

M. S. SWAMINATHAN RESEARCH FOUNDATION

2001-2002 TWELFTH ANNUAL REPORT

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



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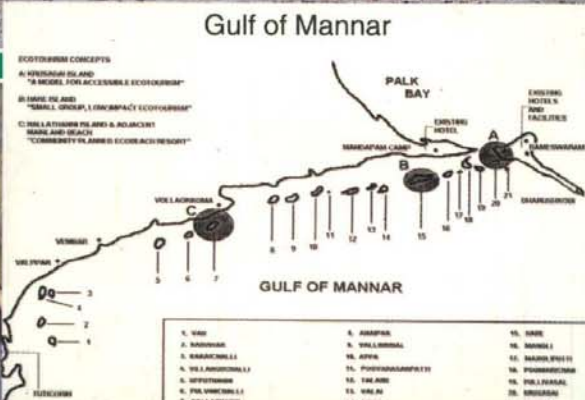
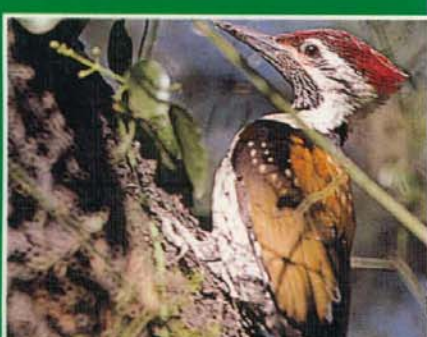
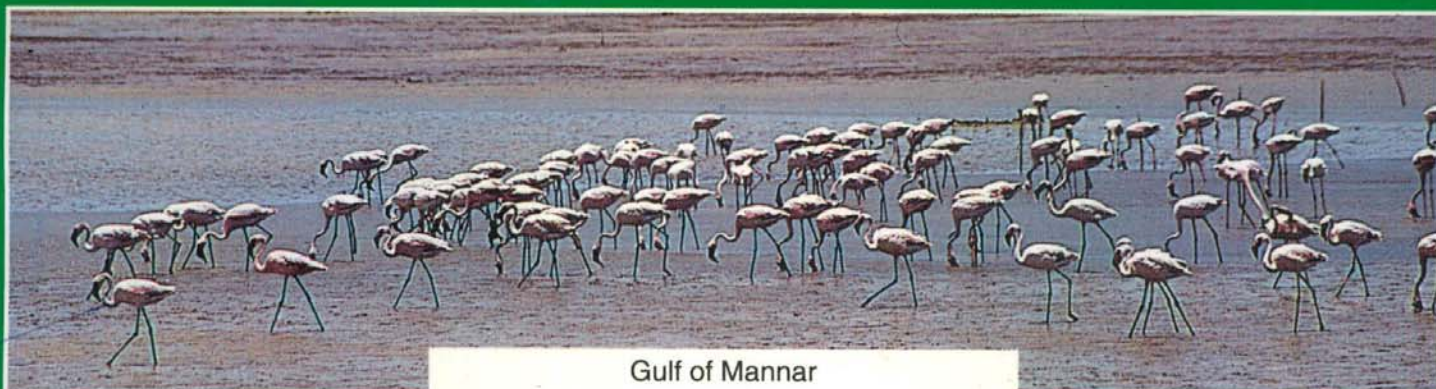
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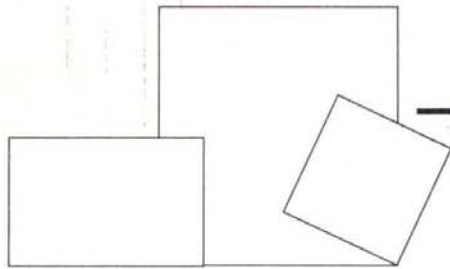
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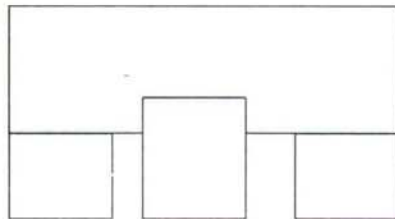
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Front Cover

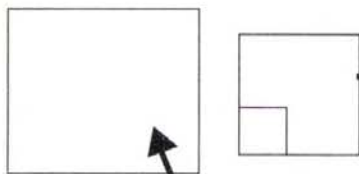


Organic cultivation of pineapples and minor millets in Kolli Hills and the ECOCERT given to the community.



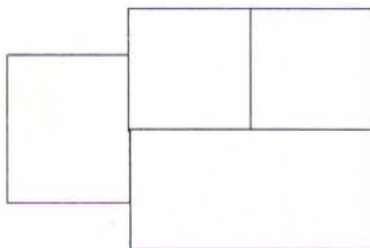
Pro-poor ecotourism and Centre for Bird Studies in the Gulf of Mannar Biosphere Reserve Area launched by the Hon'ble Chief Minister of Tamil Nadu in July, 2002.

Back Cover



Dual property bacterial isolate (nitrogen fixing and phosphate solubilising) from wild rice - root section of Pokkali plant stained with X-Gluc showing colonisation (stained blue).
Inset showing the phosphate solubilising activity in the presence of salt.

Multi-purpose cyclone shelter at Gayaspore, Orissa inaugurated this year



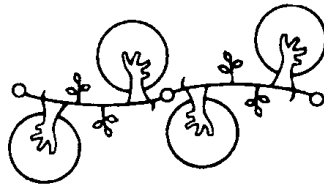
Demand-driven dynamic information on sea conditions provided by the Rural Knowledge Centre, Veerampattinam, Pondyerry



Concrete models developed for promoting Artificial reefs in the Gulf of Mannar region

Twelfth Annual Report

2001 - 2002



M. S. Swaminathan Research Foundation
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and Rural Development
Chennai, India*

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Chairman's Introduction

The scientific activities of MSSRF have been continuing for twelve years. Though young in age, the institution has been able to attract national and international support and recognition, thanks to the hard and dedicated work of its staff, guidance and participation of rural and tribal families and support from government departments and agencies as well as its clear vision and goals. Thus, MSSRF is still the only scientific institution in Asia to have been awarded the Blue Planet Prize, one of the most prestigious prizes in the world in the field of environment protection and sustainable development. In recent years the institution also received the Motorola Gold Award and the Stockholm Challenge Award. In addition, the work of individual scientists has also received important national recognition. For the second consecutive year, one of our women scientists was chosen for the outstanding National Women Scientist's Award of the Government of India.

As in previous years, we received a large number of visitors ranging from farm women and men to distinguished scientists and administrators and Ministers of the State and Central Governments and from the International arena. All of them complimented the Institution and staff on the scientific excellence and social relevance of the work and fostering a spirit of social inclusion in the research training and development programmes.

It may be appropriate to quote the observations made by a few of them who visited the institution this year: Lord Robert M May of Oxford, President of the Royal

Society of London wrote, "my great admiration for the unusual combination of high science and effective action in the hands of the people themselves". Shri Ajit Singh, Minister for Agriculture, Government of India, congratulated the staff and scholars of MSSRF for their "excellent facilities and feelings for poor farmers". Mr C Ponnaiyan, Minister of Finance, Government of Tamil Nadu wrote, "the MSSRF Team deserves deep fillip by the Central and State Governments of our country, so that they can help to improve further the overall economy of our land through modern need-based agro-revolutions". According to Dr A K Dey, Minister of Agriculture, Food and Civil Supplies, Government of Assam, "MSSRF is not only a world-renowned research institution, but an *Ashram* devoted to small farmers' well-being". Many more quotations from the remarks of visitors can be added, but it will be appropriate to conclude with the remarks of Her Excellency Penelope Wensley, High Commissioner of Australia to India: "This institution holds a critical key to securing India's future, namely sustainable development; sustainable agriculture is the way of the future. If these are not achieved, sustained and maintained, India and its people will not achieve the prosperity they deserve".

Recognition came in several other ways. Considering the contributions of MSSRF in the areas of sustainable food security, technological empowerment of the poor, engendering agricultural curriculum and biodiversity management, the Ford

Foundation, to mark its 50th year of work in India (the Ford Foundation established its first office outside the United States in India in 1952 at the request of the first Prime Minister of India, Jawaharlal Nehru) has established at MSSRF a Chair on Women and Sustainable Food Security. The *Poomani* young women's self help group, engaged in the production of *Trichogramma* to assist the spread of integrated pest management in the Dindigul district of Tamil Nadu, was chosen by the Youth Employment Summit (YES) as the most innovative self-employment generating group in Asia and has been invited to represent Asia at the inaugural function of YES at Alexandria in Egypt.

Recognising the work done by MSSRF in the area of eco-jobs and eco-entrepreneurship development, particularly under its JRD Tata Ecotechnology Centre, the Global Environment Facility (GEF) invited MSSRF to prepare a global data base on the theme "Good ecology is good business" and to organise a consultation at Johannesburg, South Africa on "Ecology of Hope", during the World Summit on Sustainable Development to be held there from August 26 to September 4, 2002. Help was also rendered to the Government of Tamil Nadu in designing the first Eco-enterprise Park in the country in the Dindigul – Madurai Area. This Park will provide self-employment opportunities in "green" enterprises, particularly in herbal, horticultural and renewable energy technologies. Earlier, MSSRF had helped the Department of Biotechnology, Government of India and the Government of Tamil Nadu in establishing at Chennai the first Women's Biotechnology Park in the country.

From its inception, MSSRF has been working at both ends of the development spectrum – grassroots and policy level. Drawing inspiration and confidence from its grassroots work, MSSRF has been able to guide public policy in areas where it has competence to do so. Following the assistance rendered to draft the Protection of Plant Varieties and Farmers' Rights Act and the Biodiversity Act, MSSRF developed detailed draft rules for the implementation of the former Act. The draft rules were peer-reviewed at a Consultation organised jointly with FAO in January 2002.

Another area where the institution can take some pride is the help given at the time of grave calamities. This is based on MSSRF's conviction that every calamity provides an opportunity to strengthen human security. Thus, in the super cyclone affected areas of Orissa, multi-purpose storm shelter-cum-education-cum information centres were established at Mallikapur and Gayaspur villages with the generous support of PricewaterhouseCoopers. Biovillages were also established in coastal Orissa with support from the Canadian International Development Agency and the Sir Dorabji Tata Trust. In the area of Kutch in Gujarat, where a severe earthquake caused unprecedented devastation and human suffering, assistance was given to the Gujarat Agricultural University and Vikram Sarabhai Centre for Development Interaction (VIKSAT) in designing a habitation-cum-rehabilitation project involving low-cost greenhouses. This work was supported by the Sir Dorabji Tata Trust and the Friends of MSSRF, Tokyo. Finally, noting the serious food shortage in Afghanistan leading to children being sold

for wheat, MSSRF proposed the establishment of a grid of Community Food Banks (CFB) in the “hunger hotspots” of the country, using the one million tonnes of wheat gifted by the Government of India to Afghanistan through the World Food Programme. The CFB movement designed by MSSRF in cooperation with the World Food Programme is an effective institutional instrument for concurrently ending endemic hunger caused by food shortages and poverty, hidden hunger caused by micronutrient deficiencies and transient hunger resulting from conflicts and natural calamities like drought. Thus, methods were developed for mitigating human suffering arising from both natural and anthropogenic disasters.

2002 marks the 10th anniversary of the UN Conference on Environment and Development held at Rio de Janeiro in 1992 and the 30th anniversary of the Stockholm Conference on Human Environment. Unfortunately, the concept that ecologically, socially and economically sustainable development holds the key to human security and future, is yet to be converted into public action on a significant scale. In contrast, there is a growing violence in the human heart, an extreme manifestation of which was the tragic event of 11 September, 2001 in the United States. Also, terms like ethnic cleansing, biopiracy, bio-terrorism, dirty bombs etc., are coming into widespread use. Hence in addition to efforts to wipe out terrorism in all its forms, there is a need for a global movement for the promotion of love and understanding of diversity and pluralism in human societies in terms of religion, language, gender, ethnicity, colour and political belief. Knowledge relating to the

extraordinary unity in the genetic make-up of human beings, as is evident from the human genome analysis and map should be widely disseminated. The starting point obviously is children and youth, since they constitute the majority of the population in most developing countries and will play a key role in shaping the future.

MSSRF has already started an “Every child a scientist” programme for tribal children at the Community Agro-biodiversity Centre at Kalpetta, Wayanad, with generous support from the *Malayala Manorama*. A similar programme is being started at Chennai for children belonging to the economically and socially under-privileged sections of society. A “Touch and smell garden” has been established for visually handicapped children with the generous support of the American Express Foundation under their project Sahyog. It is based on the model of a similar garden already established at the National Botanical Research Institute, Lucknow. The basic principle guiding these projects is the conviction that science occupies a central but not separate position in our culture, and that together with art, history, social sciences and the humanities, science can strengthen human values and unity. Also, if science and technology have contributed to the growth of economic and social inequity in the past, particularly from the beginning of the Industrial Revolution in Europe, they can now be enlisted as allies in the movement for social and gender equity.

At the level of adults, MSSRF’s rural systems research is designed to foster the “Every farmer a scientist” movement. Apart from training farm families in the manufacture

of biopesticides and biofertilisers and undertaking vermiculture, horticulture and aquaculture enterprises, MSSRF strives to enable farm women and men to become more efficient plant selectors and breeders through participatory plant breeding programmes.

During the year, MSSRF continued to strengthen existing partnerships and build new ones. The collaborative project with the Ohio State University, the Punjab Agricultural University and the Jawaharlal Nehru Krishi Vishwa Vidyalaya in the area of integrated natural resources management supported by the Sir Dorabji Tata Trust made further progress. The work being done under this project will provide the theoretical foundation for launching an ever-green revolution designed to achieve improvements in the productivity of major farming systems in perpetuity.

From its inception, MSSRF has been working on the enlargement of the food basket by including in the diet under-utilised crops such as millets, legumes and tubers. This work was strengthened during the year through a project on underutilised plants funded by the International Fund for Agricultural Development (IFAD) through the International Plant Genetic Resources Institute (IPGRI). The project has assigned to MSSRF the responsibility of organising and coordinating the programme in India and Nepal. This has helped MSSRF to develop meaningful partnerships with scientists in the country and in Nepal.

The results obtained under the MSSRF-ICEF programme on the sustainable management of wetlands have led to the initiation of an integrated two-country project, involving

India and Bangladesh, on biodiversity management in the Sunderbans World Heritage site. This is a unique exercise in partnership between Indian and Bangladesh scientists in conserving one of the priceless biological treasures of the world. This two-country project in the development of which MSSRF was given an important role by UNDP, is being funded by the UN Fund for International Partnerships and UNDP.

Project ACCESS (Action for Child Care and Education Services and Strategies) initiated in June 1991 with financial support from the Bernard van Leer Foundation was formally closed in December 2001. An evaluative overview of the 10 year project is being prepared. Acknowledging the terminal report, Ms Liana J Gertsch of the Bernard van Leer Foundation wrote:

“MSSRF has been a building block for BvLF's programme in India. It was our first partner, and became the keystone around which many other initiatives were built. Not only the project was important, but also the dialogue, the materials and the contacts, which we shared over time, were indispensable. The material was shared extensively throughout the region and many counterparts have benefited from it. Aside from the dissemination inside India, the Tamil materials in Malaysia were a great boon, and your work on preschools (the burden), quality and costing were highly appreciated in Indonesia. The entire portfolio has been touched in some way or another by the work of MSSRF. During discussions and debates in-house, we referred frequently to the work of MSSRF to illustrate our experience”.

Annual Report 2001-2002

The work done under the programmes of the JRD Tata Ecotechnology Centre during the period June 1997-December 2001, was reviewed by Dr Manjul Bajaj on behalf of the Sir Dorabji Tata Trust. In her report, Dr Manjul Bajaj has concluded that "both in terms of direction as well as degree, the progress made over the last four years can be described as very substantial and impressive. The focus of the Centre has shifted perceptibly from innovation *per se* to management of innovation and fostering replication".

Complacency and self-congratulation are the greatest enemies of progress in every field of human endeavour; and particularly in science and technology. Therefore, the theme "Back to basics" was chosen for the 2002 Annual Programme Review, in order to examine critically how far MSSRF's work continued to remain "pro-nature, pro-poor, pro-women and pro-job led economic growth". The work currently in progress was examined from this perspective. Some of the issues examined were:

- Has the principle of social inclusion leading to a "win-win" situation for all been adhered to?
- Are the programmes and strategies of MSSRF designed to promote gender justice and equity?
- Have indicators been developed to measure environmental, economic, social and inter-generational equity?
- Can the programmes lead to a self-replicating momentum or will they remain unique showpieces? How can the

extrapolation domain of experiences and achievements be enlarged?

- Has there been enough effort in the areas of networking and building symbiotic partnerships?
- Has MSSRF's goal of serving public good with maximum economy, efficiency, accountability and transparency been adhered to?

After examining how far we have succeeded in achieving the above objectives, the staff re-dedicated themselves to the basic principles and philosophy of the Foundation. Further, it was agreed that rules cannot serve as a substitute for character and that integrity is not negotiable. It was further agreed that gender balance should be maintained among professional staff and that mainstreaming the gender dimension in all the work of MSSRF is imperative. It was emphasised that MSSRF should adopt neither a government nor corporate culture, but should foster a culture which considers that science and education should subserve a human and social purpose.

From 1 April, 2002, new personnel policies were introduced in order to strengthen MSSRF's capacity to attract and retain dedicated staff. The aim of the new personnel policies is to create a 21st century institution where good work is appreciated and appropriately rewarded, where authority and accountability are linked at all levels, and where staff and scholars derive satisfaction from work culture and opportunities. The new personnel policies also recognise the need for all policies to be tempered with compassion, as policies can provide only a

structure, with interpretation and implementation being in the hands of individuals.

The work done during the year under the six major programme areas is described in detail in this Report. However, it would be useful to highlight briefly the progress made.

Programme Area 100

Emphasis was given to promoting Joint Mangrove Forest Management Systems involving multi-stakeholder participation in preserving mangrove ecosystems in their pristine purity, as well as in the rehabilitation of degraded mangrove wetlands. Detailed guidelines were prepared for this purpose and circulated widely among central and state government agencies. The Mangrove Atlas of Tamil Nadu was completed and work relating to the preparation of Mangrove Atlases for Andhra and Orissa is in progress.

The Mangrove Information System was strengthened. Steps were taken to ensure the long term sustainability of the meaningful work done during the last 12 years, since support from the India-Canada Environment Facility will be coming to an end soon. For ensuring sustainability, a proposal for the establishment of a Resource Centre for the Sustainable Management of Mangrove Eco-Systems was prepared. Also, a publication summarising all the work done since 1990 was brought out.

Another important development during the year was the formal initiation of the conservation activities in the Gulf of Mannar Biosphere Reserve with support from Global

Environment Facility and UNDP, by the Government of Tamil Nadu. Steps were taken to strengthen sustainable livelihood options (both land and water based) in the buffer zone of the Biosphere Reserve. Also, a detailed strategy was developed for pro-poor eco-tourism in the area, including the establishment of a Centre for Bird Studies. The Government of Tamil Nadu proposes to launch this eco-tourism plan this year, which has been designated by the UN as the "International Year of Eco-Tourism".

The project for introducing nuclear and biotechnological tools for coastal systems research, supported by the Department of Atomic Energy, made excellent progress, as would be evident from the results given in this report. India is importing large quantities of pulses and oilseeds and hence the work done under the DAE-MSSRF project on the testing of the Trombay varieties of groundnut, black gram and green gram is significant, in as much as it has shown the great potential for promoting "Pulses and Oilseeds Villages", where rainwater harvesting and the cultivation of high-value and low-water requiring crops like pulses and oilseeds can be taken up in an integrated manner.

One aspect of the project is related to demonstrating how a green belt can be created in coastal wastelands. This was taken up in the Kudankulam Nuclear Power Plant area. Based on considerable scientific research, including a detailed soil survey carried out by the National Bureau of Soil Survey and Land Use Planning, technologies were developed for growing a wide range of trees and shrubs in coastal wastelands. A "Genetic Garden" comprising a wide range

of useful plants was established. This entire greenbelt demonstration project was handed over on 1 July, 2002 to the Nuclear Power Corporation of India Limited. The Kudankulam Research and Demonstration project on the greening of desertified land has opened up a new window of opportunity for the eco-restoration of coastal wastelands.

Programme Area 200

In this Programme area, dealing with biodiversity and biotechnology, further progress was made in fostering community conservation of agrobiodiversity. A three-pronged strategy was adopted to create an economic stake in conservation. First, market tie-ups were arranged for the traditional crops of tribal and rural families at Kolli Hills in Tamil Nadu, Wayanad in Kerala and Jeypore tract in Orissa. The millets of Kolli Hills are now being processed and sold in food stores in Chennai. Second, value addition to traditional crops as well as horticultural crops like pineapple and lemon was achieved by getting them approved for being marketed as organic foods. Also, steps have been initiated to get niche markets for the medicinal rices of Kerala and Orissa. Thirdly, experiments were undertaken to enhance the marketable surplus in traditional crops and land races through simple agronomic improvements and participatory plant breeding. Finally, detailed rules were formulated for facilitating the early implementation of the provisions relating to farmers' rights in the already enacted Protection of Plant Varieties and Farmers' Rights Act. This will help to get the primary conservers recognition and reward from the National Gene Fund.

The primary conservers are poor, while those who use their knowledge and material become rich. In the long term interests of *in situ* on-farm conservation of agro-biodiversity, it is essential that there is equity in sharing benefits. This is why MSSRF has worked intensively during the last 12 years, both at the grassroot and policy levels, starting with the organisation of the Keystone International Dialogue on Plant Genetic Resources in January, 1990. The traditional wisdom of the tribal women and men of Kolli Hills embodied in the folk songs of the area was compiled in a book. The royalty from this book will go to the tribal families of the area. Also, under the Participatory Plant Breeding programme, tribal and rural families were introduced to the science and art of crop improvement through breeding. It is hoped that such steps will motivate the younger generation in agro-biodiversity rich areas to continue to remain in villages and earn their livelihoods by conserving and domesticating local land races, wild foods and medicinal plants and getting these marketed on the basis of prior arrangements with the private sector. When such arrangements get replicated, economics and ecology will become two sides of the same coin and good ecology will become the instrument for strengthening sustainably the livelihood security of the primary conservers of agro-biodiversity.

With support from the Summit Foundation, steps were taken to foster a multi-stakeholder management structure for the Similipal Biosphere Reserve of Orissa, on the model of the structure developed for the Gulf of Mannar Biosphere Reserve. Also, the biovillage model of strengthening rural

livelihoods was undertaken in the buffer zone of the biosphere reserve. The Gram Swaraj movement initiated in the Jeypore tract of Orissa, involving the establishment by tribal women and men at the level of each village, of a field gene bank, village seed bank, water bank and grain bank evoked excellent response.

Substantial progress was made in the molecular mapping of mangrove species and in developing transgenics in rice, black gram and mustard possessing genes for salinity tolerance derived from *Avecennia marina*, a mangrove species. MSSRF is the first in the world to have designed and implemented a research programme for identifying and transferring genes for salinity tolerance from mangrove trees. Other activities included genome mapping of varieties of rice and *Vigna* and the conservation of bioresources in coastal areas. A Recombinant DNA Greenhouse has been constructed in strict accordance with biosafety regulations.

Research on microbial diversity with particular reference to salt sequestration and nitrogen fixation made further progress. Over 1,000 microbial strains adapted to diverse agro-ecological niches in the saline soils along the coastal area have been isolated. A comprehensive Atlas of lichen species has been prepared. Biomolecules with potential application in the treatment of tuberculosis were identified in *Excoecaria agallocha*.

At the policy level, the suggestion to develop an integrated approach to biodiversity and biotechnology was accepted by the Government of Madhya Pradesh, which is the first State in the country to establish an

integrated Department of Biodiversity and Biotechnology. Suggestions have also been made to the Union and State Governments for setting up institutional structures for the management of change in agriculture, with particular reference to biotechnology, climate and biodiversity conventions and the World Trade Agreement. This will be essential for harnessing new technologies and new opportunities for shaping the future of agriculture in such a manner that there is broad consensus on the choice of technologies and development strategies.

Programme Area 300

As mentioned earlier, the work done under the JRD Tata Ecotechnology Centre during the last 5 years was thoroughly reviewed by an external evaluator. Based on the positive review, the Sir Dorabji Tata Trust was kind enough to enhance the endowment for the Centre. This will help to consolidate and strengthen the ecotechnology movement. In order to study more critically the cost-risk-benefit structure of the different microenterprises managed by self help groups, a Senior Economist was appointed on the staff of this Centre.

An important feature of the work of the JRD Tata Ecotechnology Centre is promoting the social management of innovation. This facilitated the adoption and adaptation of new technologies, like modern information technology, in a manner that is socially meaningful and replicable. The spirit of innovation among rural women and men is remarkable. For example, the Reddiyarchatram Seed Growers Association launched a website

“Oddanchatrammarket.com” in 2001 to provide information on daily stocks and prices of vegetables, fruits, flowers and dairy products transacted at Oddanchatram market in the Dindigul district of Tamil Nadu. Now that restrictions on the movement of agricultural commodities within India are gradually being removed, resulting ultimately in the *Common Market of India*, catering to over 16% of the human population, the example set by the rural families of Kannivadi in Tamil Nadu needs to be replicated.

The NABARD-MSSRF Precision Farming Centre made further progress in assisting farm families to increase factor productivity, with particular reference to water and nutrients. Precision farming coupled with a low-cost greenhouse movement involving the cultivation of high value horticultural crops can help to improve the income of small farmers considerably. The triple goals of the Precision Farming Centre are to promote productivity, quality and income revolutions in small scale farming. Precision farming coupled with the biovillage model of integrated attention to on-farm and non-farm livelihoods can help accelerate progress in poverty eradication and gender equity.

The National Network on Community Banking and Biovillages currently comprises 334 self help groups with over 5,000 members. Three Federations of SHGs were formed covering over 4,000 women and men members. The microcredit banks were financed by the Friends of MSSRF, Tokyo, led by Dr Geeta Mehta.

Programme Area 400

The Uttara Devi Centre for Gender and Development continued to assist all groups within MSSRF to integrate gender considerations in their field programmes. The main thrust was in studies in gender and biodiversity, especially the role of wild foods in food security in Wayanad. These will lead to field interventions promoting rural livelihoods with gender equity and food security. Progress was made also in assisting through technical collaboration the Kerala Agricultural University to mainstream gender in the undergraduate curriculum, and in research and extension efforts.

Voicing Silence marked its 10th year in the field of gendered theatre with three major efforts

- Critical documentation of its 10 years of work for publication
- Continued efforts to empower, through theatre, a community of women performers in traditional theatre genres
- The fourth KULAVAI, or Women’s Theatre Festival, dedicated to women directors.

The B V Rao Centre for Sustainable Food Security undertook the task of preparing a Food Insecurity Atlas of Urban India, on the model of the earlier work on rural India. In addition, substantial progress was made in the preparation of a Sustainability of Food Security Atlas of India. A Resource Centre for Community Food and Feed Banks was established. All these projects are generously supported by the World Food Programme both financially and technically.

The Food Insecurity Atlas of Rural India, released by the Prime Minister of India in April 2001, received excellent reviews in professional journals. It also formed the basis of state level consultations in Orissa, Rajasthan and Madhya Pradesh on methods of achieving freedom from endemic, hidden and transient hunger by 15 August, 2007 which marks the 60th anniversary of India's independence. MSSRF has also proposed to the Government of India a Food Guarantee Scheme (FGS) on the model of the Employment Guarantee Scheme of Maharashtra for ending the irony of the co-existence of large grain reserves and millions of children, women and men going to bed undernourished. The FGS is designed to use grains for eco-development, like wasteland and watershed development, eco-restoration of hydrologic and biodiversity hot spots, and waste recycling. The Government of India is in an advanced stage of initiating such a project dedicated to the memory of the late Jaiprakash Narain.

Programme Area 500

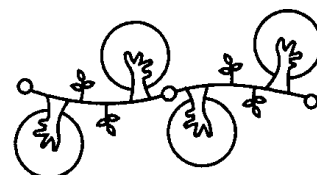
Satisfied with the outstanding progress made during 1998-2000, IDRC of Canada extended support to the continuation and expansion of the Information Village Project in the Union Territory of Pondicherry. The user-driven approach of this project was further strengthened through a fortnightly newsletter and an Open Knowledge Network.

MSSRF's emphasis is not only on connectivity, but more importantly on content – both dynamic and generic.

The Hindu Media Resource Centre organised several media workshops, public fora and Millennium lectures by eminent persons and continues to serve as an effective instrument in promoting greater public understanding of science. The library and Information Services provide MSSRF staff and University students and scholars with recent information, particularly on topics relating to environment and biodiversity conservation and sustainable management.

Our gratitude goes to all our partners in the work relating to sustainable rural and agricultural development. In particular, we thank our donors for their trust and generous support. The work described in this Report would not have been possible but for the advice and support of numerous experts and institutions in the public, university and private sectors.

Finally our thanks go to Shri N Ram and the *Frontline* for assistance in designing the cover and to Reliance Printers for their fine job. Above all, the efforts of Dr Sudha Nair, Mr S Senthil Kumaran and Ms R V Bhavani in compiling and collating the material and Dr Nandhini Iyengar in editing the report are gratefully acknowledged.



Coastal Systems Research

The work done on mangrove wetlands has provided guidelines for a Joint Mangrove Management system, which will enable all the stakeholders to preserve for posterity this unique ecosystem in its pristine purity. The project supported by ICEF has shown how the ecological integrity of the mangrove areas can be preserved, while strengthening the livelihood security of the mangrove forest dependent communities. The DAE supported project on Coastal Systems Research has helped to standardise methods for the eco-restoration of coastal wetlands. The UNDP-Ministry of Rural Development project helped to standardise sustainable livelihoods for the landless poor as well as the fisher families in the Gulf of Mannar area.

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Sub Programme Area 101

Coastal Wetlands : Mangrove Conservation and Management

Sustenance of a healthy mangrove environment is possible through collective management, especially with community involvement. The current project is people-centred, process-oriented and science-based. It addresses capacitybuilding with the help of local communities, voluntary organisations, Forest Departments (FD), grassroot level democratic institutions and associated Government Departments, to restore, manage and conserve mangrove wetlands, through participatory management and action.

In addition to community mobilisation in mangrove conservation and management, poverty-alleviation efforts are also being undertaken. An important output during the year was developing guidelines for Joint Mangrove Management (JMM).

A series of National Workshops on Mangrove Conservation and Management were conducted at Chennai, Bhubaneswar and Rajamundry (AP) that facilitated the detailed interaction with the Forest Departments on specific problems in the respective states and the need for developing a JMM model for adoption.

101.1 Tamil Nadu

The Joint Mangrove Management (JMM) and village development activities are being implemented in 7 demo villages, four

in Pichavaram and three in Muthupet. Of these, six are fishing villages and one is a farming village. Karisaikkadu is the demo village that was selected this year.

Community mobilisation, group formation and microplanning

Regular monitoring of the functional aspects of VDMCs (Village Development and Mangrove Councils) and SHGs (Self help groups) was done. The third microplan was prepared for the villages participating in the project viz., MGR Nagar, Vadakku Pichavaram and Veerankoil. The first microplans were prepared for Kalaingar Nagar, Manganangkadu, T S Pettai and Karisaikkadu. In Manganangkadu and Karisaikkadu, other processes like Participatory Rural Appraisal (PRA), identification of Mangrove Management Unit (MMU) and group formation were also carried out.

Mangrove conservation and management

The Joint Mangrove Management activities are being successfully implemented in all the demonstration villages. They have MMUs and strong management systems. The details of area under restoration and protection by the community management system are presented in Table 1.1.

Extension of MMU of Vadakku Pichavaram

The village community of Vadakku Pichavaram had restored about 32 ha of degraded mangrove forest in 1999-2000. The area is part of Pichavaram Reserve Forest Extension, locally called *vavva thittu*, with an area of 54 ha, including 2 ha of associated dry land. After having completed the restoration successfully, the community wanted to

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take up restoration of another degraded patch with an area of 20 ha, near the existing MMU. The degraded patch is situated south of the old MMU and east of the village.

During the General Body meeting, the committee decided to conserve another 46 ha of mangrove forest, including 20 ha of degraded area where cattle grazing is severe. The VDMC approached the Forest Department to undertake restoration activities in the area, locally called *kakkathi*. A joint visit was arranged to examine the area for its suitability for restoration activities in April 2001. After examining the area, the Forest Department gave permission to implement restoration activities. As a result, the MMU area of Vadakku Pichavaram has increased from 54 to 100 ha.

Approval of the JMM proposal

In July 2001, a meeting with the Principal Chief Wildlife Warden, Tamil Nadu was

arranged to discuss the JMM proposal. During the meeting, extending the joint mangrove management activities in the Muthupet mangrove wetlands was also discussed. The Principal Chief Conservator of Forests formally approved the proposal to implement the JMM activities. He also requested MSSRF to arrange training programmes on mangrove ecology and mangrove restoration for the field staff of the Forest Department. The Chief Wildlife Warden, Tamil Nadu Forest Department, approved the proposal of Joint Mangrove Management of Palanjur and Thamarankottai Reserve Forest and a formal directive was issued to the Conservator of Forests, Trichy Circle and the Wildlife Warden, Nagapattinam, requesting the field staff of the Muthupet range to take part in the Joint Mangrove Management activities to be implemented jointly by the Forest Department, the people of the respective hamlets and MSSRF.

Table 1.1 : *Mangrove area restored and protected in Tamil Nadu*

Village	Total area restored	Status of the plantation		Area under the MMU (ha)
		Planted	Survival %	
Pichavaram				
MGR Nagar	40	4,00,000	90	84
Vadakku Pichavaram	52	5,20,000	95	100
Kalaingar Nagar	75	7,50,000	85	200
TS Pettai	83	8,30,000	80	130
Muthupet				
Veerankoil	100	10,00,000	75	1,490
Manganangkadu	70	7,00,000	80	189
Karisaikkadu	40	4,00,000	80	530
Total	460	46,00,000		2,723

Restoration

A total area of 460 ha has been restored so far, of which 200 ha were restored this year, 88 ha in Pichavaram and 112 ha in Muthupet. Sixty ha are under restoration. Forty-six lakh seedlings have been planted and the survival rate is above 80 percent.

Planting of *Avicennia marina* has so far been carried out as restoration activity in the degraded areas. Though the planting of *A. marina* propagules was carried out in the core area where the degradation was severe due to the development of hyper saline condition after coupe felling carried out by the Forest Department, it was felt that it would lead to the elimination of other existing species. However, according to the mangrove dependent communities who have observed the status of mangrove forests for a long period, *A. marina* has been the dominant species in these regions for the past 60 – 70 years.

After the second year of restoration, it was observed that natural regeneration with other true mangrove species (*Bruguiera cylindrica*, *Ceriops decandra* and *Agiceras corniculatum* etc) available in Pichavaram mangrove wetland is taking place in the restoration sites. Keeping this in mind it was decided to include different species of true mangroves. A mangrove nursery has been established with propagules collected from the Godavari mangrove wetlands in Andhra Pradesh.

The field nursery was established in the VDMC common land adjoining the MMU of Vadakku Pichavaram to introduce new mangrove species in the restoration sites.

Seed samples of *Sonneratia apetala*, *Sonneratia caseolaris*, *Xlyocarpus moluccensis*, *Avicennia alba*, *A. officinalis* (*Pichavaram mangroves*) and *Agiceras corniculatum* were collected from Kakinada and raised in the nursery.

Species like *Rhizophora mucronata*, *Rhizophora apiculata*, *Ceriops* and *Bruguiera* were used for plantation. Nearly 5,00,000 seedlings were raised in the nursery in Muthupet.

Canal maintenance

During the summer months all the members of the VDMC of both MGR Nagar and Kalaingar Nagar were involved in desilting both the main and feeder canals of their area without any remuneration. The VDMC mobilised the members, MSSRF provided transport and the Forest Department supervised the work. At Vadakku Pichavaram during the General Body meeting it was decided that each SHG should contribute Rs. 450 for desilting the restoration canals. But the women SHG members decided to desilt the canals engaging women, as men labourers demanded more wages. In T S Pettai, the VDMC contributed funds for canal maintenance.

In Muthupet, it was decided that those who are engaged in fishing in the restoration canals had to desilt them periodically. But they could not maintain the canals properly. Through a series of discussions with the EC members of VDMC of Veerankoil, the members of the SHGs, particularly the women who are also members of the EC, contributed Rs. 9,000, which was utilised for desilting the restoration canals by engaging labourers from their village.

Community mangrove nursery

Activities were initiated to raise a community nursery as an additional income generation activity for the local community. The following activities were carried out in the community mangrove nursery in both sites of Tamil Nadu :

- A mangrove nursery for 4 species has been established in Muthupet in the demonstration hamlets of Manganangkadu and Karisaikkadu. Women SHG members have been engaged to manage it.
- In Pichavaram, a mangrove nursery for *Xylocarpus granatum*, *Sonneratia apetala* and *Avicennia alba* has been established. The propagules were brought from the Godavari mangrove wetlands in Andhra Pradesh.
- Terrestrial species have also been raised in the demonstration hamlet of Kalaingar Nagar. Nursery techniques for raising Teak, *Dalbergia belerica*, Red sander, Moringa, Bamboo, *Thespesia* and Silk cotton have been provided to the women SHG members. Buy-back arrangements have been made with the Forest Department.
- A nursery for *Avicennia marina* was started in the mangrove forest area in the MMU of Manganangkadu hamlet.

Sustainable mechanism developed to manage MMUs

Measures have been taken to ensure sustained growth in the restored sites.

- In Vadakku Pichavaram, the VDMC has appointed a watchman for protecting the restored mangrove forest against cattle grazing. The salary is met from the monthly interest from fixed deposits and amount collected from all SHGs. A similar approach was followed in T S Pettai.
- In MGR Nagar and Kalaingar Nagar, the VDMCs have assigned the protection work to the SHGs on a rotation basis. The Forest Department has provided a boat for patrolling against cattle grazing and illegal felling.
- In Muthupet, canal fishers and SHG members are involved in desilting the canals.

Assessment of fishery potential

It was decided to study fishery potential from both the scientific and fisherfolk points of view. A meeting was organised with the experts of local institutions, CAS in Marine Biology, Annamalai University and Fisheries College and Research Institute, Tuticorin. The discussions were aimed at developing a methodology for carrying out surveys on sustainable utilisation of fishery resources of mangrove wetlands and to quantify the fishery potential of the mangrove wetlands so as to develop a code of conduct in fishing activities in the near future in and around the mangrove wetlands. The discussion centred around the assessment of fishery potential of the mangrove area, traditional practices and knowledge, augmentation of the existing natural systems, training the local community in improving methods, sustainable utilisation of resources and new avenues to increase the income of fishermen.

Based on the recommendations of the experts, an action plan was prepared. It consists of the following steps: a broad-based questionnaire has to be framed, to obtain data on the family status of the fishermen community, their social and economic background, technology adoption, preference etc. A detailed survey has to be conducted for a short and effective period, say 3-6 months, among a randomly selected population, to obtain more reliable data. Based on the data a status report has to be drawn up for implementation by the community.

Self help groups

86 Self help groups (SHGs) are functioning in the project villages in Tamil Nadu. Of these 57 are women SHGs and 29 are men SHGs. In the current year 15 women and 8 men SHGs were formed. SHGs are utilising the money by providing loans to the members themselves at low interest rates. Initially the members utilised the money for household purposes (education, marriage, house construction etc) and later for productive purposes (Table 1.2).

The members are also utilising the matching grant and revolving fund mobilised from DRDA and financial institutions. The interest amount is collected and a certain amount (Rs.600 per year per group) is contributed towards salary to the watchman and desilting of restoration canals. The total savings so far amounts to Rs. 14,50,600.

Poverty alleviation programme

To implement the mangrove conservation and management activities, the concerns of the poorest sections of the mangrove

dependent communities were identified through the Participatory Rural Appraisal (PRA) processes. This was supplemented by the Below Poverty Line (BPL) list obtained from the Block Development Office (BDO). Alternative income generation activities, supplementary income generation activities, alternative unconventional methods of fishing and additional and increased income from existing land and water-based activities were implemented. A total of 390 families benefited through these poverty alleviation initiatives. Various microenterprises such as boat nets, crab fattening, coir rope making, palm candy production, crab culture, cross-bred cows, canal fishing, chalk piece making, composite fish farming, value-added products of fish, floriculture, medicinal plant cultivation, coconut leaf plaiting etc were initiated.

Gender issues

The concerns of the women of the mangrove dependent communities were identified through gender aggregated and segregated exercises of the Participatory Rural Appraisal (PRA) processes. Based on the concerns of the women, separate microplans were prepared and implemented. Financial resources for women for basic amenities like lavatories and smokeless chula were mobilised from DANIDA and Panchayat Unions and for various microenterprises from banking institutions.

After the intervention of MSSRF, the situation has changed due to the introduction of frequent meetings, creating an awareness among the community about equity of gender participation, and training and exposure visits for both men and women. Equal representation is being ensured in all project activities.

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Table 1.2 : *Utilisation of loans by members of SHGs in the demonstration villages in Tamil Nadu*

Purpose	To pay old debts		For agriculture and fishery		For new income generation activities		To meet social commitments	
	No. of Members	Amount (Rs.)	No. of Members	Amount (Rs.)	No. of Members	Amount (Rs.)	No. of Members	Amount (Rs.)
Pichavaram								
MGR Nagar								
Women SHGs	46	1,26,000	13	1,85,000	13	23,000	54	1,35,000
Men SHGs	23	46,000	9	12,000	3	9,000	17	29,000
Vadakku Pichavaram								
Women SHGs	28	2,23,000	94	1,40,000	5	13,000	235	3,14,000
Men SHGs	18	36,000	112	2,25,000	16	53,000	96	1,18,000
Kalaingar Nagar								
Women SHGs	53	1,19,000	7	13,000	9	42,000	17	35,000
Men SHGs	38	73,000	12	17,000	5	29,000	8	19,000
T S Pettai								
Women SHGs	7	12,000	2	2,000	—	—	4	6,000
Men SHGs	2	4,500	—	—	—	—	—	—
Muthupet								
Veerankoil								
Women SHGs	56	1,85,000	24	36,000	7	19,000	82	1,54,250
Men SHGs	20	22,000	—	—	—	—	31	46,000
Manganangkadu								
Women SHGs	15	29,000	8	19,500	3	2,800	14	12,500
Men SHGs	5	6,000	—	—	6	4,000	5	3,500
Karisaikkadu								
Women SHGs	—	—	—	—	3	1,800	7	2,800
Men SHGs	—	—	—	—	2	700	4	1,000

Leadership training was provided to women representatives. In view of this the following changes were achieved :

- The women participate in all the meetings to discuss various issues and do not hesitate to demand their basic rights.
- Women come forward like men to operate the groups with firmness and understanding.
- Both men and women are able to approach banks and government agencies to get loans and support from government schemes.
- Women self help groups (SHGs) approach the government officials for their requirements. They even participated in the *Gram sabha* meetings and mobilised external resources for renovating the community pond.
- Gender equity has been established in social activities.
- Equal wage is provided to both men and women in all MSSRF activities.
- The General Body of the VDMC has elected a woman as President of the Executive Committee.
- Women members in almost all the demonstration villages operate accounts of the VDMC.

Alternative employment

Due to the creation of alternative employment opportunities, the community derived additional income from activities like dairy farming, coconut-leaf thatching, palm candy production, medicinal plant cultivation, crab

fattening, coir rope making, floriculture and canal fishing in the restoration canals etc.

Through these income generation activities members have been able to earn more. This has resulted in additional savings and improved purchasing power. It further enables them to make prompt and regular repayment of loans.

Withdrawal strategy

A Federation of all the VDMCs in Pichavaram region has been formed for integrating the restoration and microenterprise activities to be implemented in future to facilitate the withdrawal strategy. The objectives of the Federation are as follows :

- To conserve and manage mangrove forests jointly
- To enhance development, fulfil the basic needs of the people, develop microenterprises and provide opportunities to the poor
- To solve the problems of SHGs, to identify and start a suitable microenterprise for each SHG and to form new SHGs
- To act as a bridge between the village people and various Government agencies and financial institutions

In future, the Federation of VDMCs will act as the apex body in conserving and managing mangrove wetlands in collaboration with the Forest Department of the respective region. In addition, it will prepare an action plan every year to implement various activities of the JMM. The Forest Range Officer acts as the secretary of the forum to present the

concerns of the Federation at the District level Forest Protection Committee along with other members of the Federation.

101.2 Andhra Pradesh

In Andhra Pradesh, the Joint Mangrove Management (JMM) model and socio-economic development activities are being implemented in seven villages, namely Matlapalem, Bhairavalanka, Dindu, Kobbarichettupeta and Gadimoga in Godavari and Dheena-dayalapuram and Zinkapalem in Krishna mangroves. Activities were started in Gadimoga in Godavari and Zinkapalem in Krishna this year, on a request from the villages to MSSRF to adopt them. Nearly 1,835 families with 5-7 members per family, 48 women self help groups (SHGs) and two youth groups are the partners in the project. 16 microplans have been drawn up in the past five years to address the concerns in the demonstration villages. So far Rs. 6,735,320 was spent from the project and Rs. 5,470,325 was got from other departments to implement the activities listed in the 16 microplans. The voluntary labour extended by the villagers is immeasurable. In addition they have also contributed Rs. 8,75,835 towards housing and microcredit activities. This method ensures the sustainability of the concept of participatory socio-economic development of villages and management of mangroves even beyond the tenure of the project.

Institution-strengthening towards sustainable management of mangroves

Involving the local people, government officials, NGOs and elected members of the Panchayat, sensitising and awareness

generation exercises were carried out. Exposure visits, meetings, training using cultural troops, video play, wallboard paintings etc were used for this purpose. The linkages between NGOs, government officials and the community were strengthened to improve the capacity of the villagers to utilise funds from government schemes and other agencies to implement the microplan activities and the JMM model. Eco Development Committee (EDC) meetings were conducted regularly to impart participatory training in leadership skills and gender concerns.

Preparation of microplans

Seven microplans were prepared for five villages in Godavari and two villages in Krishna districts. Activities were implemented accordingly, with the involvement of all the stakeholders, including the Fisheries Department and the Forest Department. The Fisheries Department undertook the activities of rearing fish in the community pond in Dheenadayalapuram village. The social forestry wing of the Forest Department supplied the required saplings free of cost to raise community and homestead plantations to reduce the dependency on mangroves.

Vegetation survey in Godavari and Krishna mangroves

Vegetation survey was conducted to assess the status of pristine mangroves and degraded mangroves and to determine the rare, endangered and threatened category of species in the Godavari and Krishna mangroves. The survey has resulted in the identification of 34 mangrove and associated species in Godavari district and 22 mangrove and associated species in Krishna district. *Excoecaria*

agallocha and *Avicennia marina* are the dominant species. *Xylocarpus moluccensis* and *Sonneratia caseolaris* are the rare species recorded in this survey. *Scyphiphora hydrophyllacea* is found occurring in Kothapalem Reserve Forest (RF) of Godavari mangroves and has been determined as a rare species as it does not occur in any other place along the east coast. *Tamarix troupii*, a mangrove associate, has been recorded in Rathikalava RF in Godavari mangroves. In Corangi RF, zonation of mangroves is clearly visible with *Avicennia alba* in the Kakinada Bay followed by *Sonneratia apetala* and *Excoecaria agallocha* zones towards the landward side. Halophytes namely *Salicornia brachiata*, *Suaeda maritima* and *Suaeda nudiflora* have been recorded in the degraded areas, where the tidal flushing is occasional. In both the mangroves alarming invasion of *Prosopis juliflora* has been noticed.

Community mangrove nursery

In the Community Mangrove Nursery, 20,000 saplings of *Excoecaria agallocha* and 25,000 saplings of *Avicennia marina* were established by the women of Matlapalem and Bhairavalanka respectively. In Dheenadayalapuram, 2,00,000 saplings of *Avicennia marina* and 3,000 saplings of *Rhizophora apiculata* have been raised and these saplings will be bought from the community for planting in the restoration sites. Through this community mangrove nursery the members of EDC will get approximately Rs. 2,25,000. The women were trained by project personnel in the basic techniques of seed collection and nursery raising.

Restoration of mangroves

Restoration of degraded mangroves was carried out in the Mangrove Management Units (MMU) of Matlapalem, Dindu, Bhairavalanka, Kobbarichettupeta and Gadimoga in Godavari district and Dheenadayalapuram in Krishna district. Community members, MSSRF and the staff of the Forest Department jointly selected the restoration sites. The village level institutions, namely Eco Development Committees (EDC) and Vana Samrakshana Samithis (VSS), carried out the restoration activity. So far 300 ha of degraded mangroves have been restored by undertaking contour survey to determine the depth of canals to be constructed, raising of mangrove nurseries, canal construction and planting of mangrove seedlings. 70 ha of degraded mangroves were restored this year by Gadimoga EDC, Bhairavalanka VSS and Dheenadayalapuram EDC. Training in canal digging, canal alignment and planting was imparted to the villagers. The field staff of the Forest Department, who participated in the exposure trip to Pichavaram mangroves, were also involved in the training. The details of restoration completed and the area under management in each MMU are given in Table 1.3

Collaboration with Forest Department

The Forest Department is involved in all the project activities, training and exposure trips. MSSRF and the Forest Department jointly identified the degraded area and planned the canal design along with the community.

Table 1.3 : *Details of restoration and the management of mangrove area under MMUs in Andhra Pradesh*

Demonstration Village	Degraded area restored (ha)	Area of MMU under management (ha)	Money earned by the villagers as wages (Rs.)
Matlapalem	5	502	1,02,500
Dindu	25	900	1,65,000
Kobbarichettupeta	35	3,925	99,000
Bhairavalanka	75	615	11,28,000
Gadimoga	25	900	4,15,000
Dheenadayalapuram	135	2,000	7,65,000
Zinkapalem	—	600	—
Total	300	9,442	26,74,500

Mangrove genetic resources conservation centre

In the mangrove genetic resources conservation centre at Chollangi mangrove nursery in Coringa Wildlife Sanctuary, two species namely *Xylocarpus granatum* and *Kandelia candel*, collected from Mahanadi delta have been planted, in addition to seven mangrove species occurring in Coringa and two species collected from Sunderbans.

Land based alternatives

3,000 saplings of Eucalyptus were distributed for the homestead plantations at Gadimoga, Dindu, Bhairavalanka and Kobbarichettupeta. Casualties in community plantations in Dindu and Matlapalem were replaced. In Kobbarichettupeta a community plantation was raised in 0.1 acre by planting saplings of Eucalyptus. Pruning of Casuarina plantation was done in 15 ha of the VSS plantation in Bhairavalanka. The paddy blast disease was observed in Bhairavalanka and fungicide provided to all the families.

Two new sprayers were provided to the villagers of Matlapalem and Bhairavalanka. An old sprayer was serviced and is being used in Matlapalem.

Nearly 18,000 timber yielding and horticultural saplings of Casuarina, Eucalyptus, Acacia, Subabul, Teak, Drumstick and Guava were distributed in three demonstration villages in Krishna, while 400 Coconut saplings were distributed in Nali, 140 in Dheenadayalapuram and 140 in Zinkapalem worth Rs. 14,000. They were procured from the Social Forestry wing. 2,390 stem cuttings of *Jatropha curcas* and 1,700 stem cuttings of *Adathoda vasica* for live fencing were distributed. Five varieties of vegetable seeds were provided for raising kitchen gardens in Nali. 710 Moringa seedlings were distributed in Dheenadayalapuram, Zinkapalem and Nali. To reduce the dependency on mangroves for firewood, kerosene stoves and gas stoves were distributed with matching contribution from the villagers, details of which are given in Table 1.4.

Table 1.4 : *Gas stoves and kerosene stoves supplied to villagers*

Name of the village	Kerosene stoves	Gas stoves
Dindu	30	18
Matlapalem	15	25
Gadimoga	1	12
Dheenadayalapuram	67	—
Zinkapalem	50	—

Self help groups

Self help group members are taking decisions about preparing microplans and their implementation. In Bhairavalanka, SHG members decided not to take Rs. 3,000 as loan from DRDA. They wanted to wait another six months for taking a loan of Rs. 10,000 to buy milch animals. SHG members are now voicing their concerns even through media – the Bhairavalanka water problem has appeared in *Vaaritha*, a leading daily Telugu newspaper. They are also able to talk with the Collector for addressing common needs like bridges and water. 39 SHGs are functioning. The members are using the money for procuring prawn seeds for aquaculture, vending and setting up small shops and hotels.

Socio-economic development and poverty alleviation

Following the training given to self help groups, financial assistance was provided to five SHGs each in Dindu and Matlapalem (54 members, Rs. 81,000 in Dindu and 49 members, Rs. 73,500 in Matlapalem). In addition, 34 poor families were identified in Matlapalem and Rs. 33,000

was provided. In Bhairavalanka four SHGs (51 members, Rs. 51,000) took a loan from the project and deposited the money along with their contribution for purchasing milch cattle through the DRDA.

1,500 fishlings brought from Kuchipudi fish hatchery were supplied to Dheenadayalapuram for community fish rearing with matching contribution from the community. At the time of harvest *i.e.* after 7-8 months it is expected that the survival rate would be 70% (1050 nos.) with an average weight of about 500 gm per piece. The market rate per piece would be Rs. 20 and Rs. 40 per kg. The total expected income is about Rs. 21,000. The net profit would be about Rs. 12,000 to 15,000, which will be added to the core fund of the village to be utilised for village development activities.

130 *Vanaraja* chicks procured from KVK, Kavuru were distributed in Zinkapalem and 30 in Dheenadayalapuram with matching contribution from the community. These chicks are expected to lay eggs for 160 days a year. With this scheme a family having 4 chicks may get Rs. 1,280. *Vanaraja* chicken meat is sold at Rs. 70 per kg. Each bird weighs about 3-4 kg on maturity. Last year *Giriraja* chicks were distributed and nearly

50 per cent of the families produced next generation chicks. These families have three to four second-generation chicks each. This is one of the indicators of the sustainability of the project.

Information and awareness

Newsletters were prepared in both Telugu and English, and distributed to all the stakeholders. *Pagativeshalu*, folk media for generating awareness on the importance of mangroves and land-based alternatives to reduce dependency on mangroves, was held in the new demonstration villages. Paintings on the importance of mangroves and project interventions on land based alternatives (LBA) and restoration were displayed in ten places in Gadimoga, six in Kobbarihcettupeta, two in Matlapalem and three in Dindu in Godavari and two in Zinkapalem in Krishna mangroves. Mangrove conservation clubs were formed in 2 villages in Godavari and one village in Krishna by depositing Rs. 5,000 in the bank. The interest accrued will be spent on programmes related to environmental awareness. Mangrove Day was celebrated on 5 June, World Environment Day, at Dheenadayalapuram. The role of mangrove forests in protecting the coastal villages during the cyclones and the need for conserving mangrove forests in a participatory manner were highlighted.

Exposure trip

An exposure trip to Pichavaram mangroves in Tamil Nadu was organised in September 2001 for the EDC/VSS members of Matlapalem, Bhairavalanka, Dindu, Gadimoga and Kobbarichettupeta in Godavari and Dheenadayalapuram, Nali and Zinkapalem in

Krishna along with Forest Department staff and NGOs. The members interacted with the villagers of MGR Nagar in Pichavaram mangroves and exchanged ideas and experiences in mangrove conservation and management. The participants were exposed to crab fattening techniques being practised at Pichavaram. The participants also visited MSSRF, Chennai. Prof M S Swaminathan addressed the gathering and stressed the importance of mangroves and the need for conservation in the interests of future generations.

Exposure trips to mangrove forests were also organised for the school children of the demonstration villages of Godavari on 14 and 15 December 2001 to understand the importance of mangroves and the uniqueness of the ecosystem. They were taken to the mangrove plantations, nursery and the information centre at Chollangi mangrove nursery. A similar visit was organised for the NGOs and Government officials on 16 December 2001. The members of Gujarat Ecological Commission also participated in this visit. Pamphlets related to the importance of mangroves were distributed to the participants.

Training and capacitybuilding

The Coir Board supplied ten coir ridding machines under the UNDP project. The machines were installed at Dindu and a training centre on coir rope making was started on 22 May 2002.

An orientation programme on livestock management was conducted jointly with the Veterinary Department, Nagayalanka, in Krishna district. Training in candle making, vermi compost and apiary was organised at

KVK, Kavuru. A tailoring centre was established in Zinkapalem village and training was given to 10 women in Dheenadayalapuram and 8 in Zinkapalem. Sewing machines were procured with financial support from the Mandal Development Office (MDO). Two orientation-training programmes were arranged for the farmers of Dheenadayalapuram through the Agriculture Department, Avanigadda.

A one-day training programme on the modalities of preparing a microplan and content creation on project activities in the new demonstration villages of Godavari was organised at MSSRF, Kakinada on 8 September 2001 for the EDC members of Kobbarichettupeta and staff from NGOs *Sravanti* and *Pallesiri*.

Training on establishing a mangrove nursery was organised at Bhairavalanka on 24 December 2001 to involve more women in the restoration activities and increase their income.

Strengthening the SHGs of Bhairavalanka, Matlapalem and Dindu was essential because most of the groups were not functioning well. Workshops were conducted in these villages with resource persons from Mandal Parishad, Revenue Department, Banks and NGOs. The importance of self help groups and ways of sustaining the groups were discussed in detail. Now the villagers are repaying the loan borrowed from MSSRF without default.

A training programme was organised in Dheenadayalapuram for rural development and mangrove management. Leadership qualities were discussed at length.

Training on gender mainstreaming was organised for the community members and

NGOs at MSSRF, Repalle for involving women in decision-making. Sharing of workload mutually by men and women was also discussed.

Workshops

A trainer's training programme on mangrove restoration and conservation was held at Kakinada from 25 to 27 July 2001, involving participants from the Forest Department, NGOs and the community. Restoration of mangroves, participatory techniques, self help groups, sustainable fisheries, gender mainstreaming and land based alternatives were among the issues discussed. A field trip to the mangroves of Godavari was undertaken to explain restoration techniques and vegetative propagation of mangroves.

A one-day workshop was organised at the Mandal Development Office on 8 September, 2001, on the eve of International Disaster Reduction Day for the newly-elected Panchayat members. During the discussions members said that the alternatives, especially the gas stoves and pucca houses, will drastically reduce mangrove dependency and that they would work towards fulfilling these goals. Members also expressed a wish to develop the community plantations in the *porambok* and temple lands available in the villages with the help of MSSRF.

An orientation programme was conducted for 20 farmers of Dheenadayalapuram at Market yard, Nagayalanka by the Department of Agriculture on 15 June 2001. Aspects of cultivation practices, from selection of seeds to harvesting the crop, including application of fertilisers, especially biofertilisers such as vermi-compost and organic manure were discussed.

A workshop was conducted at MSSRF, Repalle for officials of the Forest Department, the villagers and NGOs on restoration techniques and nursery raising in a participatory approach.

A three-day FAO-sponsored workshop was held at Rajamundry from 12 to 14 February, 2002 on restoration of mangroves through participatory mangrove management. The workshop helped the participants in understanding the restoration of mangroves, alternatives developed for mangrove dependency, poverty alleviation and community mobilisation towards joint mangrove management and policy discussion on JMM guidelines.

Gender mainstreaming

Community halls in Matlapalem, Kobbarichettupeta and Gadimoga were

repaired for conducting EDC meetings and training programmes, which helped better participation of women. Loans were provided to women self help groups to increase their income through vending. Gas stoves and kerosene stoves were also provided.

Participatory social and gender impact assessment

Greater efforts were made to sustain the participation and involvement of women. A module for Participatory Social and Gender Impact Assessment (PSGIA) was developed and the PSGIA was conducted in Bhairavalanka, Godavari mangroves, to assess the impact of the project intervention. The villagers used tools like drama, rangoli and dialogue. They also performed 21 small skits to depict the impact of the project.

How a mangrove-dependent community views the Project

What do Thirukoti Ammaji, Mulaparathi Durga, Jennepalle Chinni, Vadrevu Satyavati, Mandala Sesharatnam, Pemmada Appayamma, Sangadi Sathyamma, Chekka Nookaratnam, Pinapothu Tanukulamma, Pinapothu Satyanarayananamma and Y Damayanthi have in common?

They are women decision makers (EDC, SHG and VSS members) from mangrove communities of Andhra Pradesh. On 14 February 2002, they, along with some 200 other women and 60 men, interacted with some 30 delegates in a National Workshop on Mangrove Conservation held in Rajamundry, organised jointly by MSSRF and the AP Forest Department. The meeting enabled these members to brief workshop participants about their experiences in mangrove conservation and management and the role played by MSSRF in empowering the village institutions.

Some of the views expressed:

- Ms Jannepalle Chinni of Bhairavalanka: "We have got smokeless chullahs, coir rope training, kerosene stoves, moringa seedlings and hybrid chicks from the Project. Now we are getting loans to buy milch animals. MSSRF has paid the initial deposit. If we are somewhat better off now than before, it's because of the Foundation." She added: "Initially we used to run away when MSSRF staff visited us. We thought they were from the excise department. At one time, our people were playing cards and brewing illicit liquor. Now we are working and earning. It is really a change, and we owe it to the Foundation".
- Ms Pinapothu Tanukulamma: "The project's daily loan scheme has helped us a lot. We take money in the morning, buy and sell fish and earn a bit of money."
- Mr Mulaparathi Krishnamurthy of Bhairavalanka said that initially he and his fellow-residents ignored the project staff. But they were patient. "You showed extreme tolerance and kept visiting our village, something no one else did because we are a remote island. Now we have great faith in the project. We have dug the channels and planted the saplings with our own hands, so we will definitely protect our forest."
- An old lady, Ms Sangadi Sathyamma of Dindu, said: "We have realized the importance of mangroves from the recent cyclones. We will do whatever we can to protect mangroves".

101.3 Orissa

The project is being implemented in two sites: Mahanadi delta in Kendrapara district and Devi river mouth in Jagatsinghpur district. Initially four demonstration villages were selected for the project, three in Mahanadi delta and one in Devi mouth site. Ten additional demonstration villages, 4 in Mahanadi delta and 6 in Devi mouth site were taken up after the super cyclone of 1999 (Table 1.5)

Institution strengthening towards sustainable management of mangroves

Entry point activities in the new demonstration villages were followed by

participatory rural appraisal, group formation and institutional development. Microplans were prepared jointly by the stakeholders for village development as well as mangrove conservation and restoration activities. Community based institutions were set up involving the local people, government officials, Forest Department, NGOs and PRI members. Linkages were established with NGOs (Nature's Club, PREM CASA, and VARAT) and various departments of the government for implementing the socio-economic and mangrove conservation and management programmes.

Conservation and restoration

Restoration of degraded mangrove areas was taken up in Kajalapatia, Kharinasi,

Table 1.5 : *Project villages in Orissa*

Sites	Old Demonstration Villages	New Demonstration Villages
Mahanadi delta	Kandarapatia Kharinasi ward-11 Kajalapatia	Kalatunga Jambu ward -14 Kharinasi ward-6 Badatubi
Devi river mouth	Bandar	Dhanuharbellari Naupal Amarapat Dandabedi Kerabellari Nendhera

Kandarapatia, Kalatunga and Badatubi in the Mahanadi delta and Bandar and Naupal of Devi mouth delta. 193 ha of degraded area have been restored in the MMUs of the 7 villages. Direct planting of propagules and plantation of nursery-raised seedlings are the two methods of restoration practised. Nursery raised seedlings were used mostly for gap fillings and to restore areas where direct planting was not possible. The details

of restoration completed in different Mangrove Management Units are given in Table 1.6.

In six demonstration villages, 2,64,500 mangrove seedlings were raised for planting in the restoration area (Table 1.7).

In addition, 50,694 seedlings were used for gap filling in 16.5 ha of restoration area in Kajalapatia and Bandar villages.

Table 1.6 : *Details of restoration of mangrove areas*

Demonstration Villages	Degraded areas restored (ha)	MMU (ha)	Money received by community towards wages (Rs.)
Kajalapatia	39	95	85,078.80
Kharinasi	11	65	12,540.00
Kandarapatia	5.5	80	11,000.00
Kalatunga	35	116	61,523.40
Badatubi	7	65	12,000.00
Bandar	87	130	72,739.00
Naupal	8.5	50	34,890.00
Total	193	601	2,89,771.20

Table 1.7 : *Seedlings raised and the species involved*

Demonstration Villages	Seedling raised	Species
Kajalapatia	45,000	<i>B. cylindrica</i> , <i>B. parviflora</i> , <i>R. apiculata</i>
Kandurapatia	12,000	<i>B. cylindrica</i>
Kalatunga	78,000	<i>B. cylindrica</i> , <i>X. granatum</i> , <i>R. apiculata</i> , <i>K. candel</i> , <i>S. apetala</i> , <i>B. parviflora</i>
Bandar	70,000	<i>B. cylindrica</i> , <i>A. corniculatum</i> , <i>S. apetala</i> , <i>R. apiculata</i> , <i>B. parviflora</i> , <i>B. gymnorrhiza</i>
Naupal	50,000	<i>B. cylindrica</i> , <i>X. granatum</i>

Vegetation survey in Mahanadi delta and Devi mouth

A detailed survey on the status of mangroves in Mahanadi delta and Devi river mouth was done through quadrat method. Specimens were collected, identified and herbaria prepared. In total 34 species of true mangroves, 9 species of obligate mangroves and 42 species of mangrove associates were recorded in Mahanadi and Devi mouth mangroves. Herbaria were also prepared and deposited at the Mangrove Interpretation Centre of the Forest Department. The dominant species of Mahanadi delta are *A. officinalis*, *A. marina*, *S. apetala*, *E. agallocha* and *R. mucronata*. The dominant mangroves of Devi river delta are *A. officinalis*, *S. apetala*, *E. agallocha*, *M. wightiana* and *P. coarctata*. Due to biotic factors of high magnitude and habitat loss in the Mahanadi delta many taxa have moved towards threatened categories. Some of the species in Mahanadi delta like *M. angulata*, and *B. sexangula* are endangered. *T. dioica*, *S. alba*, *S. griffithi* and *D. spathacea* are rare and *S. caseolaris*, *S. carinatus* and *X. mekongensis* are

vulnerable categories that need to be conserved.

Mangrove genetic resource conservation centre

In the nursery of the Genetic Resource Conservation Centre at Petchella, Mahanadi delta, 9,500 seedlings of 21 mangrove species have been raised and will be planted in the Mangrove Genetic Conservation Centre at Kansaridiha Forest Block located in an area of 100 ha to increase the plant biodiversity of the area.

Hydrological studies : Geomorphological setting and hydrological studies were carried out in the Mahanadi and Devi deltas. The Mahanadi delta is a typical delta occupying an area of 9,000 sq km. The mouth of Mahanadi and Devi are dynamic in nature due to the delta building activity. The Mahanadi river was earlier emptying into the sea at Hukitola bay but now it is entering the sea close to Paradip. The Devi river has three mouth positions migrating from north to south. The tidal variation in the creek at Kantilo forest block in the Mahanadi delta indicated that there is a reduction in spring tidal

amplitude from 2.4m to 1.2 m between the monsoon season and pre-monsoon season, necessitating canal formation for establishing mangroves. These canals are to be maintained by the VLLs for at least 2-3 years, to ensure good establishment of mangrove seedlings.

In Devi mouth site, Salio and Bandar were chosen for the study. At Salio as the amplitude is low, canal excavation is required. In Bandar, where the tidal amplitude is adequate, direct planting could be done, without forming canals. These studies have clearly indicated the locations where canal excavation is required for the successful establishment of mangroves.

Salinity data was collected for pre monsoon, monsoon and post monsoon seasons at 6 stations in the Mahanadi mangroves and 10 stations at Devi mouth. During the South-West monsoon, in Mahanadi mangroves, salinity varies from 0 ppt at Kharinasi to about 15 ppt at Kandarapatia. The creek at Kantilo showed 14 ppt indicating that limonitic to mesohaline conditions are prevalent in Mahanadi. In Devi mangroves, salinity varied from 0 ppt at Gandukula, Dhanu-harabelari, Kerabelari, Bandar and Salio to 30 ppt at Hawakana. In Borua the salinity was 21 ppt, due to its proximity to the mouth. This shows that limonitic to polyhaline conditions are prevalent.

Daily discharge data was collected from Mundoli weir in Mahanadi from 1969 to 2001 to analyse the changes in flow pattern. The total annual discharge shows more or less a uniform character up to 1994. After 1994, the discharge has shown a decreasing trend from as high as 60 million cusecs in 1994 to less than 5 million cusecs in 2000. This may be due to the diversion of fresh

water for various purposes. The impact of this sudden decrease in discharge has to be correlated with mangrove species diversity changes.

Land based alternatives

A Mangrove Dependency Survey shows that there is a reduction of 30% dependency on mangroves for fuel, fodder and house building material in the demonstration villages. Plantation of multipurpose tree species has been undertaken in homestead as well as common lands. The Baseline Survey Report of new demonstration villages shows that people are dependent on mangrove forests to a great extent for fuel, fodder and house building materials. But as mangrove resources are limited and being depleted more and more, people have to spend more time collecting fuel and house building materials from far away places. So seedlings of MPT species were distributed to the community for raising plantations in homesteads. Common land plantation has been done in school premises, temple areas, roadside and saline embankment of some of the demonstration villages.

The rate of survival after two months was found to be high (>80%) due to good rainfall.

Inter-Nodal bamboo multiplication : Bamboo multiplication by vegetative propagation was taken up as one of the land based alternatives in the demonstration villages.

Distribution of fuel-efficient stoves : Fuel-efficient chullahs (stoves) developed by OREDA were distributed in one new demonstration village at Kalatunga, for reducing dependency

on fuel from mangroves. Out of 158 households, 102 households have taken the chullah.

Fodder cultivation : Fodder cultivation was demonstrated in Kharinasi -11 and Kalatunga by planting Para grass (*Brachina matica*) that is cultivated in wetlands where no other crop can be grown. It was brought from the Veterinary Department, Government of Orissa for multiplication. After a period of one and a half months, the yield of grass was found to be 1 kg per sq meter.

Income generation activities

Several income generation activities were taken up.

On-farm activities

Distribution of fruit crop seedlings : Horticultural crop seedlings like coconut, cashewnut and hybrid mango were distributed in the new demonstration villages for homestead plantations.

Seed distribution for kitchen garden : Vegetable seeds were distributed in the new demonstration villages to enhance kitchen gardens. The seed packets (30 g) contained seeds of pumpkin, okra, snake gourd and bitter gourd.

Biofertiliser : A small biofertiliser unit for production of *Azolla* has been developed in Kalatunga village to cater to the needs of the paddy growers. *Azolla* multiplication is being done in small tanks (5m X 1.5m X 1m) by using single super phosphate and forate-10G for about 15 days after which it is harvested. The objective of this unit is to demonstrate about *Azolla* production and its use in the place of inorganic fertiliser. Starter culture was brought from the District Agriculture Office, Kendrapara.

Mixed farming : Mixed farming was started in Kalatunga village. Pisciculture, duckery and banana plantation were introduced.

Disease and Pest management : Coconut trees of Naupal and Amarapat were severely affected by *Opisania arenosella* and Rhinoceros beetle. Two different types of pest predators, *Bracon hebetor* and *Bracon brevicornis* were used to control the pests.

Other activities : Cultivation of Oyster mushroom was taken up. Linkages were established with government and developmental agencies for vermi composting.

Power tiller

Two power tillers were provided by MSSRF in Kharinasi-11 and Kandrapatia villages. They were hired out at Rs.120 to Rs.140 per hour. The money thus earned (Rs. 41,475) was deposited in the village fund.

Off-farm activities

Some income generating activities were introduced.

Distribution of poultry chicks : Vanaraja, Giriraja and Redrock were distributed in demonstration villages in keeping with the objectives of earning more income and providing occupation to the women in their leisure time. 900 chicks were distributed in 4 demonstration villages.

Crab fattening : Demonstration of crab fattening was started in Kalatunga village. A bamboo net (8' X 6') was placed in the creek and food supplied regularly. The harvest is awaited.

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Beehives : 20 beehives were distributed in 4 demonstration villages.

Socio-economic development and poverty alleviation

The tested activities were introduced in the new demonstration villages.

Self help groups : 38 SHGs have been formed in the villages of Mahanadi site, and 14 SHGs in Devi mouth site for income generation activities and microenterprises. Out of the 38 SHGs, 6 are men SHGs.

Formation of mahila mandal : Two mahila mandals were formed, one at Kajalapatia and the other at Bandar. Women were encouraged to generate savings and take up various enterprises for additional income. Six SHGs received Rs. 65,000 as loan from NABARD to undertake microenterprises

Microenterprises

The project facilitated several micro-enterprises to generate more income to the community like dry fish making, betel shop, poultry farming, apiculture, rice business, fishing boat and net, fish / prawn pickle making, tailoring, crab fattening, seed business, dairy and goat rearing.

Information and awareness

The following activities were undertaken :

- A newsletter in English was prepared and distributed to all the stakeholders.
- Competitions were conducted for school children on the importance of mangroves and landbased alternatives to reduce dependency on mangroves.

- Interventions on land based alternatives (LBA) and restoration were made in two places in Mahanadi site and two places in Devi mouth site.
- A mangrove conservation club was formed in one village in Mahanadi site.
- Activities like mass meeting, cycle rally, debate and essay competition, and poster display were conducted to generate awareness among the communities.
- Mangrove conservation day and *Bana Mohatsav* were celebrated.

Exposure visit : An exposure visit was organised for the Chief Conservator of Forests (CCF), Orissa, to Pichavaram mangrove restoration site in Tamil Nadu. During this trip the CCF observed the fishbone model of canal and the crab fattening done by MGR Nagar Institution. After the exposure visit, the CCF issued instructions for taking up the canal digging technique by the Forest Department in three divisions.

A training cum exposure programme on fish pickle making was organised for 56 SHG members from 19 SHG groups of both sites at the Central Institute of Freshwater and Aquaculture (CIFA), Kausalyaganga, Bhubaneswar in two batches during November and December 2001.

Training and capacitybuilding

Training programmes and workshops were conducted in both the sites.

- A two day training programme was conducted in May 2001 to evaluate the socio-economic status of the communities.

- An orientation programme was conducted in all the operational areas to educate the LJSS members in nursery-raising and restoration and management of mangroves.
- Training on poultry rearing was provided to 300 beneficiaries from 38 SHGs of seven villages in the Mahanadi sites.
- Apiary has been introduced as one of the sources of earning in seven demonstration villages of Mahanadi site and in this regard orientation programmes were organised in October 2001.
- Training on Nalia (*Myriostahia-wightiana*) grass weaving was given to 15 SHG members of Kharinasi-11 demonstration village.
- Integrated horticultural training on raising vegetable and fruit crops was organised for about 30 farmers at Naupal village of Devi mouth site in December 2001.
- A two day training on Participatory Rural Appraisal (PRA) was imparted to the staff of MSSRF and Forest Department at Kendrapara office on 21 and 22 September 2001.
- The Project Coordinator and Mangrove Biologist from Devi mouth site attended a 3 day FAO training-cum-workshop on Mangrove Restoration and Conservation in Chennai from 5 to 8 June 2001. Another training-cum-workshop was organised at Bhubaneswar for the staff of MSSRF and Forest Departments of Orissa and West Bengal from 30 October to 1 November 2001.

- One in-house training was organised on TOT, microplanning and documentation at Kendrapara for the staff of MSSRF from 16 to 20 November 2001.

101.5 Remote Sensing and GIS Work in ICEF Project

The maps to be published in the "Atlas of Mangrove Wetlands of India, Part I – Tamil Nadu" for Pichavaram and Muthupet were finalised and scrutinised by Survey of India. The structure of the Atlas has been updated with recent remote sensing and collateral data on the mangroves of Pichavaram and Muthupet.

The baseline maps of sites in Krishna and Godavari delta of Andhra Pradesh were scrutinised by Survey of India. Thematic maps, illustrations and descriptions of mangrove wetlands of Krishna and Godavari delta have been prepared. The mangrove change detection map of Krishna delta indicates the reduction in area from 1986 to 1996 and increase in mangrove area from 1996 to 1998 in Kottapalem RF Bit No.1. The draft version of the "Atlas of Mangrove Wetlands of India, Part II – Andhra Pradesh" is nearing completion with the help of field scientists who are actually involved in mangrove management.

Baseline maps of Orissa mangrove sites, namely Bhitarkanika, Mahanadi and Devi mouth have been sent to Survey of India for scrutiny. Thematic maps are being prepared by integrating socio-economic, hydrological and geomorphological information in GIS along with temporal analysis of remote sensing data of the three sites.

This information will be published as "Atlas of Mangrove Wetlands of India, Part III – Orissa".

Sub Programme Area 102

Nuclear and Biotechnological Tools for Coastal Systems Research

Sustainable management of natural resources and enhancing livelihood opportunities of the rural community hold the key for the integrated development of coastal regions. Current resource use practices and increasing dependency on the land and marine based natural resources have severely affected the sustainability and productivity of the coastal regions. The ongoing research programme initiated in 1998 was designed primarily to integrate the conservation of natural resources with the development of the farm communities of the coastal areas of southern India. Various activities have been undertaken in Kalpakkam and Kudankulam, which are regions adjoining the Atomic Energy establishments, and in Chidambaram region along the east coast of India. This project, supported by the Department of Atomic Energy (DAE), aims at evolving appropriate models for sustainable development in these regions by strengthening the livelihood security of the local communities through blending frontier sciences and technologies like nuclear tools and biotechnology with the traditional wisdom of rural communities. The objectives include carrying out fundamental and basic research on the molecular biology of abiotic stress, developing methodologies for stress management at the farm level, demonstration

of sustainable and integrated farm practices and evolving and strengthening grass root level institutions to enable the local communities to play a major role in spreading the sustainable development process to various parts of the coastal regions. Substantial progress has been made during the last four years of operation.

102.1 Isolation of Stress Induced Genes

Rapid salinisation of the coastal agricultural land due to current agricultural practices, limited availability of fresh water and intrusion of sea water necessitate immediate steps to be taken for sustaining, if not improving, the agricultural productivity in the coming years. Advances in biotechnology and molecular genetics have made it possible to genetically equip crop varieties to withstand stress conditions. However, the limiting factor has been the availability and sourcing of genetic material that offers resistance to the increasing stress factors, particularly salinity, prevailing in the region or being anticipated in future due to rise in the sea level as a result of global warming.

In this context, mangrove species occupying the estuarine regions and showing adaptation to saline environments were selected as source plants for identification and isolation of salinity-tolerant genes. The ultimate objective of this initiative is to develop location specific crop varieties for coastal agriculture. *Porteresia coarctata*, a mangrove associate species and wild relative of cultivated rice, was selected for the present study. The approach followed includes construction of enriched gene libraries, identification, isolation and characterisation of salt tolerant genes,

and their subsequent integration into crop species of importance to coastal agriculture. Wild plants of *Porteresia coarctata*, (Forsk.) Vierh. were collected and treated with 0.5 M NaCl for 48 hrs. Total RNA from the leaf tissue was isolated following the GITC method with minor modifications. Poly (A)⁺ RNA was purified over oligo-(dT) cellulose column and used as template for cDNA synthesis. The SuperScript™ Lambda System for cDNA Synthesis and λ Cloning (Life Technologies, USA) were used for cDNA synthesis. First strand cDNA synthesis was primed with *NotI*-primer adapter and the double stranded cDNA was directionally cloned in plasmid vector (pSPORT 1) using the *Sall* adapter ligated at the 5' end. The *Sall* adapter ligated cDNAs were size fractionated over SizeSep™ – 400 Sepharose CL-4B spun column (Pharmacia Biotech, USA) before cloning in the plasmid vector. The ligated cDNAs were transformed into the DH5α strain of *Escherichia coli*.

Several clones from cDNA library were randomly selected and the insert size in each of the clones was determined by PCR, using the universal M13 forward and reverse primers. The clones having cDNA of above 600 bp size were isolated by alkaline lysis method (Birnboim & Doly, 1979). The 5' end of the cDNAs were subjected to single-read sequencing using M13 reverse primer and Big-Dye™ Terminators in an automated sequencer. The DNA sequences were clipped for removing vector and adapter sequences and manually edited for sequencing errors. The edited DNA sequences were used to search for nucleotide and protein homology among the existing genes in the databases, using BLASTN and BLASTX algorithms, respectively. Sequencing of more

than 60 ESTs has been undertaken in this manner.

Analysis of sequence homology with those available in worldwide databases helped in identifying a number of full-length genes. These include genes encoding for Histone H3 protein, V-type ATPase, Metallothionins, Superoxide dismutases, P5CS and Na/K antiporters. The study of the transcriptional and translational regulations was carried out to assess the mechanism of inducing these genes. Those clones identified as partial or having homology with unknown proteins, are being studied for their expression pattern, using northern approaches.

102.2 Soil Biological Criteria and Bioremediation

Salt tolerant cultures obtained from *Anabaena torulosa* along with *Anabaena strain AL31* have been successfully field-tested and shown to help in sequestering salt synergistically in the native strains. Other groups of bacteria that promote plant-growth and are efficient under moderately saline soils have also been identified. Since the focus of the study is to understand the efficiency of plant-growth promoting bacteria like the biological nitrogen fixers and phosphate solubilisers under saline conditions, the screening for such organisms was also carried out in the laboratory, along with the field level trial of the *Anabaena* strains developed by BARC.

Future studies will be undertaken at the field level for testing these strains in combination with other growth-promoting bacteria short-listed under laboratory conditions for various crops. Performance levels will be evaluated in the field under saline and non-saline

conditions to help in understanding the roles of such organisms in increasing the resilience of the soil individually and in combination. Strains are being tested individually now. Scale up of such strains for use by farmers will be encouraged after the initial field level trials are carried out.

102.3 Activities being Undertaken in Kalpakkam

A model demonstration-cum-experimental plot was developed in 1998 at the Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, based on the model of integrated intensive farming system with emphasis on critical water use efficiency, forward-backward linkages, organic farming and low input agriculture. Testing the efficiency of the BARC-developed mutant varieties in groundnut (TG24, TG26), Blackgram (TARM-1) and Greengram (TU-1) was also undertaken. Over the years this plot has served as a model for training and capacitybuilding for local farming communities.

Intensification of activities with a number of new interventions and crop species was undertaken during the year. The activities in the demonstration plot established outside the IGCAR campus concentrated on integration of aquaculture activities. Water harvesting structures were constructed and used for the culture of prawns and fishes. The harvested rainwater enabled the raising of two crops of paddy and one pulse crop during the year. In addition, the entire requirement of manure for the cultivation of different crops was met from the agricultural wastes and leafy green manure crops raised at the plot.

Linkages were established with various farming groups at Kalpakkam. A few farmers, convinced by the performance of the BARC mutant varieties (Groundnut-TG24; TG26; Blackgram –TU-94; and Greengram – TARM-1), opted to undertake seed production for these varieties. Seeds ranging from 1-2 kg (for blackgram and greengram) and 15-20 kg (for groundnut) were supplied to these farmers to raise the crops in their own fields. The entire harvest of these crops will be purchased from the farmers for cultivation in Chidambaram and Kudankulam regions.

Training and capacitybuilding in sustainable agricultural practices based on the Integrated Intensive Farming Systems (IIFS) model are major objectives of the project. During the year extensive exposure trips and training programmes were organised for farmers from other regions to explain to them the features and activities in the demo plot. About 350 farmers visited the site. In all these exercises, close collaboration and working relationships were developed with officials of the Agriculture Department.

102.4 Activities being Undertaken in Kudankulam

Since 1999, the major focus has been on management of natural resources and enhancement of livelihood security in Kudankulam and adjoining regions. A number of activities have been introduced with the objective of arresting natural resources degradation through successful demonstration of greenbelting, rainfed agriculture and water resource management. Activities were also initiated to improve the livelihood options of the local farming and fishing communities

through the formation of Self help groups and linking them with various microenterprises.

Soil survey and land use planning : Land use of an area reflects the collective wisdom of the people living in that area. It is evolved through the ages by trial and error and matching the requirements of crops with the capability of the existing resources to meet the needs of the community. The land use in Kudankulam area has undergone a drastic change in the past few decades. The once-vibrant agricultural area, supporting a variety of cereals, pulses, oilseeds and other crops, is lying fallow at present and slowly turning into a barren, degraded area. It is obvious that the land use pattern practised for ages in the area has become irrelevant in the present situation.

In this context, a detailed soil survey was undertaken with the help of National Bureau of Soil Survey and Land Use Planning (NBSS&LUP, Bangalore) in the three villages in Kudankulam region, covering an area of 10,000 ha. High intensity land resource survey conducted in Kudankulam Vijayapati and Erukkandurai villages has shown in detail the nature and distribution of various resources like climate, soil and crops as well as the socio-economic situation, marketing and other infrastructural facilities available in the area, their extent, their problems and potential.

The survey revealed that among the various land resources, rainfall is the most critical factor limiting crop production in this arid region. Though the area receives about 450 mm of rainfall annually, its erratic nature and short duration limit the choice of crops that can be grown. Due to the short rainy season, the growing period is also short,

(65 to 90 days) and only short duration crops that can be harvested within this period can be cultivated.

The high intensity soil survey has identified 26 soil series in the two landforms, namely marine and inland plains, occurring in the three villages. The detailed soil map shows the distribution of different management units (soil phases) occurring in each parcel of the land in the three villages. The various thematic maps prepared for the area show the constraints and potentials of the soil resources occurring in the area. Of the 26 soil series identified and mapped, three from the marine landform and six from the inland plains occur in large areas, occupying about 60 per cent of the total area of the three villages. The remaining 17 series occur only in patches and occupy very little area. The dominant soils are deep to very deep, welldrained and clayey or loamy in texture, with very few constraints for crop growth. Only the minor soils, occurring in limited areas, have moderate to severe limitations like shallow depth, sandy texture, severe erosion, excessive drainage, presence of a large volume of gravel in the subsoil and at the surface, calcareousness, salinity and alkalinity for crop growth. The study has also pointed out the suitability of different crop species based on the soil maps. In the coming years, it is planned to develop a systematic and scientifically developed cropping pattern for a few selected crop species, based on the soil survey report.

Development of greenbelt : In the water-scarce and dry region of Kudankulam, demonstration of establishing a green belt suitable for the arid zone was initiated in

1999. 7,698 trees, belonging to 21 different species, were planted. The performance of these plantations is being measured in terms of their survival (90%) rate and plant height. A large number of Neem and Tamarind were planted. The average plant height recorded for Neem was 18.5 feet, while that of Tamarind (local and urigam varieties) was 13.5 and 8 feet, respectively. Since the plants have performed exceedingly well, irrigation of these plants was discontinued last year.

Demonstration of rainfed agriculture : The activities in Kudankulam concentrated on developing a demo-cum-experimental plot for testing the yield and performance of different crop varieties under rainfed conditions. A number of crop varieties were cultivated in the 9-acre demo-plot established in the NPCIL campus. Blackgram, Groundnut, Sorghum, Bajra, Amaranthus, Cluster beans, Cucumber, Sweet potato, Bottle gourd, Snake gourd; Ash gourd, Banana, Castor and Watermelon were among the major crops tested for their suitability in the region. Performance and yield data are being collected.

Genetic garden for horticultural species : During the last year, a genetic garden for fruit crops was developed in a 4-acre area adjoining the demoplot in the NPCIL Campus. Till date, about 60 varieties of fruit crops belonging to 16 different species, collected from different agroclimatic zones, have been planted for studying their adaptability to the dry region. Mango, Guava, Cherry, Pomegranate and Custard apple are among the species showing a better growth rate. It is envisaged that in the long

run, the genetic garden will serve as a repository for the conservation of a wide range of fruit tree species, specifically for dry zones.

Training and capacitybuilding : The project also intends to disseminate development models among the rural families of the coastal areas in Kudankulam and adjoining regions. Exposure visits to the demonstration fields were organised on a regular basis for the farmers to assess the performance and replicability of different agricultural interventions. Orientation and training programmes on poultry, vermicomposting, fish products, small-scale industries, horticulture and pest management were organised during the year for about 250 people in 10 batches. These programmes were organised with the help of the Agriculture, Fisheries, Veterinary and Horticulture Departments, Women's Development Corporation of Tamil Nadu and other agencies like NABARD, National Union for Fisherman Society (NUFS), SYGYS etc. These activities have generated interest among the local communities and helped them in establishing direct linkages with the Government Departments.

Strengthening the livelihood of rural communities : The project concentrates on imparting technological skills and economic empowerment to rural communities by strengthening their livelihood options. Towards achieving this objective, 16 self help groups, each with 20 members, have been formed in Kudankulam, Idinthakarai and Olagarechagarpuram. These SHGs were able to generate a total saving of Rs. 2,28,906 and also obtain bank loans

to the tune of Rs. 2,26,000. Efforts were made to link these SHGs with microenterprises. One of the enterprises, based on the available resources, was fish processing and product development. Ten SHG group members were selected from Idinthakarai and were trained for 15 days in fish pickling and fish products by the Fisherman Unisom Society, Nagercoil. They, in turn, served as resource persons for training unemployed young women in fish product development. During various interactions with the exporters, market linkages have been developed. Other viable microenterprises are being planned.

Establishment of knowledge centres : Pioneering efforts are being made in establishing locally managed and operated knowledge centres to cater to the present and future needs of rural communities. Access to location-specific demand-driven information is the key to the empowerment of rural communities and has immense implications for addressing the problems of livelihood security and standards of living. A rural knowledge centre has been established in Idinthakarai on a demonstration basis, in association with the village Panchayats. The space, running cost and the volunteers managing the centres are being provided by the Panchayat. More than 50 women volunteers received training in location-specific data collection, database development and knowledge dissemination and computer literacy. An in-depth analysis of the needs and likely impact of this centre is being undertaken by the volunteers to decide on the contents of the databases as well as the sustainability of these knowledge centres.

Sub Programme Area 103

Promoting Alternative Options for Livelihood Security in the Gulf of Mannar Region

The project on promoting alternative livelihoods in the Gulf of Mannar Biosphere Reserve region aims at technological and economic empowerment of the poor fisherwomen and men to reduce over-exploitation of the bioresources of the Gulf of Mannar. This project has two components:

Component 1 : Promoting and strengthening Self help groups and land-based alternative income generation activities

The objectives of this component are:

- organising and strengthening about 750 self help groups for women
- promoting land based income generation activities such as charcoal making, coir production and dairy farming among the members of the Self help groups and
- renovating 17 freshwater tanks located near the Gulf of Mannar to improve income from agriculture-based activities.

This component is sub-contracted to DHAN Foundation, Madurai, for implementation.

Component 2: Promoting livelihood security through mariculture activities and establishing Village Knowledge Centres

This component aims at:

- assessing possibilities of providing sustainable livelihoods through marine-based activities

- establishing linkages between village level institutions and technical institutions for technology transfer, marketing and processing
- establishing Village Knowledge Centres in the villages where this sub-project is being implemented. MSSRF is directly implementing this project since April 2001.

Approach : The project is implemented in a participatory mode, in which village level institutions are the nodal centres. Technical institutions such as the Central Marine Fisheries Research Institute (CMFRI) of Mandapam and local NGOs like Chevaliar J L P Roche Society, Tuticorin and National

Union of Fishermen, Nagercoil are partners. The approach given in Figure 1.1 is followed in the implementation of Component 2.

Mariculture activities selected for demonstration: Consultations were held with local communities, research institutions and private entrepreneurs and four mariculture activities were selected. Table 1.8 gives details of the mariculture programmes.

103.1 Establishing a Community-owned Agar Plant

Agar is a colloidal substance extracted from red seaweed, which is available in plenty in the Gulf of Mannar region. It is a necessary component in many food, pharmaceutical

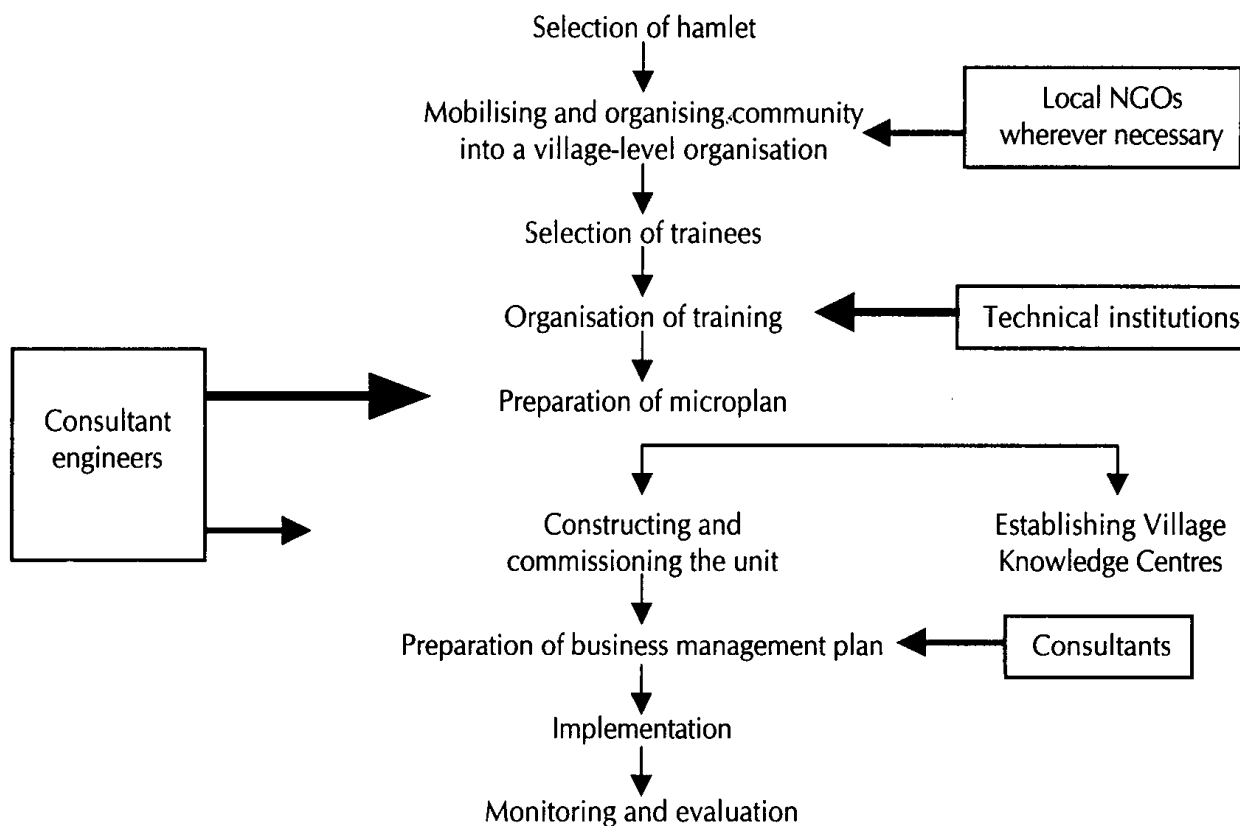


Figure 1.1 : Approach followed in the implementation of the project at Gulf of Mannar

Table 1.8 : *List of selected mariculture activities, villages and training institutions in the Gulf of Mannar Region*

Name of the activity	Village	Region	Institutions involved
Agar plant	Kunjarvalasai	Mandapam	CMFRI
Fish pickle unit	Vellapatti	Tuticorin	Navam Fish Pickle Unit, Nagercoil
Artificial reef	Therespuram	Tuticorin	CMFRI
Pearl culture	Mundalmunai	Mandapam	CMFRI

and biotechnological industries. The annual requirement of agar in India is about 450 tonnes, of which only 150 tonnes are produced domestically. The harvestable quantity of seaweed available in the Gulf of Mannar is about 6,000 tonnes per year, from which about 720 tonnes of agar can be produced. Agar production could, thus, be a viable employment-generation activity in the Gulf of Mannar area.

Process involved in agar production : Seaweed collected from the coastal waters is sun-dried thoroughly and then cleaned and softened in an agitator. The softened seaweed is then boiled in steam in a digester. The steam is produced from a baby boiler. During digestion, agar oozes out from the seaweed and mixes with the water, thus forming agar gel. The solidified agar is then deep-frozen in a freezing plant to remove the water. After removal of water, agar is dried, packed and sold. The process indicates that skilled and semi-skilled labourers are needed to produce agar from seaweed.

Community mobilisation and organisation : This programme is being implemented in Kunjarvalasai village in the Mandapam

region. The United Village Development Society has been formed specifically for the agar plant. This society has a General Body with 95 men and 86 women members. It has elected an Executive Committee with a representative from MSSRF. The General Body of the society is the decision-making unit, which approves the plan of activity prepared by the Executive Committee. The society has its by-laws prepared jointly with the MSSRF and expert institutions. So far, the functioning of the society has been satisfactory. The society has a savings bank account in which funds are deposited, as per the business/microplan.

Construction of the building and fabrication of machinery : The building for the agar plant is now under construction on about 68 cents of non-agricultural land. It has a main building, office and seaweed storage house. The building complex has a rainwater harvesting system. It also has a small green belt and water used for seaweed cleaning is to be used to irrigate this green belt. An agar plant requires the following machinery: agitator, baby boiler, digester and freezing unit. These items are being fabricated by standard manufacturing companies. It is expected that the plant will soon be in operation.

103.2 Establishing a Community-based Fish Pickle Unit

Fish pickle is a value-added fishery by-product. A market survey conducted by the Department of Fisheries Economics, Fisheries College and Research Institute of the Tamil Nadu Veterinary and Animal Husbandry University indicates that fish pickle has a good market in inland towns if it is supplied regularly. Some NGOs and private entrepreneurs operate cottage-scale fish pickle units, but have been unable to produce pickle and supply it on a regular basis to traders. There are also complaints that in cottage-level fish pickling units, adequate standards of hygiene are not maintained. The indications are that if fish pickle is produced in small-scale industrial units under hygienic conditions, the product has potential as a successful business venture.

Process involved in fish pickle production : Fish pickle can be prepared from all non-fatty fish, edible oysters, prawns and crabs. However, fish pickle is more profitable than prawn and crab pickles because the cost of fish is much less. In fish pickling, fresh fish are first descaled, degilled and degutted and then hot-blanching for the removal of bones. Then the muscle is cubed and cooked with spices and condiments after which it is cured and packed in pasteurised bottles for marketing.

Community mobilisation and organisation : In the Vellapatti village where the fish pickle programme is being implemented, the Vellapatti Women Fish and Allied Products Producers Association has been formed with only fisherwomen as members.

The total number of members in the General Body is 199 and the Executive Committee has 16 members among whom representation has been given to MSSRF, Fisheries Department of Tamil Nadu and two local NGOs namely, JLP Roche Victoria Memorial Society and Tamil Nadu Multipurpose Social Service Society of Tuticorin. The functioning of the society is outstanding, both in terms of process adopted in decision-making as well as in taking responsibility. This Association is registered under the Tamil Nadu Societies Registration Act 1975. All the funds relating to establishing the fish pickle unit are routed through this Association.

Construction of the building : The building unit is currently being constructed on about 12 cents of non-agricultural land. It is about 1,400 sq ft in area with separate rooms for fish storage, pre-processing, cooking, curing and packing and has a rainwater harvesting system. The fish pickle unit will become operational in 2002.

103.3 Artificial Reef

Artificial reefs are man-made structures deployed in the sea to increase the hard-bottom habitat available to marine organisms. In the past, scrap materials were normally used to develop artificial reefs, but because durable scrap material is not easily available and also leads to pollution, specifically designed and constructed concrete structures are now used for the purpose. The holes, crevices, vertical relief and ledges of the artificial reef structures create a complex habitat for marine organisms. Artificial reefs are constructed for the following purposes:

- To provide habitat or shelter for fish and other marine organisms
- To provide substrata or bases on which corals may form new colonies and on which other marine organisms can grow anew
- To serve as a feeding, breeding and nursery area
- To act as a deterrent to bottom-trawling
- To help create fishing grounds

In the Gulf of Mannar area, fish production is declining because of over-exploitation and habitat degradation. Coral mining and bottom-trawling are two typical examples of practices that degrade fish habitats severely. The artificial reef programme attempts to increase, on an experimental basis, the fish habitat by deploying specifically designed concrete modules and by monitoring them continuously to assess their effectiveness as tools to increase fish production.

Community mobilisation : The artificial reef programme is being implemented in Therespuram, a suburban area of Tuticorin town. Therespuram has a total population of 10,011. Almost all the working males of the village are engaged in fishing and some of the women are involved in fish trading. A total number of 15 fishers' associations (13 fishermen's associations and 2 fisherwomen's associations) and 5 local NGOs exist in this village. Since these associations cover different strata and castes of fish workers, a society with representatives from these associations constitutes the General Body. The Therespuram Artificial Reef Society also has an Executive Committee, with representatives

from MSSRF and the Fisheries Department of the Government of Tamil Nadu. The functioning of the society is unsatisfactory and steps are being taken to motivate the society members through awareness and other programmes.

Selected artificial reef modules : On the basis of discussions held with members of the society and scientists from the Tuticorin Regional Centre of the Central Marine Fisheries Research Institute (CMFRI), four modules were selected for use in the artificial reef programme (as seen in the back cover). One module is to provide breeding grounds for a commercially important fish called groupers, whose population has declined drastically in recent years due to the loss of habitats. Another module is specifically selected to provide shelter and feeding grounds for lobsters, which are commercially very important. The other two modules are general ones, which provide feeding and breeding grounds for a variety of small fish. The surface of all these modules is rough, so that sessile organisms like corals and oysters can find niches for attachment and growth.

Plan of deployment : These modules will be deployed in an area identified by the local fishing community and located about 12 km from Therespuram. The seafloor was surveyed to collect baseline information. The survey was conducted with the participation of the local community and scientists from the CMFRI. Underwater photography showed that the site is barren, with a few bottom-dwellers like star fish and sea urchins. A total number of 400 modules, 100 of each design, will be deployed. They will be arranged in a circle and cover an area of about 1 sq km. The artificial reef modules will be deployed in September 2002. The site is on the north-

eastern side of the *Van Thivu* (Van Island) and the coral reef associated with this is almost completely mined.

Construction of the modules : Three major problems were encountered in the construction of the concrete modules :

- there were no design and construction engineers or companies in the locality who had experience in constructing the modules
- there are no estimates of the material requirements and costs of construction of each module and
- it was not known how long the construction of all the modules would take.

In order to solve these problems, a local engineer was hired and one model version of each module was constructed under the supervision of the project staff, scientists from the CMFRI and members of the Therespuram Artificial Reef Society. On the basis of the experience gained, three construction engineering groups identified by the society were given one-day training. Orders will be placed with these groups by the society after finalizing issues related to costs and time schedules.

103.4 Pearl Culture

A pearl oyster feeds on minute organisms by filtering seawater. While filtering seawater, some foreign particles, for example, sand granules, enter into the tissue of the pearl oyster. These foreign particles cause irritation to its body tissue. In order to assuage this irritation, a pearl oyster secretes a shiny substance around these particles. These shiny substances around hard nuclei are called pearls.

Development of a new approach for community based pearl culture programme :

Pearl oysters can be induced to produce pearls by inserting nuclei and cultivating these nuclei-implanted oysters in the sea. Pearls are harvested after 8 to 10 months. However, since harvesting of mother pearl oysters from the natural oyster bed is banned, mother oysters have to be produced in a hatchery. Pearl culture thus involves three steps:

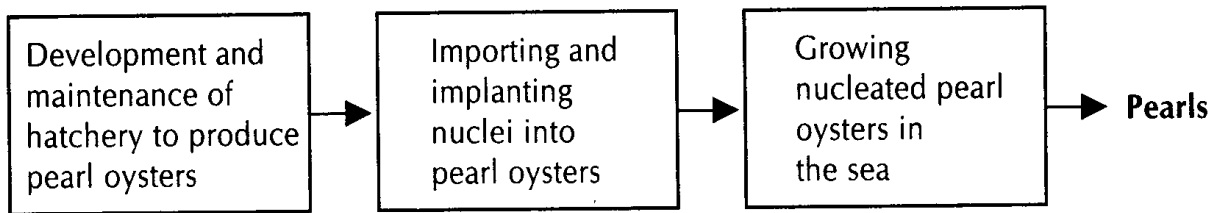
- Production of mother pearl oysters in a hatchery
- Implanting nuclei in mother pearl oysters following a surgical procedure
- Growing out nuclei-implanted mother-pearl oysters in the sea.

Some previous attempts at pearl culture on a commercial scale failed because private entrepreneurs were unable to undertake these activities, as they require high levels of scientific skills.

To overcome the problems and to create income-generation opportunities for the local people, a new scheme has been worked out in consultation with CMFRI. The scientific and technical staff of CMFRI will produce mother-oysters in their hatcheries and implant them with nuclei, while members of the local community will grow the nucleated pearl oysters in the sea (Figure 1.2).

Community mobilisation and organisation : Mundalmunai, a hamlet of Pamban Panchayat, has been selected as the location for the pearl culture programme. This hamlet is located near Krusadai island, where the Tamil Nadu Fisheries Development Corporation of the Tamil Nadu Fisheries

Old approach – private entrepreneurs had to carry out all the following activities by themselves :



New approach– Local fishers only grow the implanted oysters in the sea

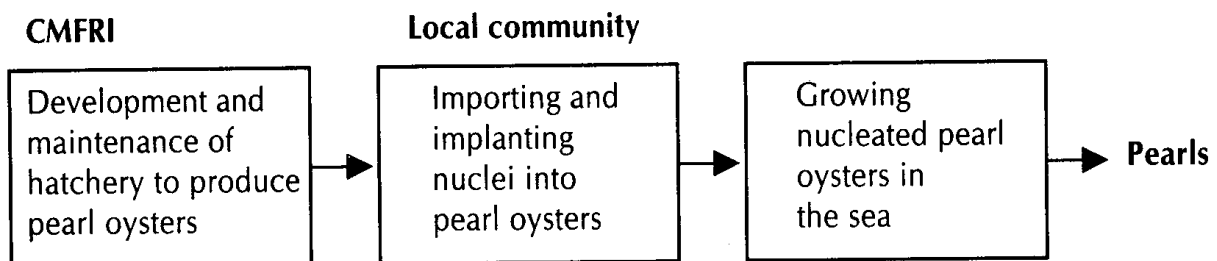


Figure 1.2 : **Old and new approaches to introduce pearl culture as an income generation activity**

Department has already started work in the field of pearl culture. The Central Marine Fisheries Research Institute has suggested this site. Organisational work and community-based work have begun recently. A Memorandum of Understanding has been signed with the Central Marine Fisheries Research Institute to supply nucleated pearl oysters.

103.5 Training

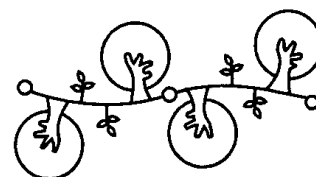
Agar production : Two batches from the village communities have been trained in agar production. In the first batch, 15 women from Chinnapalam were trained and in the second batch, 10 persons from the United Village Development Society of Kunjarvalasai. The Central Marine Fisheries Research Institute, Regional Centre, Mandapam conducted the training courses at its agar plant.

Fish pickling : Ten members of the Vellapatti Women Fish and Allied Products Producers Association and one man from the village received training in fish pickling.

The training was given in the fish pickle unit of a local NGO namely, NAVAM Fish Pickle Unit, Nagercoil, which is in the business of fish pickling for the last 10 years. The duration of the training was 25 days and it was organised as a residential programme.

Artificial reef

A five-day training course on artificial reefs was organised for 15 members of the Therespuram Artificial Reef Society. It was conducted in the Central Marine Fisheries Research Institute, Tuticorin.



Biodiversity and Biotechnology

The community biodiversity conservation movement was further strengthened in Tamil Nadu, Kerala and Orissa by linking conservation and commercialisation in a mutually reinforcing manner, thereby creating an economic stake in conservation. With support from SDC, the inter-related goals of biodiversity conservation, natural resources management and poverty alleviation were linked together in the form of an integrated field action programme. Work on molecular mapping and genetic enhancement also made substantial progress resulting in the transfer of genes for salt water tolerance from a mangrove species to rice. Work on the identification of microorganisms adapted to saline niche also made much progress. A Lichen Atlas is nearing completion.

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Sub Programme Area 201

Community Based Agro-Biodiversity Conservation and Management

One of the focal areas of the Foundation activities, this programme is supported by the Swiss Agency for Development and Co-operation (SDC), the Summit Foundation, USA, and the Ford Foundation. The three project sites where it is in operation are Kolli Hills of Namakkal district in Tamil Nadu, Wayanad district in Kerala and Jeypore tract in Orissa. It is coordinated from Chennai.

201.1 Conservation Traditions: Chroni- cling and Revitalisation

The second phase of the SDC supported project Biodiversity Conservation, Integrated Natural Resources Management and Poverty Reduction commenced on 1 April 2001 and will continue until 31 March 2006. The project aims to promote biodiversity conservation as an effective instrument of Natural Resource Management (NRM) and Poverty Reduction. The current phase of the project has been placed within the broader context of natural resources and multiple dimensions of biodiversity. It has been so structured that it furthers the gains made by the first phase of the project and has the following objectives:

- to develop innovative approaches that effectively link biodiversity conservation and enhancement with improvement of the livelihoods of the rural poor through

a Natural Resources Management approach

- to increase the capacities related to biodiversity management at various levels (farmers, local communities, NGOs, Government agencies and policy makers) and work towards improving the policy/legal and institutional framework for biodiversity management at the national level as well as through State-level travelling workshops organised at the three sites.

The principal approaches of the project include

Enhancing income and creating an economic stake in conservation to address poverty reduction

Promoting community food security systems through Field Gene Banks, Seed Banks, Water Banks and Grain Banks to improve *in situ* on farm conservation practices among them

Forming Community Agro-biodiversity Corps trained in giving constant attention to conservation, sustainable use and equitable sharing of benefits

Influencing public policy and action.

201.1.1 Kolli Hills

In situ on-farm conservation continues to be one of the major activities.

Minor millets seed multiplication: One acre of rainfed land was leased in the Kolli Hills for raising a crop of various varieties of minor millets, followed by a second crop of

coriander and beans to meet the shortage of quality seeds. Three acres of irrigated land was leased in Kondichettipatti village near Namakkal for multiplying seeds of minor millets. These were cultivated using organic inputs and will be used for meeting the needs of cultivators. A total of 2,261 kg of seeds was produced, of which 1,567 kg was little millets (*Panicum sumatrense*), 448 kg was Italian Millet (*Setaria italica*) and 246 kg was *Varagu* (*Paspallum scrobiculatum*) seeds.

Community seed bank: Six women belonging to SHGs manage the community seed storage structures in three villages, used for storing seeds of minor millets as well as seeds of other varieties that the local tribals require. The seeds, with additional material provided by MSSRF, were distributed only to the local needy people. A seed exchange register is maintained to keep track of the inflow and outflow of seeds from the community seed banks and ensure supply of quality seed. Tribal farmers borrowing seeds are expected to return twice the quantity of seeds borrowed from the bank. Two new community seed banks have been initiated in Arippalapatti village. Members belonging to SHGs have constructed the Community Seed Banks, using locally available material and inputs. Packets of surplus seeds of one kg each, are distributed to needy farmers visiting the weekly *shandies* at Solakkadu, Thēnpulam and Manapparai villages in the Kolli Hills. The seed exchange system was explained to those borrowing the seeds and their signatures recorded in seed exchange registers. A total of 1,350 kg of minor millets seeds was distributed to the local people by SHG members during *Aadi* festival in the Kolli Hills.

Minor millets seed exchange is going on in the plains of Namakkal as well. Seeds of minor millets were distributed in the locality through local *shandies* and farmers' market (*Uzhavar sandhai*) and on local festivals. The seeds are stored in a seed shop in Namakkal town. Local farmers are encouraged to borrow the seeds after understanding the seed exchange system and signing the borrowers' register maintained at the shop. A total of 428 kg of seeds has been distributed (*Karum Samai* 168 kg; *Malliya Samai* 57 kg; *Sen Thinai* 186 kg and *Paalan Thinai* 17 kg). The SHGs formed by other NGOs in Namakkal also showed interest in the system. SHG meetings have been used for distributing seeds of minor millets. A total of 2.4 tons of minor millets seeds was distributed this year, out of which 1,389 kg was Little Millet seeds, 987 kg was Italian Millet and 24 kg was *Varagu*. 258 men and 218 women have borrowed seeds through this system.

Community grain bank: The project activities kindled the interest of the Project Officer, District Rural Development Agency (DRDA) and the District Collector, who suggested that a Community Grain Bank be established in one of the villages in Kolli Hills. SHGs, MSSRF and several government agencies entered into a MoU to form and execute the community grain bank. Members of the community have contributed money and bought the land in the name of the group and a grain bank will be established soon.

Capacity building and networking: Members belonging to self help groups, minor millets growers and students participated in capacity building and training activities. Of the total number of 608 trainee days 243 were

for men and 365 for women. The topics included community seed bank, community grain bank, traditional seed exchange system, rain water harvesting, soil conservation, minor millets-cum-paddy mill, marketing of millets, value added products from millets, socio-economic data, low cost green house, vermicompost, kitchen garden models, SHGs and accounts keeping.

M S Swaminathan Nature Club: The Neduvalampatti SHG has a tie-up with the MSS Nature Club at the Semmedu School. The SHG and Nature Club have created a model Hill Banana plot in the school premises. As per the MoU between the SHG and MSSNC, the benefits of the sales will be shared by the club and SHG. Out of 150 banana trees, 100 are yet to yield; fruits from the others have been sold and money deposited in a bank account. As banana wilt disease has affected the growth severely, biocontrol measures are being taken.

A medicinal plant nursery using a low cost mist chamber was set up in the school premises, where two hundred saplings belonging to six species of medicinal plants are being cultivated through the active participation of nature club members. A vermicompost model has also been established. These models have been created here to spread information on agro-biodiversity to the students.

Minor millets local marketing: To enhance the consumption of traditional grains and also to revitalise the cultivation of minor millets, market linkages were established. A steady local demand and value addition will fetch a profit of three rupees on an investment of five rupees. Towards this end, a sum of Rs.5,000 was given to each SHG as an interest free

loan. A MoU was signed between MSSRF and SHGs. Seven important and location-specific outlets in Namakkal and Kolli Hills are used for selling the products. Meetings of NGOs, SHGs and Tamil Nadu Women's Development Corporation's (TNWDC) Block Level Coordination Committee are used for selling these products. The SHG members sell these products in weekly shandies as well. So far, three SHGs have invested Rs 9,000 and bought 1,800 kg of minor millets. They were dehusked in the sangha mill, cleaned, packeted and sold in the outlets. The business transaction was roughly Rs.18,000. This year too a MoU was signed between SHGs and other organisations such as TRIFED to sell minor millets. The SHGs were given advance money to procure minor millets and sell them to TRIFED. They sold 9.1 tons of raw minor millets to TRIFED. The groups did business worth Rs.50,000. This year's major highlight is the establishment of external market linkages with Food World Super Market chain for minor millets, thereby increasing the income of the rural poor. The impact of this exercise will be seen in the coming year.

Monitoring of minor millets-cum-paddy dehusking mill: The mill jointly owned and run by Chinnamangalam SHG is doing well. Around 1,200 kg of minor millets were consumed locally due to the operation of the mill. Similar mini mills have been set up in Kolli Hills.

201.1.2 Wayanad

This year witnessed the dedication of a fine building complex and other infrastructure of the Community Agro-biodiversity Centre (CAbC) by the Hon'ble Chief Minister of

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Kerala, Mr A K Antony. The Centre continued its pioneering community-oriented work in agro-biodiversity conservation with special emphasis on integrated natural resource management and poverty reduction. A new programme on environmental and biodiversity education has been launched to test, adapt and transfer appropriate education methods by combining information technologies with conventional field-oriented nature study programmes. The focus was on grouping the activities into research themes and developmental priorities, based on expected benefits to farmers in terms of economic development, conservation and sustainable utilisation of natural resources and biodiversity. Activities of the Centre were prioritised, resulting in the identification of the following areas for concentration:

- Biodiversity Conservation, Integrated Natural Resource Management and Poverty Reduction
- Conservation and Sustainable Use of Medicinal Plants
- Study on Gender and Wild Food Management
- Developing Low External Input Sustainable Agriculture Farms
- Biodiversity Education & Training to children
- Saving Endangered Plant Species.

To begin with, problems and constraints in achieving the research themes of the programmes were identified and recorded. The summary of the activities and results achieved during the year are given in Table 2.1.

Table 2.1 : *Achievements during the year*

Activity	Result
Increasing the profit from paddy cultivation by selecting some key varieties	Increase in the area of paddy cultivation and more economic profit
Protecting the existing traditional rice varieties	Protection of 20 traditional on-farm varieties
Encouraging multi-crop systems with emphasis on food crops	Increase in the cultivation of food crops
Testing and adapting vermi and biocompost units, and rainwater conservation methods	Frequent training in vermicomposting
Preparation and maintenance of Biodiversity Registers	Community Biodiversity Registers for two Grama Panchayats
Educating SHGs to produce and market value-added products	Emergence of 53 SHGs; internal loan amount transaction increased to Rs. 2 lakh*
Enhancing the capacity of communities to negotiate with the government	Emergence of a powerful committee of key stakeholders in agriculture
Preserving thickets/groves in and around the lowland agro-ecosystems	Protection of thickets & groves in the demo villages

Biodiversity Conservation, Integrated Natural Resource Management & Poverty Reduction: In April 2001, the second phase of the SDC project was launched in cooperation with some of the resource poor NGOs and Grama Panchayat bodies of the district. The activities of this phase were aimed not only at promoting the idea of sustainable use of biodiversity and natural resources, but also establishing a strong link between such concerns and the development needs of local communities. The focus was on developing new methodologies for involving stakeholders in the decision-making process, in the integration of natural resource management, conservation of biodiversity and poverty reduction through increasing cooperation

among them. The constraints in achieving the objectives were identified as: *low income, inadequate food, inadequate employment opportunities; poor ecological security; high run of water; polluted water; inadequate drinking water; high incidence of pest attacks; low yield and poor marketing facilities.* These constraints were then analysed systematically, using the constraint tree approach and starting from the core problem. Direct and substantive causes were deduced and placed in a flow chart. As an example the problem tree for the problem "inadequate food" is illustrated in Figure.2.1. This analysis has helped in identifying the critical entry points for research and development interventions as shown in Table 2.1.

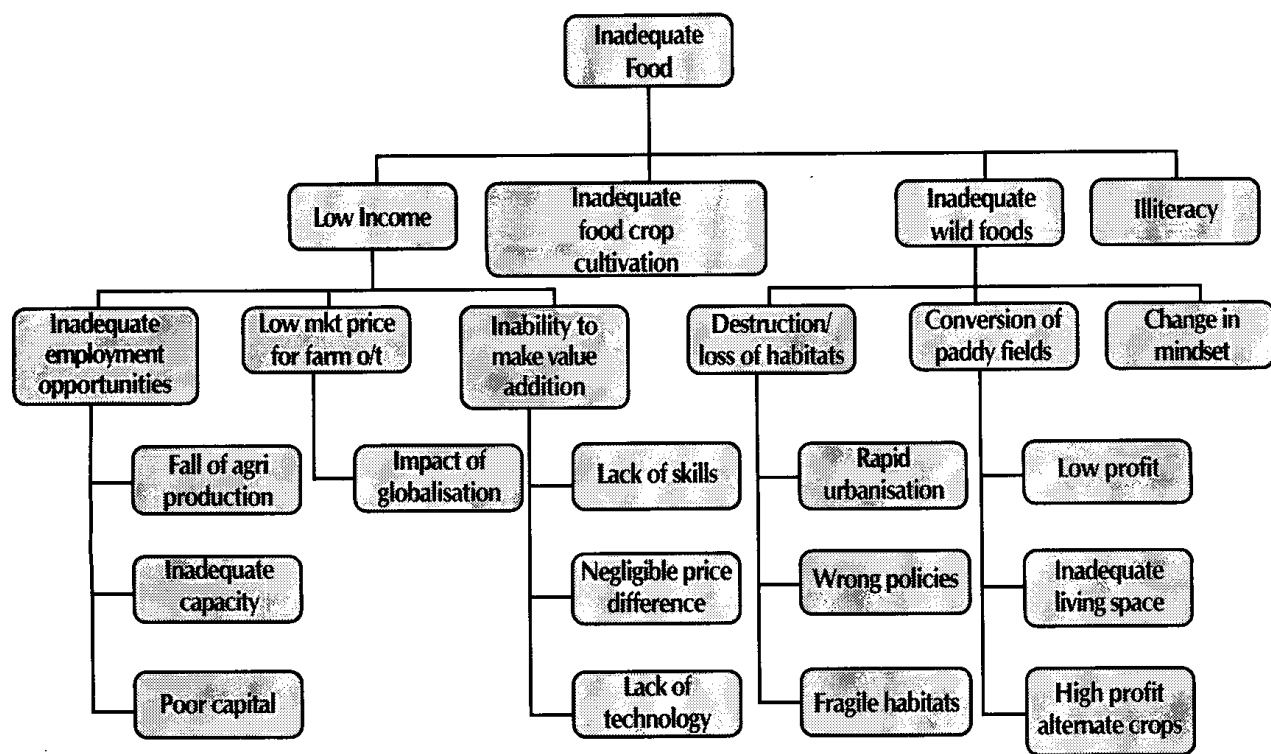


Figure 2.1 : *Problem tree of inadequate food*

Conservation and sustainable use of medicinal plants: The project "Biohealth Programme for Conservation and Sustainable Use of Medicinal Plants" entered its most productive phase during the year. The development of health care products and conservation of medicinal plants by involving trained women self help group members and conservation experts continued. This initiative, which started in 1997, is still in operation and so far more than 500 women have been trained. The elements that make this programme sustainable are: interest and commitment of women SHG members; potential of this programme to secure income and health; availability of a large number of medicinal plants in the area; excellent conditions for cultivation of medicinal plants and interest of the local Panchayat bodies to use this as a tool to mobilise self-sustaining programmes in terms of economic returns. The project activities focused on the following research and developmental themes:

- Medicinal plant conservation and sustainable use
- Training for the preparation of healthcare products
- Market facilitation for income generation
- Medicinal plant knowledge documentation

One of the health care products named *Navadhanya mixture* has been introduced in the market with the help of IFARM. The product is being sold in a big way in and around the district. Other formulations that are in demand are products related to women's diseases, memory enhancing, cosmetics and quick wound healing. The major impact of

this programme is reduction in the expenditure towards healthcare needs among at least 500 families in the district. In addition several families that are directly involved in the programme earn a marginal income from the sale of healthcare products. The earnings of the trainees during the project tenure through this enterprise ranged between Rs.5,000 and Rs. 1,50,000 and many of the groups are earning a good income.

Medicinal plants collected during the year are being preserved in live conditions and multiplied. A nursery has been raised for all important plants used in primary health care. This is meant for establishing community medicinal plant gardens in order to transfer knowledge at the local level, without much ambiguity in the identification of plant species and their uses in various systems. Such gardens also contribute to the conservation of some of the rare and endangered plants.

Developing Low External Input Sustainable Agricultural (LEISA) Farms: The profit motive has resulted in the low productivity of the land. A great majority of poor farmers in the district operate under this limitation and face several other constraints such as extremely limited capital resource base, traditional mode of agricultural production, illiteracy and abundance of family labour. The crop diversity, which was rich until the recent past, has now been reduced to a handful of high fertiliser/pesticide intensive cash crops. In order to address these problems, the concept of integrated farming based on LEISA was taken up during the year and is being tested in the form of CA&C. The activities taken up are: training, education and awareness programmes for farmers on various aspects

of sustainable and organic farming methods; capacitybuilding to use technologies like bio and vermicomposting, mushroom cultivation and honey production for crop management and income generation; diversification and integration of crops by giving importance to food crops. The results of this programme are summarized below:

- A three-month farm radio programme titled, "Sustainable Agriculture for Food Security" was broadcast in collaboration with All India Radio (AIR), Calicut, through all its stations in Kerala. It had a good impact among farmers as evidenced by the number of letters the Centre received, requesting guidance and support in sustainable and organic farming.
- Several training programmes were held on vermicomposting and biocomposting methods. Of the 60 farmers who participated, 50 were provided with *earthworm nucleus culture* to start vermicomposting trials in their respective fields.
- One acre of the CAbC farm is being developed as an integrated farm with a number of component crops like cardamom, black pepper, fruit trees like jack and mango, medicinal plants, vegetable crops, fish pond etc. Three vermicompost production tanks were constructed in the farm for earthworm multiplication.
- An experimental trial cultivation of pepper and Ceylon cassia has been started in the farm in association with Indian Institute of Spices Research (IISR), Calicut.

- A village has been identified and the socio-economic survey has been completed with the aim of disseminating the concept.

M K Ananthasivan Knowledge Centre for Education & Training of Children: Funded by the Department of Biotechnology (DBT), a programme titled "Education of Tribal & Rural Youth for Bioresources Conservation & Sustainable & Equitable Use, with special reference to Medicinal Plant Heritage of Kerala" was launched. This project is aimed at improving the quality of student learning through computer-aided instruction as well as video and audio-visual aids. In this context, linking non-traditional subjects such as information technology and biodiversity provides a superb setting for the youth and children to gain knowledge and understanding of nature and the importance of sustainability. It is believed that over a period of three to four years, the trained students and youth under this programme will form a Bioresource Conservation and Development Corps (BCDC). The objectives and activities of this programme are: to support the emergence of *Bioresources Conservation and Development Corps* and *Conservation Gardens* in tribal hamlets and schools; educate youth, students, school dropouts, the neo-literates, teachers and parents on the importance and value of biological resources, giving emphasis to medicinal plants and associated knowledge systems; develop computerised information on medicinal plants, endangered plants, wild food plants etc. and human health-related issues and other socially and ecologically relevant demand-driven information; link bioresources utilisation and biodiversity conservation through interactive

learning and teaching; train youth and students in plant identification and herbarium techniques in order to enhance their skill in inventorying bioresources; support students and youth to conduct awareness raising campaigns, seminars, workshops and field visits and engage trained students and youth in media work and documentation of case studies on bioresources conservation. Progress has been made in developing a curriculum, selecting children and resource persons and setting up the entire infrastructure.

Capacitybuilding and Networking: Training and Capacitybuilding programmes undertaken at Wayanad are summarised in Table 2.2.

A workshop on "Conservation of Paddy Land Ecosystem" was conducted for 13 representatives from 8 NGOs of Wayanad district. PRAs were conducted in selected villages for undertaking NRM and paddy field conservation activities. Another major outcome is the taking over of PBR activities by the Panchayats.

201.1.3 Jeypore Tract

Biodiversity conservation and income generation activities in the region were further strengthened.

Community Seed Bank and Village Grain Bank: Different types of seeds and grains

Table 2.2 : *Training and capacitybuilding programmes*

Training programmes	Target groups/ numbers
Preparation of PBRs of Thariodu and Pozhuthana Gram Panchayat	Volunteers Ward Resource persons from the Panchayats
Microenterprises Management	SHG Leaders
Conservation of Biodiversity : Role of Grassroot Level Organisations	19 Preraks of Literary Mission
Resource Mapping	8 representatives from the Panchayats
Nursery Techniques	SHG members
Social Forestry (Forestry Clubs in Schools)	30 students
Nature Club Formation	Students from Pozhuthana Panchayat
Forestry Club Formation	100 students from St.Joseph High School
Training of PBR Volunteers	75 volunteers from Pozhuthana Panchayat
Vermicomposting	13 members from Keerthi SHGs
Mushroom Cultivation	Thulasi, Sneha and Nithya SHGs
Bee-keeping	Farmers, women and youth
Leadership Development/ Account-keeping	Leaders of various SHGs
Vegetable Cultivation	12 SHGs of Padinjarethara

from the village were stored by the community in a common place and utilised according to their needs under the supervision of a management committee. The activity which has been in practice for the last three years is being taken up by other NGOs. As part of this effort, grain banks and seed banks are being maintained in the villages of Boliguda, Mohuli, Patraput, Pujariput and Tolla.

The Field Gene Bank now contains 17 upland, 25 medium land and 45 lowland varieties. There are some constraints faced by the seed and grain banks: returning of other seed varieties rather than the ones borrowed; mixing up of grains and seeds of different varieties and availability of very small quantities of seeds of different crops. However, efforts are being made to overcome these constraints. Landless people of the village are contributing grains to the village grain bank. The Government of Orissa has linked the seed and grain banks and integrated these into their programmes. The system has helped in inter-village seed exchange systems, helping farm families to access pure seeds of their choice every season.

Formation, training and strengthening of SHG networks: Jeypore tract is facing a unique economic and ecological crisis as the continued dependence of indigenous tribal population on natural resources (chiefly land, forest, water and vegetation) is leading to acute poverty and unsustainable livelihoods. The major problems listed by the people in a series of PRAs conducted in the village included poverty, unemployment, natural calamities, food scarcity, small land holdings, inadequate crop yields, shortage of agricultural inputs and poor marketing of

produce. It is understood that the continued dependence on depleting natural resources and declining agricultural production requires innovative approaches that can link conservation of the biodiversity of the region with enhancement of livelihoods.

A series of activities were initiated through SHGs to provide viable alternatives for economic well-being and livelihood sustenance, keeping in mind the ecological fragility of the region. They include the following:

Horticultural activities: In highland and wasteland regions, where crop production is unsatisfactory, horticultural activities such as cultivation of vegetables, fruits, medicinal plants and seasonal flowers during the rainy season can be a viable alternative to generate income. Some horticultural activities were undertaken in the demonstration villages. Vegetable seeds of selected varieties were given as loan in Tolla, Boliguda, Mohuli, Pujariput and Patraput villages. They were cultivated both on an individual and collective bases.

Poultry farming: In Patraput a group of 16 farm families were keen to start a poultry farm. They formed a SHG named *Bamanadei*, and constructed a farmhouse with bricks covered with thatch. A financial assistance of Rs.18,000 was provided as a revolving loan for a stipulated time towards purchase of essential materials and construction of the farmhouse. Bad weather, low temperature and insufficient electrification (hired from another house) led to the sudden death of 200 out of the 500 chicks. The villagers pursued the activity and saved the other chicks. In spite of the setback, the activity provided a platform

for income generation. It has created an enormous impact on individual farm families, some of whom have undertaken the activity independently.

Watershed management: Watershed development was undertaken in Tolla. The village boundary consists of hills and degraded forests. PRA conducted in the village revealed that during heavy rain, the water rushes down from the hills with sand, which is deposited in the fields leading to crop and productivity losses. Every year 8-12 acres of good land is lost as a result. At the CVC meetings members decided to construct a new water harvesting structure and repair old structures. Accordingly a plan was developed by which every household contributed labour. To ensure participation, a fine was imposed on members who did not attend the meeting. A total of five check dams was constructed after observing the flow of water. The edges of the check dams were planted with grass and tree seedlings to bind and conserve the topsoil. A percolation pond was dug adjacent to the last check dam. Cement worth Rs. 750 was provided for the construction of the check dam spillway.

Fish farming: The activity commenced in the month of June 2001. A dam to check flowing rainwater and a pond were constructed in Tolla. Every household in the village contributed labour to complete the project. A conservative assessment of the cost of labour involved in the construction is Rs.1,67,000. The CVC decided to undertake fish farming as an additional activity.

Villagers mixed fresh cow dung and lime to enhance the growth of phytoplankton before

releasing fingerlings into the pond. A total of 16,000 fingerlings costing Rs.1,500 and Rs.3,500 for the construction of the spillway was provided as a loan, and later recovered from the villagers. Similarly at Baliguda village, Rs.2,000 and Rs.3,000 were provided for preparing 3 kg of fish fry and spillway construction respectively. The varieties are *Rohu, China Rohu, Mirkal, Bhakura and Kalabanisi*.

The CVC formed a management committee consisting of male and female members. It was decided that one person would collect husk from every household to feed the fingerlings. Women would collect fresh cow dung and mix it in the ponds. During the rainy season, villagers had to keep watch on the pond in turns. The villagers were unable to provide sufficient feed and hence growth of the fishes was very slow. At Baliguda village, the water level of the pond came down, leading to low survival of fishes. The growth of phytoplankton was very slow, making it difficult for fishes to survive.

Capacitybuilding and networking

Efforts at capacity building and networking continued.

Manual and database on tribal medicinal practitioners of Jeypore: Jeypore lies in the Eastern Ghats, and is known for its rich diversity in medicinal plants, several of which are endemic. The tribal population possessing knowledge of several useful plants, accumulated and enriched through generations, is now waning. Moreover, this knowledge is passed on from one generation to another without any written documentation. It is therefore important that before this rich

unwritten folklore on uses of plant resources is lost, it is properly documented and preserved. Establishment of databases is one of the ways in which this can be achieved. A workshop was held at Jeypore on tribal healthcare practitioners with the purpose of documenting their traditional knowledge, in which 63 tribal medicinal practitioners from the KBK districts participated. The data has now been translated from Oriya into English and is in the process of collation. It is proposed to publish a manual in Oriya and English and establish a database for wider dissemination. It is intended to provide detailed information on the tribe, specialisation in curing of diseases, plant species used, its distribution and status, parts used and the method of extraction of medicines.

Exploratory workshop on biodiversity conservation and poverty alleviation in Kalahandi, Bolangir and Koraput (KBK) districts: In this workshop, held in August 2001, a total of 74 participants, 61 representing various Government Departments, NGOs, Universities and Journalists, and 13 MSSRF staff, took part. The participants identified key areas of current concern to the KBK districts such as land settlement issues and soil conservation, water harvesting structures, poverty alleviation, agronomic practices, infrastructure development, communication, awareness and networking. Five working groups were formed, which discussed and identified the problems and attempted to determine suitable implementable solutions. An exhibition of the activities taken up at Jeypore tract by MSSRF was also arranged at the venue.

Other workshops conducted in the Jeypore site include Block level farmers' workshop on germplasm collection and documentation, involving 100 farm families, Workshop on sustainable development and appropriate technology (45 farmers) and State level workshop and farmers' meet on spices production and marketing (70 participants: mixed groups).

Formation of apex body

Based on the understanding that some people in the villages are not able to comprehend the activities being taken up, an apex body was formed to explain the activities undertaken and solve the problems related to the CVC. It was envisaged that the apex body would play an active role and conduct monthly meetings of the CVCs of all the villages, represented by 3 male and 3 female members; select a President, Vice President, Secretary and Asst Secretary for holding office for a period of one year and send members who are effective communicators to explain the activities, solve the problems and implement the decision taken by the CVC. Further, it will decide on the work to be taken up, estimate the expenditure and inform the CVCs regarding training, workshops, exhibitions and exposure visits from other organisations.

The list of exposure visits, exhibitions and training programmes that were carried out in Jeypore is given in Table 2.3.

Table 2.3 : *Activities carried out in Jeypore*

Programme	Target Group
Exposure visit to Central Forest Nursery, Jeypore, Koraput	Farm families
Exposure visit to Regional Research for Transfer of Technology Station (RRTTS), Semilguda, Koraput	Farm families
Exposure visit to Gunduri and Labanyanagar Village Field Bank, Community Seed Bank and Village Grain Bank	Farm families
Exhibition during Utkal Diwas at Jeypore	Farmers
Exhibition during Parav 2002 (Annual Tribal Festival), Jeypore	Tribals and farmers
Exhibition at District Level Farmers' Meet at Semilguda, Koraput	Farmers
Programme on the role of community seed bank and its establishment	Farmers, local youth, local NGOs
Training in biofertilisers, green manure and quality seed production	Farmers
Training on identification of local issues and solutions	Farmers
Crossing techniques training programme	Village leaders, volunteers, local youth
Programme on improved method of paddy transplantation and related operations	Farmers
Training on horticulture and vegetable cultivation	Farmers
Training in poultry farming	Farm families

201.2 Participatory Plant Breeding (PPB) for Poverty Reduction among Tribal Poor

In tune with the broad objective of integrated natural resource management and sustainable use of natural resources leading to poverty reduction, the PPB programme set the following objectives:

- Consolidation of gains realised from the PPB activity under SDC Project (1998-2001)
- Initiating people-led participatory selection and breeding

- Shaping a new initiative to set up gene-seed-grain banks

The activity focused on selecting villages within a 10 km radius of MSSRF station, Jeypore, for economic operation, availing the help of NGOs willing to work with MSSRF to extend the cultivation of selected landraces to a few more villages, carrying out all experiments in a participatory mode in which farmers' capacity would be built on MSSRF technical input and monitoring and initiating pure line breeding from farmer-preferred LR x LR (LR: Landrace) crosses to improve productivity, while retaining farmer-desired traits.

Scientific identification of parent seeds confirmed by farmers, resulted in 3 crosses for community hybridisation and generation of F₁ seeds.

Interestingly the female parents are high yielding LR, selected earlier for large-scale cultivation during *Kharif* 2000, while the male parents possess traits complementary to those of the females.

Participatory hybridisation programme: The crossing programme was implemented in three villages chosen by the farmers. A team of young people with basic education, belonging to farming families, was identified and trained by the scientific staff in emasculation-pollination techniques. Scientists will monitor the programme on a participatory mode with the volunteers in charge of the hybridisation work in the selected villages.

Demonstration of optimal cultivation of rice landraces: The variable results of demonstrations laid during *Kharif* 2000 were explained to the farmers. Although the farmers had no objections to adopting formal

practices, they could not do so for a variety of reasons. Partial adoption of formal practices was the major reason for the variable performance of landraces across fields. The lesson learnt in the process is the need for better planning and organisation and more volunteers and scientific staff to vigilantly monitor farmers' cultivation. Yet farmers concurred that adoption of formal practices helped them to meet their own food needs and realize proportionate economic benefit from excess yield (Table 2.4). More farmers and 2 NGOs have joined the PPB farmers in large scale cultivation of identified LRs and agreed to work as extension links with other farmers of the respective villages. This activity will consolidate the gains of formal cultivation and gradually spread them across the tract.

Type of land	Female	Male
Upland	Paradhan	Mora
Medium Land	Sapuri	Gathia
Lowland	Kalajeera	Machhakanta

The market rate among locals for these grains is not less than Rs.10/kg.

Table 2.4 : *Yield advantage realised by some farmers by formal cultivation of LR in large areas, Jeypore*

LR	Name of the farmer	Land type	Area sown (sq.m)	Plot yield (kg)	Yield (kg/ha)
Sapuri	Sunadhar Katia	ML	1,633	961	5,883
Limbachudi	Trilochan Ghiuria	ML	1,321	590	4,466
Kalajeera	Dhanurjoy Pujari	LL	570	325	5,700 *
	Trilochan Ghiuria	LL	1,178	489	4,149
Barapanka	Jagannath Patnaik	LL	2,400	1,384	5,766 **

* Sold grains in the local market at Rs.10/kg

** Sold grains in the local market at Rs.12/kg.

LR - Land Race ML - Medium Land
LL - Low Land

PPB-led-PCS (Participatory Conservation): This activity was initiated to design a model of sustainable use-led-farmer conservation of tribal genetic resources. The design developed for PPB-cum-PCS will use large areas. Identified LRs will be grown with a set of border rows assigned to germplasm (GP).

Presently there is a need to confirm the identity of the GP and purify them in the field. This activity is planned through farmer-validation of the GP in the field with the help of farmers with high indigenous knowledge (IK).

Maintenance of germplasm involves not only periodic renewal of quality seed but also proper characterisation. Therefore a set of 9 quantitative descriptors – days to 50% flowering, seedling growth, tillering capacity, panicle density, plant canopy, synchrony of tillering, straw density, visual assessment of productivity and days to maturity – have been developed. They would be recorded on farmer-selected plants in each entry of the GP.

This activity will consolidate a paradigm of PPB-led-PCS backed by complete documentation. It will also demonstrate an integrated approach to conservation and sustainable use of biodiversity managed by people.

Disruptive Ecological Selection (DES): A variety adapted to a specific ecology, when grown and selected for desired traits including productivity in another ecology, may, over a few cycles of selection, give better performance in the new ecological environment. This approach has been successfully applied in incorporating traits associated with winter in summer varieties and vice versa.

From the PPB work done during 1998-2001, two new possibilities of such an improvement in rice opened up.

DES – Ex-situ: Veliyan, a high yielding variety at Wayanad turned out to be a good fodder variety at Jeypore. The performance of the variety, Veliyan was striking at Jeypore during Kharif 1999 demonstrations giving a range of 1,900 ~ 4,300 kg/ha of grain and of 5,700 ~ 6,800 kg/ha of straw yields. A design was therefore developed to produce fodder and grain from the same field so that farmers can make use of the fodder to feed the cattle and harvest seed and grain for raising crops in the subsequent seasons. Thus farmers would become self-sufficient in the needs of fodder and necessary seed material. However the potential of Veliyan as a food crop remains to be tested. The new design requires the field to be partitioned into 3 tiers. In the central tier, the crop will be left to mature for harvesting good seeds. In the two flanking tiers, two cuts of fodder – one when the crop is about 3 feet high (and around half-way to flowering) and another when the crop is at maturity would be taken to evaluate the utility of Veliyan as fodder and also as a dual purpose crop. The crop would be raised in medium land where life-saving irrigation facilities are available.

DES – In-situ: Evaluating the logic behind rice varieties reserved for upland, medium land and lowland: The logical base behind the classification of Upland (UL), Medium Land (ML) and Lowland (LL), and varieties identified for growing in these lands, is not strong. But traditional wisdom prevails to assign specific LRs to a specific land type. An analysis of the performance in Kharif 1999 in small plots and Kharif 2000 in large plots

indicated that the variation in the maturity profile between LRs grown in UL, ML and LL was not pronounced and on principle there is no prior ground for those varieties to be raised only in those designated lands exclusively. There was a general agreement when farmers were informed of the basics of the earlier results. A few came forward to grow UL variety, Paradhan in ML; ML variety, Sapuri in LL and LL variety, Kalajeera in ML. For a fair comparison of performance these varieties would also be grown in their designated land types.

Farming system: To account for the suggestion that PPB activity should become broad-based and also look at promising farming systems, options of intercropping were discussed with the farmers. Farmers have been using, based on their traditional wisdom, the following four cropping systems, rice – pigeon pea; rice – ragi; rice – cowpea and rice – niger. Their merits were considered in depth. Farmers were keen to select a remunerative crop combination and thus selected rice-pigeon pea for further work. Most of the pigeon pea grown there is of the perennial long duration type whose stem is used as fuel. It was decided to collect seeds of the 3 LRs of pigeon pea – *Chanchi kandula* (5 months duration), *Dumuria kandula* (6 months duration) and *Kala kandula* (7 months duration) which are commonly grown in Jeypore to initiate work in the next season.

Gene-Seed-Grain Banks: The concept of gene, seed and grain banks was consolidated to be disseminated in a comprehensible mode to the farming community. In the mean time, the farmers of Patraput village were enthusiastic in their desire to activate their existing self-

help groups in channelling, for the larger benefit of villagers, the enhanced production of local varieties as a result of PPB interventions. They have started to build on their own a seed bank with good storage facility. This activity would be pursued to put the concept of gene-seed-grain bank in active mode.

Status of Field Gene Bank: The gene bank has seventeen upland varieties, twenty-five medium land varieties and forty-five lowland varieties.

201.3 Community Gene Bank

Community Gene Bank is one of the components of the Integrated Gene Management System. This *ex-situ* facility has been linked with both *in-situ* and *in-situ* on-farm conservation. Collections stored at this bank would facilitate revival of any germplasm loss in the field and help tribal and rural farm families to get recognition and reward under the provision of the Plant Varieties Protection and Farmers' Rights legislation. Whenever required by the community, accessions in the bank would be given to them with the prior informed consent of the farm families.

Germplasm collection: Community Gene Bank activities involved collection of different traditional cultivars from Kerala, Tamil Nadu and Jeypore. This year the collection of the Community Agro-biodiversity Centre, Wayanad, comprised *veliyan* for flood resistant variety, *thondi*, *palthondi* and *chennellu* for medicinal purpose, *chomala*, *mullanpuncha*, *mullanchanna*, *koorichanna*, *gandhakasala*, *kaima*, *wayanadan*, *karivali*, *koduveliyan* and *mandya* for biriyani. Traditional cultivars collected from parts of

Wayanad consisted of both legumes and cucurbits. Legumes such as *kuttipayiru*, *kurutholapayiru*, *mochakotta* and *valamara* and cucurbits such as pumpkin, bitter gourd, bottle gourd, cucumber, *peechinga*, *cheranga* and *neykumbalam* have been collected.

44 paddy germplasm collections from Kalahandi and Khandamal have been received and are yet to be processed after receipt of passport data and other relevant information.

Efforts have been made to collect all crop germplasm, especially from Dharmapuri, Thiruvannamalai, Pondicherry and Wayanad districts.

Duplicate samples of 148 germplasm have been contributed to the National Gene Bank at National Bureau of Plant Genetic Resources (NBPGR), New Delhi.

Multiplication, evaluation and characterisation of genebank accessions from both Wayanad and Jeypore have been planned. Farmers have been identified to undertake field evaluation.

Receipts have been issued to the farmers for the germplasm collection made at Thiruvannamalai and Dharmapuri districts, but are yet to be issued for the collection from Wayanad and Jeypore. This is a proof of identity of the material stored in the bank. Farmers may produce this receipt whenever they require seed material to revive it in the field.

Community Herbarium: Voucher specimens of traditional paddy varieties such as *veliyan*, *chomala*, *gandhakasala*, *chitteni*, *chettu cherthadi* and *chettadiyan* have been received from Wayanad.

Voucher specimens of 42 different traditional paddy varieties from Jeypore have been deposited.

On farm conservation: Under the National Agricultural Technology Project on Plant Biodiversity (NATP-PB) an effort was made to collect crop germplasm, *ex situ*, *in situ* and *in situ* on-farm in Tamil Nadu and Wayanad.

Based on the survey conducted in Chidambaram, Thiruvannamalai, Dharmapuri and Wayanad, it was decided to select biodiversity rich spots. Accordingly, Vadakku Pichavaram and Keerapalayam (Chidambaram), Chengam (Thiruvannamalai) and Galigattum (Dharmapuri) in Tamil Nadu and Nedungode Colony, Panayi Colony and Pallookappil Colony in Wayanad have been chosen.

Villagers, both women and men, participated in interaction and orientation programmes as well as in seed fairs and exhibitions organised in their respective villages.

Medicinal Plants: In Chidambaram, two villages, Vadakku Pichavaram and Keerapalayam, have been identified for on-farm conservation of medicinal plants. 6,000 seedlings belonging to 20 medicinal plant species were distributed at Vadakku Pichavaram and in Keerapalayam 3,600 seedlings belonging to 13 medicinal plant species were distributed.

At Vadakku Pichavaram, 6 medical camps were organised with the help of Siddha doctors. Out of interest, wherever the villagers see a medicinal plant, they plant it in their gardens. In Keerapalayam, one self help group member has taken a piece of land

on lease to collectively grow seedlings for distribution.

At Vadakku Pichavaram, 2 acres of land belonging to 4 persons has been prepared and seedlings are to be distributed.

Networking with NGOs who supplied seedlings, Siddha doctors, villagers, Panchayat President and Block Development Officer (BDO), have added great strength to this on-farm conservation effort.

A Handbook in Tamil on the medicinal plants seedlings distributed to these villagers is being prepared.

Traditional paddy cultivars: On-farm conservation activities at Chengam have been focused on traditional paddy cultivars along with millets and pulses. Seed multiplication and cultivation were undertaken. *Seeragasamba, bangalorekar, ambasamudhiram, pulithikar, thuyamalli, vadansamba, neikitchidi, arcot kitchidi, gundu nellu* and *karuppu nellu* have been put under trial in the demonstration plot. At the same time farmers have sown these varieties in their land. The limitations of sowing, transplanting and cultivation cost analysis were demonstrated.

Demonstration trials resulted in the establishment of Pudupattu Community Seed Bank. Mr Subramaniam, a progressive farmer, extended support by providing space in his house. Now this seed bank has 10 different varieties of traditional paddy.

A one-day workshop was organised to discuss traditional cultivation methods, storage and maintaining cultivars. Both women and men participated and shared their

knowledge on traditional agricultural practices. They expressed their desire to get seed material from the Pudupattu Community Seed Bank in the forthcoming season. In spite of traditional cultivars being of long duration and many other constraints, farmers in this area prefer traditional practices.

Traditional Crops: In Galigattum, in addition to the collection of 24 different traditional crops, on-farm conservation has also been initiated. The farmers are looking for cash crops since they do not get a good income. Transportation, elephant menace and failure of rainfall have led to a shift in agriculture patterns. 5 farmers have been identified to demonstrate organic cultivation. *Thotta ragi, kittu ragi, sivappu avarai, amanakku, kadugu, mochai* and *avarai* have been chosen for the trial. One kg of *ambasamudhiram, bangalorekar, puluthikar* and *thuyamalli* from Chengam have also been distributed for trial as there is only one traditional variety of paddy available in the region. Seed storage at the Galigattum community seed bank has been organised to ensure easy availability of these varieties in time and also to encourage cultivation every season. *Kalanjium* and *Ragi kuzhi* are the different types used. Seasonal rainfall coincides with the Tamil months and accordingly agriculture practices are being continued.

Legumes and cucurbits: In Wayanad, colonies such as Nedungode, Panayi and Pallookappil have been identified for on-farm conservation of legumes and cucurbits. Surveys were conducted to trace the different varieties collected and distributed for cultivation. One set of collected material has been planted at the CAbC farm. Efforts are

being undertaken to trace lost crop species of legumes and cucurbits of Wayanad. One women's group has been formed to take up cultivation of legumes and cucurbits.

Documentation: Collection, documentation and validation of indigenous technical knowledge (ITK) have been undertaken through the National Agricultural Technology Project. Tamil Nadu, Kerala and Karnataka in the southwest coastal zone and Andaman and Nicobar Islands are the target zones.

The objective of this project is to identify, collect, classify and document ITK with respect to production and farming systems in different agro-climatic zones.

Indigenous Technical Knowledge on rain water management, methods of checking soil and water erosion, practices to check wind erosion, tillage and intercultural management, crops and cropping systems, pest and disease management, methods of weather forecasting, horticultural crops, veterinary science and animal husbandry, fisheries, farm implements, ethno-botany and agro-biodiversity, grain/seed storage, fuel management, wood stove / chullah & thermal efficiency, waste water management, garbage disposal and management, food product development, agro / animal-based yarns / natural dyes and weaves, low cost housing materials and ethnic food have been documented.

A total of 225 ITKs have been documented in this zone apart from the collection of published information in the form of books and CDs. Of these 46 have been selected for incentives (to the disclosers) and 12 have been selected for validation. A high level committee places its decision on validation,

incentives and documentation before the Indigenous Technical Knowledge – Information Committee (ITK-IC) for approval. Distribution of incentives such as cash awards has been suggested based on the complete verification of the practices.

201.3.1 Community gene management system - Orissa

The Summit Foundation, Washington, supports the Community Gene Management System operating in Koraput, Kalahandi and Kandhamal districts of Orissa. The objectives of the project are:

- to conserve valuable tribal genetic resources by the revitalisation of their *in-situ* on-farm conservation traditions
- to evaluate their adaptation, yield and quality potential to match the needs of tribal communities
- to develop mechanisms for making conservation and commercialisation mutually reinforcing through equitable methods of benefit sharing

The objectives are sought to be achieved through the establishment of field gene banks, community seed banks, village grain banks, water banks, community farming and networking and capacity building.

While rice was the common mandate crop for conservation in all the three districts, millets, pop sorghum and black gram were identified for Kalahandi and Koraput and pigeon pea for Kandhamal. 86 local land races of rice were conserved and evaluated across the three districts. In the case of other crops, 5 varieties

of finger millets and 2 varieties of pigeon pea were conserved and evaluated in Koraput and Kandhamal districts respectively. In Kalahandi, although 73 samples of finger millets, 29 samples of black gram and 9 samples of pop sorghum were collected, it was difficult to identify them as distinct varieties; they have been sent for laboratory testing.

The need to ensure seed security and grain security led to the initiation of community seed banks (CSB) and village grain banks (VGB). The flow chart (Figure 2.2) shows the steps involved in setting up CSB and VGB.

During the year, 7 CSBs were started. The seeds collected from the farm families covered all the mandate crops. In Koraput, 61 families contributed seeds and 29 availed of loan; the numbers were 121 and 38 in Kalahandi and 94 and 9 in Kandhamal respectively.

A VGB was initiated in each of the districts and all the members availed of loans. Community farming of rice on leased land has been introduced in Kashiguda village of Koraput and is proving to be a support for the CSB and VGB.

Water conservation through construction of simple check dams and contour bunding is an essential part of effective natural resource management. This has been successfully undertaken in Koraput and Kalahandi field stations. As a result, 93 acres of land in Koraput and 19 acres in Kalahandi have been saved from sand casting and 12 acres of land in Koraput and 5 acres in Kalahandi have come under irrigation.

Training, exposure visits, exhibitions and networking with Government agencies and NGOs are undertaken regularly as part of the capacity building process.

201.4 Participatory Management of Simlipal Biosphere Reserve

Simlipal, the eighth Biosphere Reserve of the country, with an area of 5,569 sq km has the unique distinction of being a Tiger Reserve, a National Park, a Wildlife Sanctuary and an Elephant Reserve. The area stands as a link between the flora and fauna of southern India and sub-Himalayan northeast India. There are about 1,076 identified plant species, 42 species of mammals, 264 species of birds, 29 species of reptiles, 12 species of amphibians and 26 species of fishes. About 450,000 people live in the 1,265 villages situated in the reserve and depend on it for their livelihood. Simlipal also protects the catchments of numerous perennial rivers that are the lifelines of the people of Mayurbhanj, Balasore, Keonjhar and Bhadrak districts of Orissa.

Towards achieving the project objectives of conservation and management, an expert consultation was held at Bhubaneswar on 18 and 19 June 2001. Officials of Orissa Forest Department, representatives of the Foundation and some NGOs attended the consultation. Based on the discussions held at the expert consultation and interaction with various stakeholders of SBR, a sixteen member Board of Trustees was identified. To achieve the objective of the biovillage model of integrated on-farm and off-farm livelihood generation, the following steps were carried out in the selected villages Rapid Rural Appraisal (RRA)

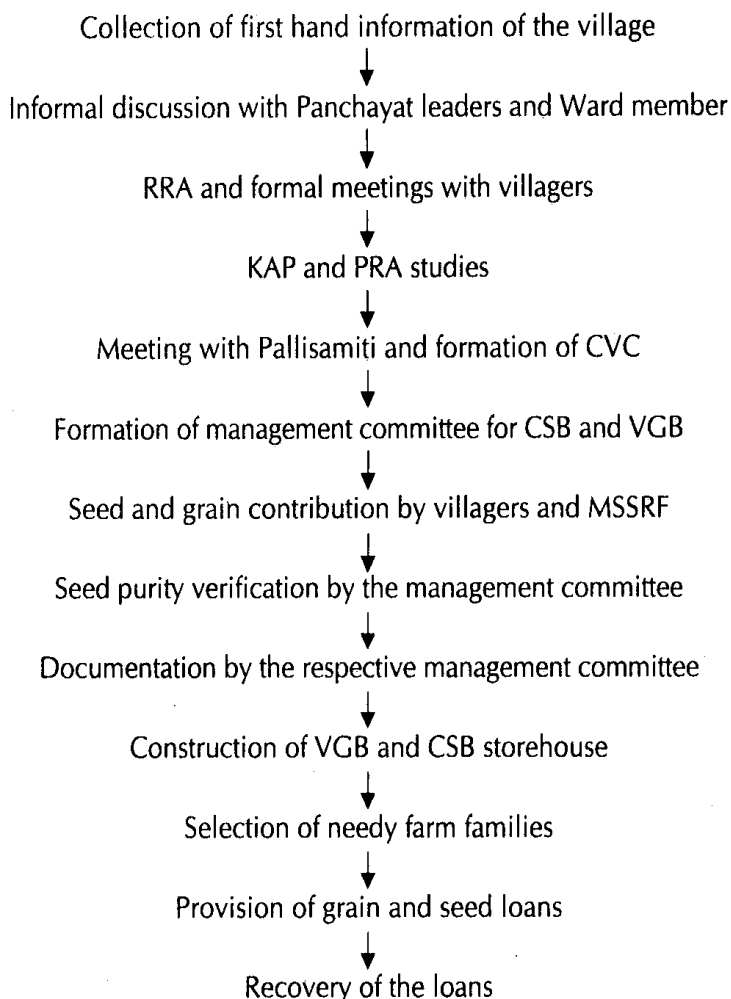


Figure 2.2 : *Flow chart for initiation of community seed bank and village grain bank*

and Participatory Rural Appraisal (PRA), formation of community based institutions (CBIs) like SHGs and Village Development Committees (VDCs), developing the capacity to take responsibility for launching and managing activities, linking CBIs with Banks, participatory microplanning exercise in which microenterprises are identified by the communities and/or special interest groups (SHGs), capacitybuilding of CBIs to take responsibility for initiating and managing the microenterprises, arrangement of microcredit facilities for the SIGs,

facilitation of activities and help in marketing the products.

Participatory Rural Appraisal (PRA): PRA was carried out in Baniabasa and Budgaon villages to obtain information on socio-economic status, forest dependency and agricultural status. PRA revealed that agriculture (rain-fed cultivation) is the primary occupation of the people in these villages. Rice is the dominant crop and grown on more than 90% of the total area but productivity is very low (1-2 t/ha). Although agriculture is the primary occupation, during PRA villagers

admitted that they are getting about 65-73% of their annual income from forest products. Livestock also play a critical role in the area's economy and culture. Cattle are reared mainly for draught, power, manure and prestige. Goats, sheep and poultry are kept for social, cultural, religious, sustenance and insurance purposes. Animal sacrifices are common in the area and play an extremely important role in traditional culture.

Formation of Community based institutions: Based on the information obtained from PRA, the formation of SHGs, VDCs and other specialised groups was undertaken in the villages by stressing the importance of community-based institutions in their socio-economic development. Women were encouraged to participate in the activities, particularly through the formation of savings and credit SHGs, to boost their confidence and enhance their managerial capabilities. So far, two Village Development Committees, namely Budgaon Development Committee and Chapudi Development Committee, have been formed in Budgaon area. One man and one woman from each household have become members of these development

committees. An executive committee comprising 10 members was selected by each VDC. The role of the Executive Committee (EC) is to plan, coordinate and monitor the development activities and to facilitate the VDC meetings. The VDCs meet four times a year whereas the EC meets once every month. A total of 11 SHGs was formed in Budgaon area and 6 SHGs were linked to banks (Baitarani Gramin Bank, Shyam Sundarpur and SBI, Bhuasuni). Due to various reasons, the formation of VDCs was delayed in Baniabasa and Bospala villages. So far, three SHGs have been formed in the area.

Participatory microplanning: The SHGs carried out participatory microplanning exercises in Budgaon and Chapudi hamlets in which microenterprises were identified (Table 2.5). Locally posted 'Village Animators' engaged and supervised by the social worker of MSSRF facilitated the groups during the participatory microplanning process. During the process, the groups identified seven microenterprises viz. *sal* and *siali* leaf plate making, *tasar* cultivation, rope making from sabai grass, poultry, cultivation of medicinal plants,

Table 2.5 : *Income generation activities in Budgaon and Baniabasa villages*

Sources of income	*Percentage of average annual income	
	Budgaon	Baniabasa
Timber trade	37.5	35.0
Non-timber forest products	18.8	17.5
Fuel wood	15.0	12.5
Agriculture	22.5	25.0
Others	6.3	10.0

*Calculated based on information provided by villagers during PRA.

vegetables and mushroom. Of these, leaf plate making and tasar cultivation have been initiated.

Eco-tourism: Based on interaction with various stakeholders of SBR, the development of a well-planned community-driven eco-tourism model was found to be a viable economic activity that could minimise the negative human impact on the reserve and improve local livelihoods. Eco-tourism planning should be site-specific and should be developed through collaborative efforts of the stakeholders with the objective of promoting conservation and sustainable development in a balanced way.

Gender concerns: In Budgaon area, due to socio-cultural reasons, women were hesitant to participate in large public meetings such as VDCs and community-level decision making. Special efforts were made to ensure that women, both as individuals and through their groups, participate in all the ongoing project activities. In both the VDCs, four women (40%) were included as members of the Executive Committee (EC) to ensure their active participation in decision making and planning processes. Five SHGs for women were formed in the area and linked with banks and these SHG members started showing their management capabilities through these groups. It is observed that the demand on women's time is considerably high because they bear most of the burden of domestic work, childcare and collection and marketing of NTFPs.

Capacitybuilding and networking

Capacitybuilding activities were carried out in Budgaon and Chapudi hamlets (Budgaon area) to strengthen the capabilities of

communities and SHGs so that they can effectively manage the microenterprises initiated by them. The capacity building activities were carried out through sensitisation, training and exposure visits (Table 2.6) with major stress on the following areas:

- Awareness creation on wildlife conservation, improved natural resource management, tribal rights, gender and equity issues
- Identification and planning of village development activities without violating existing laws
- Effective community and/or group involvement in participatory microplanning exercises through which they can identify and analyse the opportunities and constraints and determine priorities
- Planning and formulation of development activity proposals at household and community-based institution level
- Developing the management skills of SHGs
- Developing the technical skill of Village Animators to act as village level resource persons

A sports meet co-sponsored by MSSRF and held at Budgaon from 17-19 January 2002, helped in creating mass awareness among the local community in and around Budgaon area about the on-going programme. A quiz competition on various aspects of biodiversity in which 32 students participated was conducted for school children. After the sports meet, many villagers from neighboring villages expressed interest in implementing the biovillage model in their areas.

Table 2.6 : *Exposure visits and training programmes conducted in Budgaon area*

Area of training	Site/ Location	Participants
SHGs and microenterprises	Budgaon	Villagers
PRA, participatory microplanning	Budgaon	Animators, SHGs
Exposure visit	Jeypore	Farmers
Bank linkage & microcrediting	Chapudi	VDCs
Accounts & record keeping	Chapudi	SHGs
Leaf plate making by machine	Chapudi	SHG members
Exposure visit	Lulung	SHG members

201.5 B R Barwale Chair in Biodiversity

The B R Barwale Chair in Biodiversity provides technical assistance to the biodiversity components of the various projects, with particular emphasis on agro-biodiversity.

A report on 'Improving Incomes of the Rural Poor through Conserving Agro-biodiversity and Enhancing the Contributions of Underutilised Species for Food Security through Participatory Pathways' was prepared. The report hypothesizes that participatory conservation of ecologically sound mixed cropping patterns and appropriate market linkages would enhance agro-biodiversity and ensure food and nutritional security while providing sustainable livelihoods at the household and community levels.

A report entitled 'self help group (SHG): An Effective Pathway for Biodiversity Conservation' was prepared for the purpose of analysing MSSRF efforts in the area. The Foundation attempts to increase the economic

stake for conservation of agro-biodiversity, which is achieved through the provision of innovative technologies to reduce drudgery and attain gender equity, value addition, effective market linkages and organic farming certification for local landraces and folk varieties.

A research paper titled 'Indicators for Assessing the Impact of the Project - Biodiversity Conservation, Integrated Natural Resource Management and Poverty Reduction' was prepared with the aim of assessing the impact of the project in order to help communicate information about complex processes, events or trends to a wider audience. Simple measurable indicators have been developed for poverty, biodiversity and Natural Resources Management (NRM).

A report on the current situation of the ecologically fragile wetland in and around Pallikaranai near Chennai was prepared. It is a low lying region having several natural depressions that form lakes, ponds and tanks and help in storing large quantities of fresh water. The swamp has been a cause of concern due to silting and encroachments in

the lakes and ponds, drawing out large quantities of ground water for commercial purposes, the conversion of large areas of wetlands into buildings, roads and solid waste dumping ground. This report summarises that the inlet channels through which the tanks, ponds and lakes received water need to be traced, cleaned and directed towards them. It also highlights the responses of the local community who feel that large tanks would serve as water harvesting bodies during the rainy season apart from providing livelihood opportunities through fish harvesting. The structures also act as a means of aquifer recharge. These efforts require encouragement and support from local NGOs and others concerned about the environment.

Links were established with the Millennium Ecosystem Assessment Board 2002 by way of providing inputs for their work on identifying indicators for measuring and improving the health of an ecosystem. It was suggested that *in-situ*, on-farm community conservation and the effective utilisation of bioresources could prove to be healthy interventions. These suggestions were illustrated with some examples of the work done by MSSRF in this regard. The Board has welcomed these suggestions and has been able to incorporate some of them into their framework.

201.6 Enhancing the Contributions of Nutritious but Neglected Crops to Food Security and to Incomes of the Rural Poor: Asia Component - Nutritious Millets

Over 2 billion people suffer from micronutrients deficiencies. It is possible

to eliminate hidden hunger caused by the deficiency of micronutrients (minerals and vitamins) by consuming nutritious millets. Compared to rice, finger millet grain is eight times richer in calcium, four times in minerals and two times in phosphorous. The protein content of millets is more than that of rice and they have a well-balanced amino acid profile. They are a good source of methionine, cystine and lysine and are rich in important vitamins such as thiamine, riboflavine, folin and niacin. Lower incidence of cardiovascular diseases, duodenal ulcer and diabetes among populations consuming millets make millets ideal health foods. Pests and diseases are relatively low among millets and they respond well to lower levels of inputs and hence are environmentally friendly and sustainable. Since the grains can be stored easily they make ideal crops for community grain banks. With these considerations in view the Foundation at the request of IFAD and IPGRI is co-coordinating the Asia component (India and Nepal) of a pilot project on nutritious millets. The crops identified for research in India are *Eleusine coracana* (Finger Millet, ragi), *Setaria italica* (Italian Millet, Thenai), *Panicum sumatrense* (Little Millet, Samai) and finger millet in Nepal. Though the crops are of local importance, they are well suited to the prevailing weather conditions, can grow even in marginal environments and play a major role not only for regional food security but also for nutrition security because of their high mineral (Iron and Calcium) content and broaden the food basket.

The purpose of the project is to conserve Plant Genetic Resources (PGR) through development-oriented research, to tackle the

major causes of under-use and broaden the food basket by reviving the cultivation of traditional crops that are nutritious but neglected. Its goal is to increase income and strengthen the food and nutrition security of small farmers and rural communities. The project is multi-dimensional in nature, involving multi-stakeholders, and aims at addressing the entire chain from sustainable production to grain utilisation by the consumer of nutritious millets - processing, value addition, marketing and utilisation.

Inception workshop: An inception workshop on "Enhancing the Contributions of Nutritious but Neglected Crops to Food Security and to Incomes of the Rural Poor: Asia Component - Nutritious Millets" was held on 24 and 25 January 2002 at MSSRF, Chennai. All the stakeholders involved in implementing the project participated. They identified the sites and evolved methods for implementing the activities.

Activities at Kolli Hills: Participatory Rural Appraisals (PRA) conducted in Padasolai focused on agricultural seasons, diversity in landraces of millets, rainfall distribution, families growing millets and constraints and opportunities for millets production in Kolli Hills. Millets farmers were encouraged to form two self-help groups and a one-year action plan was prepared. Two demonstrations-cum-seed multiplication trials will be conducted in the village.

Participatory varietal selection of germplasm from ex-situ collections: Over five thousand germplasm accessions of the target crops were introduced from ex-situ collections maintained at ICRISAT, and improved varieties

from small millets improvement project in Bangalore, Almora, Pantnagar, Rajendranagar and from various other organisations. From among these, 2,716 accessions consisting of 432 Little Millet, 1,347 Italian Millet and 1,347 Ragi were grown during the summer season (kodai kalam) under good management conditions in two acres of irrigated land that was taken on lease from a farmer in Singlipatti village in Namakkal area for characterisation, seed increase, participatory selection by farmers and collaborating scientists for further testing in the coming season.

It is interesting to note that some accessions of Italian millets flowered in less than 30 days. 10 men and 11 women farmers of Kolli Hills growing millets, were taken around the nurseries. They selected varieties for planting in the coming season in their fields. The reasons for selecting particular varieties by farmers was mostly based on early maturity, long, thick and attractive panicles, tiller number and yield potential. Morphological characters are also recorded to facilitate future selection of varieties.

Nepal component: The inception meeting to identify partners and sites was held on 2 and 3 May, 2002 in Kathmandu. The Nepal Agricultural Research Council (NARC), Kathmandu and the Local Initiatives for Biodiversity Research and Development (LI-BIRD) a voluntary organisation based in Pokhara were identified as partners. They selected finger millets for conducting research and decided to carry out the agreed activities at Kaski and Nuwakot districts and prepared road maps to successfully implement the activities.

Sub Programme Area 202

Molecular Mapping and Genetic Enhancement

Recent advances in the area of biotechnology and molecular genetics have opened up possibilities of utilising new technologies for conservation, sustainable use and genetic enhancement of coastal ecosystems that are being depleted by increasing population pressure and decreasing agricultural productivity. The ongoing research programme on molecular mapping and genetic enhancement aims at utilising state of the art technology for genetic characterisation and enhancement of coastal bioresources. The major objectives of the ongoing programme are to

- analyse genetic diversity and species relationship among the Indian mangrove species using molecular marker technology as a prelude to genetic conservation, and
- isolate and characterise stress tolerant genes, particularly salinity, to develop salt tolerant crop varieties for coastal agri-ecosystem

202.1 Molecular Marker Assisted Genetic Indexing of Coastal Agro-biodiversity

For many reasons, both physical and technical, genetic characterisation, composition and diversity in the taxa occupying the coastal estuarine ecosystem have not been studied earlier. The ongoing

programme on molecular marker based analysis for genetic indexing takes into account the most predominant mangrove vegetation along the Indian coastline. Substantial progress has been made in 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 standardising protocols for molecular analysis in this group of plant species. These studies have provided sufficient insight into the genetic characterisation, species identification and the pattern of genetic variation in 28 mangrove species, species relationship and underlying evolutionary differentiation in 22 mangrove genera using various marker systems. They have also helped in identifying priority areas and species for conservation and consolidation of mangrove genotypes. In addition this programme takes into account genetic indexing of wild species and relatives of cultivated legumes, millets and cereals.

202.1.1 *Species relationships among Indian mangroves*

Genetic characterisation of mangrove species is one of the major ongoing objectives of the programme. The genomic analysis using various molecular marker systems is being undertaken in a few additional species and also several new populations. Extensive collections have been made in Andaman and Nicobar islands, and the pattern of genetic diversity and variation in the species collected are being compared with those of mainland species. Comprehensive analysis of species belonging to the family

Rhizophoraceae and AFLP analysis have been undertaken in 33 mangrove associate species.

Analysis of mitochondrial DNA variation for species identification and relationships in Indian mangrove rhizophoraceae:

Rhizophoraceae is a small pan-tropical family with 16 genera and 120 species. Within the family three tribes have been recognized. Tribes Macarisieae and Gynotrocheae include inland genera and tribe Rhizophoreae comprises mangrove species. Tribe Rhizophoreae, generally referred to as mangrove Rhizophoraceae, includes four genera viz., *Rhizophora*, *Ceriops*, *Bruguiera* and *Kandelia*. This tribe exhibits characteristics of true mangroves including uniform viviparous condition, formation of pure stands and complete fidelity to the mangrove habitat. Despite major differences in the floral characters, the ranges of characters overlap among different species within this tribe. All the characters used for identification of different species are quantitative and often make species identification difficult. Although these species are widely accepted as ecologically and economically important components of mangrove vegetation and the tribe recognized as a natural and discrete taxon, there has been lack of genetic information about them and the classification till recently was based only on morphological variations. Earlier genetic studies in Rhizophoreae species had been restricted to reports of somatic chromosome numbers ($2n = 36$) in all the species and isozyme analysis in a few species of *Ceriops* and *Kandelia*. There has been no information on non-morphological genetic attributes

across all the members of the family and also among the mangroves per se until recently.

Ten species belonging to four genera of the mangrove tribe Rhizophoreae found in the Indian subcontinent were analysed for species identification and genetic relationship using nine mitochondrial gene probes. RFLP pattern observed with 17 probe enzyme combinations of the genera *Rhizophora*, *Bruguiera*, *Ceriops* and *Kandelia* differentiated these species into three classes of mitotypes with further resolution within them. Clustering of these mitotypes indicated that *Rhizophora* was more closely related to *Ceriops*-*Kandelia* than to the *Bruguiera*. Though the component species of each genus clustered together, a high degree of heterogeneity was observed among four species of the genus *Rhizophora* and three species of genus *Bruguiera*. The variation between two species of *Ceriops* was minimal. Species-specific profiles were observed for all the species in some probe-enzyme combination. Though the monotypic genus *Kandelia* shared a number of loci with genus *Ceriops*, it remained distinct. The putative parents of the naturally occurring inter-specific hybrid in Pichavaram were reconfirmed to be *R. apiculata* and *R. mucronata*.

Amplified fragment length polymorphism analysis (AFLP) in Mangroves: AFLP analysis was carried out in 33 mangrove and associated species using 5 primer combinations $E_{AGC} \times M_{CTT}$, $E_{AGC} \times M_{CAT}$, $E_{AGC} \times M_{CTA}$, $E_{AAC} \times M_{CTG}$, and $E_{AAC} \times M_{CTA}$. These five primer combinations revealed a total of 572 loci of which 567 loci were polymorphic (99%). Around 1% polymorphism was

observed in two primer combinations. The other three primer combinations did not show any monomorphic loci. It was observed that the 10 species of the family Rhizophoraceae shared many common bands. In most primer combinations, the natural hybrid *R. x lamarckii* showed a similar profile to *R. apiculata*. The two species of *Ceriops*, *C. decandra* and *C. tagal* that were not very clearly distinguishable with other marker systems, showed a considerable amount of polymorphic loci. The three species of *Bruguiera* showed monomorphic bands and species-specific loci were distinct. *Kandelia candel* remained distinct for most combinations. The three species of *Avicennia* showed considerable monomorphic loci between *A. marina* and *A. officinalis* while *A. alba* remained distinct. The two species of *Suaeda* remained distinct for all primer combinations used. On the whole, our preliminary analyses indicate that the species relationship between these 33 mangrove and associate species analysed conform to our earlier analyses using other markers such as RAPD, RFLP, and PCR-RFLP of chloroplast gene regions.

202.1.2 Genetic diversity in Indian cultivars and landraces of *Oryza sativa ssp. indica*

Rice (*Oryza sativa* L.) is one of the most important food crops grown worldwide and is the staple food for half of the world population. The varieties of *O. sativa* have been traditionally classified as *indica*, *japonica* and *javanica* subspecies. Diversity and polymorphism using molecular markers have been studied in more detail in *japonica* than in *indica* and *javanica* rice. Given the

large amount of unexplored genetic diversity in cultivated *indica* varieties, and in particular, among accessions of its sexually compatible wild relatives, it becomes important to characterise the extent of such diversity. India is the second largest rice producing country in the world. Until 1968, the varieties developed by agricultural research stations in India were largely by direct pureline selection from landraces and occasionally derived by selection after hybridisation between the purelines. Later on, modern cultivars were developed by hybridisation of the local landraces and traditional cultivars with exotic germplasm.

Genetic diversity among 49 Indian accessions of rice (*Oryza sativa ssp. indica*) including 29 landraces from Jeypore as well as 12 modern cultivars and 8 traditional cultivars from Tamil Nadu, was investigated using AFLP markers. In total, nine primer combinations revealed 664 AFLPs, 408 of which were found to be polymorphic. These landraces represent lowland (12 accessions), medium-land (8 accessions) and upland (9 accessions) rice ecosystems. The 8 traditional cultivars (including GEB-24) were from southern India, and the 12 modern cultivars were developed for the same region by hybridisation of locally adapted landraces and traditional cultivars with exotic varieties like TN-1 and IR-8 in order to incorporate agronomically desirable traits.

The number of AFLP bands per primer combination observed across all the 49 accessions varied from 41 to 112 over the nine primer combinations used. The number of polymorphic AFLP per primer combination varied from 29 to 68 with an average of 45.

In total, 408 fragments out of 664 (62%) were found polymorphic. Each primer combination could differentiate all the accessions used.

The percentage of polymorphic AFLPs was almost similar within the cultivars (traditional and modern together) and the landraces, 48 and 50%, respectively. The level of genetic diversity within rice cultivars and landraces was found to be similar. In the present study, the modern and traditional cultivars were considered as separate groups. A higher level of polymorphism was found in modern cultivars in comparison with traditional cultivars (44 and 33%, respectively). Within the landraces, lowland landraces were more polymorphic than the medium-land and upland landraces (39, 22 and 29%, respectively). However, across the cultivars and the landraces, 62% of the AFLPs were polymorphic. This indicated a moderate level of genetic divergence between the cultivars (traditional and modern together) and the landraces studied. Further, the medium-land and upland landraces were more divergent than the lowland landraces from the cultivars.

The results obtained were analysed based on four different comparisons:

Traditional cultivars compared with modern cultivars from Tamil Nadu: The diversity value was slightly higher for modern cultivars than for traditional cultivars. These modern cultivars were developed for the same region where the traditional cultivars were grown. In fact, some of these traditional cultivars were directly used as parents to develop the modern cultivars. Therefore, hybridisation of exotic germplasm with the local germplasm during the course of breeding programmes might have contributed to the increased

diversity among the modern cultivars compared to the traditional cultivars.

Landraces from Jeypore compared to those from Tamil Nadu: The eight traditional cultivars analysed in the present study are essentially landraces from Tamil Nadu, obtained by direct pureline selection. Therefore, a comparison between these cultivars and the landraces from Jeypore provides an estimate of the diversity present in the landraces from these two regions. The diversity value for the landraces from Jeypore was higher than that for the landraces from Tamil Nadu. This could be explained by the fact that Jeypore is considered a secondary centre of origin for rice and a hot spot for genetic diversity in this species.

Comparison of lowland, medium land and upland landraces: Lowland landraces showed remarkably higher genetic diversity than the medium-land and up-land landraces. This could be due to the reason that the lowland environment, as compared to the medium land and upland environments, is more complex, unpredictable and subject to several biotic and abiotic stresses. This, in turn, may have required greater genetic variability in order to reach and sustain adequate yield levels.

Comparison across all accessions: The intra- and inter-group diversity components of AFLP variation were compared, considering the lowland landraces, medium-land landraces, up-land landraces, modern cultivars and traditional cultivars as five separate groups. It was found that the observed variation in AFLP profiles was almost equally divided between the intra- and inter-group components.

In order to understand the relationships among the rice accessions better, Principal Component Analysis (PCA) was also carried out. PCA is the preferred method to assess the relationship among genotypes as it takes into account the correlation among a large number of interrelated quantitative variables. On the basis of the first principal component, which accounted for 16.7% of the total variation, the landraces adapted to medium-land upland cultivation were clearly separated from lowland landraces and from cultivars. The latter were more widely spread than the landraces across the second principal component, which explained 9.0% of the total variation. The lowland landraces were positioned between the upland and medium-land landraces and the cultivars, although they were closer to the latter. The tight cluster including the medium-land and up-land landraces was better resolved by the third principal component which accounted for 5.5% of the total variation and, with the exception of Paiken, allowed for the separation between medium-land and upland landraces.

Modern cultivars showed more diversity than the landraces from the same region, and yet clustered closer to the traditional cultivars. Therefore, these results indicate that the development of modern cultivars did not appear to have caused genetic erosion. In fact, following hybridisation of the landraces and their derivatives from the exotic germplasm, genetic diversity has increased in terms of available polymorphisms at a single locus. However, in terms of cultivated genotypes, total genetic diversity erosion is probable, because only a small number out of the 500 modern cultivars are currently

being cultivated in India, and they occupy more than 95% of the area under rice cultivation. Therefore, it remains essential to conserve the biodiversity present in the rice landraces and utilise it to broaden the genetic base of cultivated rice varieties. Molecular markers such as AFLPs will play an essential role in characterising biodiversity for its exploitation in modern breeding programmes.

202.2 Genetic Enhancement

Isolation and characterisation of salt tolerant genes: The emphasis has been on isolation and characterisation of genetic material containing novel genes for resistance to abiotic stress, particularly salinity.

Isolation of stress induced genes: The identification of novel genes from the mangrove species is based on exposing target mangrove species to varying degrees of salt stress and identifying and characterising stress induced proteins. The second approach involves developing gene libraries enriched with stress induced genes and screening for potential genes conferring stress tolerance. It also involves characterisation, evaluation and controlled expression of the promising genes. Four cDNA libraries have been constructed from the salt treated *A. marina*. By screening with heterologous probes from other organisms or through RT-PCR probes, a few potential stress tolerant genes were isolated from the cDNA libraries and fully sequenced. A number of full-length genes of practical importance to abiotic stress tolerance have been identified, sequenced and characterised.

Development of transformation systems: Transformation vectors have already been constructed for dicots with 35S promoter

(pGA643 series) and for monocots with ubiquitin promoter (pCAMBIA series) incorporating BADH, SOD 1, LTP 1 and Gly I from the mangrove species. Transformation with constructs containing SOD1, LTP1 and Gly I in rice, *Brassica* and tobacco are at different stages of development. Putative transformed plants were identified using PCR and Southern techniques. The seeds from these plants have been collected and subsequent generations are being raised to study the efficacy of these transgenics and raising purelines. As per the guidelines, an exclusive containment facility has been created for undertaking such studies.

Identification of differentially expressed genes: A typical eukaryotic cell contains about 15,000 to 30,000 distinct mRNAs, of which about 50% of the transcript populations are made of abundant ones that are responsible for the normal upkeep of the cell; the other half contains the 'rare' mRNAs. Hence differential display has been initiated to identify genes responsible for a specialised function (salt stress related genes) from the population of abundant transcripts. Differential display is a technique used to identify/ isolate differentially expressed genes under altered growing conditions. The key element of this technique is to use a set of oligonucleotide primers, comprising one primer that anchors to the polyadenylated tail of a subset of mRNAs and another that is arbitrary in sequence so that it anneals at a different position relative to the first primer. This method has been used to synthesise single strand cDNA from total RNA of salt treated and untreated leaves of *Avicennia marina*, with oligo.(dT) primers and reverse transcriptase. 3'anchored oligo (dT) primers

and 5' arbitrary primers (Clonetech Laboratories Inc.) were then used in combination to amplify this single strand cDNA. The salt-stress induced PCR fragments were separated on a denaturing polyacrylamide gel and visualised autoradiographically. A total of 28 primer combinations were analysed and 16 differentially expressed, salt induced DNA fragments were obtained. These were then cloned into T/A cloning vector and sequenced. Their characterisation is underway. Preliminary results are encouraging and experiments are underway to obtain unique, novel genes responsible for conferring salt tolerance.

Functional genomics in mangroves: The development in recent years of automatic high throughput sequencing methods has made it possible to determine the sequence of complete genomes which has been achieved in many species notably, *Arabidopsis* and rice. Apart from this, large scale Expressed Sequence Tags (EST) approaches are being undertaken worldwide as a rapid and cost effective way to identify functions of new expressed genes. ESTs are single run sequences of 300 – 500 base pairs read from a cDNA clone chosen at random from a library. The 5' extremity is sequenced first and this data is analysed in international databanks like the NCBI BLAST server. Automatic alignment of the sequence in dbEST against nucleotide and protein sequence database is carried out and this is sufficiently accurate to unambiguously identify the corresponding gene.

Using the cDNA library constructed from *Avicennia marina*, it has been possible to sequence over 1,600 ESTs.

Sequences of these clones were deposited in the worldwide databases at NCBI. This is the largest ever bulk submission from any laboratory in India. Having identified full length or novel genes, sequencing is being undertaken at the 3' extremity. In order to characterise the rest of the insert, sub-cloning of these clones onto a plasmid vector is being carried out for functional analysis and DNA sequencing. Two common strategies are being followed for sub-cloning these DNA inserts into a plasmid vector:

- a directed cloning strategy based on a previously determined restriction enzyme map and
- random "shotgun" cloning using frequent cutting restriction enzymes or sheared DNA. DNA sequence information obtained from shotgun cloning can be analysed by computer algorithms to compile an aligned sequence that can be used to find all known restriction enzyme sites within that DNA segment.

It is intended to employ the primer walking method by designing primers from the 5' extremity in order to sequence the insert. Apart from full length gene sequencing, chip based approach of microarrays will be undertaken to determine patterns of differential gene expression or to compare differences in mRNA expression levels between identical cells subjected to different stimuli, namely salt stress, to discover novel genes.

Sub Programme Area 203

Monitoring Ecosystem Health using Microbial Diversity

Indexing and documenting growth-promoting bacteria and prospecting them for their functional efficiency under saline stress for the coastal agri-ecosystem and developing a site-specific ecological methodology to quantify lichen diversity and forest/urban quality are the twin goals of this programme.

203.1 Microbial Diversity in Coastal Agri-ecosystems

Increasing salinisation in the coastal region due to irrigation practices increases the concentration of soluble salts in the root zone of soils. The identification of bacterial strains and in some cases host cultivars that are tolerant to these stresses, opens the way for alternate, lower cost solutions to this problem. While sequestering beneficial organisms from almost all the cash crops cultivated in the area, all the cultivars normally used and different farming practices have been taken into consideration. This provides a wealth of information on the conditions under which these organisms were selected and can survive.

A specific culture collection of beneficial organisms for this specific agro-climatic zone has been identified. Over 1,000 strains have been isolated under the category of plant growth promoting bacteria and this year the focus was on confirming their functional efficiency under greenhouse conditions.

The salt-tolerant rice rhizospheric *Pseudomonas* strains were tested under non-saline and saline greenhouse conditions to assess their biocontrol efficiency against bacterial leaf blight (BB caused by *Xanthomonas oryzae* pv. *oryzae*) and sheath blight (ShB caused by *Rhizoctonia solani*) diseases in Paddy (IR50 and CO43). A total of 22 strains was tested for suppression of BB under non-saline soil conditions (IR50) of which the best 16 strains were tested under saline soil conditions (CO43) also. They were found to suppress incidence of BB by 15-74% under non-saline and 46-82% under saline soil conditions. For the suppression of ShB disease, 18 strains were tested under non-saline soil conditions (IR50) of which the best 11 strains were tested under saline soil conditions (CO43) also. They suppressed the incidence of ShB by 22-57% in non-saline soil, and 5-36% in saline soil conditions. An interesting observation was the multiple protection exhibited by 4 strains against both rice diseases tested. The antagonistic strains consisted largely of fluorescent pseudomonads. The most common species encountered were *P. fluorescens*, *P. putida*, *P. cepacia* and *P. aeruginosa*. Some non fluorescent species like *P. alcaligenes* and *P. pseudoalcaligenes* also showed disease suppression, although their performance was poor. This is one of the first reports of *Pseudomonas* strains suppressing disease under saline soil conditions.

While screening endophytic populations from wild rice, salt tolerant nitrogen fixing and phosphate solubilizing strains were identified and *Glucanoacetobacter swaminathaniana* sp. nov (LMG21291^T - MTCC3851^T) has been proposed, based on its biochemical

characteristics. Some of the phosphate solubilising strains from the culture collection have already been taken to the field to test their efficiency and the early results are promising.

From the culture collection, 302 strains were confirmed to belong to *Azospirillum* spp. On screening them for salt tolerance, 66 strains were found to tolerate up to 500mM NaCl. The diversity analysis of *Azospirillum* strains in the coastal sites revealed seven species to be present of which only *A. brasiliense* genotypes were being selected in the saline sites. To develop *Azospirillum* based biofertilisers for the coastal niche, the efficiency of 20 salt tolerant *A. brasiliense* strains was tested under greenhouse conditions for plant growth promoting efficiency in rice varieties CO43 and White Ponni. The preliminary results are promising and the best strains will be selected for further field trials.

203.2 Lichen Research

The lichen community of a particular niche is characterised by environmental factors. Since lichens are slow growing and long lived and are also sensitive to environmental changes, they serve as good indicators of the ecological status of a location. The diversity and distribution patterns of lichens are influenced by macroclimatic factors like temperature, rainfall, age composition of forest and management practices, microclimatic factors like light intensity, humidity and host tree species and substrate features like bark type, substrate corrugation and age, moisture retention, pH and nutrient status. Hence in a climatically uniform region one can often expect a remarkable assemblage of one or a

group of lichen species. Information of the diversity and distribution patterns is especially critical for lichens, since they are the potential candidates for effective ecological monitoring and assessment which will be directly relevant to ongoing conservation planning and implementation strategy.

In the previous years transects were laid down at three different forest types namely the Dry Deciduous forests (DDF), the Moist Deciduous forests (MDF) and the West Coast Tropical Evergreen forests (WTEF) within Siruvani Hills (Western Ghats) and data collected on both forest structure and lichen communities. The combination of both these data is being used in identifying the indicator lichen communities. Out of fifty transects, thirty seven transects were found to be undisturbed where the lichen diversity

increased with *Porina mastoidea* (agg.) as a dominant member with species like *Phyllopsora parvifolia*, *Leptogium cyanescens*, *L. denticulatum*, *Pyrenula*, *Megalospora* as co-dominants.

In a similar manner lichen diversity and distribution were quantified in and around Chennai city from fourteen different locations (Table 2.7) as urban areas are considered to be synonymous with environmental degradation caused by industrialisation, vehicular pollution, land use pattern changes etc leading to pollution of air, water and soil. These adverse environmental conditions also lead to the loss of lichen species from their habitat, gross distribution pattern changes, reduction in population size and reduction in reproductive potentials of individual species.

Table 2.7 : Lichen Diversity of Chennai locations

Name of the Location	Vegetation type	No. of species occurred
Avadi	Avenue trees (in industrial area)	1
Central Polytechnic Campus	Avenue trees (urban 2)	1
Ennore	Mangrove (in Industrial area)	0
Guindy National Park	Tropical Dry Evergreen Forest	31
IGCAR	Shore line	16
Indian Institute of Technology	Human modified tropical dry evergreen Forest	17
Madras Christian College	Scrub Jungle	16
Mahabalipuram	Shore and interior rocks	7
Perambur	Avenue trees (urban 1)	1
St. Thomas Mount	Hillock (urban)	10
Theosophical Society	Mangrove (partially polluted)	5
Thirukazhukundram	Hillock (rural)	5
Tirunindravur	Avenue tree (rural 1)	1
Vandalur	Avenue tree (rural 2)	5

The study revealed the presence of 51 lichen species belonging to 31 genera and 20 families in and around Chennai city. In terms of species richness, the remnants of the Tropical Dry Evergreen Forest (Guindy National Park) host 31 species, whereas no lichen species occur in the Mangroves of Ennore Creek due to high levels of air pollution (from multiple sources) and large scale degradation of mangroves due to other biotic factors. It also facilitated the identification of lichen 'hot spots' in and around the city to develop a conservation strategy.

Earlier researches have revealed that lichen secondary compounds have bioactive potentials. So far only 700 compounds have been isolated from a small portion of lichens out of 13,500 lichen species described so far. The secondary chemistry of many of the tropical lichens is still unknown or remains under-explored and these organisms may serve as the potential source for novel compounds.

In this context, the characterisation of lichen diversity from the Western Ghats facilitated the screening of some of the potential, chemically rich lichens for their secondary compound profiles. So far species belonging to *Dirinaria*, *Heterodermia*, *Parmelia*, *Phyllopsora*, *Ramalina*, *Rocella* and *Usnea* have been screened for their secondary compounds. Lichen compounds such as Caperatic acid, Atranorin, Lichexanthone, Divaricatic acid, Norstictic acid, Terpenoids, Roccellic acid, and Salazinic acid were isolated and screened for anti microbial properties.

Sub Programme Area 204

Conservation and Bioprospecting of Endangered, Medicinal and Mangrove Species

The major objectives of this programme, since its inception, have been propagation (*in vitro* and *ex vitro*) and reintroduction of endangered and mangrove plant species and identifying bioactive natural products from these plants which may have pharmaceutical or agricultural value. Studies have also been initiated to identify nutritionally-rich salinity-tolerant plant species, which can be promoted in coastal agriculture.

204.1. Micropropagation Studies

Vegetative and tissue culture propagation and reintroduction methodologies have already been established for 25 endangered, medicinal and mangrove species. New protocols were developed for two more plant species *viz.* *Salicornia brachiata* and *Bauhinia tomentosa*.

Salicornia brachiata (Chenopodiaceae): It is an annual erect herb distributed mainly in the salt marshes of Tamil Nadu, Bengal and Sri Lanka. It is an important species providing vegetable, animal fodder, herbal salt and oils.

Succulent shoot tips from 3 month old seedlings were used as explants for tissue culture studies. Shooting response was best when MS media was supplemented with BA (3.96 μ M) + KN (0.46 μ M) + IAA (2.28 μ M) (55.3%). However the number of shoots per

explant and shoot elongation were better in MS medium with BA (4.44 μ M) + KN (0.46 μ M) + IAA (2.85 μ M).

The elongated shoots were best rooted in 1/2 MS medium supplemented with 2 μ M IBA, 0.4 μ M NAA and 0.1 μ M GA₃. Root elongation was good when the media was supplemented with 1 μ M IBA, 0.1 μ M NAA and 0.2 μ M GA₃. The rooted plantlets were kept in a growth chamber (NK Systems) at 26°C and 70% RH for one month. Most plants survived and grew like seed-grown plants.

Bauhinia tomentosa (Caesalpineaceae): It is a shrub or tree that is commonly grown as an ornamental plant. Flowers and buds of this genus have diuretic and anti-dysentric properties, while the leaves are used as plaster in abscess. Roots are generally used to treat liver inflammation and the whole plant is used as an antidote against snakebite and scorpion sting. This species is the least investigated, both in terms of tissue culture and phytochemical analyses.

Cotyledon segments from 7-day-old seedlings were used as explants for tissue culture. MS medium supplemented with 1.5ppm 2,4-D and 0.1 ppm BA gave best callus initiation and proliferation. Regeneration of shoots from calli was observed when organogenic calli were transferred to MS medium, supplemented either with thidiazuron or BA. However the regenerated shoots did not elongate in the same medium. Shoot multiplication and elongation were observed when the calli with regenerated shoots were transferred to MS medium containing isopentyl adenine (2iP) or a combination of 2iP and BA.

204.2 Bioprospecting Studies

Twenty-one species of various rare, endangered and mangrove plant species were screened for their anti-microbial and anti-fungal activity. Three plant species (*viz.* *Excoecaria agallocha*, *Syzygium travancoricum* and *Lobelia nicotianaefolia*) were shortlisted for further studies based on the bioassays. The bioassay guided fractionation yielded two anti-microbial compounds (β - Sitosterol and O- methyl myoinositol) from *Excoecaria agallocha*. Fourteen components of the essential oils from *S. travancoricum* that make up 86.9% of the total oil, were reported last year. During the current year studies were undertaken to see the effect of propagation method, season and location on the essential oil content of *S. travancoricum*. Studies were also initiated on the anti-mycobacterial and anticancer properties of *E. agallocha*.

Essential oils from Syzygium travancoricum : The yield of essential oil was low (0.02%) in the case of *in vitro* raised multiple shoots and rooted plants though the composition was more or less the same with 40% trans- β -ocimene and 8% caryophyllene. However the composition and yield were statistically similar for *in vitro* raised plants after 4 years, when compared to naturally growing trees. Since the multiple shoots possess volatile oils, this opens up an area for exploring the production in cultures.

The seasonal variation in essential oil content was also checked. Maximum yield of 0.2% was recorded in June and the lowest of 0.1% in February. Ocimene recorded a maximum composition of 59% in June and a minimum of 35.6% in February, whereas the highest

composition of 30.7% caryophyllene was recorded in December.

There is a marked variation in the yield as well as in the composition of the essential oil in the two sites namely, Gudalur and Wayanad. The yield was only 0.12% in Gudalur but higher in Wayanad. However, the oil was rich in Trans- β -Ocimene in Gudalur samples. The composition was 69.3 and 59% trans- β -Ocimene and 11.2 and 11.2% caryophyllene from Gudalur and Wayanad plants respectively. The percentage of caryophyllene was found to be the same in samples from both the areas. Such studies help in identifying the best period for collection and also in identifying different chemotypes.

Antimycobacterial activity of Excoecaria agallocha : The HIV-tuberculosis co-infection has caused an impact on tuberculosis epidemiology all over the world and the efficacies of the therapeutic schemes traditionally prescribed in the treatment of tuberculosis, such as isoniazid, rifampicin and pyrazinamide, have decreased due to the appearance of multidrug resistant *M. tuberculosis* strains. The aqueous extract of *E. agallocha*, a medicinally important mangrove plant, has been studied for its antimycobacterial activity against *Mycobacterium tuberculosis* H37Rv strain at 0.1, 1.0 and 2.0mg/ml. The growth was more or less equivalent to the control at 0.1mg/ml. The maximum reduction of 60 and 100% were observed at 1.0mg/ml and 2.0mg/ml respectively on the 3rd day. However, 0.1mg/ml did not inhibit the growth of *Mycobacterium tuberculosis*.

Analysis of seed oil quality in Salicornia brachiata: The need for salt tolerant crops increases each year as a growing world

population seeks to feed itself and the problem of soil salinisation accelerates in many parts of the world. Research in this direction was initiated last year with the selection of two mangrove species *Sesuvium portulacastrum* and *Salicornia brachiata*. Proximate composition of leaves was studied and a higher protein and carbohydrate content was found compared to regular green leafy vegetables like lettuce, spinach, moringa, mustard, cucumber etc. Studies were undertaken on the quality analysis of seed oil from *Salicornia brachiata*.

Seed oil yield of *Salicornia brachiata* varied from 18.8 to 19.4% in all the six populations studied. A comparison of *Salicornia* seed oil with other edible oils (Table 2.8) showed that unsaturation (measure of Iodine value) is very low and it is slightly higher only to coconut oil. The saponification value, which is an indication of average molecular weight of fat, is very high (547.5) for *Salicornia brachiata*. Saponins are quite bitter and can be found in many common foods such as beans. They can be removed by carefully leaching the seed or flour in running water. High ester value is an indication of a high amount of glycerides.

Fatty acid composition of S. brachiata seed oil : GC analysis showed 4 prominent peaks in the seed oil of *S. brachiata*. Comparison of these peaks with GC-MS fatty acid library identified these fatty acids as palmitic, myristic, 10-undecenoic and oleic acid respectively. A comparison of *S. brachiata* seed-oil with other edible oils shows that *S. brachiata* oil is deficient in long chain unsaturated fatty acids. However it is very rich in mono-unsaturated fatty acid (oleic acid), which is at par with mustard oil and lower only to groundnut and canola.

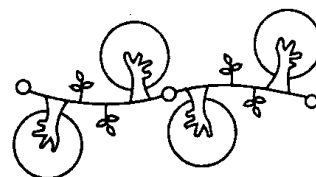
Table 2.8 : Comparison of oil quality of *Salicornia brachiata* with some edible oils

Refined vegetable oil	Moisture Percent by weight (max.)	Saponification value	Iodine value	Acid value	Unsaponifiable matter percent by weight (max.)
<i>Salicornia brachiata</i> oil	-	547.5	19.1	9.2	-
Coconut oil	0.10	250	7.5-10.0	0.5	1.0
Cotton seed oil	0.10	190-198	98-112	0.5	4.5
Groundnut oil	0.10	188-196	85-99	0.5	1.0
Safflower oil	0.10	186-196	135-148	0.5	1.0
Sunflower oil	0.10	188-194	100-145	0.5	1.5
Mustard oil	0.10	168-177	96-112	0.5	1.2
Rapeseed oil	0.10	166-198	94-126	0.6	2.0

10-undecenoic acid, which is an abundant fatty acid in *S. brachiata* is used in the manufacture of 11-aminoundecenoic acid, which is the starting material for nylon 11. It also oxidizes heptaldehyde to heptanoic acid, the polyol esters of which are important lubricants. 10-undecenoic acid is also being used as an inexpensive source for the synthesis of the pheromones of cotton pests, peach tree borer and cherry tree borer.

Ancel Keys and Mark Hegsted, pioneers in fatty acid research, showed that all

saturated fatty acids are not equal in their cholesterol raising effect. Hegsted's formula indicated that saturated fatty acids with a short carbon chain (C6 to C12) were not cholesterol raising and that myristic acid (C14) was the most hypercholesterolemic of the saturated fatty acids and palmitic (C16) the most potent saturate (IFICF, 1998). Thus the oil from *S. brachiata* can also be a promising edible oil source after saponins are removed in running water.



Ecotechnology

The Biovillage and Community Banking movement made good progress in Pondicherry, Tamil Nadu and Orissa. Help was also rendered to the earthquake affected areas of Kutch in initiating economically viable microenterprises supported by microcredit. The programme initiated in collaboration with the Ohio State University with support from the Sir Dorabji Tata Trust on the sustainable management of the major soil types of our country also made good progress. The ecotechnology programme has shown methods of assisting the rural poor, particularly women, to become skilled workers, by mastering the blending of traditional wisdom with frontier technologies.

Sub Programme Area 301

JRD Tata Ecotechnology Centre

The JRD Tata Ecotechnology Centre continued its activities of evolving methodologies for operationalising sustainable development in the area of agriculture and rural development through participatory research, capacity building and grassroot institution building. The biovillage concept which blends livelihood security with sustainable management of natural resources and represents a forward-backward linkage within the rural society for sustainable development is being demonstrated in more and more villages. It represents a capacity building process that enhances the ability of the community to identify various options in livelihood strategies, technologies and sustainable management of natural resources and choose the appropriate option. This approach encourages a value addition process within the system to generate sustainable employment and income.

Table 3.1 gives a broad outline of the activities of the centre.

The programme activities are coordinated in Chennai. In addition to these activities, certain laboratory studies were also conducted in Chennai to support the field activities and are reported in SPA 301.4

The activities of the Centre were evaluated by an external evaluator Dr Manjul Bajaj, on behalf of Sir Dórabji Tata trust, Mumbai. Recalling the review conducted in 1997, she has made the following observations :

The overall gains made by the JRD Tata Ecotechnology Centre in the last five years are very impressive. The focus of the agency has shifted perceptibly from innovation per se to management of innovation and fostering replication.

She has pointed out three important trends in the activities of the Centre:

- *The emergence of grassroots groups through which programmes are delivered is the single most important achievement in the last four years.*

Table 3.1 : *Region-specific activities of JRD Tata Ecotechnology Centre*

SPA	Region	Area	Focus
301.1	Coastal	Chidambaram in Tamil Nadu, Pondicherry and Karaikal in Pondicherry, Mallikapur and Gayaspur in Orissa	Water-use efficiency, soil conservation, alternative agriculture pattern and disaster management
301.2	Hill	Kolli Hills in Tamil Nadu	Agro-biodiversity and food security; linking conservation and development
301.3	Semi-Arid	Kannivadi and Pudukottai in Tamil Nadu	Value addition to the time and labour of rural poor; increasing the productivity of rainfed agriculture system

Grassroot institutions, in the form of self help groups (SHGs), Associations and Federation of self help groups, have been established at Kannivadi, Kolli Hills, Chidambaram, Pondicherry and Karaikal and in the villages of Kendrapara district, Orissa. These institutions now form active partners in the development activities in the region. They have also formed networks with the local government, Non Governmental Organisations (NGOs), private sector and other development institutions. There are now 300 SHGs in the villages where the Centre is operating. In 2001-2002, nearly 5,000 of its members have had transactions amounting to Rs. 1.25 crores, in the form of loans from banks, internal savings and credit and turnover in the business of microenterprises.

- *The development of apex level institutions federating the SHGs is another very laudable step as it puts in place a mechanism whereby the Centre can actually withdraw from the project after its completion in such a manner that the growth process can be sustained beyond the life of the project.*

Reddiarchatram Seed Growers Association (RSGA) and *Kulumai*, a federation of SHGs in Kannivadi, *Thenkoodu*, a federation of SHGs in Chidambaram and Bio Village Council (BVC), a federation of SHGs in Pondicherry are the apex level institutions which the Centre has established. In addition *Sethiathope Ayacuttharar Association (SAA)* is involved in the Chidambaram region for propagating the models of sustainable development. These apex institutions are not only involved in facilitating saving and credit but are also actively involved in channelling

the development programmes of the government, capacity building and helping in negotiations and conflict resolutions between various stakeholders in development. The emergence of *Thenkoodu* and the involvement of SAA took place in 2001-2002.

- *A third major gain at the social mobilisation level is the emergence of villagers earlier trained by the project as trainers in their own right, thereby creating a pool of skilled rural people who can give an impetus to technological progress in their respective areas.*

International organisations like Commonwealth of Learning (COL), Canada have started interacting with the grassroot institutions promoting the capacity building process among the rural community. RSGA with the support of COL has conducted nearly 8,500 trainee days for nearly 400 farmers and agricultural labourers in sustainable agriculture. Similarly four SHGs began conducting literacy programmes using modern information and communication technologies. The women who are involved in the production of *Trichogramma parasitoid* have trained representatives of NGOs and villagers from Andhra Pradesh. The Government of Pondicherry has recognized 7 members of SHGs at Pondicherry as trainers for microenterprises.

The evaluation report has also pointed out the initiatives of the Centre in the technological front and its interaction at the policy level. The report has made recommendations for two levels.

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At the project level it has suggested that the Centre strengthen itself in the areas of marketing and economics; record keeping at the village level and risk analysis and insurance issues.

At the organisational level suggestions have been made to pay greater attention to human resources management by enhancing training budgets, introducing periodic work culture audit and encouraging the staff to develop their own career development plans.

The important activities of the year may be summed up as follows:

- The facilitation of management of nearly 300 SHGs and four federations, with nearly Rs. 1.25 crore turnover
- Capacity building to the tune of 14,000 trainee days in various areas of sustainable development at which more than 60% of the participants were women
- The evolution of grassroot institutions into development agencies with organisations like RSGA conducting direct training programmes on sustainable agriculture to the tune of 8,500 trainee days, thereby facilitating horizontal transfer of knowledge
- The introduction of adult literacy as an important component of ecotechnology whereby four SHGs using modern information and communication technologies have started conducting adult literacy programmes in the villages
- Publication of four reports and two articles in national and international journals
- Providing support to nearly 50 microenterprises of SHGs towards self-sustainability
- Completion of the second year field trial of the impact of grass carps in controlling water hyacinth in the ponds and the completion of the third field trial on the impact of *Dodonaea* in controlling American bollworm
- Evolution of grassroot institutions as development agencies through activities such as
 - Constructing cyclone shelters in Gayaspur and Mallikapur villages in Orissa
 - Constructing school building in Thonimalai in Tamil Nadu
 - Creating an impact in Keelamanakudi village in reducing chemical fertilisers and pesticides in the cultivation of paddy
 - Monitoring and supporting SHGs
 - Facilitating the use of biofertilisers in more than 5,000 acres and biopesticides in 1,000 acres in Kannivadi region
 - Facilitating negotiations between various stakeholders in issues such as pricing and wages
 - Emergence of RSGA as a formal seed company, encouraging seed production to the tune of 50 acres of hybrid and open pollinated varieties in Kannivadi region

- Running a website to facilitate the development of the horticulture market
- Linking minor millets with urban markets and improving the trends in the household consumption pattern of minor millets in Kolli Hills

301.1 Coastal Region

The activities of the Centre in the coastal region laid stress on efficient water management, diversification in the cropping pattern and generating multiple livelihoods. The projects focus on issues such as water and soil management in agriculture and common property resources.

301.1.1 Chidambaram

Models for sustainable development suitable for coastal regions are being studied in villages around Chidambaram since 1997. The models focus on water and soil management. Eco-aquaculture, Integrated Intensive Farming System (IIFS) and Community Pond Management have been tested and demonstrated in the villages. In addition to these activities microenterprises have been encouraged among the SHGs. It is hoped that these activities will lead to the emergence of biovillages in coastal areas.

Ecoaquaculture: The model aims to identify appropriate production processes for inland fresh water aquaculture. Utilisation of ground water and canal water for aquaculture purposes is being opposed on environmental and social grounds. The ecoaquaculture model focuses on culturing of the fresh water prawn *Macrobrachium rosenbergii* utilising

harvested rainwater under the conditions of Low Intensive Sustainable Aquaculture (LISA). Organic fertilisers and zero-water exchange system are some of the important traits of this model. This is the fifth year of the demonstration of the model. As in previous years, data has been collected on aspects such as inputs, environmental parameters, productivity, labour usage pattern etc. During 2002, it has been planned to consolidate the five-year trends and evolve an approach for an appropriate production process.

Sustainable management of community ponds: Community ponds play a crucial role in the coastal delta regions not only in the management of canal system of irrigation but also in providing water for drinking and household needs of the poorer sections of society. However most of these ponds are filled with *Eichhornia crassipes* (water hyacinth) leading to inefficient use of the ponds. The experiment conducted during the previous year to control water hyacinth using grass carp was repeated again during 2001-2002 in 5-m³ dug out ponds with the following treatments: Control (water hyacinth alone), different weight of the grass carps viz., 5, 50, 100, 200 and 500 gm and each with and without commercial feed. Two kg of water hyacinth and one kg of grass carp were introduced in all the treatments and the final weight was taken after 40 days. The data is being analysed statistically. Annamalai University was helped to clean its drinking water ponds invaded by water hyacinth during 2001-2002 using grass carp. In the coming year, the Centre is planning to facilitate SHGs in nearly 30 villages to manage water hyacinth using grass carps.

Integrated Intensive Farming System (IIFS): The concept of IIFS is being demonstrated in a model farm at Keelamanakudi, near Chidambaram. This region has been deliberately chosen so as to demonstrate the alternatives to mono cropping of paddy. In this farm, more than 12 inter-related activities such as paddy cultivation, horticulture, floriculture, fishery, mushroom production and biofertiliser production are taking place in one acre of land. More than 25 farmers and landless labourers of Keelamanakudi village are working with the project staff in analysing the economic efficiency, ecological viability and social feasibility of the model.

The analysis of the five-year data shows that the paddy productivity under an integrated organic condition is more or less equivalent to that of conventional farming (Fig. 3.1a). In terms of cost-benefit analysis, IIFS shows an advantage in comparison to conventional farming (Fig. 3.1b). Organic carbon which is one of the indicators for sustainability, has been consistently improving in the case of IIFS (Fig. 3.1c). Another important issue is the pattern of labour usage and studies are being conducted to analyse the possible impact of IIFS on types of labour and on gender issues.

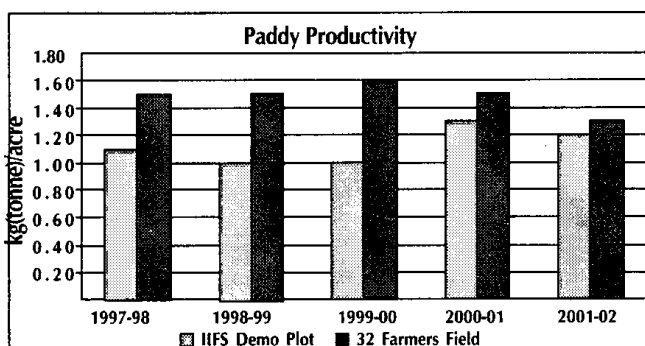


Figure 3.1a

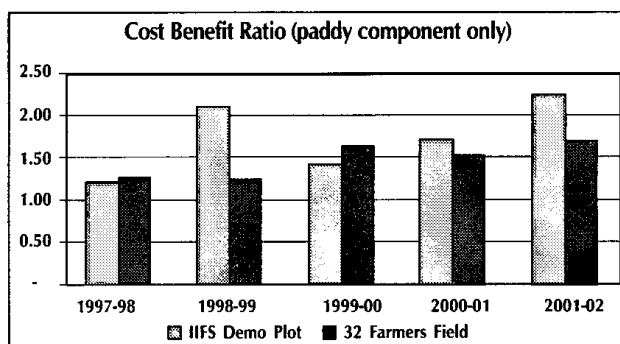


Figure 3.1b

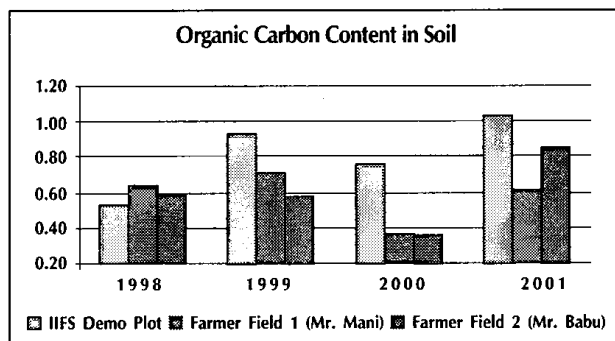


Figure 3.1c

Figure 3.1 : Analysis of various parameters in IIFS model and conventional farming at Chidambaram

The project has been conducting farm surveys and analysis of soil samples from selected fields every year in addition to PRAs. During 2002-2003, the five-year experience will be analysed and consolidated in a report to offer a perspective on IIFS.

Grassroot institutions: 15 SHGs were formed. Another important event of the year was the formation of *Thenkoodu*, a federation of all the 40 SHGs. *Thenkoodu* is now actively involved in promoting microenterprises and value addition activities. Turkey-rearing, calf-rearing and seed production are the microenterprises which have been initiated by the SHGs. Ornamental fish breeding is being continued by two women SHGs. Integrating piggery with aquaculture is being attempted by one of the SHGs. Nine farmers have replicated the ecoaquaculture model in their field. Four farmers have adopted the IIFS concept as a

complete package, with the following integration: paddy- black gram - fish farming - dairy. 15 other farmers have taken up fish - jasmine integration for the optimum utilisation of the available natural resources in their farms. In an area dominated by monocropping of paddy, these new microenterprises linked with agriculture and aquaculture may show multiple livelihood opportunities for the poorer section.

Training was conducted in the areas of precision farming, microenterprises and eco-aquaculture, amounting to 2,726 trainee days. 132 women and 85 men participated.

The IIFS model and the capacity building programmes have helped in popularising organic manure and biopesticides (Farm Yard Manure and neem cake) and helped in reducing the use of chemical fertilisers and pesticides without affecting the productivity as shown in Figure 3.2.

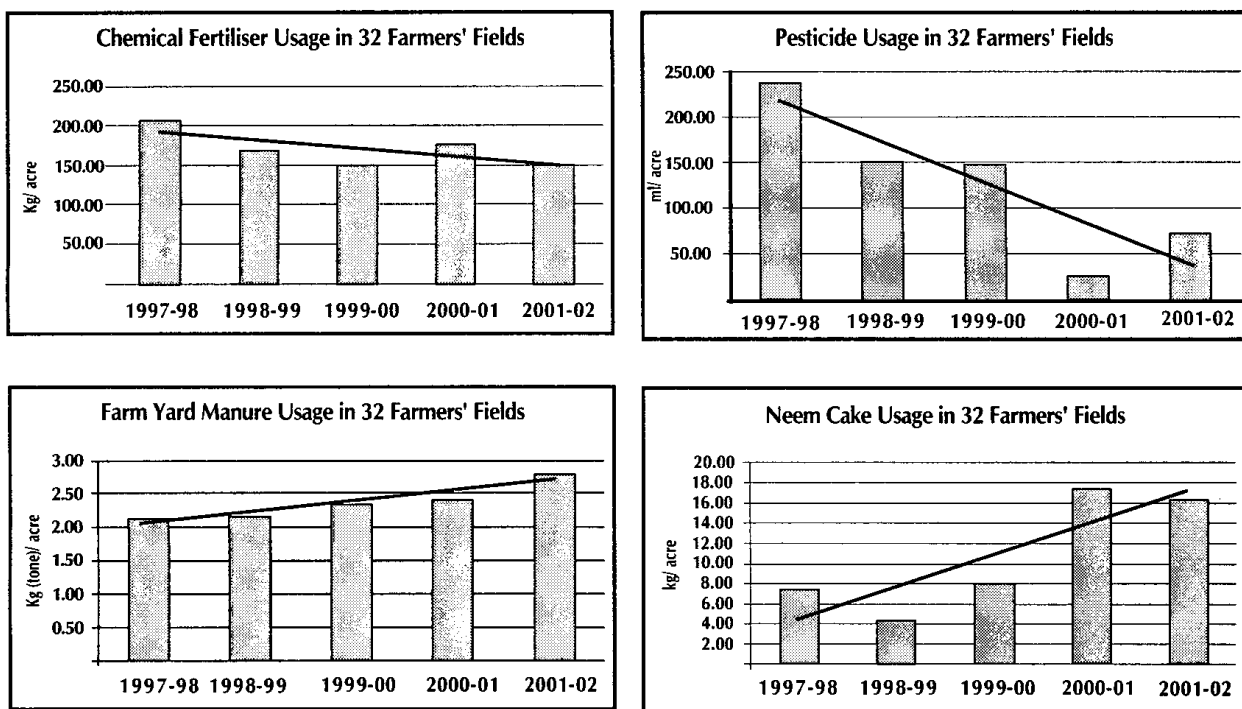


Figure 3.2 : Impact of IIFS model on conventional farming practices

During the last four years *Sethiathope Ayacuttharar Association (SAA)* consisting of nearly 40,000 farmers has been observing the activities of IIFS, ecoaquaculture and development of microenterprises. During 2001-2002 it came forward to replicate and spread the message in the delta region. Discussions were held with the Association and the MOU is being prepared. This would also form the strategy for enabling the grassroot institution to manage the development process and facilitate the withdrawal of MSSRF from the project area by 2005.

301.1.2 Karaikal

In the coastal region of Karaikal the focus has been the development of coastal eco-aquaculture for shrimp farming. A perspective plan was developed with Low Intensive Sustainable model. Green belt development and bioponds were incorporated in the plan. Four women SHGs were formed for managing the initiatives. A nursery was also raised by the SHGs for green belt activities. Two of the four SHGs initiated microenterprises in dairying. Approval was obtained from Aquaculture Authority of India to begin shrimp culture. However due to limited project time and fund-flow, the feasibility of implementing the project is being studied.

301.1.3 Pondicherry

The concept of Biovillage was initiated in Pondicherry in 1994-95. The support of United Nations Development Programme (UNDP) helped to establish the project in 19 villages. A Biocentre was established at Pillayarkuppam village to act as a centre of horizontal transfer of knowledge and offer single window system for extension.

During 2001-2002, as a strategy to withdraw, the Biocentre has started to focus on training, demonstration and linkage with government departments and nationalised banks. The SHGs were federated into the Bio Village Council (BVC), which will take up the activities of the Biocentre in due course. The executive committee of the BVC liases with SHGs, the Biocentre, banks and government departments. A bank account has been opened in the name of the BVC. 117 SHGs have become members of the BVC and contribute Rs.400 per year towards its functioning.

Sustainability of the Biocentre was given priority. Livelihood opportunities with microenterprises like mushroom (oyster and milky) production, spawn production, fodder, vegetable and flower production, vermicompost, fishponds and *Corcyra* production were strengthened through consistent training and market linkages. Capacity building was one of the important activities. The BVC played a crucial role in organising and conducting training programmes. Training was imparted in various activities such as mushroom production, fodder production, horticulture, floriculture, credit management, animal husbandry, etc. Training was given to 2,283 women and 93 men during this period. Out of the 4,876 trainee days, 1,360 trainee days were devoted to various women SHGs in other parts of Pondicherry, based on the request of several government departments and Non-governmental Organisations (NGOs). The members of the BVC and the staff of MSSRF conducted follow-up studies and linked the trained women to banks for microcredits and microenterprises. 117 SHGs have achieved a

turnover of Rs. 56.35 lakhs through savings, credit and business.

Other activities: The BVC celebrated women's day at the Biocentre. More than 500 women members took part in the programme. Officials from NABARD, banks, and a few farmers interacted with participants on various issues like banking, saving, microenterprises and marketing. *Adiperukku vizha* (village festival) was organised at the Biocentre. Nearly 500 SHG members participated and discussed various issues such as the achievements and shortcomings of SHGs.

Production activities at the Biocentre: Spawn production of oyster mushroom went up to 1,800 kg and was used by the entrepreneurs. In turn they produced 1,000 kg of mushroom. The products were marketed in the retail shops at Pondicherry. Production of milky mushroom is under process. Importance is being given to this activity as it can be carried on round the year and fetch a high market price. SHG members were trained intensively in the production of host (*Corcyra*) of egg parasitoid. Nearly 3,500cc of *Corcyra* was produced during the year. There is a demand from government and private sugar factories for the product. After sustained intervention, many farmers have started using biofertilisers (*Azospirillum*, *Phosphobacteria*) in their fields. An in-depth survey revealed that these organisms have a major role in the yield. Slow conversion to organic cultivation is possible within a few years.

301.1.4 Gayaspur and Mallikapur in Orissa

In Gayaspur in Kendrapara district and Mallikapur in Jagatsinghpur district of Orissa, the emphasis was on developing the ability

of the communities in disaster management and sustainable development. These are the two villages that were badly affected by the cyclone in 1999.

Last year, the project started focusing on facilitating the village communities in building cyclone shelters-cum-multipurpose buildings, including grain banks and knowledge centres. The villagers came together and formed a committee called "*Maa Taradevi Grammya Committee*" to monitor and supervise the progress of their work. A constitution was prepared and Grammya committee got it registered under Society's Act. In Mallikapur, a school committee took the responsibility of constructing the cyclone shelter in the school.

During 2001-2002, the Government of Orissa allotted land to *Maa Taradevi Grammya Committee* in Gayaspur. The committee approached the architect to design the building and took the responsibility for constructing the building. In this process, awareness was generated among men and women of the village regarding the design of buildings that can withstand cyclones. MSSRF entered into a Memorandum of Understanding (MoU) with the village committees and transferred to them the funds that had been donated by a leading business firm. The villagers completed the construction of the buildings that were inaugurated this year. On the day of the inauguration, all the villagers took an oath to manage the building and develop the village; the copy has been given to the District Collector, who has promised to provide infrastructure facilities for the village. The villagers have developed action plans for managing the buildings.

Gayaspur has developed an action plan for sustainable development. Five SHGs have been formed. In order to bring the villagers above the poverty line, training on skill empowerment and capacity building, kitchen gardening, apiculture, oyster mushroom cultivation, etc. was conducted jointly with Krishi Vigyan Kendra (KVK). The intensive training has resulted in poor women taking up backyard kitchen garden and poultry as microenterprises. As a result of this initiative, the project has been expanding to neighbouring villages. To meet the grain requirement during the scarce period, the village committee initiated Community Grain Bank activity. Many households have contributed 50 kg each as an initial stock to the grain bank and during 2001-2002 nearly 30 households borrowed from the grain bank in times of scarcity of income.

The initiatives at Gayaspur have attracted the attention of the neighboring villages and they have come forward to form SHGs and become involved in the sustainable development of the villages.

301.2 Hill Region

In the hill regions, the emphasis has been on achieving food security by enhancing traditional practices.

301.2.1 Kolli Hills

Biodiversity with food security is the theme in Kolli Hills in Tamil Nadu. The focus of the activities at Kolli Hills has been on encouraging the tribal families in strengthening the traditional agricultural farming systems for minor millets and fruit

crops. The project has been working with the tribal communities in evolving multiple livelihood opportunities in the hill ecosystem by developing models for increasing productivity and appropriate market linkages.

Market linkages: The market linkages for creating an economic stake in the cultivation of nutritious millets was continued by linking the primary producers of minor millets with markets at the local, regional and national levels. The market incentives motivated the millets growers and kindled their interest in millets cultivation. To create an awareness among the urban people, diverse market promotional strategies such as small recipe booklets on millets and advertisements in the weeklies and dailies were introduced. Quality control and timely supply of products are the crucial factors in marketing value added products to organised sectors. The details of the market linkage are given in programme area 200 under 201.1.1 Kolli Hills.

Micronutrient studies on little millet (Panicum sumatrense): The impact of micronutrients like zinc and iron on the productivity and quality of little millet was studied for two seasons under rain fed conditions. Significant differences were observed in the vegetative growth parameters but not much in productivity, reproductive parameters and quality in terms of nutrient profile in the grains.

VAM and its association with Azospirillum on little millet: The earlier studies indicated that application of *Azospirillum* enhanced the productivity in little millet by fixing atmospheric nitrogen in the rhizosphere. A limiting nutrient for proper root and grain development is phosphorus (P). Inherently

the soil in Kolli Hills has considerable amounts of P; however a large portion of it is unavailable to the crop. Specific VAM species were isolated, multiplied and used in the trial. The results indicated that the application of VAM species like *Glomus fasciculatum* and *Gigaspora margarita* mobilised P and made it available to the crop. 12% increase in grain productivity was also noticed. Further their associations with *Azospirillum* increased the growth and yield parameters particularly the harvest index and improved the crop productivity by 23%. The findings need to be confirmed in different localities in Kolli Hills in the coming seasons.

Shelf life of the dehulled millets: The shelf life of products of dehulled little millet and Italian millet was studied. The products were packed in an airtight manner in 20 gauge plastic bags. They were monitored periodically at an interval of 5 – 10 days from 20 days to 100 days and the results indicate that the products could be stored up to 100 days under room temperature without any deterioration in the quality in terms of odour, colour, bitterness, rancidity and pest infestation. Even 150 days after storage in an airtight packet there were no changes in colour, taste and odour.

Food fortification: Bread and chapattis are some of the potential products for fortification with minor millets to create a demand in the urban sector, considering the good micronutrient profile of millets. The organoleptic properties and shelf life of the fortified products are the primary criteria in marketing, besides nutrition. Experiments were conducted to study the organoleptic properties and shelf life of the fortified

products in comparison with available standard products (branded bread and chapattis) in the market. Fortification with little millet flour at three and five percent in bread and 15% in chapattis was tried. Results revealed that the total sugar, total protein and crude fibre content in minor millet bread at 3 and 5% were higher and variation was not observed in taste and aroma. There was no significant difference in shelf life but the intensity of the fungal colonisation was lower (around 70%) in 5% fortification, followed by 3% (40%) fortification. In millet fortified chapattis a slight difference in taste and aroma was noticed and there was a marginal increase in sugar content, 2.5 fold increase in protein and 1.6 fold in crude fibre. The shelf life of millet-based chapattis was higher compared to control. In control the fungal colonies appeared even on the second day but in the case of millet chapattis the fungal colonies emerged only after the fourth day. The colony density was far less in millet chapattis than the control and the species composition varied.

The initial study revealed the lack of anti-fungal properties in millet grain in spite of its reduced fungal infection in fortified products. Though the fortified bread and chapattis have significant variation in organoleptic properties, only fortified chapattis had longer shelf life. Based on the results it was found that millet fortification in bread turns into a non-viable proposition in comparison with conventional fortification for micronutrients, whereas it has a potential in chapattis. The project consistently explores other viable opportunities and recently found that flakes and biscuits are potential products that have a niche market in health food sectors.

Enhancing rural livelihoods through agro-industries: Efforts on strengthening livelihoods through value addition as *organic biodiversity products* were augmented by reinforcing the industrial linkages. The ECOCERT International Agency issued the organic certificate valid for 12 months to export 400 tons of pineapple from Kolli Hills. The quality norm of fruit weight (> 500g) and sugar content (brix value > 10) were observed in the procurement process. Men and women members of the SHGs pooled the products coming from different localities and ensured the sugar content, size and weight of the fruits, while marketing the produce at the collection centres. This process instilled a feeling of collective ownership and enhanced the negotiation and business skills among the self help members. The collection was done under the direct supervision of Ion Exchange Environmental Farm Ltd. (IEEFL). Only 14 tons were marketed out of the estimated potential of 400 tons due to the delay in the certification and the procurement process. A rough estimation of increase in the profit margin through organic marketing is around 10 %. The members of the SHGs, IEEFL, United Western Bank and MSSRF held discussions to organise the credit support to continue organic pineapple production in the coming year and the bankers have agreed in principle to provide the monetary support to strengthen the production systems and certification. The certifying agency extended the validity period of the certificate to one more month, up to May 2002. Subsequently COCERT will inspect and certify the fields.

It is planned to upscale the marketing quantity to 500 tons by involving more farmers under certification. The process kindled the interest on the part of the

corporate sector in reducing the cost of certification and steps were taken in this direction.

Strengthening millets based mixed cropping system: To improve the food and income security of tribal families it was decided to establish viable and efficient mixed cropping systems and create sustainable market linkages. A microsite with maximum varieties was identified. Participatory appraisals were done and activities were planned. Joint appraisal was conducted focusing on agricultural season, landraces, rainfall distribution, constraints and opportunities associated with millets cultivation. The appraisal also helped to identify the millet-growing families at present. Two millet growers groups have been formed and a joint one-year action plan prepared.

Quality Protein Maize: Quality Protein Maize (QPM), which has four times higher protein content than the normal maize seed, has a potential for poultry industries. The QPM seeds were supplied by Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, through the Ministry of Agriculture, Government of India, and field-tested in Namakkal during rabi season. Eight QPM varieties and two farmer-cultivated varieties were tried. The average yield varied between 5,000 and 8,500 kg per hectare in QPM as against 6,500 kg in local varieties. QPM varieties have advantages over local varieties in terms of protein content and yield advantage and can be cultivated in Namakkal region as an irrigated crop.

Documentation: A book on folk songs of Kolli Hills has been prepared with nearly 300 songs and an ethnographic account of the

Malayali tribe, to understand the cultural and social background of the group. The book contains a brief sketch about the entire Project-process. The folk songs reflect the local knowledge of biocultural diversity which facilitates better planning in biodiversity conservation. A learning centre for functional literacy is operating at Chinnamangalam village, Alathur Nadu, the details of which are given in SPA 301.3.

Capacity building: Capacity building and skill enhancement resulted in 250 men and women farmers being trained; a total of 3,500 trainee days was achieved. Emphasis was on imparting skills in professional management, marketing, communication, management of assets, enterprise and organisation building. The participants were trained in quality control, packing and marketing of the products. Organic pineapple growers were trained on quality control parameters, sustaining soil health and increasing productivity. 25 SHGs are functioning and 2 SHGs received matching grants from banks, which enhanced their local lending process mainly for activities such as agriculture, health, repaying of debts and social and religious obligations. The important income generating activities taken over by the SHGs are processing mills, petty shops and goat rearing.

Impact studies: Two different kinds of surveys were carried out during 2001-2002:

- Assessing the impact of the project by comparing the present status with benchmark recorded before implementing the project in minor millets cultivation and consumption

- Utilisation and awareness of the processing mills which were initiated by the project

The impact on food consumption, increase in area under cultivation, interest in minor millets cultivation, awareness about the processing mill and its utilisation, interest in consuming millets and reasons for not taking up the millets cultivation were compared between 1997-98 and 2001-02. The details are given in Table 3.2. The survey was conducted in Alathur Nadu and Devanur Nadu, covering 44 randomly selected households. The study included little millet, Italian millet, finger millet, and kodo millet in kg per annum per household.

The analysis shows that the rate of millets consumption has increased by more than four times from 1998 to 2002. Similarly, the area under minor millets cultivation has also increased from 12.5 acres in 1997-98 to 50 acres in 2001-02, which is 4 times higher when compared to the base year (1997-98). During 1997-98 only 56 % of the surveyed households expressed an interest to continue millets cultivation whereas in 2001-02, 100% response was recorded and it was mainly to ensure food security and have a nutritious diet. The processing facilities and market linkages motivated most of the farmers to take up millets cultivation after a long gap. The focused group discussions revealed a change in the attitude of the people regarding minor millets. A few years ago offering millets food to guests was considered a sign of low social prestige but now the perception has changed and serving millets food confers good recognition in the community.

Table 3.2 : *Impact of the minor millets project in 1997-98 and 2001-2002 - a comparison*

Particulars	1997-1998	2001-02
Average consumption of minor millets (kg)	57	247
Area under cultivation of millets (acre)	12.5	40
Interest in minor millets cultivation (%)	57	100
Awareness about (%)		
Processing mill	0	93
Utilisation	0	50
Reasons for not taking up millets cultivation	Introduction of tapioca, drudgery in processing, climate, risk, low productivity, nonavailability of seeds, lack of market opportunities high labour demand	Tapioca cultivation, climate, risk scarcity of suitable land, labour availability

Utilisation and awareness of processing mills:

A small survey was organised to assess the food consumption in the villages surrounding the processing unit nine months after its installation and fifteen farmers who used the mill for debraning were identified. The results revealed that four of them had cultivated millets during the previous season. All of them are regular growers of tapioca during the past ten to fifteen years and nearly 99% of them are landholders (both the *mettankadu* and *kollkadu*). The percentage of users of minor millets increased from 40 to 60% during the last three months after the installation of the processing facility. The average frequency of consumption is 8 to 10 days in a month, with an average of 1.5 to 2 kg per household.

Grassroot institutions: A Federation called Kollimalai Oorttuneer has been formed with representatives from 25 tribal SHGs.

The Federation emphasises the management of sustainable development programmes through capital mobilisation, market linkages, participatory research, conservation of traditional varieties and biodiversity and the protection of the cultural heritage of the tribal community.

301.3 Semi Arid Regions

Increasing the yield and providing economic opportunities for livelihood are the major concerns in the semi-arid regions.

301.3.1 Kannivadi

Kannivadi region, located in Reddiarchatram block, Dindigul district, Tamil Nadu is a semi-arid region cultivating horticultural crops. Agriculture is the major economic activity. The livelihood of most households in the region is agricultural labour. A majority of the farming households are small and marginal

landholders. Time and labour being the two assets of the rural poor, the objective of the on-going programme is to add value to them. The activities include training and capacity building, field demonstration and participatory research, strengthening the existing grassroot institutions and evolving models for optimum utilisation of the existing bioresources towards poverty eradication.

Ecopreneurship for strengthening of livelihoods of the rural poor: Efforts were continued to enhance productivity and quality control for better marketing of the ecopreneurial activities started last year such as *Trichogramma* cards, paper and board from banana waste, biomanure from banana and other agricultural waste, vegetables from low cost greenhouse and ornamental fish breeding. Improving the communication skills of the women entrepreneurs and adopting new marketing strategies to expand the marketing areas are some of the other issues focused on during the year. In biopesticide production and backyard ornamental fish breeding, the replication process was facilitated.

Village level Trichogramma biopesticide production: The production process and marketing of *Trichogramma* have been stabilised through regular evaluation and planning by *Poomani* and *Kavikul* women self help groups. The members of these two SHGs trained the Chinnammal women's SHG in production and marketing. The groups are gradually increasing the production rate by refining the process in order to meet the market demand. They have covered 590 trainee days. The total production by the groups for the year is 3,500 cc of *Corcyra*

eggs to the value of Rs. 34,000. About 300 acres of land has been covered. As a result 1-2 sprays of chemical pesticides have been reduced which ultimately reduces cultivation expenditure by Rs. 300 per acre. Feedback reveals the decline of stem borers, leaf feeders and bollworms in the fields. Apart from meeting the demands of the local farmers, the groups are supplying *Corcyra* eggs as inoculums to the private sector in other parts of Tamil Nadu. This has helped the women to overcome the initial problems they faced in marketing the product. At present the groups are negotiating with the corporate sector for a market tie-up to produce up to 1,00,000 cc per year. The cost benefit analysis shows that the profit margin is more than 50%. Nearly 40 women belonging to two self help groups have emerged as trainers. They are training women self help group members in *Trichogramma* production in other parts of Tamil Nadu. *Poomani* women's self help group has developed a perspective plan to emerge as a training centre in the region and prepared a training manual with the participation of the other groups on the production process. Results of the laboratory experiment to re-use *Corcyra* waste as ornamental fish feed shows 25% increase in the growth rate of the fish. An ongoing experiment is testing the possibility of using the *Corcyra* waste as poultry feed.

Board and paper making from agricultural waste: The conversion of agricultural waste produced in the region, especially from banana fields, into paper and boards has been increasing gradually. The unit is fully equipped with all machinery including a heavy hydraulic press, which can help to increase the production many fold. It is

equipped with an effluent treatment plant to recycle the minimum effluent occurring during the production. The Pollution Control Board, Government of Tamil Nadu has certified the unit. The unit has been giving employment to six women and two men for six days a week. The members of the women SHG that is managing the unit have undergone training for developing a business plan and quality control. Shree Aurobindo Ashram, Pondicherry, which has experience and knowledge in this field, is helping the group in quality control. New market avenues have been identified; this includes the international niche markets. Local market linkages were created with stationery and wholesale merchants, educational institutions and government departments. For selling the boards interior decorators and bridge and building contractors have been approached. Loan repayment to Canara Bank by the SHG is promptly done as per the repayment schedule. A business expert from Mexico stayed with the group and helped the members to develop simple methods for implementation of the operational technology. The members have improved their entrepreneurial capacity and gained confidence in asset management.

The production of biomanure from the banana waste by two women SHGs is continuing. They have produced seven tons of biomanure from 20 tons of banana waste. Different composting methods were attempted; the result shows differential in the rate of composting and the cost involved. The period ranges from three months to six months and the cost per heap Rs. 600 to Rs. 1,000. Niche markets for the biomanure produced, which is rich in potash suitable

for root crops like beetroot, radish etc, have been identified. The tea and coffee planters from the neighbouring districts (the banana waste with high pH is suitable for the acidic soil of the region) are negotiating with the group to establish market tie-ups. Creating an awareness among the farmers of Kannivadi region about biomanure through different advertising methods has been planned to strengthen the local market. Members of two women self help groups have become resource persons to train others in the region.

Through self-replication the total number of backyard ornamental fish breeding units has gone up to 23 in five villages. Molly varieties in different colours and Kappies have been reared in the low cost tanks in the backyards. Efforts are continuing to identify more market sources for better bargaining and also to breed high value ornamental fish varieties. The water is changed once in three days and reused for irrigating the low cost greenhouse, also installed in the backyard. Some of the households were unable to continue the activity due to seasonal migration for a month or two during the paddy-harvesting season.

Low cost green house: The vegetables produced in the seven greenhouses have found good markets due to their organic nature. The good vegetative growth of the plants made the women members decide to select leafy vegetables for one season. Each unit managed to generate Rs. 3,000 per year. Twenty more women have approached the women's group for training in low cost greenhouse technology. Apart from the application of FYM, soil fertility is being managed by avoiding heavy feeder crops and inclusion of pulse vegetables in the crop

rotation cycle. Negotiation is going on with private medical companies for a market tie-up to cultivate medicinal plants. Similarly discussions are going on with commercial nurseries for raising high value floriculture crops and orchids.

Other income generation activities such as goat rearing through stall feeding by the members of two men SHGs, managing a pulse processing unit by another men SHG, mini dairy, running tea shops and home level cleaning powder production by a women SHG are being successfully managed.

The local partners: grassroot development agencies: The grassroot organisations like Reddiarchatram Seed Growers Association (RSGA) and *Kulumai* federation of self help groups are collaborating with the Foundation. Sharing the objectives, approaches and responsibilities has helped to develop a system of operating by drawing up annual action plans and organising periodical evaluation every six months.

Reddiarchatram Seed Growers Association: RSGA successfully initiated its own seed production and marketing business. It has got permission (RC and CSR numbers) from the District Sales Tax Department, Dindigul and marketing license from Seed Certification Department. The members of the association multiplied breeder seed into foundation seed for tomato crops in one acre of land with the support of Horticulture College and Research Institute, Periyakulam and Seed Certification Department, Madurai. The seeds will be marketed in its own brand name. The organisation has also established a tie-up with SIMA Cottonseed Company for the

production of cotton foundation seed for 10 acres. It also acts as an intermediate agency to supply good quality seed material between the local farmers and private seed companies.

The Association has successfully completed a computer mediated training programme on 'sustainable agriculture and value addition' for small and marginal female and male farmers and the agricultural labourers of the region with the support of Commonwealth of Learning, Canada. The project followed the participatory approach; PRA and PAME approaches were adopted for information gathering, execution and periodical evaluation. Many of the resource persons for training the farmers were local farmers/volunteers. They were trained on Microsoft front page, creating hyperlink, inserting the image in the folder, sound recording and scanning, using Adobe-Photoshop software, saving and using video clippings. The training helped them to develop an extensive database covering details on soil, pest management and different agronomic practices for 41 crops cultivated in the region. They also converted these details into farmer-friendly multimedia folders with some additional information collected from local extension officials. These folders are available in the Kannivadi Knowledge Centre and accessible to the men and women farmers of the region. The same folders are converted into print form and CD as training manuals. The Association is documenting the traditional techniques in the areas of soil, water and irrigation management. One postgraduate student from Gandhigram Rural Institute, Gandhigram, conducted a six-month course on the activities of RSGA. Since December 2001, they have been coming out

with a bimonthly newsletter in Tamil, *Malarum Vidhai*, on agriculture and animal husbandry. Through the initiatives of RSGA, nearly 5,000 acres of agriculture land has come under the use of biofertilisers.

The Association is managing a website called Oddanchathirammarket.com with the objective of enhancing the marketing of vegetables from the area. To make the website viable and sustainable the commission agents have agreed to share the financial responsibility. The stock and price details of the market are uploaded everyday. The experience has made the Association and the 130 commission agents of Gandhi Market, Oddanchathiram, plan to develop infrastructure facilities and export directly from Madurai, the nearest airport, to other parts of the world. The website has been receiving an average of 45 to 50 hits per day. The commission agents from vegetable markets located in other south Indian states and export agencies are some of those who visit the website.

Kulumai federation of self help groups : It is an umbrella organisation operating in the region with 60 women and 30 men SHGs whose members belong to small, marginal and landless households. The organisation works on the basis of the norms, rules and regulations evolved by the members of SHGs and an annual action plan with monitoring mechanism and evaluation at the year-end. This year the federation has taken a concrete step by establishing an office with two employees for managing its activities. It has also evolved the norms and rules for providing credit facility to the member SHGs from the common savings of the federation. The ten-member committee ensures the

smooth operation of the SHGs. The organisation also conducts capacity building programmes for the members, constantly focusing on issues related to the functioning of the SHGs, rural entrepreneurship, developing microplans, monitoring the project activities and conflict resolution. The total savings is Rs. 6,47,729. Canara Bank, the lead bank of Dindigul district, has extended a loan of Rs. 3,35,000 and the repayment rates by the SHGs have been always more than 100%.

Other activities like savings, credit, enterprises, linkup with banks and executing literacy programmes through SHGs are being managed by the organisation. Internal credit from savings and the matching loan provided by the local banks help the rural households to keep away from the clutches of the local moneylenders. About one third of the beneficiaries have utilised the loan for agricultural activities. Others have used it for health care and a few for education.

Kulumai is collaborating with Canara Bank, to prepare a training and credit component plan to increase the various skills of the SHG leaders and its office bearers and also to streamline the credit link with Canara Bank units in the region. The office bearers visited Pondicherry and helped the Pondicherry Biovillage Council to federate the SHGs and evolve a system for smooth functioning.

Village knowledge centres - knowledge management for livelihood security: Village Knowledge Centres, operating with the main objective of adding value to information by converting the generic to the local specific, have added the dimension of skill enhancement of the local women and men

farmers and farm labourers. Sustained efforts were made to strengthen the activities of the existing centres and make them useful to the underprivileged sections of the village community. The vigour of the community's dual role as both consumer and supplier of information in the rural development process has been increased, taking into account the socio-cultural context and gender dimensions. As a part of the training programme the Village Knowledge Centres prepared training materials for sustainable agriculture and functional literacy programmes. Another initiative taken up by the community is the compilation of rural yellow pages, having names, addresses and contact phone numbers of the local service personnel, from blacksmiths to doctors.

T Pudupatty and Samiarpatty Centres have been conducting functional literacy classes using touch screen monitors. The learners/participants are in the age groups of 15 to 55. The first batch in each hamlet consisted of 25 women and 25 men. The family is the agency that facilitates the learning process and guarantees that the learner will continue the course till he or she becomes a functional literate. Hamlet-specific reading materials have been prepared to sustain the interest of the learners. The Knowledge Centre managed by RSGA is implementing a computer literacy programme for the school children of the surrounding villages. Extensions of the Information Centre are operated in five villages that provide support in information gathering. A compilation of the information is then displayed at the designated public spots.

A SHG-managed learning centre was started at Chinnamangalam village, Kolli Hills,

covering three hamlets, with the objective of achieving functional literacy for the tribal men and women to overcome the constraints and problems in their day-to-day life. Innovative approaches were adopted by applying modern ICT techniques. Use of advance technology like digital cameras and computers accelerate the processing of individual based curriculum development. Fifty tribal men and women have been selected as participant learners. A pre-literacy survey was organised to understand the status and to be compared with, later. Classes are functioning.

To expand the local area network, a second spread spectrum tower has been installed recently at Thonimalai, a settlement located in the western slopes of Palani hills. The Village Knowledge Centre started in the settlement recently aims to cover the settled *Pulayan* tribe living close to Thonimalai and the *Paliyan* tribal foragers visit the area as seasonal migrants once a year for a few months. These two groups have been maintaining their relative isolation from the rest of the system. Two women SHGs have taken the responsibility of managing the Knowledge Centre with the support of the village community. The Centre also has video conferencing facility. The SHGs renovated the abandoned school with the support of the District Rural Development Agency (DRDA) and the village community. Efforts are being made to gather baseline data for adding value to products like coffee and lemon which are the major crops of the region. This would facilitate starting new Village Knowledge Centres to cover the remote and inaccessible hamlets.

Pulse Village Module: The activities under this module focus on increasing the yield of pulses, especially where the crops are cultivated under conditions of limited water supply. During this period the focus of activities under this module was to replicate the Variable rate Application Technique (VAT) along with Integrated Pest Management (IPM) in the fields. Bengal gram (55 acres at Srirampuram village), black gram (5 acres at Ellpatty village) and red gram (10 acres at Samyarpatty) were cultivated, following VAT. 1,117 trainee days have been completed for 75 farmers. Each training programme covers a crop season for a period of 15 to 20 days.

Demonstration and experiments for fertiliser application as per the VAT have been conducted at the demo plot and farmers' fields in the last two years. The results of the on-farm trials have shown that it is possible to save about 39% on fertiliser (nitrogen and phosphorus) inputs by this technique. Along with VAT, the project had also imparted training on seed selection and preventive measures in controlling pests and diseases. The demonstrations have shown that the farmers would be able to get an additional profit of Rs. 3,306 per hectare, compared to the cultivation practices being followed.

As part of the replication process, during July 2001, a large-scale on-farm demonstration was undertaken involving 48 farmers, covering an area of 75 acres (65 acres for cowpea and 10 acres for black gram), in the Samiyarpatty region. The project provided quality pulse seeds, along with management and technical support. The precision farming techniques adopted by the farmers are quality seed selection, soil sampling, application of

foliar nutrients and preventive pest and disease control using biopesticides.

The project has technical tie ups with the Space Application Centre, Ahmedabad, for making use of remote sensing imageries for deriving soil variability maps and other parameters for Srirampuram region in the scale of 1:10,000. The maps currently available are in the scale of 1: 50,000. The maps would also demarcate the individual farmer's field. Scientists from the institution had come to Srirampuram to meet the farmers, and had one-to-one interaction. A three-year perspective plan for joint collaborative activity has been worked out and the field activities will commence soon. Through the collaborative work the following objectives would be addressed:

- Study of the spectral variability in crop and soil using high-resolution remote sensing data
- Correlating the spectral variability with the variability in the field measurements
- Prescribing variable rate management practice
- Creating a spatial farm information system for real-time use by the farmers.

The project is also exploring the possibility of incorporating water harvesting and water management as part its activities. Field models developed at Pudukottai will be tried out at Kannivadi for demonstrating the sustainable use of resources, especially cultivation under irrigated conditions.

Seed Village Module: Through this module the project focuses on adding value to the

agricultural activities of the rural poor, by providing skill enhancement and market linkage. The marginal farmers and labourers were trained in the production of quality hybrid seeds; later they were encouraged to form an association. The Reddiarchatram Seed Growers Association (RSGA) was the outcome of an earlier initiative of the Seed Village Programme. The objective under this project has been to infuse the concept of precision farming into the existing activities, strengthen the market linkage and create activities that would supplement the income of the resource poor farmer.

During the last three years the RSGA has been able to develop the necessary skills for taking up the leadership role in carrying forward the activities envisaged under the programme. It has also been able to negotiate for and on behalf of the farmers with seed companies, government agencies and funding agencies. As part of developing and strengthening the activities under this module, the following approach was adopted:

- Identify new seed companies for developing strategic partnership, thereby reducing the risks associated with a single seed company
- Develop necessary skills and infrastructure for providing quality seeds to farmers
- Undertake certified seed production and marketing

As part of the demonstration of post harvest technique a model of "Zero Energy Cool Chamber" has been constructed in a farmer's field. The cool chamber can store vegetables and fruits for an extended period (4 days),

thereby increasing the shelf life of the produce. Studies on the efficacy of the cool chamber are being carried out.

Lysimeter: Trials on the manually operated lysimeter were continued to find the quantity of nitrogen (N) and irrigation required for tomato (variety *vaisali*) from September 2001 to February 2002. Three levels of N and six regimes of irrigation were tried. The amount of irrigation given was equal to the total crop-water use since the previous irrigation and nitrogen applications were based on the crop stages. Fruit yield and growth parameters were recorded and analysed statistically.

The results revealed that the application of irrigation at 25% higher than the crop water use gave higher fruit yield per plant compared to 25% lower and 50 and 100% higher levels. It is in conformation with the results recorded during the previous experiment. 12% increase in the average fruit weight and 26% lower flower shedding were recorded after irrigation at 25% higher crop water use treatment. The flower shedding was higher (32%) when the crop faced water stress during the crop growth *i.e.*, 25 and 50% lower water application than the crop water use level. The recommended level of N application gave highest fruit yield, average fruit weight and lower flower shedding percentage. The interaction between different levels of N and irrigation indicated that the application of 25% higher irrigation based on effective crop water use and the recommended level of N resulted in higher fruit yield.

Networking, capacity building and process documentation: To gather the local strength and identify local partners to sensitise, share and develop their capacity, meetings and

camps were organised in co-ordination with the animal health department, primary health care department, agricultural extension department, horticultural department, commercial banks and local and Panchayat leaders. Some of the records of the meetings were converted into training materials and are being used in the Village Knowledge Centres.

During 2001-2002, training programmes were conducted to the tune of 6,878 trainee days covering 248 women and 111 men. In addition, RSGA conducted nearly 8,500 trainee days in areas relating to sustainable agriculture. Adoption of the project-process approach and process documentation of the project intervention have helped to capture the dynamics of the project and provide insights into the thinking process. A monograph has been published on the project implemented in the region between 1996 and 1998 for promoting partnerships between the private sector seed industry and rural women.

301.3.2 Pudukottai

The project was started in January 2001 at Ariyamuthuppatty village, Annavasal block, Pudukkottai district, Tamil Nadu, India. The project aims at developing methodologies for enhancing the productivity of rainfed alfisols and the income of the farmers of the area. The district is almost entirely covered by alfisol and about 37% of the soil belongs to Vayalagam series. Soils of these series are shallow to moderately deep, medium textured, acidic in reaction and high in iron and aluminum content. Surface encrustation is a major problem. Nutrient contents are very poor with very low organic

carbon content. As a result agricultural productivity is very low.

Baseline and household surveys were completed. Participatory rural appraisal was also done to find out the preferences and expectations of the villagers. Four SHGs, one for men and three for women, were formed. Members of one women SHG started production of *Trichogramma* and are continuing it successfully. Members of a men group started silkworm rearing. Other members have opted for dairying.

The project site received a rainfall of 910.4 mm in 60 rainy days during the calendar year 2001, 46.3 mm less than the average. Though the total rainfall was almost normal, its distribution was not favourable for cropping. There was a prolonged drought in two spells in the first season for a period of 33 days. This coincided with the grain filling stage of many of the short duration pulses and peg formation of groundnut. Again, there were prolonged dry spells in the second season, which affected the grain formation of pulses. There was an unusual wet spell in the first week of February 2002. This caused grain shedding and increased the incidence of fungal diseases and pod borer. Grains already formed germinated in the pods. As a result, the yield of pulse crop was reduced drastically.

In the demonstration plot, application of green manure and press mud compost improved the soil fertility and the response of the crops to organic manure application was seen. The trials conducted for two seasons viz., kharif and rabi, indicated that raising two crops under rainfed conditions is possible. Among the cropping systems tested,

red gram + lablab and red gram + groundnut intercropping systems were found to be the best, even under conditions of uneven distribution of rainfall. Among the double cropping systems, groundnut followed by vegetables (cluster beans and radish) performed well. However, farmers are hesitant to adopt double cropping due to the risks involved and their low capacity to invest. Alternate cropping systems need to be worked out for a more reliable and steady income.

Training programmes were organised for the villagers for capacity building and for starting new microenterprises. A total number of 446 trainee days was achieved during the year. A nutrition garden was raised in the village primary school for supplementing the mid-day meal. Two technical folders on increasing the productivity of rainfed pulses and IPM for rainfed pulses were printed in Tamil and distributed to the local farmers. A local monitoring committee was formed to monitor the progress of the project.

301.4 Chennai

Project management, including planning, monitoring and organising periodical reviews are some of the major activities undertaken at Chennai. Training programmes are being regularly conducted for the different stakeholders on themes like sensitising partners for participatory approach, gender issues, microlevel planning, monitoring and evaluation of project activities etc. Facilitating the process of urban market linkages through joint meetings is another vital activity being performed. The project outcomes

and results are consolidated in the form of reports, monographs and research articles. Annual retreat for the staff was organised at Sithayankottai, near Kannivadi.

The staff also played an active role in organising the Gender Concern Forum and integrating gender issues in development interventions. Two village-level studies were conducted on knowledge management and social construction of indigenous knowledge. One study has already been published in an international journal and the other study has been presented in an international conference. A workshop was organised for 40 Ph.D. students from various southern universities on social science theories, field realities and development workers. The workshop was organised in collaboration with the University of Madras.

The laboratory at Chennai supports the activities of the field centres through research and training programmes. The soil-testing laboratory analysed nearly 600 soil samples collected from the field sites.

301.4.1 Biopesticide production

Since 1999, the bioefficacy of different plant species has been tested, based on the traditional wisdom and practices of the tribals of Kolli Hills. Four plants *viz.*, *Cipadessa baccifera*, *Clausena dentata*, *Dodonaea angustifolia* and *Melia dubia* were tested to curtail the pest *Helicoverpa armigera* last year. This year, an in-depth study of various dimensions of *D. angustifolia* was continued and the compounds responsible for the antipest and antimicrobial properties were identified using IR spectroscopy, NMR, and GC-MS.

Efficacy of hexane fractions of *D. angustifolia* on *H. armigera*: Previous results revealed that plant extracts with hexane and acetone were more effective compared to other solvents. Hence the crude extracts were fractionated into 12 fractions (T1- T12) using hexane and ethyl acetate (EA) combinations and tested against adult moths to observe adult longevity, fecundity and hatchability. The samples with 20% benzene + 80% acetone (T12), 80% EA + 20% hexane (T2) and 50% benzene + 50% acetone (T11), were effective in controlling the pest population, resulting in 2, 8 and 13 eggs with 9, 11 and 10.6 days of longevity, respectively, compared to control (515 eggs).

Efficacy of secondary metabolites of hexane fractions of *D. angustifolia* on *H. armigera*: The samples such as T12, T2 and T11 along with T6 and T9 (which stimulated the egg laying) were further fractionated using different solvents and tested against the pest population. The results are presented in Figure 3.3.

Bioefficacy of fractions of acetone extract of *D. angustifolia* in combating *H. armigera*: The acetone extract was fractionated (16 fractions T1- T16) with solvents, acetone, benzene, chloroform and methanol and it was found that 40% acetone with 60% benzene (T4) and 100% chloroform fraction (T11) totally arrested the fecundity, although the adults lived for 8 days. Adult longevity was also drastically reduced to 6 days in T7 (80% acetone + 20% chloroform) when compared to 16 days in control. Only 20% acetone with 80% chloroform (T10) fraction showed 11% hatchability, which is 7 times less than the control (79.7%). All other fractions resulted in 0% hatchability.

Effect of secondary metabolites of acetone extract fractions on *H. armigera*: The samples such as T4 and T11 along with the stimulated samples such as T14 and T16 were further fractionated using different solvent combinations and tested against the pest population. The results are presented in Table 3.3. All the secondary metabolites

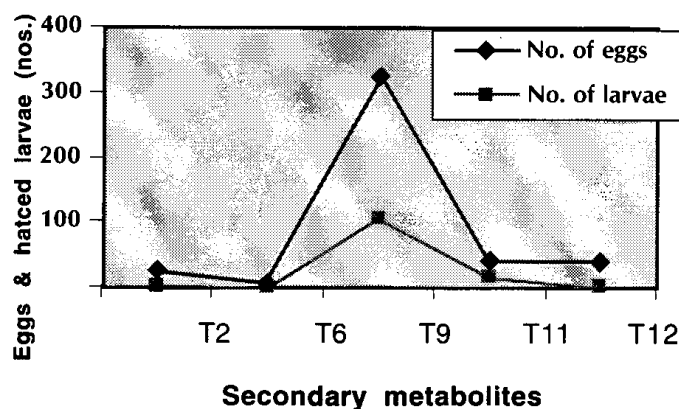


Figure 3.3 : **Effect of secondary metabolites of hexane fractions on *H. armigera***

T2- 80% Ethyl Acetate + 20% Hexane

T6-100% hexane;

T9-100% Acetone;

T11-50% Benzene+ 50% Acetone

T12-20% Benzene+ 80% Acetone

Table 3.3 : Effect of acetone extract fractions of *D. angustifolia* on *H. armigera*

Treatment	Adult longevity (days) *	Egg (nos)*	Hatchability (%)*
T4	7.25	4.50	0
T11	9.50	103.00	0
T14	6.75	13.00	0
T16	7.50	6.00	0
Control	16.75	490.75	78.07
CD (P=0.05)	6.20	81.46	3.50

* Mean of four replications T4- 40% acetone + 60% benzene, T11-100% chloroform, T14- 40% acetone + 60% methanol, T16 -100% methanol

reduced adult longevity and arrested the egg-laying capacity of the moths, except T11 which exhibited 103 eggs.

Antimicrobial activity of *Dodonaea*: The crude extracts of *D. angustifolia* were bioassayed against selected microbial pathogens. The effective inhibition of *E. coli*, β -Haemolytic streptococcus, *Pseudomonas aureginosa*, *Salmonella typhii*, *Shigella flexneri* and *Klebsiella pneumoniae* were recorded at 10mg concentration of the crude hexane extract.

The crude hexane extract was further fractionated. The fraction 80% EA + 20% hexane was effective against β -haemolytic *Streptococcus* at 1 mg level.

Purification and identification of compounds: The fractions which yielded promising results in controlling the pest were separated using TLC and HPLC. Then the samples were subjected to GC and NMR for identification.

Biosafety test against *Trichogramma*: To test the safety aspect of *D. angustifolia* to natural enemies (parasitoids and predators), *Corcyra* and *Trichogramma* were tested. Among the

various extracts tested 15% water extract showed 47% parasitisation of *Trichogramma* in the second generation, on par with the control.

Field Studies: Field trials have been conducted to test the efficacy of water extracts of *Dodonaea angustifolia* on *H. armigera*. This pest has found its new host i.e., rose. Being a perennial it colonises the crop throughout the year. Gardeners, especially nursery owners, are facing severe loss. Hence field trials were made with various extracts of *D. angustifolia*, and NPV and chemical insecticides for comparison. The results are being studied.

301.4.2 Hatchery activities

Two larval rearing cycles of the fresh water prawn *Macrobrachium rosenbergii*, were completed at the eco-aquaculture hatchery, Chennai. Fifty-thousand post larvae (*Macrobrachium rosenbergii*) were produced following water quality parameters such as water temperature-28 to 31°C, salinity- 10 to 12 ppt, pH-7.5 to 8.5, dissolved oxygen-

saturation level, nitrite- <1ppm, nitrate-< 20ppm. Post larvae (PL) were sold to prawn farmers at Nellore (40,000), and 10,000 (PL) stocked at IIFS site at Keelamanakudi, Chidambaram. The 3 years experience in the rearing of fresh water prawn revealed that, though the production is ecofriendly with maintenance of all other physico-chemical parameters, the problem encountered during every cycle was different. During the current year mass mortality occurred due to mid-cycle disease. Hence it was impossible to achieve the target (one lakh per cycle). A maximum of only 40,000 PL /cycle was attained. Due to setbacks after every cycle it was very difficult to run three cycles per year. Ultimately, it was not feasible to run the hatchery economically or within the limited budget.

Training programmes with different modules were conducted for farmers, students and researchers. Fifteen postgraduate students were given one-day exposure training on hatchery technology and forty-five students and researchers (post graduate, researchers and polytechnic) were trained on freshwater prawn breeding and hatchery management.

Two hundred rural women were trained in various aspects of breeding like freshwater prawn and ornamental fish breeding and management, feed preparation for backyard ornamental fishes and composite fish culture.

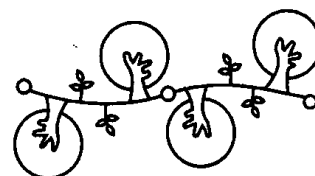
A base line survey of the fisher-folk community was conducted to identify the candidates for a three months certificate course on freshwater prawn breeding and hatchery management. 60 fisherwomen were selected. A simple training manual in Tamil has been prepared.

301.4.3 National network on biovillages and community banking

The National Network on Biovillages and Community Banking is supporting the self-help groups (SHGs), the federations and non government organisations in credit management and development of microenterprises and market linkages. Nearly 2,000 trainee days were conducted in Tamil Nadu, Kerala, Orissa and Gujarat in establishing microenterprises. It has been interacting with VIKSAT, a non-government organisation, for supporting earthquake relief programmes. It has also conducted training programmes for five non-government organisations on Biovillages. 25 microenterprises were initiated through credit. It also monitors the progress of these microenterprises and gives managerial support when needed.

301.4.4 NABARD resource centre for precision farming for poverty alleviation

This resource centre is being coordinated from Chennai. In addition to the various field activities in Kannivadi, Kolli Hills and Chidambaram the Centre conducted training programmes for 30 banking officials from all over India on precision farming and microenterprises management. Similarly 35 bank officials from Dindigul district were trained in subjects like VAT, decentralised village level soil laboratory, etc. In Kannivadi training was given to the tune of 1,812 trainee days, covering 130 farmers, in areas such as precision farming and information management. The Centre is planning to spread the concept in Kendrapara district of Orissa.



Reaching the Unreached

***P**roject ACCESS came to a conclusion during the year. The work on the gender mainstreaming of the curriculum of agricultural universities made good progress, particularly in the Kerala Agricultural University. *Voicing Silence and Empowering Women through Theatre* led to the staging of *Manimekalai*, the great Tamil epic. Work on the development of a *Food Insecurity Atlas of Urban India* as well as a *Sustainability of Food Security Atlas* made good progress and these two Atlases will be released during 2002.*

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Sub Programme Area 401

Project ACCESS

The project Operation Resource Support, which began in 1998, was formally closed in December 2001, though some follow-up activities are continuing.

Workshop on Quality Improvement in Early Childhood Education (ECE)

A significant event in 2001 was the international workshop on "A Strategy for Quality Improvement in Early Childhood Education" held in August 2001 (23-25) with the participation of policy makers, practitioners, trainers and leading international experts.

As part of the process of developing a coordinated strategy involving various stakeholders for the improvement of the quality of ECE, a series of presentations on the findings of the study "Quality Matters!" were made across the country in leading centres of research, training and planning, with emphasis on the rating tool, TECERS, early in 2001. As preparation for the workshop, several advocacy meetings, including two for the staff of ICDS and District Programme Nutrition Officers from the thirty districts of Tamil Nadu, and two involving the private and NGO sectors were held. Nearly 500 copies in English and 250 copies in Tamil of TECERS were distributed as part of the process. Selected invitees to the workshop were requested to field-test the tool in their respective areas and assess its utility and need for further adaptation. These

experiences formed the basis for their presentations at the workshop.

The aim of the workshop was to initiate the development of a process and strategy for the improvement of quality in ECE in India with the use of appropriate rating tools. The specific objectives were

- to introduce, critique and study the various possible uses of the rating tool TECERS
- to develop, modify, adapt, improve and refine the rating tool as an instrument for the measurement of quality and
- to develop the outline for policy guidelines on regulation of quality, licensing and accreditation with the help of a rating tool.

Panel discussions, presentations and small group discussions were held on the TECERS tool from two perspectives – the use of the tool for training, research, monitoring and evaluation on the one hand and policies for regulation, licensing and accreditation as strategies for improvement of the quality of ECE on the other.

The outcome of the workshop was the formulation of specific action plans with agreed goals and volunteered leadership on the following three themes :

- development of a common tool, with variations for use in diverse situations in the country;
- exploration of issues and development of strategies for regulation and accreditation in ECE and
- advocacy, awareness building and demand creation on issues of quality in ECE with diverse stakeholders.

The action plan that emerged from the discussions was compiled and disseminated to all the participants. The report on the outcomes of the workshop, titled *Scaling Heights*, has been prepared in the form of a resource guide. 300 copies have been printed and are being distributed.

A National Task Force for developing the tool has been set up with Dr Vrinda Datta, Reader, Unit for Family and Child Welfare, Tata Institute of Social Sciences and Convenor, Maharashtra FORCES, as the coordinator for the first two activities; while FORCES, the national advocacy group for ECD will take up a campaign for awareness building, demand creation and advocacy at the policy level.

Products

A 17-minute training film, 'Orientation to TECERS' has been developed as a practical illustrated guide, containing practice and test questions on the use of TECERS (formulated on a 3-point scale) with 14 examples drawn from diverse field settings in Tamil Nadu. The film went through the usual critiquing process before being finalised in both Tamil and English versions. A unique feature is its ingenuity and low-cost nature, having been made with only available raw footage without any extra shooting. Screened on the first day of the TECERS workshop as part of the presentation, it has been shown during several more meetings, workshops and seminars for academicians, Government supervisors, teachers and ECD functionaries, for the purposes of training, monitoring and evaluation.

A manual in Tamil on women and child rights has been prepared for use by women

self help group members, Panchayat members and other grassroots workers, to generate community awareness and action. It offers basic information in simple language and contains suggestions for action. The manual is available in camera-ready form on CD-ROM and can be printed and distributed for use by interested agencies. So far copies have been printed for distribution by TN-FORCES and PLAN International (1,000 each) and a request is expected from the Tamil Nadu Women's Development Corporation. An English master copy is also available so that it can be easily translated and reproduced in other Indian languages. The manual has been visualised as a grassroots application in series with the earlier brief prepared for legislators at the State and local levels.

Information centre

A wealth of material has been developed and maintained over the last ten years. A comprehensive catalogue of resource materials including print, video and audio materials has been prepared and about 600 copies of the catalogue have already been distributed to academic institutions, ECD experts and other stakeholders working on child care issues. All the video cassettes have been digitised for better storage. In addition, an archive of classified photographs, transparencies in regular use for advocacy, other printed materials, master copies and CDs of video films and audio materials on ECD themes and issues have been classified and computerised for easy accessibility. The available raw video footage is also being maintained as a rich source for production of films on ECD that could be availed of in future by others.

Networking

As a founder member of both FORCES and TN - FORCES, Project ACCESS has continued to play an active role in the planning of strategies and activities. It is also a resource agency at both the national and State levels. A coalition of five national networks campaigned actively during the year on the need to include below-sixes in the Right to Education Act. The role of project ACCESS was preparing documents and briefings, writing articles in Tamil and English and organising press conferences and meetings with political leaders as part of the campaign. Besides, there have been regular resource inputs into meetings, seminars, workshops and training sessions on ECD and Child Rights issues.

Project ACCESS has also been active in the formulation of the stand taken by FORCES in various meetings, including the Policy Committee Meetings held in January 2001 at Puri and in September 2001 at Jaipur. After the seminar organised by FORCES in February and later at the consultation sponsored by the National Commission for Labour in March 2001, "Maternity Entitlements" has been taken up as a major theme this year by FORCES. As an outcome, the proposed draft legislation on "Maternity Entitlements" is currently being developed at ACCESS. ACCESS is also coordinating, on behalf of FORCES, a study on *Panchayati Raj and Child Care Services* in Kerala, as this is the only State in India where the ICDS has been handed over to the Panchayats.

At the invitation of the Tamil Nadu State Planning Commission and as part of the Working Group on Women and Children set

up by it, base papers have been prepared on Integration and Convergence of ECCE Services and Empowerment of Women through Certification of ECCD Training. These are inputs for the preparation of the Tenth Five Year Plan.

ACCESS has been a member of the CASSA network (Campaign Against Sex Selective Abortions) ever since its inception in December 1998 and has provided constant support, participating as a resource agency in several workshops during the year. ACCESS is part of the core group of CASSA, critiquing and developing alternative amendments to the PNDT Act (Pre-natal Diagnostic Techniques Act) and suggesting better implementation strategies.

Members of the ECD Trainers' Network, which was set up last year, have begun to conduct training programmes at different places, with regular interaction and sharing of ideas and expertise among the members. An orientation programme in ECE was conducted by some of the members in October 2001 in Thiruvalla, Kerala at the request of the Association of ICSE/ISC schools in Kerala. Project ACCESS provided technical support for the network. Discussions are being held with the Department of Social Welfare, Tamil Nadu and the Government of Pondicherry for holding new training courses at various levels.

Evaluation

Project ACCESS (Action for Child Care and Education Services and Strategies) initiated in June 1991 has been in operation for a little over ten years. The major activities and outputs of Project ACCESS have been in the four domains of advocacy, research, capacity building and development of

resource materials related to ECD (Early Child Development) through networking and participatory methodologies. These activities (all documented in successive Annual Reports) have brought national and international stature and recognition to MSSRF.

From the beginning, sustainability has been a prime concern and the emphasis has been, not so much on institution building at the internal level, as on building up a strong and committed external network of concerned stakeholders to carry the work forward when the project ends. These networks and institutions have been initiated, supported, nurtured and strengthened during the project period. The main outcomes are:

- FORCES (Forum for Crèche and Child Care Services) at both national and State (Tamil Nadu) levels, now leading in the advocacy and policy lobbying field, following a smooth transition of leadership
- Trainers' network in Tamil Nadu, now an informal network of ECD professionals concerned with training and curriculum development in ECD
- Most recently (as an outcome of the workshop held in August 2001) the National Task Force on the development of quality rating tools in ECD, and an association of ECD professionals and
- An extensive and catalogued collection of resource and training materials in ECD in print, audio and video (now digitalised)

Though the project is formally at an end some in-house activities continue. A minimal ECD Information Centre is being maintained and

materials are disseminated on demand by a skeleton staff, under the management of the MSSRF Library, while Mina Swaminathan continues to be actively involved as a Resource Person with various networks. A critical review of the story and impact of Project ACCESS is being prepared with the help of an external consultant. HRD is included as a special component of the review.

Sub Programme Area 402

Uttara Devi Resource Centre for Gender and Development

Progress on the two core activities and in the internalisation of the gender dimension was slow though qualitatively significant, because of the constraint on human resources. In spite of continued efforts, the Centre functioned without full-time professional staff for most of the year, depending on Resource Persons, Visiting Fellows and part-time workers, coordinated by the Hon. Director. This has led to intensive reexamination of the role of the Centre and the development of new strategies to achieve its objectives in the future.

402.1 Core Activities

The main activities were related to studies by Visiting Fellows, capacity building and broadening the scope of the studies on gender and biodiversity management.

Visiting fellows

The study of gender roles and local institutions in Kolli Hills by Dr Shubh Kumar-Range, Visiting Fellow in 2000, was published

early in 2002 as a monograph titled *Like Paddy in Rock : Gender Roles and Local Institutions in Kolli Hills*. The publication has been widely distributed and appreciative feedback has been received.

Dr Baljit Kaur, Senior Lecturer, Education Department, University of Canterbury, Christ Church, New Zealand was the Visiting Fellow in 2001. Dr Kaur, a distinguished scholar in the field of Child Development, was on a sabbatical in 2001-02 working on a history of Early Childhood Education in India, based on her own earlier field research on this subject in the mid-nineties. This had involved her not only in extensive archival research but in-depth interviews with over fifty leading personalities who have contributed to the growth of ECE in the last century in one way or another. Dr Kaur spent a large part of her sabbatical in India, and over three months at MSSRF, during which time she worked on the first draft of her forthcoming book, as well as on filling the gaps in her data by consulting local archives and completing interviews with important informants. The manuscript is likely to be ready by the latter half of 2002 and is expected to be published by one of the leading academic publishers.

Capacity building

Engendering the curriculum of agricultural studies, especially at the undergraduate level, has been a key area of interest at the Centre. It was initiated in 1999 with a view to bringing about greater sensitivity to gender issues in agricultural research, teaching and extension systems. This year, the focus was on continued capacity building of the Centre for the Study of Gender Concerns in

Agriculture (CSGCA) at the Kerala Agricultural University in Thrissoor, for the faculty of which a series of preparatory workshops on gender analysis had been conducted earlier. Resource materials developed by GENDEAVOUR and resource persons from the network set up in April 2001 were drawn upon for this purpose and support was provided to two major activities undertaken by CSGCA during the year. The first, held in November 2001, was a three-week induction and training for the facilitators of the Central Sector scheme on women in agriculture in the North-Eastern States. 15 participants from 5 States attended the course. GENDEAVOUR participated in the opening and concluding phases of the course, introducing concepts of gender analysis and their application to problems faced in the field, setting assignments and guiding the participants in drawing up context-specific action plans for themselves.

The second, held in May 2002, is the first exercise in participatory curriculum-building by the Faculty of KAU to bring greater gender awareness and responsiveness to gender concerns into specific components of the undergraduate programme and to develop appropriate teaching-learning strategies and activities. 15 participants from diverse disciplines participated in the exercise. The role of GENDEAVOUR was to weave in gender concerns and suggest appropriate pedagogical strategies to bring these into the students' sphere of learning. A major output of the workshop is an outline for a short core course in gender concepts, to be made compulsory for all undergraduate students.

The design for a one-week orientation course for the Faculty of Agricultural Universities on gender concepts and tools was developed at the Resource Persons' Network held in April 2001.

Wild foods management

Encouraged by the insights and gender implications of the pilot study on wild foods management undertaken last year, it was decided to take up this area of research as one of the permanent activities of the Community Agro-biodiversity Centre in Wayanad. One staff member, supported by colleagues at the CABc and specialists in Ecology, Anthropology and Gender Studies, is in charge of a year-round study of the use and management of wild foods by different communities in the area. Four communities (three specific socio-cultural groups and one mixed) spread in 16 locations over five sites in two ecological zones (wet and dry) have been selected for study this year. Drawing on the outcomes of the pilot study, the immediate objectives of the study have been defined as

- Better understanding of the mechanisms of wild food management in terms of community, gender and age and
- Correlating people's knowledge with scientific understanding of different wild food species.

It is expected that the study will also cast light on several related issues, ranging from enriching the "food basket" to understanding the relationship between changing gender roles, relations and responsibilities and the utilisation and management of the wild food resource base, access regimes to different landscapes,

seasonal, annual and "emergency" uses of wild foods and linkages between the forest, labour, nutrition and gender.

The mid-term report contains detailed information on wild foods known and used by the community, their multiple uses, seasonal variation in diverse landscapes, management practices and perception by age and gender. It includes case-studies reflecting recent trends and their impact on the life of the community.

The outcome of the study is expected to be a context-specific people's plan for improving the quality of life through conservation, sustainable use and development of wild foods.

402.2 Internalisation of Gender Concerns

The internalisation process proceeded through a combination of strategies which was reviewed during the year and new priorities were set.

Gender concerns forum

The Forum met three times during the year, twice in August 2001 and the third time in April 2002.

The first meeting was devoted to the theme "Are we Missing the Bus? Partnerships, Alliances and Networking in Biodiversity Conservation" with special emphasis on women's concerns in policy circles. The topic was taken up because of the view expressed by several persons that MSSRF was moving towards being a "stand-alone" organisation in some respects. A brief note

on the theme and a set of questions were circulated in advance, dealing with the need for networking and alliances, the possible structures, the risks and dangers and the processes, at various levels. Six persons made presentations on different aspects of the theme. Ms Sumi Krishna was the discussant and Dr K N S Nair chaired the session. The presentations dealt with success stories as well as risks and dangers, theorisation and case studies, and the use of alliances to mainstream gender concerns and enable women's voices to be heard more loudly. However, in the general discussion, it was felt that though this was an important dimension, the issues had not been clearly brought out to a heterogeneous audience, that more introspection was required to come to grips with its implications and to understand the methodologies for networking, conflict resolution and related organisational restructuring.

The second meeting, also held in August 2001, was a workshop on "Women's Empowerment, Sustainable Agriculture and Rural Multiple Livelihoods" to explore some of the key issues that have come up in the course of field work. 21 staff based in various field projects attended the workshop, a key feature of which was the participation of five representatives of Tamil Nadu Women's Development Corporation, (DeW) Tamil Nadu Women in Agriculture Project of the Department of Agriculture (TANWA) and the Centre for Study of Gender Concerns in Agriculture (CNGSA) of Kerala Agricultural University (KAU). Dr Christine Okali, Visiting Fellow, School of Development Studies, University of East Anglia, UK was the Resource Person for the workshop, which was facilitated by Sumi Krishna, Meera Sundararajan, P S Geethakutty and P Thamizoli.

The objectives of the day-long workshop were to strengthen the theoretical base towards a better understanding of the issues and to evolve strategies to address them in the field. A brief note on "Women and Technology" was circulated in advance. After eliciting the participants' expectations in the form of statements about their gender interests and the gender problems they were grappling with in the field, Dr Okali made a presentation on some of the major theoretical aspects relating to social analysis, gender equity and empowerment in the context of development, and the utility of various frameworks for analysis. Working in five groups, the participants then tackled various issues relating to power relations, households and supra-household institutions and the impact of technology interventions on social systems. The concluding session was a summing up of the insights gained. In the feedback, participants expressed their satisfaction with the learning and understanding resulting from the examination of approaches, but also felt the need for further orientation and training to be able to apply them successfully in time-bound projects.

The third meeting of the Forum, held in April 2002, was an open meeting to assess training needs in relation to gender concerns, based on a questionnaire already circulated, to understand the extent and degree of staff exposure to gender sensitisation and training. About 80 participants from eleven major projects and programmes within and outside Chennai participated. Some of the issues discussed were identifying specific training needs and linking them with context-

sensitive training; more effective mechanisms to share cross-project learnings; the need to sensitise other stakeholders and partners so as to develop a common approach and avoid conflict and learning to integrate gender into action plans along with a strategy for monitoring and evaluation.

Supporting activities

GENDEAVOUR continued to play a supportive role to various other projects in capacity building of the staff through training, workshops, orientation and gender sensitisation of stakeholders in new projects, and evaluation and documentation of projects. These included

- Capacitybuilding of Staff : The Workshop on mainstreaming Gender in Biodiversity Conservation, Integrated NRM and Poverty Reduction (SDC) April 5-9, 2002.
- Gender Sensitisation and Orientation for the Participants in the workshop on "Enhancing the Contribution of Neglected and Underutilised Species to Food Security of the Rural Poor" (IFAD) January 25-26, 2002
- Evaluation and Documentation : Impact of Information Technology in Rural Areas in India (IDRC)

Review of strategies

During the year, an intensive review was undertaken of the various strategies developed so far by GENDEAVOUR to strengthen internalisation of their relative strengths and weaknesses, their utilisation and relevance. These include, besides the

Gender Concerns Forum, sensitisation, orientation and training workshops, external training and conferences, library development and library services, resource persons' inventory, collection of resource materials and tools and guidelines for MIS.

It was felt that insufficient use was being made of several of these services and little feedback was received about their utility, while at the same time there was a large unmet need for some services like regular and ongoing training and orientation of new staff. To make the strategies more effective, need-based and better utilised, it was decided to share out responsibilities more widely to various individuals in different units and projects, with only a coordinating role to be played by GENDEAVOUR. This approach has been put into effect from January 2002.

In addition, a strong demand has come up at the Annual Review in April 2002 for

- more inter-project sharing of materials, ideas and experiences
- initial orientation to gender concepts for all new staff and
- regular and ongoing training in gender analysis and its applications for planning, implementation, monitoring and evaluation at the field level.

Since it was agreed that the first set of strategies alone was inadequate, gender mainstreaming in the future will take up strategies such as

- strengthening the proportion of female staff, especially in the field, by developing adequate support services to meet the gender needs of women professionals

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- identifying persons within each unit, project or cluster of projects, responsible for mainstreaming gender, or appointing gender specialists for this purpose
- involving consultants in long-term regular associations with projects
- setting up external and internal advisory groups, including a gender specialist for each project or cluster of projects and
- developing gender-sensitive guidelines for MIS.

Sub Programme Area 403

Voicing Silence

Continuing its exploration of gendered theatre in its many forms, *Voicing Silence* carried on its work of using theatre as a voice for women, picking up threads from earlier years and weaving new patterns.

Empowering women through theatre

For the third successive year, *Voicing Silence* worked with a small group of women performing artists from traditional Tamil theatre genres in its project to empower them through theatre. The aim of this project is to enlarge and diversify the group's repertoire so as to build up new audiences in urban areas, while continuing to cater to traditional rural audiences, by developing new plays in their own forms, but expressing contemporary gender concerns, which may appeal to both audiences. This is

being done with a view to helping them to set up an autonomous all-woman theatre company.

The play developed by them last year, *Medai Pesudu*, which reexamined parts of the traditional repertoire from a feminist perspective, continued to be performed occasionally during 2002, and was also staged at AKKA, the National Women's Theatre Festival organised by "Rangayana" at Mysore in November 2001. The Festival, which hosted a variety of plays by and about women, also provided an opportunity for the spokespersons of *Voicing Silence* to interact with spectators during the morning sessions titled "Interface with Directors", to introduce the group in its wider social context and explain its approach, aims and achievements, as well as receive critical feedback.

Venturing to stage a literary classic for the first time with this group, the play selected for this year was the great Tamil epic, *Manimekalai*, never before performed on stage. The text, which was specially written for *Voicing Silence* by the Tamil poet and scholar *Inqilab*, based on his study of the original epic, is a feminist interpretation with a powerful contemporary resonance, approaching the issues of caste and gender through a story about women's autonomy and *jati*-based occupations, in the context of the prolonged ideological struggle between Buddhism and Brahmanism in that historical period.

The play was developed in the *natakam* style by A K Selvadurai, an exponent of the genre, with witty dialogue and songs in classical and popular tunes. It was directed by A Mangai, the founding director of *Voicing Silence*, with assistance from Parthibaraja.

With masks, props and costumes designed by *Maruthu* and executed by *Aazhi E Vengadessin*, it was acted with verve and passion by the twelve women artists with three musicians providing support. The play represented a successful integration of feminist ideology, narrative flow, traditional form and professional performance.

Making its debut on 31 December, 2001, the play has already had nine performances and has been well received by rural, urban middle-class, student and festival audiences (Table 4.1)

For the second year in a row, *Voicing Silence* was invited to perform at the prestigious National Theatre Festival organised by the National School of Drama in New Delhi. This is not only a recognition of the quality of the performance, but also a tribute to its all-female character and its commitment to traditional forms. Invitations for performances have been received up to January 2003, but these will have to be staggered to fit in with the tight performing schedules of the artists in their regular companies during the busy theatre season (March to September).

Table 4.1 : *Performances of Manimekalai*

Date	Place	Sponsoring Organisation	Occasion	Audience
30.12.2001	Chennai	MSSRF	Dress Rehearsal	Theatre persons / critics
31.12.2001	Natrampalli North Arcot Dt.	Gramiya-k-kalaignargal Nalvazhvu Munnetra Sangam	New Year Festival	Folk artists / rural
12.01.2002	Chandai Pudukuppam Pondicherry	Kalai Ilakkiya Perumanram	Pongal Festival	Rural
04.02.2002	Kanchipuram	Tamil Nadu Kattaikoothu Kalai Valarchi Munnetra Sangam	Permanent Theatre Launch	Rural, urban and <i>koothu</i> artists
10.02.2002	Chennai	MSSRF	Women's Theatre Festival KULAVAI	Theatre persons / urban
23.02.2002	Ammaiarkuppam	Ammaiarkuppam Thriuvallur District	Murugan Temple Temple Festival Committee	Rural / festival
26.02.2002	Chennai	New College	Annual Day Literary Society	Students
23.03.2002	Delhi	National School of Drama	Fourth National Theatre Festival	Festival / general
24.03.2002	Delhi	Delhi Tamil Sangam	None	Tamil community

KULAVAI 2002

To celebrate the tenth year of its existence, *Voicing Silence* worked towards an event which would bring together its three main goals — producing plays on women's issues or feminist themes; organising collective sharing and interaction through women's theatre festivals, or bringing together cultural workers, social activists, theatre persons and others concerned with women's issues; and using theatre as a tool for the self-expression and empowerment of women.

The efforts culminated in *KULAVAI 2002*, held in February 2002, the fourth in the series of interactive women's theatre festivals organised by *Voicing Silence* since 1996. The focus was on women directors. *KULAVAI 2002*, supported by Mithran Devanesan as Technical Director, showcased three plays by women directors from different parts of the country in different languages and hosted the seminar "Towards a Feminist Theatre". The three plays were *Manimekalai* in Tamil, (already described,) *Kitchen Katha* in Punjabi directed by Neelam Mansingh Choudhury (The Company) from Chandigarh and *Ganapathi* in sound and rhythm, mostly wordless, directed by Veenapani Chawla (Adishakti) from Pondicherry. The rich thematic, stylistic and linguistic variety celebrated the diversity and strength of the women directors and even questioned the very basis of the category of "women directors".

During the seminar nine Resource Persons (all women directors) made presentations and explored the theme, along with a number of theatre persons, both male and female. The questions addressed ranged from the

meaning and relevance of the term "woman director" and the external constraints met by women in theatre, to the differences, if any, between men and women in relation to processes of work, modes of representation, choice and treatment of subject, interpretation of texts, and style and approach in theatre. The aspects that were discussed included the relative emphasis given to process and product as well as to collectivism and shared artistic expression by men and women.

The seminar has been documented in print, the plays in photographs and the festival on video. Copies of the printed report and the edited video are available on request. *KULAVAI 2002* was able to elicit financial support from a wide spectrum of institutions, including the Government of India, the Government of Tamil Nadu, the corporate sector, media, foreign embassies, bilateral donor agencies and individual well-wishers, thus confirming the widespread interest in gendered theatre among different stakeholders.

Documentation

Another activity taken up in the tenth year was the systematic documentation of the decade of work. The objective is to have an evaluative overview of the work, framed in a gender perspective, starting with a definition and contextualisation of feminist theatre and going on to a process-based narrative recording the evolution and development of the work. The study includes a theatrical critique of the oeuvre, from a theoretical standpoint.

The task was assigned to a young theatre scholar, who has completed it after studying

the extensive archival records in print, photography and video, and interviewing in depth the main players, as well as the numerous persons connected with the evolution and programmes of *Voicing Silence*, in order to obtain multiple viewpoints. The manuscript, which is now under preparation, is expected to be accepted for publication by a leading publisher and appear in print by the end of the tenth year.

The year has also seen systematic documentation and organisation of archives. Both *Medai Pesudu* and *Manimekalai* have been documented on video. Six of the nine plays are now available on video. An exceptional feature of the video documentary on women directors (KULAVAI 2002) was the fact that it was planned, shot and edited entirely by an all-woman team of undergraduate students of Communication from MOP Vaishnav College for Women in Chennai. The entire video library has been digitalised for storage and the collection of news clippings, articles, reviews, photographs, brochures and other materials has been carefully indexed and preserved. Some of them will be available on the internet.

Sub Programme Area 404

B V Rao Centre for Sustainable Food Security

404.1 Food Insecurity Atlas of Urban India

The problem of food insecurity is a complex one especially when seen against an urban

background. The forthcoming book *Food Insecurity Atlas of Urban India*, deals with these problems at the state level. In the concluding chapter the most pressing issues which are to be taken up for policy, are elaborated.

404.1.1 Dimensions of urban food insecurity

Food security can be looked at from three different viewpoints: availability of food, which depends upon production and distribution; access to food which is based on one's purchasing power and food absorption. Even if food is available and affordable, if it is not fully absorbed into the body, the purpose is not achieved. Food absorption implies being able to assimilate the food eaten in order to lead a healthy and long life. This depends upon the health of the individual. Sanitation, clean drinking water and primary health care keep people healthy and free from disease. Thus for the purpose of the study, food security has a broad perspective.

A little more than one-fourth of the Indian population lives in urban areas. Urban incomes are higher than rural incomes; transport and electricity are available; schools and hospitals are within reach. It is not necessary for urban residents to travel long distances for their daily requirements. Life appears to be easier and better for urban people, compared to rural people. However a closer look makes one wonder whether urban lower income groups are better off than their rural counterparts.

As the retail network is generally good in urban areas, food availability may not be a

problem, but affordability for the poorer section is the main concern. A well-managed public distribution system helps to improve the availability at affordable prices. All the same, urban prices are higher than rural prices for many essential food items. Further the casual nature of employment and intermittent periods of unemployment of the urban poor reduce the affordability of good quality food. The problems of livelihood sooner or later influence the food intake. In addition, shrinking job markets for regular employment, the problems of rural migrants and the exploitation of contract labour add to urban woes.

The problems of slums, congestion, homeless families, street children, severe water shortage, polluted air, stinking water bodies, mountains of garbage and unhygienic work conditions are all unique to the urban environment. Though the health infrastructure such as availability of doctors and hospitals is better in urban areas, the benefits may not reach the lower strata, unless cheap public health care is extended to them.

Liberalisation of the national economy influences the urban people more than the rural people. It may have implications on the shrinking regular employment, increased dependence on petty self-employment and casual employment. Thus deficient food consumption, pathetic living conditions and the casual work opportunities of the poorest in the urban areas leave them susceptible to recurring hunger, disease, morbidity and shortened life spans.

All these problems of urban food security are related to the pattern of economic growth, rural-urban migration and finally the pattern

of urbanisation. Policies that only touch upon the visible effect and not the core causes of food security offer only temporary solutions. The reasons for hunger, misery and health hazards are ingrained in the very pattern of economic growth and urbanization.

The book is divided into two parts: the first deals with state level analysis and the second with the specific problems of towns and cities. In Part one, the first chapter touches upon the issues of food production, food consumption and the public distribution system. The second chapter touches upon physical access to food, the problems of unemployment and the nature of employment and poverty. The third chapter looks at the discrimination in food access and livelihood access. The fourth chapter examines the general amenities, sanitation, pollution and health infrastructure available for urban people. The fifth chapter studies the nutritional status of the urban population in terms of outcomes such as infant mortality rates and growth disorders. The sixth chapter presents the final food insecurity map of urban India and discusses the policy issues.

404.1.2 Food insecurity across different classes of towns in India

The study is a descriptive analysis of the problem of food insecurity at a disaggregated level in urban areas. Towns do not constitute a homogenous category, but vary a great deal in their size as well as the basic characteristics of their economy. Towns of different population sizes, in general, have different characteristics and play different roles in the overall urban system. Therefore, towns have been classified into

four classes based on their population size as metropolitan cities, big towns, medium towns and small towns and the problem of food insecurity studied across these different classes.

The problem of food insecurity is a complex socio-economic problem and encompasses a broad concept of deprivation of several basic requisites for a healthy life such as education, secure employment, basic sanitation facilities, drinking water and health care. While access to education and secure employment provide one with the necessary purchasing power to buy food in the market, clean drinking water as well as environmental hygiene have a bearing on the absorption of food in the body. An analysis of the basic amenities available to households such as drinking water, sanitation, housing and electricity has been undertaken as well as an analysis of the development of basic infrastructure in towns, like schools, hospitals, roads and railways, and of the nature of employment available for the work force, the level of literacy of the population and the juvenile sex ratio across the different classes of towns. The concern has been to study the inter-class variation in towns, and by implication, the nature of deprivation experienced by the general population across different classes of towns. The detailed analysis brings out the size variation as well as the spatial variation of all the aspects considered. Throughout the study, the various analyses undertaken have been presented pictorially, in the form of maps, bar diagrams, graphs and pie charts. This study is expected to serve as a guide to policy makers and will be released by October 2002.

404.2 Sustainable Food Security Atlas of India

Sustainability is related to long-term ecological health. Food security is related to being able to feed the people and keep them healthy all the time. Economic development is required for food security, so that a country is not only able to produce enough food but also provide livelihood security for people to afford enough food. Ecology and economy were in the past considered to be contradictory to each other. It was thought that one has to sacrifice economic development to achieve ecological health and vice-versa. Reconciling the environment and economic development was first discussed at the United Nations conference on Human Environment at Stockholm in 1972. At that time many countries feared that environmental protection may harm rapid economic development.

As economic development increases and ecological degradation deepens, the realisation has come that ecological degradation would act as a check to economic development sooner or later. Protecting the ecological base is even more important for food production and livelihood access than economic progress. By 1987 a report titled "Our Common Future", published by the World Commission on Environment and Development, Chaired by Dr Gro Brundtland, had introduced and defined the word 'sustainability'. Sustainability is meeting the present need without compromising on future needs.

In 1996, on the occasion of the World Food Summit, the Food and Agricultural Organisation defined the term 'food security' in a report titled "Food for All". Food security is the ability to provide physical and economic access to sufficient, safe and nutritious food to all people at all times. Sustainability of food security is the need of the hour. It is the ability to provide sufficient physical and economic access to food for all at present without compromising the ability to provide enough in future. The present study examines the ability of the Indian states to provide sufficient economic and physical access to food, water and clean air to all its residents for a long time to come.

The Indian scenario

India needs enough food to feed more than a billion people with the population still growing. To ensure this, it is necessary to look beyond mere food production. It will be possible to produce enough food for the growing millions only when our natural resources are taken care of. Vegetative foods are a part of crop production. Animal foods are a part of animal husbandry and fisheries. All these activities involve land, water and atmosphere, particularly sunlight. The health of the soil and availability of water depend upon a number of other natural resources, such as forests, biomass cover, biodiversity of fauna and flora and atmospheric pollution levels. Unless these natural resources are conserved and the quality of water, soil and air is maintained, it will not be possible to ensure long-term food security. This is already apparent in the total factor productivity studies. As degradation of the natural resources occurs, more and more

inputs are needed to produce the same output. When soil moisture and soil nutrients are deficient, more irrigation and more fertiliser will be required.

Further, in a country like India, where nearly 70% of the people live in rural areas, the depletion of natural resources leads to loss of livelihood to millions. Depletion of forests, degradation of farmlands, receding water tables and disappearing vegetation result in the poverty of millions in rural India. Their hardships and real poverty are not adequately captured in the income poverty defined by the poverty line. When there is no water in the summer months, when there is no fuel to use, when there is no shade of a tree to stand under, when the crops fail, the economic cost of survival is just not measurable in terms of the estimated income needed to buy some food grains. The costs of survival increase substantially when free natural resources are no longer available. Those who enjoy the free natural resources are richer than those who are deprived of them irrespective of their income levels. The income levels of people need to be adjusted to the quality of the environment they live in, just as the national incomes are adjusted to the richness of the natural resources in a country.

Measures should be taken to replenish the depleted resources. Wherever the rate of replenishment is slower than the exploitation, the levels of exploitation should be slowed down and conservation measures should be accelerated. It is possible to take such policy decisions at the state and the central government level, only when they have an idea of the levels of exploitation and their long-term implications with some level of certainty. This Atlas is meant to provide such

information on the health of the existing natural resources and levels of their depletion. Often there is a conflict of interest between environmental sustenance and livelihood sustenance. For example exploitation of forests for timber, clearing them for croplands or submerging the forests for the sake of irrigation dams may improve the short term and medium term interests of livelihood security but damage the prospects of food production sustenance as well as livelihood sustenance in the long run. Similarly, industries generate employment in the short run but pollute air and water bodies, posing a long-term health hazard to everyone. The capacity of various states to provide long-term food security in all these aspects is being analysed.

Framework of analysis

Ecological health, especially its relationship to economic access, is the main focus of the study. First, the ecological indicators that are vital for longterm food security are studied. They are related to land, water, forests, biodiversity and atmosphere. The levels of health of these natural resources and the levels of their degradation have a bearing on sustainable agriculture and livelihoods.

The main concern is the food security of the people affected by degradation and depletion of natural resources. The longterm impact of environmental degradation on food security is measured. Then the level of degradation in various states is assessed. All the indicators that are singled out for detailed study are mapped separately. At the end of the study, all the indicators and the relevant indices related to these five natural resources

are combined into a single Sustainability of Food Security Index. The final Sustainable Food Security Map of India gives the relative levels of sustainability at the state level.

A special effort has been made to study their implications on the livelihood access of the people dependent on these natural resources in each state. The focus is on the impact of the depletion of natural resources on the poverty groups in each state. While the indicators and the maps focus on the sustainability aspect, the analysis focuses on the hardships to the poor due to their degradation. However the maps would first identify the hot spots of natural resource degradation. The analysis would then systematically examine the impact on water and food availability at affordable prices and the impact on the livelihood security. The impact of atmospheric pollution on livelihood security and the health status of the population will also be examined. The impact is examined with the help of some indicators. The environmental sustainability index does not include the livelihood indicators. A separate index of impact indicators will be prepared and examined together with the Sustainability Index.

The measures taken for conservation of natural resources and restoration of livelihoods to the displaced population will also be assessed. The gap between the policy and its implementation, and suggestive measures will be brought out in the analysis.

The concept diagram elaborates this relationship. (Figure 4.1)

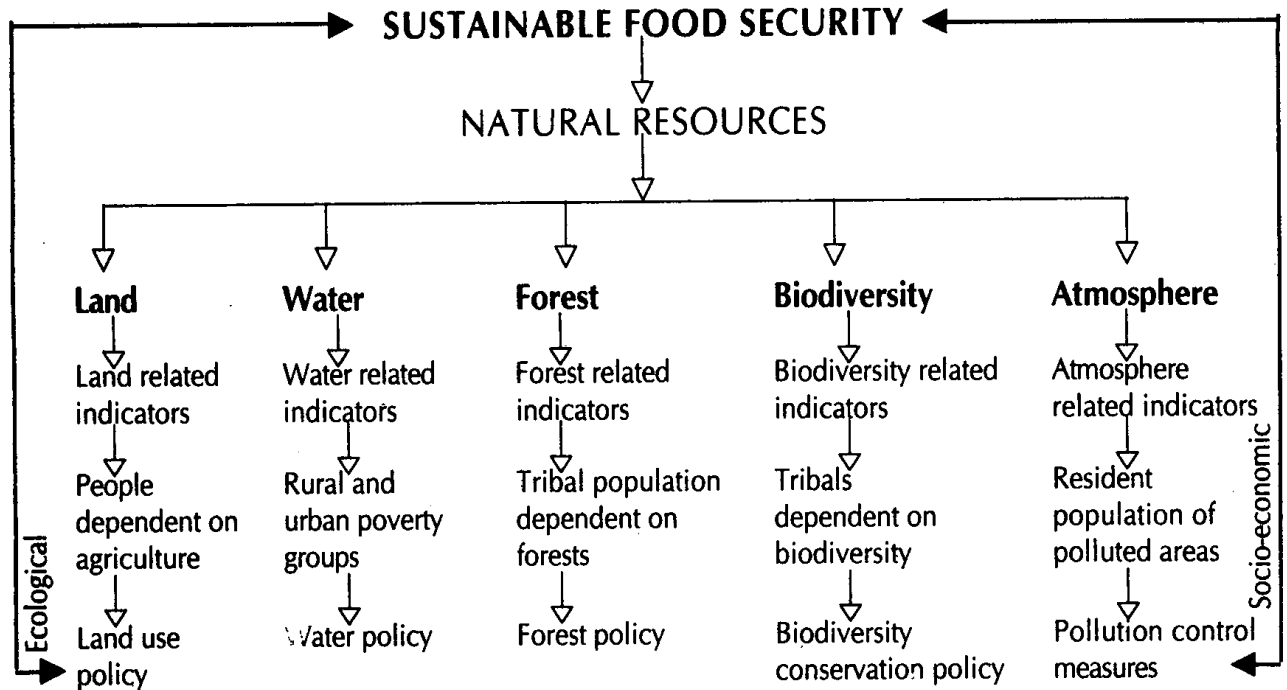


Figure 4.1 : *Sustainability of food security*

Indicators of sustainable food security

Most of the basic aspects listed in the concept diagram are related to one or more aspects of food security. It is necessary to look at the natural resources and their link to food security. The indicators of land related to food security are : land use pattern, crop pattern, soil health and the pressure of humans and animals on land. If the land use pattern has less of dense forest land, more land used for human habitation and industrial use, less of fallow and permanent pastures and so on, the ecological sustainability would be low. Similarly, if the crop pattern has more of nutrient depleting crops compared to the capacity of nutrient replenishment, the sustainability of future production is affected. Indicators of biotic stress are also important. Use of such lands with low water table and

rainfall lead to more evapo-transpiration than precipitation. They are susceptible to erosion. All these aspects are reflected in the indicators.

Forests are important for many reasons for sustainable food production. Their free services include providing raw materials, purifying and regulating water, assimilating toxic wastes, cycling nutrients, creating and maintaining soils, and regulating local and global climates. They provide timber and non-timber forest produce. They also act as carbon sinks, by absorbing the carbon dioxide in the atmosphere. Forests provide livelihood to a number of people who depend upon them for non-timber forest produce. They are the free sources of fuel wood to the people who live near the forest. Thus forests provide both longterm and shortterm food security. In addition forest

biodiversity is of great importance, as the moisture-preserving capacity improves. With larger biodiversity, forest fires occur less frequently. Degradation, cutting, shifting cultivation and over grazing reduce the capacity to provide ecological services longer into the future.

Biodiversity of fauna and flora is important not only for ecological balance and environmental health in the long run but also for the provision of nutritious food and the employment created in preserving them and propagating them in the short run. Crop biodiversity is also important for genes that may provide useful combinations for pest resistance, drought resistance and nutrition. Basic natural material preservation is useful in many ways.

Water is the next important natural resource. All the aspects of water, such as rainfall, its variation and the implications to food security in rain-fed areas, fresh water for drinking, irrigation, industrial use and household use, and the availability of ocean water, are of utmost importance, in terms of the quantity available per person and the quality. Water quality and levels of pollution have also to be considered. All water resources are important for providing food, water and employment. When polluted, their usefulness is diminished. Water pollution can be measured with the extent of dissolved oxygen demand known as biochemical oxygen demand and chemical oxygen demand. Over-exploitation of water sources and the pollution of water bodies and ground water lead to reduced food production from crops, livestock and fisheries. Toxins harm the health of humans. The indicators reflect these aspects.

The next important aspect is atmosphere and its pollution. Pollution can be caused by greenhouse gases such as Carbon monoxide, Carbon dioxide, Nitrogen based gases and Sulphur based gases, Chloro flourocarbons and other toxic substances. Household garbage and industrial pollution add to these gases. All these basic aspects listed in the concept diagram are related to food security in the three basic ways. Most of them provide food, ecological balance and livelihood opportunities.

Policy implications

Based on the analysis of the gaps that exist between the requirements for conservation, the policy adopted for conservation and the conservation undertaken, programmes and policies needed for at the state level, not only for conservation but also for the restoration of livelihoods are suggested.

404.3 Resource Centre for Community Food Banks

The Resource Centre for Community Food and Feed Banks (CFB) was inaugurated in October 2001.

The aims of the Resource Centre are:

- To be a nodal centre to collate, document, disseminate, research and advocate all issues relating to Food and Feed Banks and their operation
- Develop and execute training modules on the management and operation of CFBs for various levels of stakeholders

- Implement pilot projects based on a life cycle approach to food and nutrition security. The broad outline of the structure of Food Banks is given in Figure 4.2

Community Food Bank

The work has been at two levels :

- Liaising with State Governments to get their support for the idea of CFBs and facilitating implementation of pilot projects in an area identified by them: consultations have been held with the State Governments of Maharashtra, Rajasthan and Tamil Nadu. The Governments of Maharashtra and Tamil Nadu have identified the districts for implementation of the pilot projects. Identification of the blocks and villages to start the initial phase of work is to follow.

- Implementing Pilot Projects in MSSRF Project areas in Orissa and Tamil Nadu: In Orissa, preliminary baseline information collection has started in Koraput and Kalahandi districts. Likewise in Kolli Hills in Tamil Nadu, identification of villages and baseline information collection have commenced. In both areas, along with Food Banks, Seed Banks and *in-situ* on-farm conservation of land races and local crop varieties will be an integral part of the activity.

Storage: Effective methods of seed and grain storage are being worked out. The expertise available with the Indian Grain Storage and Management Research Institute of the Government of India will be utilised towards this end. Private companies have also expressed interest in participating in the project.

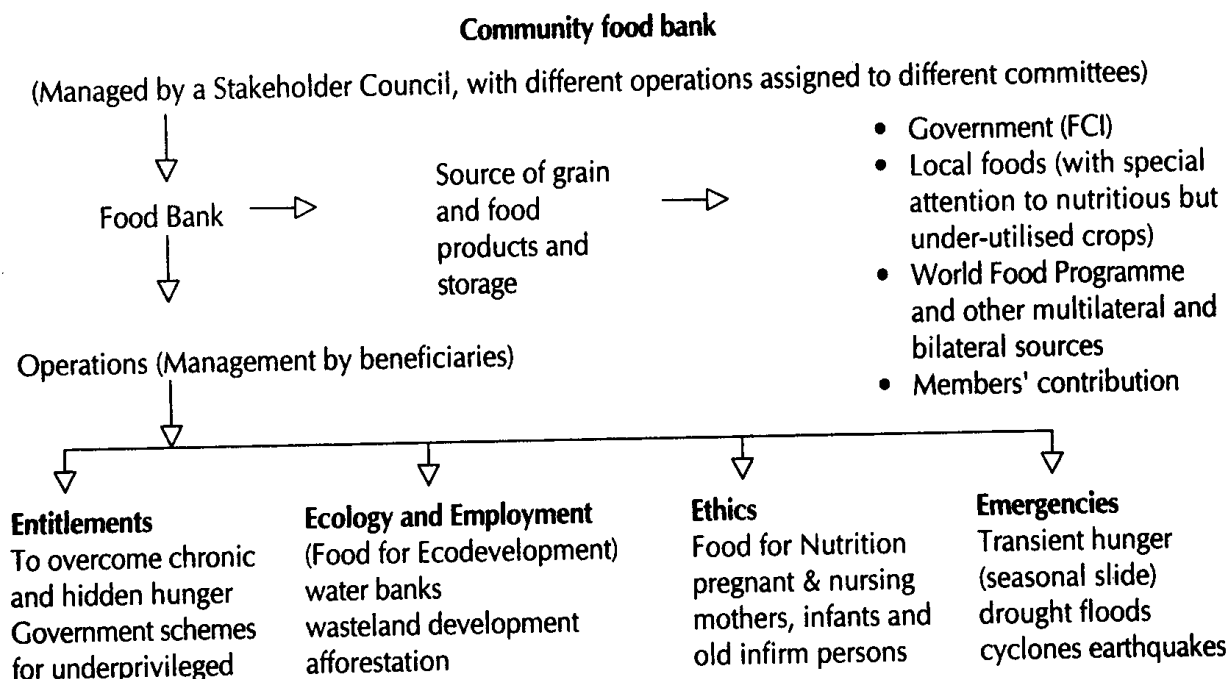


Figure 4.2 : **Structure and linkages in a community food bank**

Community Feed Banks

Closely linked to the concept of Food Banks are Fodder and Feed Banks for Livestock and Poultry. A Feed Bank for smallscale and backyard poultry units is being set up in Namakkal, Tamil Nadu. The area is known for the poultry industry. But smallscale poultry units have not been able to survive, largely due to the non-availability of local feed material and the high cost of available feed.

The objectives of the Feed Bank Project are:

- to increase the acreage under poultry crops *viz.* maize, soybean and minor millets
- to increase the yield of these crops through proper agricultural management practices
- to link the small farmers cultivating these crops to smallscale feed manufacturers, small farmers having backyard poultry and smallscale poultry units and establish decentralised feed godowns for storage
- to establish and strengthen networking among the stakeholders *viz.* small and marginal farmers, poultry units, egg and broiler coordination committees and consumers.

The Project was conceptualised in response to the felt need of the area and the existing demand–supply gap in the availability of poultry feed in the district. Through Rapid Rural Survey, field observations and focus group interviews, five interested small farmer groups have been identified in Namakkal, Mohanur and Kolli Blocks. The farmers have evinced willingness to cultivate QPM based

on visible results at the MSSRF demonstration plot in Kondichettipatti village. A random survey of a few defunct smallscale poultry units has also revealed their willingness to revive the activity if assured of good quality feed at low cost.

404.4 National Land and Water Care Movement

The first Consultative Group on Land and Water Care (CLAW) met under the chairmanship of Prof M S Swaminathan on 26 April, 2001 at New Delhi. The deliberations led to the following recommendations :

- Under National Land and Water Care Movement, 9 states, *viz* Andhra Pradesh, Assam, Gujarat, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Tamil Nadu and Uttaranchal, should be covered.
- To start with, model projects such as bioindustrial watersheds should be started in the 3 states of Orissa, Uttaranchal and Tamil Nadu.
- Under the model project for the hardware component, in each state a watershed of 2,000 ha should be taken up availing the funding support of the Department of Land Resources in the Ministry of Rural Development, Government of India, New Delhi and the natural resources of land, water and vegetation should be developed.
- Over the above watershed, software components of various supporting activities should be superimposed

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through convergence of on-going programmes of different Central/State Governments, international, bilateral, multilateral organisations and donor agencies for ensuring water, food and livelihood security, as envisaged.

- Technology extension/promotional activities such as awareness campaigns, organising of state-level consultations, publication of technical papers/reports, human resource development programmes etc should be undertaken.

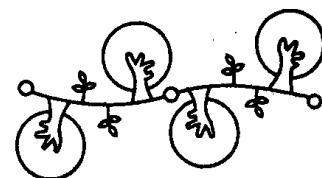
Progress: An Executive Committee (EC) to assist CLAW was set up under the chairmanship of Prof M S Swaminathan and met on 8 August, 2001.

- The state-level consultation in Orissa was launched on 18 June, 2001 at Bhubaneswar. It was inaugurated by the state Chief Minister and concluded by

the state Governor; a site for the project was finalised.

- Similarly, a state-level consultation was organised and a model project for the promotion of medicinal plants, fruits and summer vegetables was identified in Tehri District of Uttaranchal.
- For Tamil Nadu, project sites were selected at Acharappakkam and Madhuranthagam blocks in Kancheepuram District for the model project.
- A Task Force was set up for all the 3 states for providing scientific inputs and organic linkages between the states and CLAW.
- Substantial progress has been made in project formulation in all the 3 states.

Programme Area 500



Education, Communication, Training and Capacity Building

Programmes relating to Rural Knowledge Centres and The Hindu Media Resource Centre for Sustainable Development evoked considerable public and professional interest. The provision of CD ROM and Library Services to large numbers of scholars from all over the country continued in an expanded manner. Also, the work on Scientometrics progressed further and attracted national and international interest. The 2002 Annual Dialogue was on the theme "Environment, New Economy and New Employment". The aim of the workshop was to identify new opportunities in the field of ecojobs and eco-entrepreneurship.

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Sub Programme Area 501

Knowledge System for Sustainable Food Security

Funding agencies and donor governments often face the question of whether they should support ICT activities in their development projects. Should the money be invested in computers and communication devices or would it be better spent on food, shelter, health, and education? The choice need not be one of 'either / or'. If used intelligently and innovatively, ICT can form an integral component of development projects as demonstrated by the award-winning Information Village project. The Information Village Research Project (IVRP) is based on a pro-poor, pro-women and pro-nature orientation to development and community ownership of technological tools, as distinct from personal or family ownership. The first phase started in January 1998 and came to a close in June 2000, and Phase II commenced in February 2001. At present it is being operated in 10 villages, including the hub at Villianur.

Content

The creation and updating of relevant content to suit local needs is the key factor in the programme. Based on the requirement of the local community, about a hundred databases were developed under the categories of current information, long-term information, citizens' charter, cattle and feeds, health information, agricultural information, educational information and general information. From the user registers

it was found that many of the villagers use the entitlement database such as addresses of doctors, especially specialists, and ambulance services and addresses of veterinarians. The education database that describes the courses available in nearby schools, colleges and also those in neighbouring states, along with cost information, is used by the young.

This year a daily news item called "Farmers' Diary" was introduced to provide information on technologies relevant to agriculture and animal husbandry. The aim is to alert farmers by giving them information on farming practices, integrated pest management (IPM), integrated crop management practices (ICM) and integrated nutrient management practices (INM) relevant to main crops like paddy, sugarcane, cotton, pulses, cereals and horticulture crops. The information is obtained from agricultural university magazines, individuals, research stations and indigenous farming practices shared by farmers in magazines. The diary for animal husbandry gives information on animal health practices suggested by the Tamil Nadu Veterinary University, research stations and farmers' indigenous animal health practices.

The question of content creation is crucial to this project. The villagers are interested in dynamic and customised information. This is a resource-intensive activity and has implications for sustainability in view of the potential of involving more locals to create and manage the local and customised information content. An encouraging development in this regard is that some village knowledge centres create the contents related to agriculture, animal husbandry, education, employment, health, Government

announcements, income generating enterprises, general information and environment. Even after MSSRF withdraws from the scene they will create the contents on a regular basis and share the information among them. A consultant from Accenture, UK, who spent a few days in the knowledge centres felt that they could become self-sustaining in about five years.

Rural Yellow Pages

Rural Yellow Pages have been introduced in two villages (Ariyur and Embalam) on an experimental basis. Farmers can now find out who rents agricultural equipment in the region, the names of cattle agents, cattle feed centres, availability of bricks, pesticides, second-hand sewing machines, etc. They promote the business of all categories in and around the village.

Spread Spectrum Technology – new communication technology introduced

Motorola VHF Business Radios is being used for instantaneous communication and data transmission between the villages and the hub. In this technology files are transmitted sequentially to the villages and not simultaneously. The last of the villages will receive the information hours after the first. Due to low line speed the villagers cannot access internet. The maximum distance is only 25 km. To overcome these disadvantages, "Spread Spectrum Technology" was introduced in three villages, viz. Villianur, Embalam and Veerampattinam. This technology can be used to reach larger distances but it is necessary to use a repeater every 42 km.

Focusing light and video conferencing

The installation of a powerful light on top of the Spread Spectrum Antenna (used for communication) has proved to be a boon to the fishermen of Veerampattinam who go fishing at night. Even on a misty night they can now identify their village and more importantly the rocks in the sea. This focusing light helps them to save time and diesel and to avoid damage to their nets. NABARD and District Rural Development Agency managers conducted video conferencing with Embalam and Veerampattinam self help groups (SHGs) through web camera and cleared their doubts regarding the loan repayment schemes. Often, Embalam and Veerampattinam school children use this facility to get their doubts in their schoolwork cleared.

Nammavur Seithi – fortnightly newsletter

IVRP work is known well in about 20 villages. It is also known in the wider world thanks to media coverage and visits by celebrities, media persons and researchers. But beyond these villages, the project was not so well known in Pondicherry. This situation changed dramatically when a fortnightly newsletter called "Nammavur Seithi" (News of our village) was launched on 18 February 2002. Those who had not known about the knowledge centres came to the centres in large numbers and wanted to use the services provided, especially advertising their products and services. Many people told the project staff that the commercial newspapers and magazines contained only politics, international news and news about dacoity, crime, violence, etc. They felt that this newsletter provided a

refreshing change with its useful, development-related content. Now Government departments announce important schemes through this newsletter. Many villagers have sent letters expressing their thanks.

Open knowledge network

Today, every part of the world has telecentres and internet connectivity. But these do not serve the real needs of the rural poor. A month-long pilot study on sharing information among communities living far apart was carried out with One World International. The aim of this study is to eventually create a network that will connect the rural poor of the world and facilitate knowledge sharing among them at affordable costs. In the pilot study, three information villages, viz. Veerampattinam, Embalam and Kizhur, were used to feed local news, advertisements, items of traditional knowledge, government announcements and suggestions everyday, based on which a daily news sheet was produced at another village, viz. Kalitheerthalkuppam. In the experiment, data gathered from different villages, using a specially designed format, is stored as both metadata and full content. The content is stored in a server at MSSRF, and the metadata is transmitted to a server at the One World International via internet. Within an hour villagers can download the daily newsheet either through internet or through World Space radio. As a sequel a workshop was held from 29 to 31 May 2002, with participants from Africa, Latin America and Asia. They will set up similar knowledge centres and form the base of the worldwide network.

Surveys

This year IVRP conducted a survey of both users and non-users in five villages. This is an ongoing process. This survey gave very interesting results. People derive economic benefit from employment news, crop and fish market details and computer training. They also rate information on loans/ Government entitlement news and farmers' diary news. Real estate agents and small merchants finalise trading deals through wireless phones. Weather and wave height, education details, daily news, recipes, notice board announcements, important phone numbers, transportation and power cut details and public address system announcements benefit the people in intangible ways. Women are very interested in health information, recipes and naming newborn babies based on the stars. Computer training for ladies and children in the local village ensures safety (as they do not go to centres far away from their village), saves time and money. Most of the non-users said they could not find time due to labour and office work. Some feel shy because they are uneducated, old people are not sure if they would get respect from the young volunteers. Some old men avoid the centre because they are run by women! The community wants training in microenterprises and flash news on the computer screen, using multimedia, to increase the working hours of the hub and KCs. Some women are advised by their men not to go to the centre. Some need computer training certificates. Fishermen would like to have two-way communication between sea and shore, and training in protein extraction from fish.

Award

This project won the Stockholm Challenge Award in 2001 under the Global Village category. The Jury's Motivation of this project is as follows:

"Project Information Village Research is an outstanding embodiment of the spirit of the Stockholm Challenge to promote inclusion through the use of information and communication technologies. Today, thanks to Information Village Research, ten villages near Pondicherry, India, are linked with computers, providing information on such aspects as health, crops, weather and fishing conditions. These new technology tools are bridging the economic and social divide between the haves and have nots. They are empowering everyone with knowledge and opportunity by an inclusive use of local languages and a multimedia format that allows all to participate. Because of this project, some traditional barriers have fallen. For example, a temple that formerly excluded low-caste people now opens its doors to everyone so they may use computers. This project is a wonderful example of the benefits of IT, and of the power of information and opportunity".

Replication of knowledge centres concept in Gulf of Mannar region

Gulf of Mannar is situated in the southern part of Tamil Nadu near the Sri Lankan coast. Dalits and Muslims were traditionally engaged in fishing in this area. In recent times other backward communities have taken up fishing using big mechanized boats and nets. Catching of breeding fish and juveniles and damage to sea grass and coral ecosystems

due to bottom trawling, have resulted in the fish population being reduced considerably. In order to protect biodiversity in this area and to discourage overfishing, the Foundation has four alternative activities for fishing families, namely agar production, fish pickle making, production of artificial reef and pearl culture, all of which have considerable commercial potential. In order to strengthen the above activities and to enhance livelihood security and employment opportunities for the poor fisherfolk, Rural Knowledge Centres were established in Mandapam, Pamban and Kuncharavalasai. Eventually, the rural people will be able to sell their products to distant buyers through e-commerce. At present fish market details from Ramanathapuram, information on nearby educational institutions, hostels and fees, blood bank details, hospital addresses, daily news, etc. are being provided. The fishermen want to establish strong linkages with the coast guard. The community members are ready to help the coast guard by giving timely information about the movement of antisocial elements and smugglers and the coast guard will be able to help the fisherfolk in distress situations.

Technical assistance in setting up knowledge centres in Samiyarpatti and Pudupatty

Samiyarpatti and Pudupatty SHGs are conducting adult literacy education programmes using touch screen, digital camera and computer writing pads. This programme aims to help illiterates in each hamlet to acquire functional literacy with the support of the participants' families and the cooperation extended by

the local community. Local villagers produce the resource materials. All the words are related to the family, objects and artifacts in daily use and the environment and not taken from textbooks. Informatics provides the technical support for setting up knowledge centres and imparts HTML training to the village volunteers. (see programme area 300).

Sub Programme Area 502

The Hindu Media Resource Centre for Sustainable Development

The German philosopher Jurgen Habermas has developed the notion of the *public sphere* as a part of social life where citizens can freely exchange views on issues of public and political concern, resulting in the formation of public opinion.

The Hindu Media Resource Centre for Sustainable Development carries forward this idea of facilitating the formation of a better understanding of modern science and public policy. Recognising the media as a critical channel in shaping policies, the Centre aims at enhancing the quality and coverage of issues relating to agricultural research and environmentally sustainable development, by providing authentic information to media practitioners. The Centre is in its fourth year, having been set up in August 1998 with endowment support from Kasturi & Sons Ltd.

Overview of activities

To facilitate its mission to bring Science and Society together, the Centre provides a forum

for dialogue between media personnel and practitioners of frontier science. The Centre adopts different strategies to reach printed, visual and internet media practitioners in the form of lectures, public fora and media workshops (Table 5.1).

Millennium Lectures

These lectures are designed to provide an in-depth understanding of the key issues of sustainable development such as poverty, population, environment and sustainable food security. Policy makers and intellectuals of international repute are invited to present their views on these issues and introduce the audience to alternative options for sustainable development.

The first lecture for the reporting year on *Genes and the Future* was delivered by Prof W James Peacock, Chief of Plant Industry, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia on 29 January 2002. In his lecture Dr Peacock stressed that, "Without linked improvement in both genes and management, we are likely to lose any advantage that biotechnology could bring. We will then not have the capacity to meet the demands of food production over the next several decades". He also listed the recent developments in gene technology and gave examples of how the new technology would benefit the consumers, farmers and the environment. He presented facts to allay some of the concerns expressed against transgenic plants.

Ms Susan V Berresford, President, Ford Foundation, New York, USA, delivered the

Education, Communication, Training and Capacitybuilding

second Millennium Lecture on *Ideas for the Future: Where will they come from?* on 6 March 2002. Ms Berresford in her lecture said that public and private organisations should invest their energy, imagination and research in tapping the talent

and leadership qualities of the marginalised and historically disadvantaged sections, because they provide new ideas and fresh perspectives. "Our success in the present century" would come only "by expanding our talent pools", she added.

Table 5.1 : *Activities of the Centre*

Activities	Date	Details
Millennium Lectures	28 January 2002	Prof James Peacock, Chief, CSIRO Plant Industry, Canberra, Australia on <i>Genes and the Future</i>
	6 March 2002	Ms Susan Berresford, President, Ford Foundation on <i>Ideas for the Future: where will they come from?</i>
Lectures	9 November 2001	Dr Lloyd Evans, CSIRO, Canberra on <i>Malthusian Concerns and Agricultural Revolutions</i>
	15 February 2002	H E Mr Gilbert Parent, Ambassador for the Environment, Canada on <i>Canada's Environmental Priorities</i>
Public Fora	26 June 2001	<i>Is Freedom from Hunger an Achievable Goal?</i>
	29 January 2002	<i>Strategies for Fighting the Growing Famine of Jobs</i>
Media Workshops and Interactions	21 November 2001	<i>Current Status of Genetically Modified Foods and Crops in India: Implications for Food, Nutrition and Livelihood Security</i>
	28 –30 March 2002	FEJI-MSSRF-World Bank Workshop for Journalists on Water Policy
	27 August 2001	<i>Action to End the Paradox of Grain Mountains and Hungry Millions- What Now?</i>
	12 January 2002	Interaction between Scientists and Media Representatives on <i>Linking Ecological and Livelihood Security in Coastal Areas</i>
Production of Documentary Films	January 2002	Farmers' Rights: From Legislation to Implementation
Building Databases	Throughout the year	This database has a list of experts on issues related to sustainable development, media practitioners, and scientific and educational institutions.
Technical Assistance	Ongoing activity	Media liaisoning

Lectures

Public lectures are offered by domain experts on issues of topical interest. This year, two lectures were organised. On 9 November 2001 Dr Lloyd T Evans, Honorary Research Fellow, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia delivered a lecture on *Malthusian Concerns and Agricultural Revolutions*. In his lecture, Dr Evans observed that if the world has to realise the full promise of biotechnology, private biotechnology firms need to reduce or forego royalties on their patented genes, when they are needed to breed improved cultivars for use in developing countries. Paying tributes to the late Sir Crawford's Malthusian concerns, Dr Evans said the green revolution had allowed food production to keep pace with exponential population growth, but not yet in some regions such as Africa, where large populations were under or malnourished, as predicted by Malthus.

H E Mr Gilbert Parent, Ambassador-Environment, Canada gave a lecture on *Canada's Environmental Priorities* on 15 February 2002. He outlined the Canadian Government's global environmental agenda. His lecture discussed Canada's initiatives on three issues, namely, climate change, the United Nations Environmental Programme and the World Summit on Sustainable Development at Johannesburg.

Public fora

While the Centre tries to broadcast information on sustainable development by utilising the mainstream media, it also organises *public fora*, where a panel of leading scientists and development thinkers

interact with the general public on a topic of socio-political relevance. These are held in a common place accessible to the public and mainly target youth, students, media and others concerned with public issues. In these fora, the public are encouraged to raise questions pertaining to the topic being discussed.

The first public forum on *Is Freedom from Hunger an Achievable Goal?* was organised on 26 June 2001. To review the progress made since The World Food Summit, convened in Rome in 1996, the Foundation held an expert consultation from 25-28 June 2001. In this context, *The Hindu* Media Resource Centre invited the public to interact with renowned experts. Panelists included Prof R B Singh, ADG & Regional Representative for Asia and the Pacific, FAO, Dr Meryl Williams, DG, International Centre for Living Aquatic Resource Management, Malaysia, Prof Anil K Gupta, Professor, Indian Institute of Management, Ahmedabad, Dr Swapan Dutta, Plant Biotechnologist, International Rice Research Institute (IRRI), Philippines, and Dr Ram Manohar Reddy, Deputy Editor, *The Hindu*. Mr N Ram, Editor, *The Frontline* served as the Moderator.

A forum on *Strategies for fostering job-led economic growth* was held on 29 January 2002. In his presentation, Dr Martin Lees, Rector, UN University of Peace, Geneva, remarked that India has a remarkable capacity in science and technology, especially in information, space and biotechnology and said that the question was how much of this could be directed at poor and rural areas. If this was done a larger population could participate in and contribute to the Indian economy.

Prof M S Swaminathan moderated the Forum, which was held at the Indian Institute of Technology Campus, Chennai.

Both the Millennium Lectures and Public Fora were well attended by the citizens of Chennai; there was enthusiastic participation by the student community.

Media workshops and interactions

Media workshops offer the greatest opportunity for an intensive interaction between media practitioners and domain experts. They provide a platform to discuss issues and their intricacies in a detailed manner, clearing apprehensions and doubts, leading to a better understanding of each other's perspectives. This year the Centre organised three media workshops:

A national level media workshop on *Freedom From Hunger* was organised on June 28, 2001 and was attended by 30 media practitioners from all over the country. The workshop had two sessions: the first discussed *The Impact of World Trade Agreement on Agriculture*. The second session debated the *Role of Media for Promoting Science for Food Security and Poverty Alleviation*. Participants at the workshop expressed concern over the lack of information to prepare Indian mediators during the World Trade Organisation (WTO). The consensus was on the need for an informed debate on the WTO agreement. Mr N Ram, Editor, *Frontline* and Mr Darryl D' Monte, Chairperson, Forum for Environmental Journalists of India (FEJI) moderated the sessions. Dr Anil Swarup, Chairman, APEDA, Dr Suman Sahai, Genecampaign,

Dr Ram Manohar Reddy, Economist and Columnist, *The Hindu*, Ms Anuradha Desai, Chairperson, Venkateswara Hatcheries Ltd. were among the panelists.

The second workshop was held on 21 November 2001 and it dealt with the topic, *Current Status of Genetically Modified Foods and Crops in India: Implications for Food, Nutrition and Livelihood Security*. This workshop is the fourth in the series organised by the Centre in the last four years, as part of a sustained campaign to encourage a dialogue on controversial scientific issues. Mr Sashikumar Menon, Media Development Foundation, Chennai, who moderated the sessions, voiced the concerns of the media and the public when he said a "sense of fear of the unknown about GM technology" still prevailed.

The Centre collaborated with the Forum of Environmental Journalists of India [FEJI] and the World Bank Institute to organise the South Asia Regional Workshop for journalists on *Water Policy* from 28-30 March 2002. This was a preparatory workshop for the 3rd World Water Forum, to be held at Kyoto, Japan in March 2003. The main objectives of the workshop were to increase press coverage of water issues in India and to improve the quality and objectivity of this coverage. There were 60 participants in this workshop, of which 40 were journalists from India, Nepal, Bangladesh and Sri Lanka

An interaction with media representatives on action to *End the Paradox of Grain Mountains and Hungry Millions- What Now?* was held on 27 August 2001. This was organised in view of the Supreme Court Directive to State governments to take steps

to end the hunger crisis in their states, and the corresponding media outcry. Prof M S Swaminathan interacted with the media on the occasion and highlighted the importance of establishing Community Food Banks, as a component of a community-centred and managed nutrition security system.

Another interaction was organised on *Linking Ecological & Livelihood Security in Coastal Areas* on 12 January 2002. Illustrative examples of the Foundation's research on linking the ecological security of coastal regions with the livelihood security of coastal communities were presented during the interaction with scientists.

Production of documentary films

The Centre is now actively involved in the production of documentary films. A film on *Farmers' Rights: From Legislation to Implementation* was produced on the rights of tribal and rural farm families and highlights the activities of the Community Agrobiodiversity Centre (CAbC) of the Foundation at Wayanad, Kerala. The film is being used as resource material in creating awareness on the issue.

Another film *Eastern Ghats: The Hills of Hope* is currently under production. The film, being produced in the International Year of Mountains (2002), is aimed at creating awareness among the public on the current issues of concern and the need for conserving biodiversity in the Eastern Ghats. The film depicts experiences gained at two of the field sites in which the Foundation works – Kolli Hills, Tamil Nadu and Jeypore, Orissa.

Research is in progress for two more films – one on Intellectual Property Rights and another on issues related to water.

Database of contacts

This year the Centre updated and expanded its database on media organisations, practitioners and eminent personalities, mainly from southern India. This database has been of use to other projects of the Foundation, as well. The Centre has plans to extend this database.

Media resources and referral services: information dissemination

The Centre is being recognised as a referral centre by media practitioners who require information or details from scientific and agricultural experts to complete their research on news items. The Centre will henceforth also provide journalists with various pre-processed media, like photographs, videos, CD-Roms, articles etc.

Technical assistance to other projects

The Centre provides technical assistance to events organised at the Foundation and facilitates constant media liaisoning for all projects. Field visits are organised for international and national media practitioners.

Sub Programme Area 503

Design and Development of Databases and Provision of CD-ROM Services

Informatics has been set up to collect, collate and disseminate actionable information

through various database services at various levels as a service. Most of the databases are in the public domain. Informatics shares technical resources with universities, research institutions and individuals. This is to enhance capacity building and information networking.

The mangrove database

Global Mangrove Database and Information System (GLOMIS) seeks to establish a global information database on mangroves to ensure sustainable utilisation and rational management of world mangrove ecosystems. International Society of Mangrove Ecosystems, Okinawa, supports GLOMIS database. This database contains four categories, namely References, People, Institutions and Projects. All the records relate to Indian Ocean Rim countries and MSSRF is the only resource Centre for South and South-East Asia. The entries are downloaded from *Aquatic Sciences and Fisheries Abstracts*, *CAB Abstracts* and *AGRIS*. This year 800 references were uploaded in the GLOMIS web site (www.glomis.com).

SCOPE volumes converted into web form

The Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Science (ICSU) is converting all the books published by SCOPE from 1972 to 1998 into web accessible form. This year 6 volumes were converted into web form and they are available in the SCOPE web site (www.icsu-scope.org) under the Virtual directory section. All the books are free for downloading. These books deal with environmental issues, greenhouse

effect, climate change, biological invasion, dynamic changes in the ecosystem, biochemistry of world rivers, sulphur cycling of wetlands and effects on coniferous forests and grasslands.

The list of books converted this year is as follows:

The Greenhouse Effect, Climatic Change and Ecosystems, edited by B Bolin, B R Döös, J Jäger and R A Warrick, 1986, John Wiley & Sons. SCOPE 29

Biogeochemistry of Major World Rivers, edited by Egon T Degens, Stephan Kempe and Jeffrey E Richey, 1991, John Wiley & Sons. SCOPE 42

Introduction of Genetically Modified Organisms into the Environment, edited by H A Mooney, G Bernardi, 1990, John Wiley & Sons. SCOPE 44

Sulphur Cycling on the Continents, edited by R W Howarth, J W B Stewart and M V Ivanov, 1992, John Wiley & Sons. SCOPE 48

Biogeochemistry of Small Catchments, edited by Bedrich Moldan and Jirí Cerný, 1994, John Wiley & Sons. SCOPE 51

Methods to Assess the Effects of Chemicals on Ecosystems, edited by Rick A Linthurst, Philippe Bourdeau, and Robert G Tardiff, 1995, John Wiley & Sons. SCOPE 53

CD ROM Library

The CD-ROM Library offers abstracts of research papers to all academic users. Informatics offers *CAB Abstracts* contents to researchers, scientists and students from academic and Government institutions all

over the country free of cost. On an average more than 60 users visit the CD ROM library every month. This year researchers from 14 universities, 16 research institutions and 41 colleges used the CD-ROM library. Agricultural entomology, Agronomy and Pharmacognosy related literature were mostly accessed.

Sub Programme Area 504

Scientometrics / Literature Analysis Group

Studies on mapping medical research in three specialties, viz. tuberculosis, diabetes and cardiovascular diseases, have been completed and the results of tuberculosis and diabetes were published in *Current Science*. In all the three studies both the research carried out and the burden of disease in India and China have been compared.

Three studies on mapping research in mathematics (based on data collected from *Mathsci*), agriculture (based on *CAB Abstracts*) and life sciences (based on *Biological Abstracts*) for the year 1998 were completed and the reports submitted to NISSAT-DSIR.

A sample research output database (ROD) for life sciences in India has been constructed for the publication year 1992 with searchable features. A total of 7,720 records are indexed. Of these, 6,849 are journal articles from 1,582 journals and 841 non-journal articles. These have originated in 1,159 institutions. Visual Basic as front-end and the SQL server as back-end were used to create the database.

Records downloaded from six databases were merged and duplicates removed. In the unified data set the names of journals, institutions and countries were standardised. The database consists of 10 fields.

New biology research in India, as seen from three international databases that cover new biology literature, viz. *Biotechnology Citation Index*, *Biochemistry and Biophysics Citation Index* and *Derwent Biotechnology Abstracts*, has been mapped for the publication years 1992, 1995 and 1998. India has published 2,362 papers in 633 journals in 1992, 2,686 papers in 727 journals in 1995 and 3,257 papers in 818 journals in 1998. There is an increase of 13% from 1992 to 1995 and 21% from 1995 to 1998. *Current Science*, *Indian Journal of Biochemistry and Biophysics*, *Phytochemistry*, *Indian Journal of Animal Sciences* and *Biochemistry and Molecular Biology International* are the journals often used by Indian researchers in new biology. Journals used by Indian researchers to publish their work are classified into 75 sub-fields using the deluxe classification provided by the Research Department of the Institute for Scientific Information, Philadelphia. It is seen that Indians are strong in Biochemistry, Biophysics, Plant Sciences, Microbiology, Biotechnology, Applied Microbiology, Pharmacology and Toxicology. About 58% of the papers have appeared in journals with impact factor (IF) less than 1.0 in 1992, 59% in 1995 and 60% in 1998. Although the number of papers published has increased those that had appeared in medium impact journals (IF \geq 3.0) have declined from 32% in 1992 to 31% in 1998. There are 805 institutions involved in new biology research in the three years.

More than 60% of the papers come from academia, about 30% papers come from research departments and 10% from other organisations. Institutions such as Indian Institute of Science, Banaras Hindu University, University of Madras, University of Delhi, and National Chemical Laboratory are the major contributors to new biology research. Citations for each paper for the years 1992 and 1995 were looked up from Science Citation Index up to the end of 2000. The increasing role of collaboration in science internationally, is reflected in new biology research. More than 10% of Indian research papers have come with international collaboration. Indian researchers collaborated mostly with US scientists and published 90 papers in 1992, 132 papers in 1995 and 151 papers in 1998. India has collaborated with 71 nations across the world. Other than the United States, India has co-authored a large number of papers with UK, Germany, Japan, and France.

For the study of the impact of public funding in new biology research in India, information on publications resulting from projects funded by four government agencies in the years 1992-1996 was collected and citations to each one of them up to 2000. Results are being analysed.

Sub Programme Area 505

Library and Informatics Services

With a collection of 17,000 books, 68 journals, 1,350 back volumes, 190 videos, Project Reports of the Centre and a few

dissertations, Boothalingam Library is a dynamic part of the Foundation.

The library largely serves researchers, scholars and policy makers of the Foundation. It also extends its services to other students, teachers and scholars. Nearly 1,200 outside users take advantage of the services every year.

The library consists of documents related to rural development, biodiversity, plant molecular biology, microbiology, environment and gender issues. Apart from common library services, in-house users are being provided with email-based alerts with the summary of information essentially gathered from internet, tailored to suit the individuals in the Foundation.

Sub Programme Area 506

Workshops, Conferences and Training Programmes

Several workshops, conferences and training programmes were organised during the year (Tables 5.2, 5.3 and 5.4). These meetings served to design or evolve frameworks for future research, by providing scope for proactive and interdisciplinary analyses of various issues relating to sustainable development.

Expert Consultation on Science for Sustainable Food Security, Nutritional Adequacy and Poverty Alleviation in the Asia Pacific Region (25 – 28 June 2001)

The aim of the Consultation was to review the progress made since the FAO Rome

Table 5.2 : *Conferences/workshops held during 2001 - 2002*

Title	Associate Sponsors	Dates	Details in
Expert Consultation on Science for Sustainable Food Security, Nutritional Adequacy and Poverty Alleviation in the Asia Pacific Region	Food and Agriculture Organisation (FAO), UN	25 – 28 June 2001	SPA 506
National Workshop on Alleviating Micronutrient Deficiency: Role of Horticulture and Home Gardens	Food and Agriculture Organisation (FAO), UN	29 June 2001	SPA 506
Consultation on Animal Feeds, with special reference to Maize, soybean and Minor Millets	Food and Agriculture Organisation (FAO), UN	30 June 2001	SPA 506
Workshop on “Women’s Empowerment, Sustainable Agriculture & Rural Multiple Livelihoods”		17 August 2001	SPA 402
Workshop on “A Strategy for Quality Improvement in Early Childhood Education”	ACCESS	23-25 August 2001	SPA 401
Workshop on Precision Farming, Sustainable Agriculture and Poverty Alleviation for NABARD and Bank officials		4-7 September 2001	SPA 301
Workshop on Knowledge Management for International Development	Bellanet International, Canada	18 –20 September 2001	SPA 506
Dedication of the Resource Centre for Community Food Banks		2 October 2001	SPA 404.3
Policymakers Workshop on Farmers’ Rights: From Legislation to Action and Conservation of Kerala’s Bioresources		24-26 November 2001	SPA 506
Brainstorming Session on Operationalisation of Policy Framework for Agricultural Extension during Tenth Plan Period	Ministry of Agriculture (MoA), Government of India	4-5 December 2001	SPA 506
Expert Consultation on Implementing Farmers’ Rights for Conservation and Utilisation of Plant Genetic Resources in the Asia-Pacific Region: from Legislation to Action	Food and Agriculture Organisation (FAO), UN	21-23 January 2002	SPA 506
Inter-disciplinary Dialogue on New Technologies: Reaching the Unreached, Environment, the New Economy and New Employment	Global Environment Facility (GEF)	28–31 January 2002	SPA 600
Asia Pacific Gender Equity through Science & Technology (APGEST) Regional Conference	UNESCO	21-23 March 2002	SPA 601
Dotforce Local Content Workshop	One World International, UK and UNESCO	29- 31 May 2002	SPA 506

Education, Communication, Training and Capacitybuilding

Table 5.3 : *Major training programmes during 2001 – 2002*

Programme Area	Topic of Training	Site/Location	Participants	Details in
Coastal Wetlands	Alternative livelihoods- animal husbandry, agri horticulture, coir rope making, tailoring, poultry farming, fish pickle making, livestock rearing, vermicomposting	Project sites in 3 states	Rural Families	SPA 101
	Restoration and management of mangroves	Project sites in 3 states	Rural families, Forest Staff	SPA 101
	Agar production, fish pickling, artificial reef	Gulf of Mannar Biosphere Reserve	Rural men and women	SPA 102
Biodiversity	Conservation methods	Project sites	Self help groups	SPA 201
	Development of health care products and medicinal plants conservation	Wayanad	Women's Self help groups	SPA 201
	Sustainable and organic farming methods	Project sites	Farmers	SPA 201
	Plant identification and herbarium techniques	Wayanad	Youth and students	SPA 201

Table 5.4 : *Training programmes held at the JRD Tata Ecotechnology Centre*

Programme	Trainee Days		
	Women	Men	Total
Minor millets and pineapple production and marketing	905	85	990
Integrated Intensive Farming System and Eco-aquaculture	1,357	1,368	2,725
Ecopreneurship and microenterprises	1,206	160	1,366
Precision farming	3,065	3,674	6,739
Self help groups, federation and microfinancing	2,700	1,209	3,909
PRA, microplanning and PAME	280	80	360
Training for field officers and Government officials	1,300	60	1,360
Biovillages, Pondicherry	3,440	76	3,516
Training for University staff and research scholars	88	172	260
Village Knowledge Centre Management	274	192	466
Training to other NGOs	50	80	130
Training organised by Grassroot organisations in collaboration with MSSRF	1,510	1,510	3,020
Total			24,841

World Food Summit of November, 1996, in improving the productivity, profitability, stability and sustainability of the major farming systems of countries in the Asia-Pacific Region. Nearly two-thirds of the world's poor live in this region, where enhancing economic access to food has become the major food security challenge. The Consultation focused on the role of science and public policy in converting Asia's green revolution into an evergreen revolution, rooted in the principles of ecology, economics, gender and social equity and employment generation, to achieve the goal of 'Hunger-free Asia'.

The Consultation was held in Bangkok in collaboration with the FAO Regional Office for Asia and the Pacific.

The different technical sessions at the consultation were:

- Overview of the Status of Food and Nutrition Security in the Asia-Pacific Region and in India
- Overview of Status of Science in Agriculture
- Science and Sustainable Food and Nutrition Security: Challenge and Response
- Emerging Biovision: Biotechnology, Bioinformatics and Genomics, Space and Nuclear Science, Agro-meteorology, Precision Farming
- Synergy between Technology and Public Policy
- Proprietary Science, Patenting, Trade Related Intellectual Property Rights (TRIPS) – their impact on scientific research for public good

The meeting brought together representatives from academia, government bodies, heads of research institutions like ICLARM, ICAR, NBRI, and CCMB, representatives from ICRISAT, IRRI, and NRSA to name a few, representatives from FAO, WFP and NGOs like CARE and media personnel. The executive committee members of the Asian Rice Media Network also participated in the meet. The total number of participants was about 60.

The Consultation spanned four days, including three days of intense deliberation, and a day's visit to the Biovillage and Information Village Projects in Pondicherry on 27 June. The consultation concluded with the *Chennai Declaration*, as an input for the World Food Summit.

On the evening of 26 June there was a Public Forum on the subject: "Is Freedom from Hunger an Achievable Goal?" The National Media workshop on "Freedom from Hunger" was organised on 28 June. Both these events were organised under the auspices of *The Hindu Media Resource Centre* (SPA 502).

Consultation On Animal Feeds, with Special Reference to Maize, Soybean And Minor Millets (30 June 2001)

The Consultation followed close on the heels of a FAO sponsored expert consultation on Science for Sustainable Food Security, Nutrition Adequacy and Poverty Alleviation in the Asia-Pacific Region and National Workshop on Alleviating Micronutrient Deficiency.

The meeting was attended by representatives of the poultry industry and scientists/

specialists in maize, soybean and minor millets. Ms Anuradha Desai, Chairperson, The Venkateshwara Hatcheries Group chaired the sessions. Dr Surinder Vasal and Dr N N Singh spoke about the importance of maize. Dr P S Bhatnagar and Mr O P Goel highlighted the potential of soybean. Dr Dhanapal spoke on minor millets. The representatives from the industry also shared their views on the status of the industry and the challenges facing it.

National Workshop on Alleviating Micronutrient Deficiency: Role of Horticulture and Home Gardens (29 June 2001)

The workshop held in collaboration with the FAO office in India was the culmination of a pilot project on "Eliminating Micronutrient Malnutrition in Tamil Nadu". Scientists and nutritionists from India and abroad attended the workshop. The sessions focused on the problem of micronutrient deficiency, the strategies for alleviating it and novel approaches to genetic fortification of staple grains. The closing session of the workshop recommended an integrated strategy for the elimination of hidden hunger.

Knowledge Management and Knowledge Sharing for International Development: Asia Workshop (18-20 September 2001)

A workshop was organised in collaboration with Bellanet, Canada, on Knowledge Management (KM) and Sharing from 18-20 September, 2001. The aim of this workshop was to explore the commonalities between KM and best practices in grassroots networking. This workshop was the first in a series of workshops relating KM to development practice. The main objectives of the Chennai workshop were :

- to increase understanding of Knowledge Sharing, and of related strategies and methods as a key component of international development
- to learn from the experiences of Knowledge Networks in the Southern regions of the world
- to explore ways to strengthen KS Networks for improved effectiveness

Policy Makers Workshop on Farmers' Rights: From Legislation to Action and Conservation of Kerala's Bioresources (24-26 November 2001)

Following the passing of the Plant Varieties Protection and Farmers' Rights Act in the Lok Sabha in August 2001, a Policy Makers Workshop was held at Wayanad in November 2001. Participants included different target groups ranging from the grassroots and NGOs, to policy makers, members of the state ministry, officials from state Government Departments and research institutions. This multilevel participation facilitated the drawing up of the following points:

- Need for developing our own unique legislation on "Protection of Plant Varieties and Farmers' Rights" rather than adapting legislation relating to Breeders' Rights in other countries
- Establishment of Community Agrobiodiversity Centres in different parts of the country
- Need for dissemination of information relating to the Plant Varieties Protection and Farmers Rights Act in local languages

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- Wide circulation of the draft rules relevant to implementation of the Act being developed by the Union Ministry of Agriculture
- Explicit provisions in the rules for gender dimensions of Farmers' Rights
- Need for saving vanishing species and dying wisdom through effective awareness and education programmes
- Building of strong institutions and providing policy support for the revitalization of local health care traditions and for saving endangered plant species through active involvement of local communities and Community Based Organisations (CBOs)
- Provision of economic stake in *in situ* farm conservation involving eco and health tourism, manufacture of medicinal and bioproducts, and reward and recognition from the National Gene Fund
- Need for conserving life saving crops (wild edible and useful species) and evaluation in terms of their nutritional value and medicinal properties
- Need for developing socially acceptable methods of recognizing and rewarding Community Contributions to conservation of critical genetic material that is commercially successful through a cadre of Legal Consultants for advice and support
- Need for bioprospecting of bio diversity for tapping economic benefits from biodiversity by the local communities
- Need for further strengthening of traditional conservation practices such as Sacred Groves
- Proper awareness, research, training and protection essential for conserving bioresources
- Need for Validation of Properties of Medicinal Plants, survey of popular demands for common medicinal plants and economic viability of cultivating these plants for ensuring availability
- Need for establishment of a Central Body running through different community level institutions with different power structures varying in different contexts for conserving bioresources
- Need for increased focus on local issues, inventories on bioresources, resource mapping by Panchayat Raj Institutions and participatory approach in planning
- Need for scientific research on diversifying the food basket

Brainstorming Session on Operationalisation of Policy Framework for Agricultural Extension during Tenth Plan Period (4-5 December 2001)

The Tenth Plan approach paper brought out by the Planning Commission suggested reforms in the Extension Services. The National Agriculture Policy has also stressed

The Kerala's Bioresources Conservation Workshop came up with the following recommendations:

the need for broad basing and revitalising the extension services to make them innovative, decentralised, farmer driven and farmer accountable. Keeping this in view, a broad Policy Framework for Agriculture Extension has been developed, in which the major thrust areas envisaged for reforms in the Extension Policy Framework are:

- reforming public sector extension to make it professionally competent, leaner and cost effective
- encouraging private sector partnership in agriculture extension
- augmenting media support to extension

As part of the ongoing process for operationalisation of the policy framework for agricultural extension, a brainstorming session was held in collaboration with the Ministry of Agriculture, Government of India. 50 participants from the following organisations attended the workshop:

Ministry of Agriculture, Government of India, Madhya Pradesh, Maharashtra, Tamil Nadu, Andhra Pradesh and Kerala, Agriculture Finance Corporation Ltd, Private Sector, United Nations Development Programme, Department for International Development, National Institute of Agriculture Extension Management, Indian Institute of Technology, Madras, EID Parry, Tamil Nadu Agricultural University, Small Farmers Agribusiness Consortium, National Bank for Agriculture and Rural Development, PEPSICO India Holdings Limited, Ramakrishna Mission Ashram, Agriculture Technology Management Agency, The World Bank.

The broad scope of the workshop was to deliberate on the policy framework for implementing agricultural extension, identify key issues and develop the necessary strategies. The deliberations and suggestions from the workshop would help in developing the future course of action in the field of agriculture extension. The following major themes were discussed during the workshop:

Reforming public extension

Augmenting media and IT support in extension

Enhancing capacity building and skill upgradation

Funding

Guidelines

Norms

Macro management

Screening mechanisms

Monitoring

MSSRF – FAO Expert Consultation on Implementing Farmers’ Rights for Conservation and Utilisation of Plant Genetic Resources in the Asia-Pacific Region: from Legislation to Action (21-23 January 2002)

An Expert Consultation to discuss the rules relating to implementation of the proposed Indian Legislation and the International Treaty on Plant Genetic Resources for Food and Agriculture was organised in collaboration with Food and Agriculture Organisation (FAO), Rome, from 21 to 23 January, 2002.

87 participants from Cambodia, India, Indonesia, Italy, Nepal, Malaysia, Philippines, Sri Lanka and Thailand participated in the consultation. They included practising farm

women and men from different parts of India, political leaders, policy makers, plant breeders from the public and private sectors, experts in the field of plant genetic resources and plant breeding, eminent environmental lawyers, gender experts, specialists from Food and Agriculture Organisation of the United Nations (FAO) and the international agricultural research centres of the Consultative Group on International Agricultural Research (CGIAR) and eminent professionals in the field from the Asia Pacific Region.

The first draft of the Protection of Plant Varieties and Farmers' Rights was prepared at the consultation held at MSSRF in January 1994. The second draft on integrated legislation to protect the rights of breeders and farmers was prepared in 1996 at another Consultation held at MSSRF. Both these documents had been submitted to the Government of India for consideration at the Parliament.

Following this the Indian Government approved the bill on "Protection of Plant Varieties and Farmers' Rights Act, 2001", which will be enforced as soon as the rules relating to the implementation of this Act are framed and adopted. The highlight of the Consultation was the adoption of the draft rules prepared by a team headed by Dr S Bala Ravi, with Ms Ranjan Shroff (farmer), Mr L Pushpakumar (lawyer), and Dr R S Rana as members. The participants in the consultation noted that the two major steps taken during the year 2001 to realize farmers' rights in relation to the breeding of new varieties of crops are:

- FAO International Treaty on Plant Genetic Resources for Food and Agriculture adopted by the FAO General Conference in November 2001: This Treaty contains a specific clause concerning the operationalisation of farmers' rights.
- The Protection of Plant Varieties and Farmers' Rights Act, 2001 of India: It will soon come into force. This Act is significant in containing concurrent provisions for the rights of farmers, breeders and researchers as well as the protection of public interest.

Recommendations made at the Consultation fall under two broad categories, one on national issues and the other on international issues.

Recommendations on national issues

- Integrated implementation to protect the three acts, Protection of Plant Varieties and Farmers' Rights Act, 2001, Biodiversity Act (yet to be approved), and Seed Act (Revised Seed Act is now under consideration of Parliament)
- Rights of the seed, awareness generation and information empowerment, Farmers' Rights, establishment of institutional structures for effective implementation, national gene fund, infrastructure development in addition to a resource centre for farmers' rights, role of National Bureau of Plant Genetic Resources (NBPGR) as a national repository and establishing DNA finger printing centres to resolve conflicts
- Revitalisation of the *insitu* on-farm conservation traditions of biodiversity

rich coastal areas such as Goa, Kutch in Gujarat, Kolli Hills in Tamil Nadu, Wayanad in Kerala, Jeypore tract in Orissa and North Eastern Hill Regions, Eastern and Western Ghats regions

- Capacity building in the form of training programmes in the local language for tribal and rural women and men on various aspects of legislation
- Introducing information on legislation at the undergraduate level in Agricultural Universities

Recommendations on international issues

- Focus on the role of international agricultural research centres of the Consultative Group on International Agricultural Research (CGIAR) to promote the dissemination of germplasm, distribution of improved products and technologies, conserving and promoting agriculture diversity and also to focus research on the needs of resource poor farmers
- Refine and endorse the draft code of conduct and ethics and explore the possibility of legal implications with special reference to work on collaborative projects
- Assess issues on Global Gene Fund, FAO Treaty, policies related to private sector companies, projects to assess genetically modified organisms and have a regional cooperative network to provide technical and other support to realisation of farmers' rights involving national and international partners who work on the same area

The proceedings have been published, with the complete text of the Indian Legislation and draft rules relating to implementation of the legislation as well as the recommendations made at the Consultation.

Workshop on Gender Mainstreaming (5-9 April 2002)

A workshop on *Mainstreaming Gender Dimensions* was held at Kolli Hills, Tamil Nadu from 5 to 9 April 2002, keeping in mind the project's history and experience in integrating the social dimension into its activities, particularly in the case of gender. The aim of the workshop was to re-focus on the social dimension in respect of the paradigm shift that had occurred through the two phases of implementation.

The workshop was expected to explore both the conceptual shift and the practicalities associated with the gender dimensions in the field. Accordingly, concerns expressed by field staff were incorporated while framing the proposed programme. Some of the issues highlighted at the field were:

- Kolli Hills, Tamil Nadu: Exploring gender dimensions in creating market linkages for traditional crops
- Wayanad, Kerala: The need for a grassroot level workshop, exploring the operationalisation of gender in field activities
- Jeypore, Orissa: Drudgery (in agricultural production, post harvesting technologies and consumption patterns) as a critical issue with significant gender implications

The workshop was designed to enhance understanding of the gender dimensions of Biodiversity Conservation, Integrated Natural Resource Management and Poverty Alleviation at the economic, social, and 'authority' level. Accordingly, emphasis was placed on analysing institutions through which the project functions, i.e. self help groups (SHGs), community based organisations (CBOs), *Palli Samitis*, Panchayats etc. It was felt that a clearer understanding of the nature, scale and functioning of these institutions and their internal dynamics will allow for more effective functioning at the field.

This workshop enabled the participants to identify site-wise a clear set of activities that will focus on integrating gender in their approach and practical implementation.

Dotforce Local Content Workshop (29-31 May, 2002)

The aim of the workshop organised with One World International from 29-31 May 2002 at MSSRF, Chennai, was to eventually create a network that would connect the poor and the marginalised people of the world and facilitate knowledge sharing among them. To offer such a service

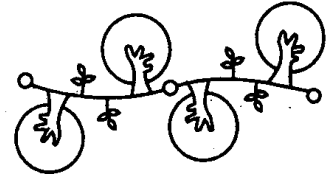
requires knowledge workers at a level above the public access points.

Forty-one participants from Brazil, Canada, China, Equador, Germany, Guatemala, India, Kenya, Malaysia, Netherlands, Nigeria, Peru, Senegal, Sri Lanka, The South Africa, Uganda, UK, USA, Zambia and Zimbabwe attended the conference.

The main aims of the workshop were:

- to conduct a detailed consultation among potential knowledge hubs and other key stakeholders on the options for local knowledge creation and exchange
- discuss the governance of the network (modelled on the knowledge centres in Pondicherry)
- present the proposed Open Knowledge Network model and
- invite comments on the different ways in which it could be implemented. The outcomes of the workshop and recommendations have been forwarded to the G8 DOT Force and the UN ICT Taskforce.

Programme Area 600



Special Projects

A major consultancy was undertaken with support from the Global Environment Facility and the Lemelson Foundation for preparing a global database on ecojobs. This is part of an "Ecology of Hope" initiative to be launched at the World Summit on Sustainable Development scheduled to be held at Johannesburg, South Africa, from 26 August to 4 September. It is hoped that this initiative will lead to the spread of interest in eco-entrepreneurship among the youth, as well as to the greening of agriculture and industry.

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Sub Programme Area 601

Assessment of Resources, Best Practices and Gaps in Gender, Science and Technology

The national scanning exercise, conducted as part of the Asia Pacific Scanning exercise on assessment of resources, best practices and gaps in gender, science and technology sponsored by UNESCO-UNDP, was completed in June 2001. Based on the analysis of the results the missing links were identified and listed as specific recommendations. The final report was submitted to the funding agency in June 2001. Since this was an exercise carried out simultaneously in eleven countries, a regional synthesis report was prepared by three RAG members (one of the members was from the Foundation).

The Regional Conference of the Asia Pacific Gender Equity through Science and Technology Network was held at the Foundation, Chennai from 21 to 23 March, 2002. It served as the forum to disseminate the regional synthesis report of the "Assessment of Resources, Best Practices and Gaps in Gender, Science and Technology" including policy recommendations and key findings, to present the best practices and decide on the follow-up actions. The policy makers, government representatives, donors, UN agencies, Regional Advisory Group members and the National Focal Points attended it. The conference was held for two days (inclusive of a poster session) and on the third day a field trip was organised to the Biovillage and Information Village projects of the Foundation at Pondicherry.

Sub Programme Area 602

Conservation, Inventorisation and Enhancement of Coastal Bioresources

This ongoing programme is supported by the National Bioresources Development Board (NBDB), Government of India, and focuses on the study of selected coastal locations in India. Coastal and marine ecosystems are among the major resource bases of our country. With a 7,500 km coastline and two major island systems, the coastal zone contains numerous lagoons, estuaries, mangroves, swampy, sandy and rocky beaches and gulfs as a hallmark of its bioresources. Increasing population pressure, landuse dynamics and greater dependency of the local communities on the bioresources have imposed severe threats to the productivity, stability and sustainability of the coastal zones.

The subcommittee on the Coastal and Marine Ecosystem of the National Bioresources Development Board, in its meeting in November 2000, had recommended long term monitoring of the bioresources in the region, their dynamics with reference to human dependency and development of strategies for conservation, sustainable use and enhancement of coastal bioresources. Based on the recommendation of the committee an integrated programme on "Conservation, inventorisation and enhancement of coastal bioresources" was initiated in March 2001. The objectives of this programme are:

- to prepare status reports of bioresources in selected coastal regions of the country

- develop conservation and restoration strategies for these regions, based on the human dependency factors
- identify location-specific genotypes for conservation of novel genetic combinations capable of withstanding stressed environment, using modern biotechnological tools.

This programme operates in network mode in collaboration with the local institutions. The locations selected for developing the report include areas with pristine diversity (Lakshadweep Islands), areas with good diversity but under severe threat (Gulf of Kutch, Gujarat; Bhitarkanika, Orissa; Malvan, Maharashtra) and areas that need immediate rehabilitation and restoration measures (Chilka Lake, Orissa; Pulicat Lake, Tamil Nadu and Vembanad Lake, Kerala).

Institutions with previous working experience in and prior knowledge of these regions were identified for the preparation of status reports. A common framework was arrived at for the preparation of these reports during a workshop conducted in August 2001. All the status reports have been developed, based on the available secondary data and include site description, population profile, biodiversity and conservation value, bioresources profiles, threat to bioresources, on-going conservation and management efforts and future prospects. The status reports for these selected sites have been compiled and submitted to the NBDB. These

studies have provided significant information on the status of bioresources and have been helpful in identifying the threats.

The main findings of these studies were that almost all the rural coastal communities depend on local bioresources for food, fuel and timber. Their livelihood is based on local bioresources and in all sites these resources are under severe pressure from over-exploitation. The greatest threat to bioresources is anthropogenic. The local people do not have any say in the management of the bioresources. They have very limited scope to improve the efficiency of their livelihood strategies and to diversify into other livelihoods. There is a lack of up-to-date information, especially in the fisheries and agriculture sectors and remote sensed information is not available for forest cover, land use, soil or water quality. It is hoped that the status reports for these sites will be of significance in developing conservation measures and action plans for sustainable management of the selected sites.

Based on the status reports, a comprehensive work plan has been developed to undertake studies in a few selected villages in each site to understand the threats to the bioresources and also to develop action plans for sustainable utilisation of these resources. Site-specific studies have been initiated in each location for this purpose with a common framework. Genetic characterisation and diversity studies of selected species/groups, in particular the mangroves, have been undertaken for Pulicat and Bhitarkanika, using molecular marker systems.

Sub Programme Area 603

Ecotourism and eco-enterprises in the Gulf of Mannar Biosphere Reserve

Diversification of the economic activities of the fishing communities by providing alternate income generation opportunities is considered an important step in reducing the ever-increasing pressure on the biodiversity and bioresources of the Gulf of Mannar Biosphere Reserve (GOMBR). Ecotourism and eco-enterprises are among the several options available for alternate income generation activities. A study was conducted in the Gulf of Mannar region to identify viable and sustainable ecotourism products and ecoenterprises, which can be owned and operated by the fishing communities. Interacting with various stakeholders, primary data for the study was collected and secondary data, available from a number of publications, was also used. This data was synthesised, as per the International Guidelines for Sustainable Tourism provided by the Convention on Biological Diversity, to prepare a concept framework and practical approach to introduce community-owned ecotourism and ecoenterprises.

Ecotourism in the Gulf of Mannar refers to "tourism that is pro-poor (that generates net economic, social, cultural and environmental benefits to the poor), pro-nature (ensuring sustainable use of natural resources), participatory (ensuring participation of all the stakeholders in decision making) and involving a learning experience and cultural exchange for visitors and hosts".

This study has identified 3 main kinds of ecotourism that can be undertaken in the Gulf of Mannar region:

- Educational tourism: to enhance awareness of the ecological importance of the Gulf of Mannar and prevent exploitation
- Nature tourism: to utilise the wilderness and beautiful natural regions such as beaches of selected islands of the Gulf of Mannar in a sustainable manner
- Religious tourism: to introduce a package tour of religious sites among the pilgrims currently visiting Rameswaram

The study has also identified 13 ecoenterprises, ranging from manufacturing of package materials from palm leaves and cotton materials to establishing e-mail and internet facility for tourists.

The study also indicated the following strengths, weaknesses, opportunities and threats to ecotourism and ecoenterprises in the Gulf of Mannar region:

Strengths

Beauty of the location and its attraction to tourists

Religious attraction of the area

Scientific value of the area for biological study

Existence of enterprises that have already started on a small informal scale

Old facilities that can be relatively easily renovated.

Weaknesses

Difficulties in including the poorest stakeholders

High costs of setting-up and maintenance involved in some ecotourism projects

Lack of safety provisions for tourists

Lack of infrastructure such as roads

Sufficient drinking water

Waste disposal etc.

Lack of market knowledge

Opportunities

Skills and knowledge of the local communities

Existing small-scale operations or facilities to build upon

Interest among tourists

Social mobilisation through SHGs and Federation of SHGs

Credit facilities through SHGs and Federation of SHGs

Availability of technical advice and skills.

Threats

Potential negative environmental impact

Lack of permission from government authorities to develop opportunities

Potential lack of market for products

Potential poor management

Potential for too many tourists (beyond the carrying capacity of the area).

The study recommends the following for the management of the Gulf of Mannar Biosphere Reserve, integrating development and conservation of the biodiversity and bioresources:

- Activating Multi-stakeholders Committee or the Gulf of Mannar Biosphere Trust at the earliest for strengthening the management of the region
- Addressing barriers to development through increasing the capacity of the government, non-government and community based organisations and building a supportive policy environment
- Conducting research studies on markets for ecotourism and ecoenterprises products, participatory business plans for the enterprises, carrying capacity of different locations within the reserve, etc.
- Developing a participatory, sustainable, community-based marine resource management plan, including ecotourism and eco-enterprises as components and implementing the plan using the participatory feedback system.

Sub Programme Area 604

**Ecology of Hope : Uncommon Opportunities for Ecojobs and Ecoentrepreneurship
Development : GEF-MSSRF**

The World Summit on Sustainable Development will be held at Johannesburg, South Africa in August 2002. This will help to assess the progress made in converting the concept of sustainable development into field level action plans based on Agenda 21, developed at

Rio de Janeiro in 1992, as well as the Biodiversity, Climate and Desertification Conventions. The concept of sustainability has undergone a change in the last 10 years. Prior to Rio de Janeiro, sustainability was largely viewed in economic terms. Rio added the environmental dimension. At the Social Summit held in Copenhagen in 1995, the social dimension of sustainability was added. It has become increasingly clear in recent decades that without assuring the livelihood security of the people, ecological security cannot be ensured.

In rural areas, lack of opportunities for productive livelihoods is a major cause for the over-exploitation of natural resources and basic life support systems. Further, the loss of rural livelihoods results in the proliferation of urban slums. The inflow of such environmental refugees into cities and towns is increasing at an alarming rate. Globalisation of economies and the growth of free but not fair trade are tending to increase the problems of unemployment in developing countries. More than 60 percent of the people of many developing countries live in villages, where their livelihoods are based on land- and water-dependent occupations. Opportunities for off-farm or non-farm employment are not expanding on a scale and speed necessary to achieve a match between population growth and the population-supporting capacity of ecosystems. The time has therefore come for a serious review of the new opportunities available for job-led economic growth. This was the major focus of the Inter-disciplinary Dialogue held from 28 - 31 January, 2002 on the theme, "Environment, the New Economy and New Employment" in collaboration with

Global Environment Facility. 45 participants from 9 countries participated in the Dialogue. The participants at the Dialogue considered the complex issues raised by the topic and specifically, the linkages between economy and environment, the economy and the potential for new employment and the opportunities for new employment in relation to the environment. An output of the consultation was a draft *Message of Hope* for participants at the World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa.

MSSRF is currently finalising a study on environmental enterprises. This study documents existing initiatives in both developing and industrialized countries that offer employment and livelihood opportunities through environmentally sound enterprises. The focus is on the application of innovative technologies towards the sustainable use of natural resources, including biochemistry and genetics, biodiversity and energy and land and water resources. An international database has been set up to inform partners in government, non-governmental organisations, small businesses and local groups on the different environmental enterprises, ecotechnologies used, outcomes in terms of employment, income and markets and other basic descriptive information.

A report on the recommendations and a document on the way forward, targeted at policy makers, is also being prepared, which is to be simultaneously disseminated at the World Summit for Sustainable Development along with the detailed database at a side event being organised during the Summit.

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- Ravishankar, T., V. Selvam, N. Srinivasa Rao, P. K. Mishra, R. Ramasubramanian, V. M. Karunakaran, Nayak, Evangelin and M. Maqbool. 2001. Gender Dimensions in the Participatory Conservation and Management of Mangrove Wetlands in East Coast of India. *Experience Sharing Workshop on Managing Natural Resources through Village Level*

- Institutions, Khajuraho, India. Indian Farm Forestry Development Cooperative Limited, India Canada Environment Facility, New Delhi. September 10-13.*
- Rengalakshmi, R., G. Alagukannan, N. Anil Kumar, V. Arivudai Nambi, G. Girigan, Hemal Kavinde, Israel Oliver King, Prathiba Joy, T. Ravishankar, Saujanendra Swain, Susanta Chaudary, P. Thamizoli, Trilochan Ray and L. Vedavalli. 2001. Enhancing the Role of Rural and Tribal Women in Agrobiodiversity Conservation: An Indian Case Study. *Expert Consultation on Agrobiodiversity Conservation and the Role of Rural Women*. FAO-RAP, CIP-UPWARD and SEAMEO-SEARCA, Los Banos, Laguna, Philippines. September 11-13.
- Rengalakshmi, R. 2002. Ways and Means to Agriculture, Role of PRIs and Corporate Linkages. *Women Farmer's Krishi Mela: Exhibition cum Meeting*. Central Research Institute for Dryland Agriculture, Hyderabad. April 25-27.
- Rengalakshmi, R. 2001. Folk Biology, Gender and Management of Minor Millets in Kolli Hills, Tamil Nadu. *Workshop on Gender and Agriculture*. Tamil Nadu Agricultural University, Coimbatore. August 10-12.
- Senthilkumaran, S. 2001. Sharing the Experiences of Information Village Research Project. *Pan-Asia Telecenter Learning and Evaluation Group Meeting*. Ulaanbaatar, Mangolia. June 26-July 2.
- Senthilkumaran, S. 2001. Rural Knowledge Centres for Information Empowerment / Employment Generation / Livelihood Security in Union Territory of Pondicherry. *Workshop on Sustainable Farm Household Information Systems for Improved Livelihoods and Reduced Hunger and Poverty*. FAO, Rome, Italy. December 4-7.
- Senthilkumaran, S. 2001. Information Village Research Project. *South Asia Foundation Conference*. Rainbow Partnership Organization, Kathmandu, Nepal. December 11-12.
- Senthilkumaran, S. 2002. How the ICT Helps Rural Poor. *Information Technology Initiatives in Rural Development*. Directorate of Information Technology, Bangalore. February 27.
- Senthilkumaran, S. 2002. Transforming Rural Communities through ICTs – An Indian Experience. *Workshop on Broadcasting and Development: Communication Strategies in South Asia*. Proshika Training Center, Manikganj, Bangladesh. March 1-3.
- Subbiah, Vijay R. Increasing Water Use Efficiency: Involving Community Participation in Local Resources Management. *Regional (District Level) Workshop on Human Resources Development in Water and Sanitation Sector*. Gandhigram Rural Institute, Gandhigram. December 19-21.
- Vepa, Swarna S. 2001. Poverty and Hunger in Bihar: Dimensions and Solutions? *Seminar on Removing Hunger to Reduce Poverty*. UNICEF, Patna. October 16.

**Participation in Training Programmes/
Workshops**

- Appa Rao, S. 2002. *All India Conference on the Role of Voluntary Sector in National Development*. Planning Commission, Government of India, New Delhi. April 20.
- Appa Rao, S. 2002. *Trainers' Training on Processing and Value Addition to Nutritious Millets*. CFTRI, Mysore. May 13-16.
- Arivudai Nambi, V. 2001. *Workshop for the Principal Trainers of Panchayat Raj*. State Institute for Rural Development, Maraimalai Nagar, Kanchipuram. December 20.
- Arivudai Nambi, V. 2002. *Multi-stakeholders Meeting of Water Users of the Palar River Basin*. Madras Institute of Development Studies, Adyar. January 28-29.
- Arunachalam, S. 2001. *International Conference on Socio-Technical Change: Lessons from ICT in Developing Countries*. University of Twente, The Netherlands. June 15.
- Arunachalam, S. 2002. *ENRAP II: Knowledge Networking for Rural Development in Asia*. Nang Rang, Buri Ram Province, Thailand. January 18-21.
- Arunachalam, S. 2002. *The IDRC Regional Workshop*. New Delhi. March 5-7.
- Arunachalam, S. 2002. *Global E-Quality: Rethinking ICTs in Africa, Asia and Latin America*. International Institute of Infonomics, Heerlen / Maastricht, The Netherlands. March 25-27.
- Arunachalam, S. 2002. *The Imfundo Workshop: Delivering the Vision*. Department for International Development (DFID), London. April 7-11.
- Arunachalam, S. 2002. *G8 DOT Force Meeting*. Industry Canada, Calgary, Canada. May 5-8.
- Arunachalam, S. 2002. *International Advisory Board Meeting*. IICD, The Hague, The Netherlands. May 20-24.
- Bhavani, R. V. 2001. *EU-India Think Tank Seminar*. European Commission, Brussels. October 15-16.
- Bhavani, R. V. 2002. *World Summit for Sustainable Development, Southern Regional Consultation*. CEE and Ministry of Environment and Forests, Bangalore. February 13.
- Dhanapal, D. 2001. *Trainers' Training on Women's Entrepreneurship Development Programme at Pattukottai*. Tamilnadu Corporation for Development of Women, Chennai. July 7-12.
- Eganathan, P. 2001. *UNESCO-Regional Training Programme on Biodiversity Systematics: Evaluation and Monitoring with Emphasis on Medicinal Plants*. National Botanical Research Institute, Council of Scientific and Industrial Research, Lucknow. September 3-13.
- Ganesan, M. 2001. *Intensive Cultivation of Vegetables Under Different Growing Conditions*. Indo-Israel Project on R&D and Demonstration Farm, Indian Agricultural Research Institute, New Delhi. December 3-14.

- Ganesan, M. 2001. *Workshop on Home Gardening and Waste Management*. Ga.Gemunafushi Island, Male, Maldives. December 23-27.
- Geetha Rani, M. 2001. *State Level Innovators Workshop*. SEVA, Madurai. August 3-4.
- Geetha Rani, M. 2002. *Workshop on Dissemination of Indigenous Knowledge and Grassroot Innovations*. SEVA, Madurai. April 28.
- Geetha Rani, M. 2002. *State Level Committee for Giving Awards and Technological Improvements of Grassroots Innovations*. SEVA, Madurai. April 29.
- Gunasekaran, S. 2001. *Workshop on Medical Informatics, Research and Communication*. JBTDRC, Mahatma Gandhi Institute of Medical Sciences, Sevagram, Maharashtra. November 26-28.
- Gupta, Ravi Kumar. 2002. *National Symposium on Thermal Ecology*. Nuclear Sciences Department of Atomic Energy (Mumbai) and M. S. University (Tirunelveli), Chennai. February 1-2.
- Gupta, Ravi Kumar. 2002. *Water Summit 2002*. Confederation of Indian Industry, Chennai. March 15.
- King, E. D. Israel Oliver. 2001. *State Level Workshop on Sharing Experiences in JFM under TAP in Tamilnadu*. Gandhigram Rural Institute, Dindigul. August 29-31.
- King, E. D. Israel Oliver. 2002. *National Level Workshop on Rapid Assessment for Prioritizing Species and Sites for Conservation of Tropical Dry Evergreen Forest in Andhra Pradesh and Tamilnadu*. FRLHT, Auroville, Pondicherry. March 5-7.
- Lakshmi, M. 2001. *OECD Conference on Genetically Modified Food: Science, Safety and Society*. Bangkok. July 10-13.
- Nagaraja, C. 2002. *National Workshop cum Training Programme on Bioinformatics and Statistics in Aquaculture Research*. Central Institute of Freshwater Aquaculture (ICAR), Bhubaneswar. January 8-11.
- Padmanabhan, Suchitra. 2001. *Workshop on Induction Training for the Facilitators of the Central Sector Scheme on Women in Agriculture*. Ministry of Agriculture, Government of India and the Centre for Studies in Gender Concerns in Agriculture, Kerala Agricultural University, Thrissur. November 6-8.
- Padmanabhan, Suchitra. 2001. *State Level Training of Trainers on Capacity Building of Panchayati Raj Institutions of Tamilnadu*. State Institute for Rural Development, Maraimalainagar. December 20.
- Padmanabhan, Suchitra. 2001. *State Level Training of Trainers on Capacity Building of Panchayati Raj Institutions of Tamilnadu*. State Institute for Rural Development, Maraimalainagar. December 27.
- Padmanabhan, Suchitra. 2002. *Workshop on Rights Based Approach to Natural Resource Management*. CARE India, Delhi. May 7.
- Parida, A. 2001. *OECD Conference on Genetically Modified Food: Science, Safety and Society*. Bangkok. July 10-13.

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- Parida, A. 2002. *Steering Committee of the ICSU Panel on GMOs*. Manchester. May 6-11.
- Rajamohan, K. G. 2002. *Workshop on Communication for Change: A Continuing Education Programme for Practising Professionals*. Shristi School of Arts, Design and Technology, Bangalore. May 6-10.
- Ramachandran, Uma. 2001. *National Conference on Environment, Biodiversity and Bioethics: Current Trends and Future Directions*. Loyola College, Chennai. September 20-22.
- Ramachandran, Uma. 2001. *Workshop on Induction Training for the Facilitators of the Central Sector Scheme on Women in Agriculture*. Ministry of Agriculture, Government of India and Centre for Studies in Gender Concerns in Agriculture, Kerala Agricultural University. Thrissur. November 6-8.
- Ramachandran, Uma. 2002. *State Level Training of Trainers on Capacity Building of Panchayati Raj Institutions of Tamilnadu*. State Institute of Rural Development, Maraimalainagar. May 20-24.
- Rao, C. S. 2001. *Consultant, Soil Microbiology CSWS Division*. International Rice Research Institute, Philippines. April 12-December 12.
- Sankararamasubramanian, H. M. 2001. *Consultancy Meeting on Low Cost Tissue Culture*. IAEA Laboratories, Vienna, Austria. October 8-12.
- Selvam, V. 2001. *International Workshop Mangroves and Fisheries*. ICLARM, Penang, Malaysia. October 22-24.
- Selvam, V. 2002. *Preparatory meeting for World Summit on Sustainable Development*. Bali, Indonesia. June 2-3.
- Subbiah, Vijay R. 2001. *Drip Irrigation System for Horticultural Crops*. Indo-Israel Project on R&D and Demonstration Farm, Indian Agricultural Research Institute, New Delhi. October 29-November 9.
- Subbiah, Vijay R. 2002. *International Groundwater Conference on Sustainable Development and Management of Groundwater Resources in Semi-Arid Regions with Special Reference to Hard Rocks*. National Geophysical Research Institute (Hyderabad), Dindigul. February 20-22.
- Thatoi, H. N. 2001. *National Workshop on Managing Natural Resources through Village Level Institutions*. Khajuraho, Madhya Pradesh. September 10-12.
- Vepa, Swarna S. 2002. *International Experts Meeting on a Forest Capital Index*. Faculty of Environmental Design and Rural Development, University of Guelph and Ecosystem Health, Research and Information on Indicators (EHRII), Toronto. January 23-24.

Awards/Honours

- Arunachalam, S. 2001. *Honorary Fellow of the Chartered Institute of Library and Information Professionals*. United Kingdom.
- Arunachalam, S. 2001. *Honorary Member of the American Society for Information Science and Technology*. United States of America.

- Arunachalam, S. 2001. Nominated *Stockholm Challenge Award Ambassador*.
- Arunachalam, S. 2001. Nominated to the Editorial Board of *The Electronic Journal of Information Systems in Developing Countries*, and as a *Trustee of the Electronic Publishing Trust*.
- Arunachalam, S. 2002. Nominated to the *International Advisory Board of IICD*. The Hague, The Netherlands.
- Eganathan, P. 2001. *Brandis Prize* in Silviculture for the year 2000. The Indian Forester, Dehradun.
- Nair, Sudha. 2002. *Young National Women Bioscientist Award* for the year 2001. Ministry of Science and Technology, Government of India.
- Parasuraman, N. 2002. *Dr. B. R. Ambedkar Award* given by Tamil Nadu. Dr. Ambedkar Mandram, Chennai.
- Parasuraman, N. 2002. *Literacy Award* given by Rotary Club of Madras Chenna Patna. Rotary International Dist. 3230.
- Parasuraman, N. 2002. *Member District Advisory for Youth Programers*; Nehru Yuva Kendra, Chennai, Department of Youth Affairs and Sports, Ministry of HRD, Government of India.
- Rao, C. S. 2001. *Brandis Prize* in Silviculture for the year 2000. The Indian Forester, Dehradun.
- Stockholm Challenge Award 2002 for Information Village Research Project, Pondicherry under a category of Global Village.
- Swaminathan, M. S. 2001. *Lokmanya Tilak Award*. The Tilak Smarak Trust, Pune.
- Swaminathan, M. S. 2002. Chairman, *Pugwash Conferences on Science and World Affairs*.

About the Foundation

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Driver

Chidambaram

Mr. A. Vedamoorthy
Scientist

Mr. E. Selvaganapathy
Technical Assistant (Field)

Kannivadi

Mr. S. Bose
Scientist

* Left during the year

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Mr. S. Murugesan
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Mr. R. Seenivasan
Scientist

Mr. M. Senthil
Scientist

Mr. B. Selvamukilan
Scientist

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Technical Assistant (Field)

Karaikal

Mr. A. Gopalakrishnan
Scientist

Ms. S. Sudarkodi
Scientist

Support Staff

Mr. S. Rajakani
Technical Assistant (Field)

Biovillages Programme, Pondicherry

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Coordinator - Biocentre and Biovillage Programme

Mr. D. Rosario
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Ms. G. Meenakshi
Scientist

Ms. J. Sasikala*
Scientist

Ms. B. Vijayalakshmi*
Scientist

Mr. S. Sundaravadivel*
Scientist

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Technical Assistant (Field)

Mr. A. Govindarasu
Technical Assistant (Field)

Mr. P. Kumaran
Technical Assistant (Field)

Mr. M. Babu
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Biovillages - Orissa

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Coordinator

Ms. Gitishree Nayak
Technical Assistant (Field)

Support Staff

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Technical Assistant (Field)

Mr. Kailash Chandra Agarwal
Office Assistant

Sustainable Management of Natural Resources for Food Security

Dr. M. Velayutham
National Coordinator

Dr. S. P. Palaniappan
Principal Scientist

Mr. R. Balasubramanian
Scientist

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Hon. Director
Project ACCESS & Uttara Devi Resource Centre for Gender and Development

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Project Coordinator

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Ms. J. Boomadevi*
Secretary

Uttara Devi Resource Centre for Gender and Development

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Programme Assistant

Dr. B. V. Rao Centre for Sustainable Food Security

Dr. Swarna Sadashiva Vepa
Principal Scientist

Ms. R. V. Bhavani
Principal Scientist

Dr. Saroja Raman*
Visiting Fellow

Dr. Ganesh Prasad
Senior Fellow

Mr. Kurien Thomas
Associate Coordinator

Ms. M. Manjula
Research Fellow

Ms. G. Anuradha
Scientist

Ms. Deepa Verma
Scientist

Ms. Suparna Mitra*
Scientist

Ms. Rose Mary J. Vadakel*
Scientist

Support Staff

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Technical Assistant

Mr. A. Sakthivelan
Secretary

Land and Water Care Movement

Dr. S. Subramaniyan
National Research Coordinator

Mr. M. Sakthivadivel
Scientist

Ms. P. Malini*
Scientist

Support Staff

Ms. A. Uma
Secretary

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Informatics Centre and Library Services

Mr. S. Senthilkumaran
Associate Director, Informatics

Ms. Sylvia Snehalatha
Manager - Library Services

* Left during the year

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Ms. Anita Vasanth
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Mr. S. Gunasekaran
Scientist

Mr. Murali Shanmugavelan*
Scientist

Mr. P. Sivakumar
Scientist

Mr. M. Manikandan
Scientist

Mr. P. Vijayakumar
Scientist

Dr. G. Jeyalakshmi
Scientist

Ms. G. Anitha*
Scientist

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Assistant Librarian

Mr. M. Kuppusamy
Library Assistant - CD-ROM

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Technical Assistant

Mr. S. Gilbert Samson
Technical Assistant

Mr. K. Rameswaran
Technical Assistant

Ms. K. Umarani
Technical Assistant

Mr. S. I. Rino
Technical Assistant

Information Villages Programme, Pondicherry

Mr. K. G. Rajamohan
Scientist

Mr. R. Rajasekarapandy
Scientist

Mr. J. Gobu
Scientist

Ms. P. Pakkialatchoumy
Technical Assistant

"The Hindu" Media Resource Centre

Ms. K. Banumathy
Coordinator

Distinguished Fellows

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Dr. L. N. Acharjyo*

Dr. L. R. A. Narayanan*

Visiting Scholar

Ms. Jacquelyn Johnson
World Food Prize Intern

* Left during the year

Administration & Finance

Mr. G. Sethuraman
Chief Manager

Mr. Sridhar Gopaldasamy*
Manager - Budget & Accounts

Ms. C. Madhumathi
Manager - Personnel & Legal Affairs

Mr. N. Parasuraman
Manager - Estate

Mr. C. V. Parthasarathy
Executive Secretary

Ms. V. Sridevi
Executive Secretary

Ms. D. Rukmani*
Assistant Manager - Personnel & Administration

Mr. S. Karthigeyan
Assistant Manager - Budget & Accounts

Ms. R. Malathy
Senior Secretary

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Secretary

Support Staff (Chennai)

Ms. T. Vijayasulochana
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Mr. M. Rajakumaran
Administrative Assistant

Ms. Seyda Habi Banu Begum
Administrative Assistant

Ms. R. Jayashree
Accounts Assistant

Mr. N. Sundaram
Accounts Assistant

Mr. C. Rukmangathan
Accounts Assistant

Ms. Bhooma Ramasamy
Accounts Assistant

Mr. C. Sivaraj
Electrical Supervisor

Mr. B. Sivakumar
Electrical Assistant

Mr. P. Muthukumar
Electrician

Mr. E. Thiruvengadam
Electrician

Ms. G. Padmavathy
Receptionist cum Telephone operator

Mr. G. Suresh Kumar
Technical Assistant

Mr. P. Shanmugam
Technical Assistant

Ms. N. Mageshwari
Office Assistant

Maintenance Staff (Chennai)

Mr. P. Lakshmanan
Gardener

Mr. T. Samuel
Gardener

Mrs. Saroja Ramdoss
Cleaner

Ms. S. Soundari
Cleaner

Mr. C. H. Venkateswarlu
Cleaner

Mr. E. Velu
Plumber

Ms. J. Lakshmi
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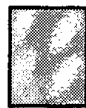
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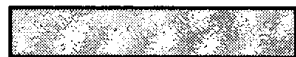
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Ministry of Rural Development
Government of India

International

India-Canada Environment Facility
New Delhi

UNDP - Global Environment Facility
New Delhi

Programme Area 200 : Biodiversity and Biotechnology

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Government of India

Department of Agriculture
Government of Tamil Nadu

National Bureau of Plant Genetic Resources
(NBPGR), New Delhi

Indian Council of Agricultural Research
(ICAR), New Delhi

International

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The Hunger Project - India
Mumbai

United Nations Development Programme
(UNDP), New Delhi

Hindustan Lever Limited
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Sir Dorabji Tata Trust, Mumbai

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Department of Science & Technology
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Programme Area 600 : Special Projects



National

National Bioresources Development Board
New Delhi

International

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Cultural Organisation (UNESCO), Jakarta

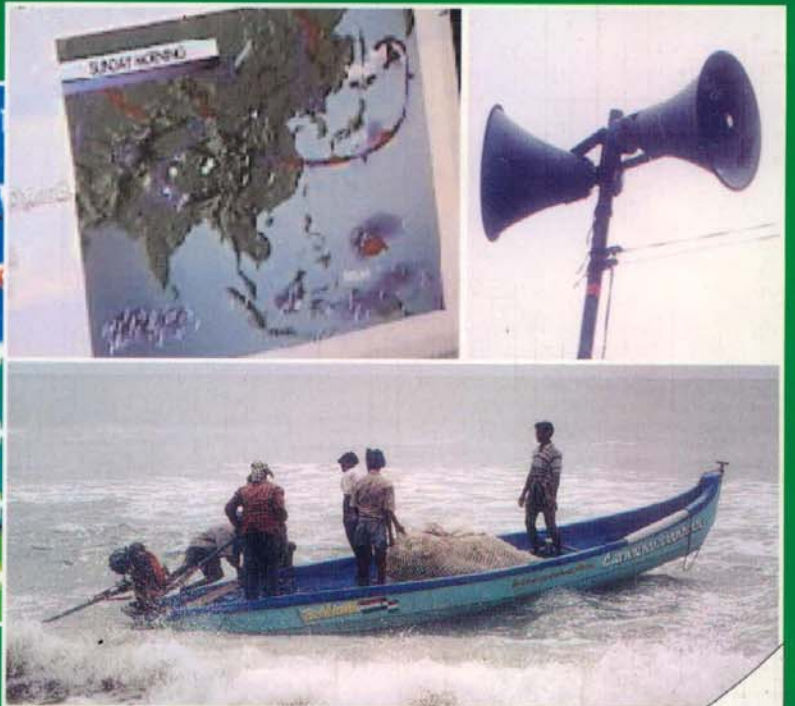
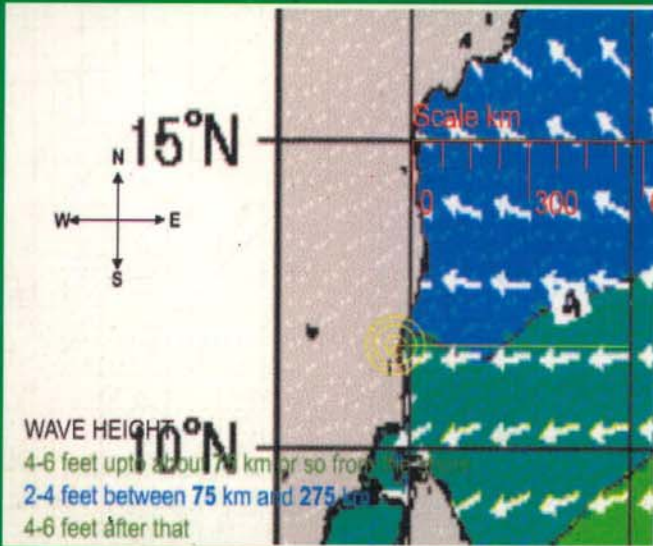
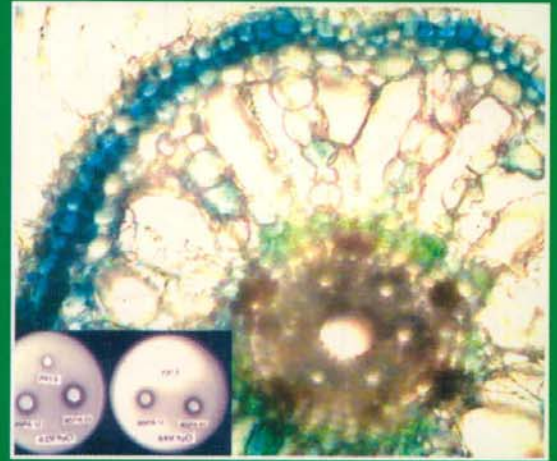
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