-15 November 1997
No. of Participants	13	9	19
Objectives	Define criteria. Select sites and working partners. Finalise information needs and criteria for evaluation of the sites.	Mid - phase evaluation of the information gathered and a trial on the prioritisation exercise.	Evaluation of each site and final prioritisation. Finalisation of the conservation recommendations for each site.

participatory approaches for setting biodiversity conservation priorities and identifying priority sites, species and strategies for biodiversity conservation in India. It also aims to develop site specific biodiversity conservation plans for selected priority sites in the country.

The Biodiversity Support Programme, USA, has provided financial aid to support its activities.

The process of prioritising was done by a working group in three workshops as seen in Table **6**.1

The participants of Workshop I selected some sites from an exhaustive list of 38 coastal sites mentioned in various literature for India.

The sites were initially graded on the basis of the following 8 criteria :

a) Geomorphology
b) Ecological importance
c) Naturalness
d) Economic importance
e) Social importance
f) Scientific importance
g) International / national significance
h) Feasibility as a protected area

The ten final sites arrived at by this process, were grouped under three headings (Table **6**.2).

Table 6.2 : *The ten chosen sites*

Deltas and Estuaries	Gulfs	Lagoons
Bhitarkanika	Gulf of Kutch	Chilika Lake
Coringa	Gulf of Mannar	Pulicat Lake
Sunderbans		Kaliveli Tank
Kundapur		
Malvan		

Table 6.3 : *Prioritised list of the chosen sites*

Priority	Deltas and Estuaries	Gulfs	Lagoons
1	Malvan	Gulf of Kutch	Chilika
2	Bhitarkanika	Gulf of Mannar	Pulicat
3	Coringa		Kaliveli
4	Sunderbans		
5	Kundapur		

These sites were scored for habitat, biodiversity, social, economic and threat values in a plenary session.

Based on this exercise, the sites were prioritised as shown in Table 6.3.

Sub Programme Area 605

Collaboration with ICRISAT

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is one of the major centres in the CGIAR system of international agricultural research (headquartered in Patancheru, Andhra Pradesh, India). Since last year, the Foundation has developed a large collaborative programme with ICRISAT in the area of information management in digital format. Several products have been jointly developed.

The ICRISAT Web Site

The World Wide Web site of ICRISAT (www.cgiar.org/icrisat) has been designed by the Foundation and updated frequently. This site is a comprehensive one, providing access to key ICRISAT publications and reports. Popular information, such as cooking recipes, is also included. Statistics of "hits" from the hosting company showed that as of Dec. 97, ICRISAT web site was among the most requested 10 sites on the service.

Diseases of Groundnut: a computer-based training (CBT) module

Over the last 25 years, ICRISAT has generated a very large base of information on diseases of groundnut, which is one of their mandated crops. To enable junior extension officials to make use of this information, ICRISAT's Training and Fellowships Program and the Foundation jointly developed a CBT which was designed using the Multimedia Tool Book, an application software package. The CBT module contains many photos/ diagrams of high quality, video clips and text prepared by senior experts of ICRISAT. Modules of questions, presented in an interactive format, are included to test the extent of learning.

The CBT module was released in Nov. '97 during the 25th Anniversary celebrations of ICRISAT.

This is ICRISAT: a multimedia CD-ROM for visitors

This product was developed in collaboration with the Public Awareness Unit of ICRISAT and was released during the 25th Anniversary meetings (Nov. '97). The CD contains information on various programmes and projects of ICRISAT and includes texts/ photos and video clips. A video (12 mins; VHS; English) was also prepared on the same topic.

This collaboration with ICRISAT is continuing with new areas being included.

Sub Programme Area 606

Gender Dimensions in Agrobiodiversity Management : Sri Lanka and Maldives

The mangement of biodiversity, particularly agro-biodiversity, by community participation should explicity integrate women as partners. There are a few ongoing efforts to include women in community-based biodiversity management. The Foundation in the year 1997 undertook a study on "Gender Dimensions in Biodiversity Management : India" with the support of FAO-RAP. Ongoing projects of the Foundation were reviewed for this study. As a continuation, the Foundation has been given an opportunity to prepare a document on agrobiodiversity management in Sri Lanka and Maldives. Dr. Virendra Kumar and Dr. Hemal Kanvinde were the consultants. These studies focus on Sri Lanka and Maldives, with a major emphasis on gender specific agro/biodiversity knowledge, practice and constraints and potentials for community-based agro-biodiversity management with equitable participation of women and men.

The case studies to be prepared had the following terms of reference :

- An overview of the importance of gender dimensions in agro-biodiversity management as well as the ongoing community-based activities, with illustrations
- Gender roles and women's contribution in the community-based agro-biodiversity mangement
- Situation review of both professional and field level women in agro-biodiversity programme
- Synthesis of lessons learnt through this study along with recommendations to strengthen gender dimensions in community-based biodiversity management programmes at the national and international levels

The details of the studies are reported under SPA 202 in this Report.

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CD-ROMs and Web Sites

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This is ICRISAT : a multimedia CD - ROM designed by the Informatics Centre, MSSRF in collaboration with ICRISAT. November 1997.

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Videos

Development of 0-3 yrs child. 4 mins, Discussion starters / Video spot. 1997.

Low-Cost No-Cost materials in child education - part IV. Video film on the use of indigenous play materials for learning of young children. 15 mins. 1997.

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Kulavai '97. A profile of women stage artists of Tamilnadu. Video-film. 135 mins. 1997.

Who will save the Gulf of Mannar ? 20 mins. 1998.

About the Foundation

M.S.Swaminathan Research Foundation (MSSRF) was registered in 1988 as a non-profit Trust, recognised by the Government of India, Department of Scientific and Industrial Research, New Delhi, and by the Director General of Income Tax Exemptions, for the purpose of exemption of contributions from Income Tax under Section 80G and section 35 (I) (ii) of Income Tax Act, 1961, read with Rule 6 of Income Tax Rules, 1962). The Ministry of Home Affairs, Government of India, has recognised the Foundation for receiving funds from sources abroad under the provisions of Foreign Contribution (Regulation) Act, 1976.

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Chennai

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Former Director
Entomology Research Institute
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Forestry Expert
Chennai

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Distinguished Fellow

Mr. K. Johnson
Project Officer

Dr. R. Krishnamoorthy *
Remote Sensing Specialist

Ms. L. Gnanappazham
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Ms. Ruchi Bhandari *
Programme Coordinator (Gender)

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Project Coordinator,Tamil Nadu

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Dr. R. Somasundaram
Site Manager, Muthupet

Dr. T. Ravishankar
Project Coordinator, Andhra Pradesh

Dr. R. Ramasubramanian
Site Manager, Kakinada

Mr. D. Ramakrishna
Hydrologist, Kakinada

Dr. Dorai Sridhar
Site Manager, Machilipatnam

Dr. Gowri Shankar Padhi *
Project Coordinator, Orissa

Mr. Prafulla Kumar Mishra
Project Coordinator, Orissa

Mr. Saroj Kumar Pradhan
Site Manager, Mahanadi

Mr. Ramesh Babu
Training Coordinator

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* *Left during the year*

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Agronomist, Pichavaram

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Agronomist, Muthupet

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Agronomist, Kakinada

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Social Worker, Bhitarkanika

Mr. Mihir Kumar Jena
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Mr. K. Anbalagan
Social Worker, Muthupet

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Ms. M. Lakshmi
Senior Research Fellow

Mr. K.M. Kadirvelu
Technical Assistant

Mr. S. Purushothaman
Technical Assistant

Biomonitoring

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Senior Scientist

Dr. G.N. Hariharan
Senior Scientist

Mr. N. Mathan *
Senior Research Fellow

Mr. P. Loganathan
Senior Research Fellow

Mr. U. Rajendra Udayar
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Ms. R. Sunitha
Junior Research Fellow

Mr. R. Arul Prakash *
Junior Research Fellow

Mr. K. Ravikannan
Technical Assistant

Bioprospecting, Biopartnership and Micropropagation

Dr. P. Balakrishna
Senior Scientist

Dr. M.S.S. Mohan
Senior Scientist

Mr. C. Srinivasa Rao
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Mr. Ajith Anand
Senior Research Fellow - CSIR

Ms. R. Latha
Research Fellow - UGC

Ms. R. Radha
Senior Research Fellow - CSIR

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Technical Assistant

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Ms. R. Anuradha **
Research Fellow

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B.P.Pal National Environment Fellow and Project Leader

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Project Leader (Participatory Plant Breeding)

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Gene Bank Manager

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Consultant

Mr. B. N. N. Chowdary
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Community Agrobiodiversity Conservation Centre, Kalpetta, Kerala

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Ms. Elsy Mathew
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Mr. T. Manoj Kumar
Training Assistant

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Ms. Pratima Gurung *
Research Associate

Mr. Saujanendra Swain
Research Associate

Mr. Susantha Sekhar Chaudhury
Research Associate

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Junior Research Fellow

Mr. Gopal Chandra Mahapatra
Herbarium Technician

B R Barwale Chair for Biodiversity Conservation

Prof. R.J. Ranjit Daniels
B R Barwale Chair

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Trainee (Arunachal Pradesh)

Mr. Nigel J.S. Kharmalki
Trainee (Arunachal Pradesh)

Mr. Puthuto Natso
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Dr. Hemal Kanvinde
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Fellow

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Director and Coordinator
Asian Ecotechnology Network

Prof. Subbiah Arunachalam
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Mr. K. Suresh *
Asst. Systems Manager

Mr. C.V. Parthasarathy
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Mr. R. Ezhil Muthu *
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* *Left during the year*

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Ms. S. Vidhya
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Clerk-Accountant- Computer Programmer

Mr. T. Raja
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\# *Project transferred to the Tamil Nadu Agricultural University with effect from November 1997*

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Endowments and Grants

Mahyco Research Foundation

Sir Dorabji Tata Trust

Gopuri Charitable Trust

The Venkateshwara Group

Sources of Project Support

Programme Area 100 : Coastal Systems Research

National

Department of Atomic Energy
Government of India.

International

Norwegian Agency for Development Cooperation (NORAD)
New Delhi.

India-Canada Environment Facility
New Delhi.

Global Environment Facility-UNDP

Programme Area 200 : Biodiversity and Biotechnology

National

Ministry of Environment & Forests
Government of India
New Delhi.

World Wide Fund for Nature - India
New Delhi.

Department of Biotechnology
Government of India
New Delhi.

International

International Development Research Centre, Canada

Ministry of the Environment
Government of United Kingdom.

Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ)
Germany.

International Atomic Entergy Agency

John D & Catherine T MacArthur Foundation, USA.

The Ministry of Foreign Affairs
The Netherlands.

Ramon Magsaysay Award Foundation
Philppines.

Swiss Agency for Development and Cooperation

Food and Agricuture Organisation
RAP/Bangkok.

Programme Area 300 : Ecotechnology and Sustainable Agriculture

National

Department of Biotechnology
Government of India
New Delhi.

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

Southern Petrochemicals Industries Corporation

Directorate of Agriculture,Government of Tamil Nadu,Chennai.

Venkateshwara Group
Pune.

Indian Overseas Bank
Chennai.

Hindustan Lever Limited

International

The Hunger Project - India

United Nations Educational Scientific and Cultural Organisation (UNESCO)

United Nations Development Programme
(UNDP-New Delhi)

International Development Research Centre (Food Links)
Canada.

Programme Area 400 : Reaching the Unreached

National

Gopuri Charitable Trust
New Delhi.

Venkateshwara Group
Pune.

Sangeet Natak Akademi
New Delhi.

National Commission for Women
New Delhi.

International

The Hunger Project - India

Humanistic Institute for Cooperation with Developing Countries (HIVOS)
Bangalore.

Royal Danish Embassy
New Delhi.

Bernard van Leer Foundation
The Netherlands

Programme Area 500 : Education, Training and Communication

National

Sir Dorabji Tata Trust
Mumbai.

R.D.Tata Trust
Mumbai.

Tata Education Trust
Mumbai.

J.R.D.Tata Trust
Mumbai.

Council for Advancement of People's Action and Rural Technology
New Delhi.

Tata Social Welfare Trust
Mumbai.

Council of Scientific and Industrial Research
New Delhi.

Department of Ocean Development
Government of India
New Delhi.

Ministry of Environment & Forests
Government of India
New Delhi.

Department of Scientific and Industrial Research, Government of India
New Delhi.

Department of Biotechnology
Government of India,New Delhi.

National Academy of Agricultural Sciences, New Delhi.

XV Genetics Congress Trust
New Delhi.

International

United Nations Development Programme

United Nations Educational, Scientific and Cultural Organisation (UNESCO)

Food and Agriculture Organisation
Rome.

International Development Research Centre, Canada

Swiss Agency for Development and Cooperation.

United States Department of Agriculture.

The British High Commission
New Delhi.

Programme Area 500 : Education, Training and Communication

National

Union Planning Commission
New Delhi.

Department of Science & Technology
Government of India
New Delhi.

National Bank for Agriculture and
Rural Development (NABARD)
New Delhi.

World Wide Fund for Nature - India

Administration of Union Territory of
Laksha Dweep, Kavaratti.

Ministry of External Affairs
Government of India, New Delhi.

National Commission for Women
New Delhi.

Department of Atomic Energy
Government of India.

International

Programme Area 600 : Special Projects

National

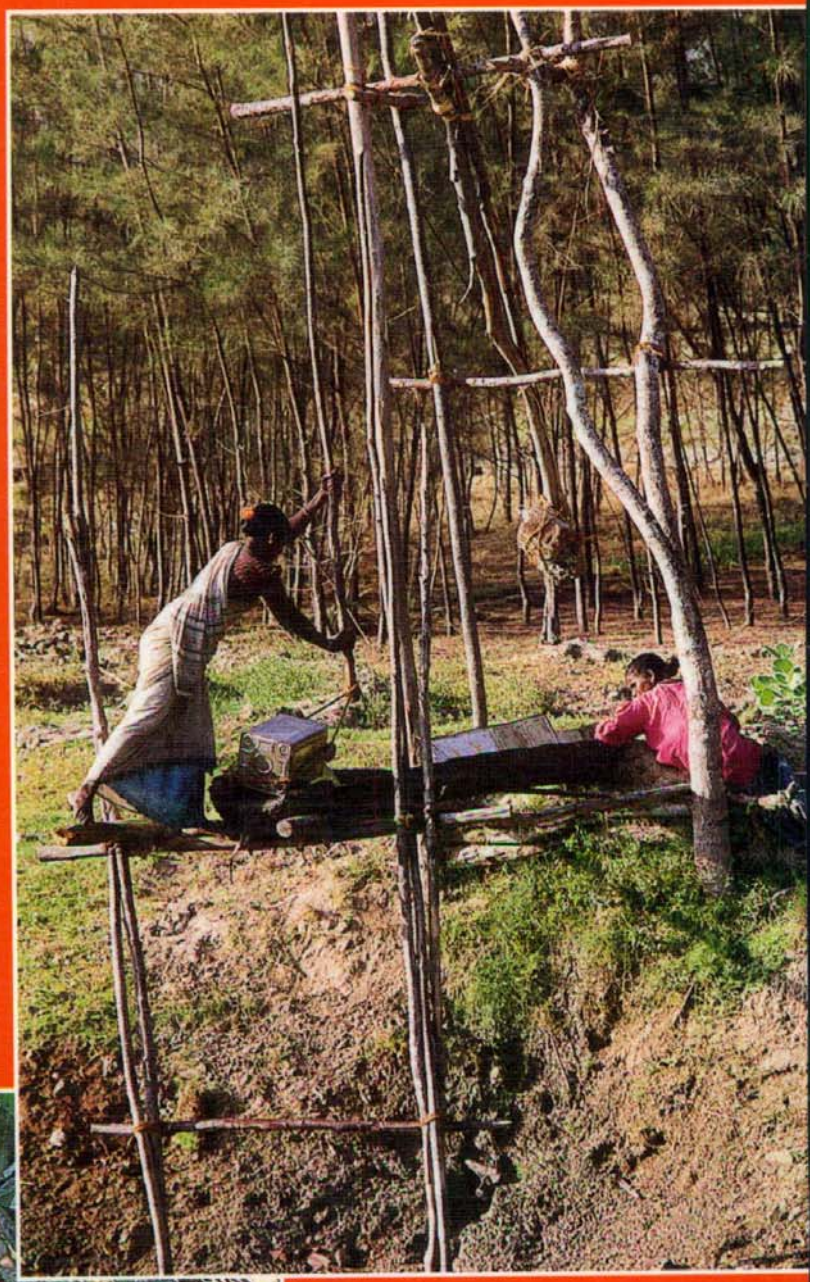
World Wide Fund for Nature - India
New Delhi.

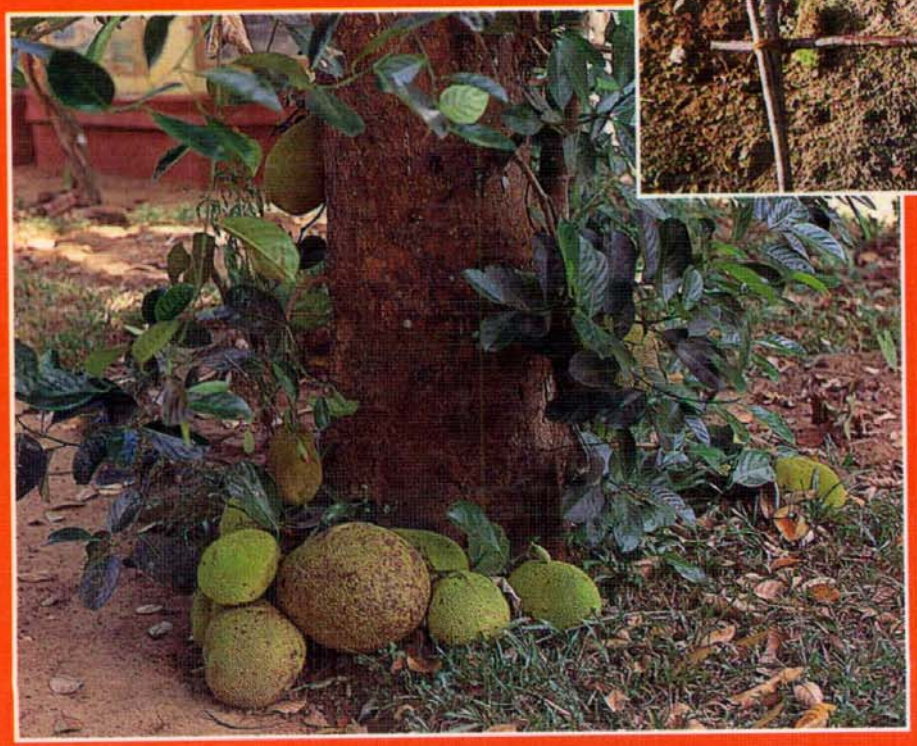
International

Food and Agriculture Organisation
Rome.

United Nations Environment Programme
Nairobi.

International Crops Research Institute
for the Semi-Arid Tropics
Hyderabad.





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