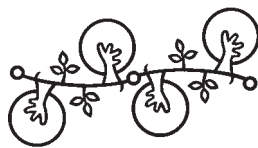


Fourteenth Annual Report

2003-2004



M.S. Swaminathan Research Foundation

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

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Chairman's Introduction

The work done under the six major Programme Areas of MSSRF during the period 1st July 2003 to 30th June 2004 is summarised in this Report. At the outset, I wish to record our gratitude to the State Government of Tamil Nadu and the Government of India, as well as to the various organizations and bilateral and multilateral donors listed at the end of the report, for their generous encouragement and financial support. I also wish to record our indebtedness to all who have contributed to the corpus fund of MSSRF. The interest from the corpus fund and from the various special endowments helps us to ensure the continuity of our core programmes. The corpus fund also helps to build and retain a team of dedicated and distinguished core staff. With interest rates declining, the need for an adequate endowment fund cannot be over-emphasized. This is why we are particularly grateful to all who have contributed to the corpus and endowments.

Thanks are also due to Dr Geeta Mehta and the Friends of MSSRF, Tokyo, for their invaluable contributions to MSSRF's Sustainable Self-Help Group (SSHG) Movement. SSHGs depend upon 4 essential components for their economic and social sustainability. These are: technology, credit, management and market. Unless the micro enterprises supported by micro credit are market driven, they will collapse. After studying the MSSRF methodology in this area, Dr Bruce Alberts, President, US National Academy of Sciences,

made the following observations in his Presidential Address to the Academy in Washington on 19th April, 2004:

“The State Bank of India is now intimately involved as a partner with the M S Swaminathan Research Foundation in each of the village projects that we helped to inaugurate. Some of the projects were dairies, as before, but other groups of villagers had set up small production plants for biocontrol agents.

In one example, a group of villagers had established a factory to produce the small parasitic wasp, *Trichogramma*, which deposits its eggs on those of larger insects and destroys them. Some of their product is being used in their own village to replace pesticides and increase plant yields – thus bringing both health and economic benefits. The remaining product is being sold in the market to generate income. And the women involved had begun to train new groups in neighbouring villages. Here was a perfect example of the type of science-based franchise for sustainable development that I had been seeking.

Is this public service activity, subsidized by the government? To my surprise, I learned that the answer is no. These cooperatively held loans are being made to so-called “Self-help Groups” each composed of 10 to 20 villagers who had learned to work together. They are among the bank's best-performing customers, with 95 percent of repayments being made on time.

The bottom-up development generated by loans to cooperative groups of the rural poor is a major movement encouraged by the Indian government. It is being stimulated, guided, and monitored by India's National Bank for Agriculture and Rural Development, which provides guidance on the establishment and evaluation of Self-Help Groups as well as many other informative details."

The Sir Dorabji Tata Trust and the other Tata Trusts have helped MSSRF to establish the J R D Tata Ecotechnology Centre which is now spearheading the SSHG revolution. 2004 is the birth centenary year of the late Bharat Ratna J R D Tata. MSSRF is commemorating the life and message of this great Indian by organising two interdisciplinary dialogues – one dealing with sustaining and strengthening the SHG movement and the other, with the pre-requisites essential for fostering a happy India. The latter dialogue is designed to give shape to J R D Tata's wish that India should be a happy country even if it does not become a super-power.

The importance of a New Deal for the Self-employed through facilitating a SSHG revolution will be evident from the findings reported in the MSSRF – WFP Atlases on food insecurity in rural and urban India. The analysis reveals that the main cause of endemic hunger in India today is lack of adequate purchasing power for balanced diets among the poor. This again arises from inadequate opportunities for gainful employment or sustainable livelihoods. With a population exceeding a billion, a majority of whom are young, over-riding priority must be given to research, training and capacity building

activities relating to the creation of opportunities for remunerative self-employment.

The United Nations has declared 2004 as the International Year of Rice (IYR) since "rice is life" to over two billion members of the human family. The IYR activities of MSSRF include the organisation of grassroot awareness generation programmes relating to medicinal and aromatic rices in Orissa and Kerala, discussions on the gender dimension of rice farming systems and the role of molecular breeding in shaping the future of rice. Both the Eastern Ghats region and the NE region are being given particular attention in programmes designed to stimulate community conservation and womens' technological empowerment.

Since its inception in 1989, a major activity of MSSRF has been in the area of restoring degraded mangrove wetlands along the east coast of India and in promoting participatory mangrove forest management, involving local communities and personnel of the Forest Departments. Much of this work came to an end in 2004, following the completion of the work in Tamil Nadu (TN), Andhra Pradesh (AP), Orissa and West Bengal under a project financially supported by the India Canada Environment Facility (ICEF). The ICEF-supported programme resulted in the restoration of over 1485 ha of degraded mangrove wetlands in Tamil Nadu, Andhra Pradesh and Orissa since 1996. In addition, it helped to foster sustainable livelihood occupations to mangrove forest dependant communities. Above all, it helped to spread an understanding of the importance of healthy mangrove forests to the

ecological and livelihood security of coastal communities. Detailed documentation of the work done, including three Atlases of the mangrove forests of TN, AP and Orissa, resulted from this project. We are grateful to H E (Ms) Lucie Edwards, High Commissioner of Canada to India for releasing the three Atlases as well as an integrated Atlas, and to Shri Ujjwal Choudhary, Project Director, ICEF and Dr Jaya Chatterji, Senior Project Officer, for their interest, advice and support throughout the duration of this 7 year project.

MSSRF's work on the isolation and use of genetic factors from mangrove species in the breeding of varieties of rice, mustard and pulses tolerant to salinity and to sea water, entered a significant phase during 2003-04. The MSSRF Bio-safety and Bio-ethics Committee and the Review Committee on Genetic Manipulation (RCGM) of the Department of Biotechnology, Government of India, accorded permission for the transgenic rice containing genes for salinity tolerance from *Avecennia marina* to be tested in controlled field trials. Replicated trials were conducted in an isolated field kindly made available by the Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam during 2004. The trial consisted of six plots (150ft. x 100 ft) three of which were treated with 50, 100 and 150 mM of saline water. The transgenic plants had a shorter height and a slightly higher yield than the control. This marks the beginning of a new chapter in the area of anticipatory research to meet challenges arising from a potential rise in sea level as a result of global warming.

The tests will be continued and seeds of the

rice strains tolerant to 150 mM of NaCl will be multiplied. When the material reaches the stage of large scale trials in farmers' fields, based on approval by the Genetic Engineering Approval Committee (GEAC) of the Ministry of Environment, participatory breeding with farm families will be undertaken in order to develop several rice strains combining adaptation to local growing conditions and consumer preferences with tolerance to salinity. This will probably be the first case of an integrated molecular pre-breeding and farmer-participatory breeding methodology in the world. This will not only help to de-mystify GM technologies, but will also help to combine genetic diversity with genetic efficiency.

In addition to undertaking research designed to strengthen our capacity to insulate coastal agriculture from sea water ingress as a result of sea level rise, MSSRF began detailed planning in collaboration with the Swiss Agency for Development and Cooperation (SDC) for minimising vulnerability and enhancing the adaptive capacity of local communities in semi-arid areas to changes in precipitation and temperature caused by climate change. This will include measures like contingency planning, involving alternative cropping strategies to suit different weather probabilities, and crop life saving research. The MSSRF approach to building community food security systems, involving an integrated chain of field gene bank, seed bank, grain bank and water bank, will be fostered in areas which are particularly vulnerable to changes in precipitation and temperature. This work will be undertaken with generous support from SDC.

With assistance from the Sir Dorabji Tata Trust, MSSRF initiated during this year steps to strengthen food, fodder and livelihood security in the Ladakh region of Jammu and Kashmir. A Planning Meeting was held in Srinagar on 29th and 30th September, 2003. This was attended by both the Governor of J & K, Lt Gen (Retd) S K Sinha, PVSM and the Chief Minister, Mr Mufti Mohammad Sayeed. The first project initiated under this programme is the training of 8 young persons from Ladakh in fruit processing and post-harvest technology, with particular reference to apricots and seabuckthorn at the Central Food Technology Research Institute (CFTRI) at Mysore from 21st to 25th June, 2004. Two onsite training programmes in Leh and Kargil are in the pipeline.

Among other significant inter-institutional and international projects, mention may be made of the India-Nepal project on enhancing the contribution of nutritious but neglected crops to food security and rural income, supported by the International Fund for Agricultural Development (IFAD) through the International Plant Genetics Resources Institute (IPGRI). The crop chosen for intensive attention in Nepal is finger millet (*Eleusine coracana*). Both yields and income were significantly enhanced through improved agronomic practices and post-harvest technology.

The other project which made excellent progress is the MSSRF – Ohio State University (OSU) collaborative programme on the sustainable management of natural resources. This project funded by the Sir Dorabji Tata Trust involves

collaboration among OSU, MSSRF, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur and the Punjab Agricultural University, Ludhiana. The next phase of this project, due to begin from April 2005, will aim to introduce integrated and sustainable farming systems on a watershed basis in farmers' fields. The work will include both participatory research and participatory knowledge management systems, and involve farm women and men. This project, will lay the foundation for adopting sustainable intensification and farming systems diversification under different soil and agro-climatic conditions.

During this year, two major National Missions were launched for achieving the following goals by 15th August 2007, which will mark the 60th anniversary of India's independence:

Mission 2007: Towards a hunger-free India

Mission 2007: Every village a Knowledge Centre.

In view of the significance of these two Missions in eradicating hunger and poverty and in achieving the first among the UN Millennium Development Goals, I would like to summarise their objectives and strategies. Both are designed to foster convergence and synergy among numerous ongoing programmes and initiatives and to provide a platform for partnership among government and non-governmental organisations; academic, private sector and financial institutions; mass media and bilateral and multilateral donors. It is only by mobilising the power of partnership that seemingly impossible tasks can be achieved.

Mission 2007 : Towards a Hunger-free India

During the last three years, MSSRF and the UN World Food Programme (WFP) have been working together to analyse the causes of food insecurity in rural and urban India. This work resulted in the Food Insecurity Atlases of Rural and Urban India. The latest in this series of Atlases is the Sustainability of Food Security Atlas of India, which provides information on the long-term sustainability of food security in the different states of the country, based on 17 indicators. This Atlas was released by H E The President of India, Dr A P J Abdul Kalam, on 5th February, 2004. MSSRF, WFP and FAO organized a National Food Security Summit in New Delhi on 4th and 5th February, 2004, in order to present the findings made during the course of the preparation of the 3 Atlases before a wider audience of professionals and public policy makers. A road map for working towards relative freedom from under- and mal-nutrition by 15th August, 2007 was prepared at the National Food Security Summit. This involves the development and implementation of a *Food Security Compact* at the level of each State.

The hunger elimination strategy consists of the following five major components. First, a horizontal dimension should be provided to all vertically structured nutrition intervention programmes, in order to ensure their delivery on a *whole life cycle basis*. This will help to achieve a paradigm shift from food security at the macro-level to nutrition security at the level of each individual child, woman and man.

Second, a *National Food Guarantee Scheme* which will combine the features of the Food for

Work programme and the Employment Guarantee Scheme of Maharashtra, should be developed and introduced. The National Food Guarantee Scheme will help to provide food grains to all who are unable to have economic access to food due to inadequate livelihood opportunities. The Food for Work programme should cover skilled work also, so that food becomes a powerful instrument for social and human development. The use of food as currency has the added advantage of stimulating the production of a wide range of food grains, since it is clear that farmers will produce more if we can consume more, ie, if opportunities for assured and remunerative marketing become available.

Third, a *Food for Nutrition Programme* should be introduced to cover pregnant women, infants and old and infirm persons. An Integrated Food Guarantee and Food for Nutrition Programme will involve all vulnerable sections and will be based on the principle of social inclusion. Urgent steps need to be taken to eliminate maternal and foetal under-nutrition resulting in the birth of babies characterized by low birth weights (LBW). The incidence of LBW children represents the cruellest form of social inequity, since such children are denied at birth opportunities for the full expression of their innate genetic potential for mental and physical development.

Fourth, the problems of protein-calorie under-nutrition and micronutrient deficiencies should be dealt with together. The idea of providing *Antyodaya Cards* (ie, entitlement cards to the ultra poor) is a good one, provided it is done in

a transparent manner with the participation of the Gram Sabhas. The Antyodaya Cards, like the Food Stamps, will entitle the poor to a certain quantity of food grains. *We should however use this opportunity to launch a frontal attack on hidden hunger caused by the deficiency of micronutrients such as iron, iodine, Vitamin A, Vitamin B12 and folic acid and zinc. All the Antyodaya Households may be supplied with either a Vitamin premix or multiple fortified salt.*

The cost of this intervention will be about 10 paise per head per day. In other words, the annual cost per household of five will amount to Rs.180. This will be an exceedingly significant step in enabling children, women and men living in poverty to benefit from the calories they may obtain through food grains. The long-term solution will be economic access to balanced diets, so that all the essential macro- and micro-nutrients can be met entirely through a food-based approach.

Finally, the problem of transient hunger can be dealt with by fostering a Community Grain Bank Movement. Community Food Banks (CFB) as well as Community Feed and Fodder Banks can be operated by local SHGs of women and men. This will also help to widen the food basket by including locally grown millets, pulses and tuber crops. The establishment of community managed Food and Seed Banks, to start with in the hunger and ecological "hot spots" of the country, will insulate the poor living in such areas, from acute distress during periods of drought, floods and other natural calamities.

Thus, an integrated hunger elimination strategy, involving the streamlining of food delivery

systems on a life cycle basis, introduction of National Food Guarantee and Food for Nutrition programmes, elimination of hidden hunger caused by micronutrient deficiencies and the establishment of community-managed Food Banks, will help to achieve the goal of *Mission 2007: a hunger-free India*. In addition, access to clean drinking water, education and primary health care need concurrent attention and investment, to ensure the biological absorption of the food consumed.

Mission 2007: Every Village a Knowledge Centre

The second Mission, fostered by MSSRF in association with a wide range of partners and with generous technical and financial support from the IDRC and CIDA of Canada, Tata Social Welfare Trust, Friends of MSSRF, Tokyo, Indian Space Research Organisation (ISRO), OneWorld South Asia and National Association of Software and Service Companies (NASSCOM), is designed to take the benefits of the digital revolution to all the 600,000 villages of the country by 15th August, 2007.

The Mission for achieving a Knowledge Revolution in India derives its strength and confidence from the numerous outstanding initiatives underway in the country under the sponsorship of Central and State Governments, Civil Society Organisations, academia and the corporate sector. The beneficial impact of ICT on the rural economy and quality of life is now widely recognised. What is now needed is the launching of a self-propelling, self-replicating and self-sustaining model of ICT for rural regeneration and prosperity. This can be

achieved in a short time and at a low transaction cost by the functional fusion of the large number of programmes in progress at the micro level. Such a fusion of objectives, strategies and programmes can be achieved only through creating a platform for partnership.

Such a platform emerged at the Consultation held on 19th and 20th May, 2004 at MSSRF, Chennai, on the occasion of the death centenary of Jamsetji Tata, who remains for ever a role model, not only because he dared to think big, but also because he accomplished what he set out to do – be it steel or textiles or hotel or building the Institute of Science, Bangalore. At the Consultation it was agreed to form a *National Alliance for Mission 2007*. The National Alliance includes a wide range of stakeholders. It was also agreed that we should mobilize the power of the new media, like the internet, as well as traditional media like television, radio and the vernacular newspapers.

The combination of the internet and community radio (FM) is particularly powerful in getting timely information across to those who need them. Seven Task Forces were set up to go in depth into the various components of Rural Knowledge Centres. The term “Knowledge Centre” was chosen because at the village level there is need for value addition to generic information by converting it into locale-specific knowledge. With training and technical help, local women and men are able to add value to information and mobilise both dynamic and generic information on a demand-driven principle.

The Ministry of Communication and Information Technology of the Government of India and the Telecom Regulatory Authority of India (TRAI), as well as several State Governments, have already developed strategies for accelerating the growth of the internet and broadband connectivity in rural India. In all, 670,000 km of fibre has been deployed across the country. Bharat Sanchar Nigam Limited (BSNL) has already laid fibre cables capable of reaching nearly 70% of our villages. The National Informatics Centre (NIC), the Indira Gandhi National Open University (IGNOU) and the State Open Universities have considerable reach in the country. Using wireless, satellite and other technologies, 30,000 exchange locations can be leveraged as hubs for distributing broadband connectivity to all surrounding villages. Therefore, “*Mission 2007: Every Village a Knowledge Centre*”, already has some of the basic infrastructure essential for its success.

The Mission will be top-down in its approach to technological connectivity, but bottom-up in relation to content and knowledge management. The satellite technology of ISRO will be fully mobilised through ISRO’s Village Resource Centre Programme. A cadre of Rural Service Providers will be built up. Ultimately, the relevance of ICT to rural communities will depend upon its ability to provide need-based and locale-specific information in areas relevant to human health, nutrition, education, natural resources management and livelihoods. Issues relating to weather, water, energy and agriculture (with particular reference to meteorological, management and marketing factors) are particularly important to rural communities. The

Village Knowledge Centres (VKC) will also help to provide to every family in the village an *Entitlements Pass Book* which gives information on all their entitlements from government programmes and on how to access them.

The replicability and sustainability of the VKC movement will depend upon its success in achieving a sense of local ownership and management. This will ensure that the Centre provides information and services really needed by the Community. Government, Civil Society and Corporate Sector organizations participating in Mission 2007 should provide their contributions in a partnership rather than a patronage mode. It is proposed to introduce two important management principles to ensure that the VKCs are locally owned and managed.

First, the MSSRF-Tata National Virtual Academy for Food Security and Rural Prosperity (NVA) will, in collaboration with alliance partners, identify about 1 million Fellows of NVA by 15th August 2007. They will have a minimum educational standard of ten years of schooling and will show leadership qualities in taking the benefits of ICT to fellow villagers. They should particularly be capable of preparing Community Business Plans to ensure the economic sustainability of VKCs. They will be selected by a Peer Review process. Their honorarium will come from the local community. The aim is to give social prestige as well as to enhance the self-esteem of rural women and men with reference to their capacity to master ICT technologies and apply them in their daily life.

Secondly, the organisation and management of VKCs will have to be done by ICT Self-help Groups (ICT-SHG), consisting of both women and men. It will be useful if NABARD could promote a special scheme for supporting ICT-SHGs. The ICT-SHGs can be led by the grassroots academicians of NVA. MSSRF's experience over the past 12 years has shown that rural women and men, whether literate or semi-literate, will master new technologies speedily, if the pedagogic methodology is based on learning by doing. A suitable cluster of ICT-SHGs can form a Federation for the purpose of ensuring that their collective strength is considerable, even though their individual strengths may be limited. The VKC can be located in a suitable place in the village, like the school or panchayat building for example, so that access is open to everyone, regardless of religion, caste or class. There could be specialization among SHG members, in areas like health, water, marketing and climate management. The ICT-SHGs can then become the flagship of the rural knowledge revolution, led by academicians of the NVA.

Both government departments and private and public sector industry should outsource jobs requiring computerisation to the VKC. Initial development capital outlay for infrastructure development can come from the Universal Service Obligation Fund (USO) of the TRAI. It may be necessary to provide each ICT-SHG a low interest credit of Rs1 lakh. Thus, in all about Rs 6,000 crores of credit may be needed over a period of 3 years for spreading the ICT-SHG network in all the villages of our country by 15th August, 2007. Business and industry can help

to establish many such centres all over rural India under their corporate social responsibility programmes. Civil society organisations, academic institutions and the corporate sector should undertake mentoring, training and capacity building roles. This is essential for enhancing the management efficiency of ICT-SHG.

These two 60th Anniversary of India's Independence Missions will help the country to leapfrog in human development and national wellbeing. The hunger elimination programme will enable every child, woman and man to enjoy a healthy and active life. The knowledge empowerment movement will help to strengthen our democratic roots and prevent the enlargement of urban-rural divide in reaping the economic, ecological and social benefits that ICT can provide. It will help to spread literacy at a faster pace and help farm families to improve the productivity, profitability, sustainability and stability of major farming systems. Poverty will persist if we continue to undervalue our rich human resource and overvalue physical assets.

The South West monsoon behaviour has been erratic until the 3rd week of July, 2004. Global climate change may introduce further uncertainties. The ICT-SHG should therefore be trained to disseminate information on methods of maximising benefit from good monsoons and minimising the adverse impact

of monsoon aberrations. Monsoon management and sustainable aquifer management are two areas where ICT-SHG can play a catalytic role. At least one woman and one male member of each ICT-SHG should be trained to serve as Climate Managers.

As in previous years, Shri N Ram, Editor-in-Chief, *The Hindu* and the staff of *Frontline* generously helped in designing the cover of the Report. Dr Nandhini Iyengar edited the report with her characteristic thoroughness. Dr Sudha Nair, Ms R V Bhavani and Mr K Rameswaran helped to compile the Annual Report and spent much time and labour on this effort. The printing has been done by AMM Screens. My sincere thanks go to all of them. Finally, my gratitude goes to Dr M Velayutham, Executive Director and all the staff and scholars of MSSRF for their dedication to the vision and mission of MSSRF. The distinguished Trustees of MSSRF and the Governing Body Members of CRSARD gave valuable guidance and policy supervision. The work reported in the following pages would not have been possible if the Trustees, donors, staff, scholars, banks and rural families had not worked together as members of a symphony orchestra.

M S Swaminathan
Chairman

31st July, 2004



Coastal Systems Research

An additional area of 746 ha of mangrove was brought under management by forming seven Mangrove Management Units (MMUs) covering 10 villages in Orissa. A total area of 240 ha of degraded mangroves has been restored. A series of 7 manuals under the common title Joint Mangrove Management in Tamil Nadu: Process, Experience and Prospects has been prepared. The GIS unit prepared Atlases of the Mangrove Wetlands of AP and Orissa. The DAE has sanctioned the next phase of the programme on nuclear and biotechnological tools for CSR, for consolidating the gains already made in the project. The project on promoting alternative livelihood options in the Gulf of Mannar region was evaluated by the funders. The final report of the project on inventorisation and characterisation of coastal bioresources is under preparation.

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Sub Programme Area 101

Coastal Wetlands: Mangrove Conservation and Management

The project on Joint Mangrove Management (JMM), supported by India-Canada Environment Facility (ICEF), was implemented in six mangrove wetlands in Tamil Nadu (TN), Andhra Pradesh (AP) and Orissa from 1996 to 2003. It helped in the restoration of 1,447 ha of degraded mangroves and organised the management of 12,766 ha of verdant mangroves under the Mangrove Management Units of (MMU) 33 village - level institutions.

101.1. Orissa

JMM activities were extended for one more year in Orissa, with the assistance of an additional grant provided by the ICEF to cover 10 more villages. This extension project came to an end in May 2004 and hence, in this Report, apart from activities implemented during the year, the cumulative results achieved in the 10 additional villages are also given.

Building people's institution for JMM

In each of the ten villages (Table 1.1), a community-based institutional mechanism called *Luna Jungla Samrakshyana Samiti* (LJSS) was established for JMM. Each LJSS has a General Body (GB) in which both the husband and wife of a household may be members. The GB elects an Executive Body (EB), which prepares and implements micro

plans jointly with the Forest Department (FD) and other partners. The LJSS protects its MMU by a system called *thengapalli*. Under this system, two or three families join together and patrol the mangrove areas. The stick carried while patrolling, is handed over to the incoming batch the next day. Through this system, the entire village protects the forest in the true spirit of community participation. In addition, Regional Forest Protection Committees (RFPCs) have also been formed by involving two or three neighbouring villages. The *Sarpanch* (village leader), representatives from the *Jilla Parishad*, Foresters and Forest Guards as well as staff from MSSRF are members of this committee. While LJSS is active within a village, the RFPCs play an active role in preventing conflicts between villages in managing the mangrove wetland. During the current year, the LJSS of all the 10 villages prepared and implemented micro plans in partnership with the FD, various government agencies, Panchayat Raj Institutions (PRI) and local NGOs. In each village, a Village Development Fund (VDF) has been constituted to ensure the sustainability of the activities initiated by LJSS.

Mangrove restoration and management

An additional area of 746 ha of mangroves was brought under management by forming seven MMUs covering the 10 villages. A total area of 240 ha of degraded mangroves has been restored, against the target of 200 ha. In about 127 ha, which receive regular tidal flushing, restoration was done by direct planting. In the remaining 113 ha, which are situated above the tidal level, the fish-bone type canal technique

(described in earlier Annual Reports) was followed for restoration. Maintenance of canals in the restoration areas was done through desilting for proper tidal flushing by the LJSS. Table 1.1 also provides details of areas restored and areas under MMUs in the 10 additional villages. To overcome the problem of low survival rate of saplings in the restored plantations, as well as to generate employment opportunities for the villagers, village level mangrove nurseries were established at Kalatunga village in Mahanadi and Bandar and Naupal villages in Devi mouth area. A total number of 3,53,000 saplings were raised in these nurseries and used for planting in the restoration areas.

Table 1.1: **Details of restoration and area under Mangrove Management Units**

Demonstration village	Area restored (ha)	Area under MMU (ha)
Kalatunga	35	50
Kharinasi Ward No-6	10	65
Badatubi	7	
Jambo	27	80
Dhanuharbellari	37 *	101 *
Kerabellari		
Amarapat	46 *	50 *
Naupal		
Sharatprasad	78 *	400 *
Shashikadeipur		
Total	240	746

* common to two villages

Land-based alternatives

Homestead plantation: Community and homestead plantations were raised in all the

demonstration villages to meet the domestic needs for fencing materials, small timber and firewood. The project utilised the saplings produced in the community-based multiple purpose tree (MPT) nurseries promoted under the project. The species planted were casuarina, eucalyptus, moringa, bamboo, *acacia auriculiformes* etc. A total of 1,41,000 MPT saplings were raised by women SHG members in the community nurseries of the demonstration villages, and used for homestead plantations. The saplings were bought at Re. 1 per sapling and distributed to 550 households in the demonstration villages.

Smokeless chullahs, gas stoves and biogas: A total of 709 smokeless *chullahs*, bought with a subsidy from NEDCAP, Kakinada, were distributed in 8 demonstration villages. The *chullas* were paid for with a matching contribution by each recipient. In addition, 233 gas stoves were distributed. Fifteen biogas plants were established in Kerabelari village. All these helped in reducing the dependency on mangroves for firewood and the drudgery of women in meeting their fuel wood needs.

Poverty reduction and socio-economic development

Self Help Groups (SHGs): An important result of the project activity was the creation of men and women SHGs in the demo villages, to organize their savings and enhance their livelihood options. As the area is prone to natural disasters, the group activities were aimed at overcoming socio-economic problems caused by natural calamities. As shown in Table 1.2, 20 SHGs in Mahanadi site, 16 in Devi

mouth site and 7 in Dhamara mouth were formed. A matching grant has been provided to all the SHGs by MSSRF; two SHGs in Mahanadi site obtained bank loans. These SHGs are involved in various on-farm income generating activities and in micro enterprises.

The case study of a men SHG in Kalatunga village indicates how the SHGs are functioning effectively and collectively to improve their living standard. The SHG purchased a tractor at a cost of Rs 3.98 lakhs by contributing Rs 30,000 from its funds and getting a loan of Rs 2,43,000 from a bank, after availing of a subsidy of Rs1,25,000. A driver has been engaged for Rs3,500 per month to operate the tractor. The tractor is being rented to neighbouring villagers and the revenue is being utilised to repay the loan. It is expected that the entire loan will be repaid within a period of three years, instead of 5 years as agreed. Motivated by the men SHG, the women SHG of Kalatunga has purchased

a vehicle to meet the transport needs of the villagers in the area.

On-farm activities: Cultivation of horticultural crops such as coconut, lemon, cashew nut and hybrid mango was promoted in the demonstration villages to increase income from agriculture. In addition, kitchen gardens with vegetables such as pumpkin, okra, snake gourd and bitter gourd were also promoted in most of the demonstration villages. The project provided KB pumps and LLHPs to facilitate a micro irrigation system for the kitchen gardens, which resulted in better crop yields. Winnowers and paddy threshers were provided to improve agricultural practices. Galvanised storage bins were also provided for protecting the harvested crop. The subsidy provided by the Save Grain Campaign (SGC) of the Government of India was utilised to provide the storage bins and conduct training programmes on phyto-sanitary applications in better storage of grains.

Table1. 2: **Details of Men and Women SHGs and assistance provided by the Project in the 10 villages in orissa**

Name of the village	Total No. of SHG	Men	Women	Total members	Matching grant (Rs)
Kalatunga	5	1	4	81	13,320
Kharinasi Ward No.6	5	-	5	96	8,400
Badatubi	4	1	3	66	6,540
Jambo	4	-	4	79	-
Amarapat	2	-	2	28	3,120
Naupal	2	-	2	30	3,600
Dhanurbellari	9	-	9	138	-
Kerabelari	3	-	3	39	-
Saratprasad	2	-	2	32	-
Shashikadeipur	5	-	5	87	-
Total	41	2	39	676	34,980

Micro enterprises: Fishing is the primary occupation of the community in all the demo villages. For obvious reasons, the fish catch, as well as income from fishing, is reducing day by day. To overcome this problem, different types of need-based micro enterprises such as poultry, apiary, potato cultivation, mushroom cultivation, betel shop, rice business, sewing, etc. were promoted. The micro enterprises, started with marginal investment, have prevented damage to mangrove seedlings and improved the livelihood options of women, who are no longer collecting prawn seeds for their livelihood.

Other developmental activities: In addition to promoting *on-farm* and *off-farm* income generating activities (Table 1.3), the construction of shallow wells and ponds was undertaken as a poverty reduction measure. So far the seven villages have earned Rs1,38,000, which is being used as village development fund, operated through a bank account.

Gender concerns

The project has tried to address gender concerns and involves women in all the developmental activities. Gender mainstreaming is ensured by enrolling both men and women as members of the General Body(GB) and Executive Committee (EC). In the EC, 33% representation for women has been ensured in all the LJSS. The women have equal rights and participate in the project activities with keen interest. Out of 41 SHGs formed under this extension project, 39 are women SHGs (Table 1.2). In Kharinasi ward No.6 and Saratprasad villages, the LJSS are

headed by women. A number of activities have been taken up to empower women financially and to reduce their drudgery.

Training and Capacity building

Several training programmes were conducted to enhance the capacity of the villagers (Table 1.4)

101.2 Facilitating Replication of JMM Through Training and Policy Advocacy in Tamil Nadu and Andhra Pradesh

The final evaluation of the project implemented from 1996 to 2003, showed that more activities

Table 1.3: *Developmental activities undertaken in the project villages*

Activity	Numbers
Power tillers	7
5 H.P. diesel pump and pipe	10
Renovation of community ponds	7
Multipurpose building	5
Deep tube wells	8
Community library	6
Solar street lights	16
Solar home lights	36
Solar lanterns	16
Musical instruments for school children	3
Furnishing / Renovation of school building	3
Culverts	6
Low cost toilets	365
Sewing machines	13
Community bathrooms	2
Saline embankment	14
Awareness pillar	1
Renovation of household ponds	101
Boats for patrolling	2
Repairing saline embankments	2

were needed to enhance the capacity of the stakeholders, If policy support needed for replication should be mobilized and attempts made to get separate JMM guidelines from the government should continue.

A new project was started with the support of ICEF, New Delhi, to create a facilitating environment and enable replication of JMM through policy advocacy, education, awareness and training. Effective implementation of the project started in the two states of TN and AP in September 2003. The following are the results expected from this project:

- 120 Range Officers and Foresters (60 in TN and 60 in AP) to be given orientation on science-based, community-centred and process- oriented approach to mangrove restoration, conservation and management
- 30 Range Officers and Foresters (15 in TN and 15 in AP) to be given hands-on training in the entire process of JMM
- Development of a curriculum for mangrove management that can be followed by the Rangers and Foresters' Training College in TN and AP
- Revising the JMM guideline prepared in the earlier project and getting it approved by the Government of India
- 120 leaders and members of village institutions and SHGs (60 in TN and 60 in AP) to be trained in leadership and membership qualities
- 3 workshops to be conducted for media, scientific community and NGOs

Table 1. 4: Training provided to members of LJSS and SHGs of the project villages

Training programme	Participants	Venue
Social animator	Social animators of all the 10 villages	Site office, Kendrapara
Volunteer for village survey	Volunteers from project villages	Kendrapara
Record keeping for SHGs	SHG members (80 participants)	Kharinasi Ward No-6
Group management	EC members of all villages (32 participants)	KVK, Kendrapara
SHG management and promotion	SHG members of all villages (100 participants)	All demonstration villages
Micro enterprises	SHG members of all villages (75 participants)	Kharinasi, Jamboo and Kalatunga
Paddy culture practices	All villages (40 participants)	KVK, Kendrapara
Bee keeping	All villages (50 participants)	Kharinasi and Kalatunga
Mushroom cultivation	All villages (40 participants)	KVK, Kendrapara
Potato cultivation	50 participants	Kalatunga
Storage of food grains	All villages (100 participants)	Kalatunga and Kharinasi
Poultry farming	100 participants from 2 villages	Kalatunga and Kharinasi
Tailoring (sewing)	80 participants from 3 villages	Badatubi, Jamboo and Kharinasi
Prawn and fish pickling	30 participants from 3 villages	CIFA, Bhubaneswar

Tamil Nadu: A proposal has been submitted to the FD for orientation and hands-on training for the field personnel and action is being taken to identify suitable trainees. The Southern Forest Range College, Coimbatore, has expressed its willingness to host orientation programmes in its campus. Resource materials, consisting of a series of 7 manuals under the common title *Joint Mangrove Management in Tamil Nadu: Process, Experiences and Prospects*, and Orientation Guides on Biology and Ecology of Mangroves, Mangrove Wetlands of India and Tamil Nadu and JMM approach and process have been prepared.

The following activities were undertaken to enhance the capacity of the stakeholders:

- Three one-day exposure visits to mangrove wetlands were organised for the trainee Foresters and Rangers of TN FD in Pichavaram and Muthupet.
- Exposure visits to Muthupet mangroves were organised for 25 NSS volunteers of Government Boys' Higher Secondary School and 12 teachers and 20 Rotary Interact Volunteers of Girls' Higher Secondary School, Muthupet.
- A 2-day exhibition on mangrove wetlands was organised for school children of Muthupet region.

The following training needs have been identified for community members and SHG leaders. leadership quality to enhance capacity to make village level institutions (VLIs) and SHGs self-reliant, access various government welfare schemes, establish linkages with external

agencies such as credit and banking institutions, insurance companies, local bodies, government agencies, marketing intermediaries, etc., financial management and monitoring and evaluation of programmes implemented by the VLIs and SHGs.

Uttara Devi Resource Centre for Gender and Development (UDRC), MSSRF, was involved in the identification of the training needs, and a suitable institution namely, *New Concepts Information System, Chennai*, to provide training on leadership and membership qualities. So far, two two-day training programmes have been conducted for 50 representatives from SHGs in Pichavaram and Muthupet. In addition, an assessment was carried out with the help of external consultants on how to sustain the VLIs formed in Pichavaram and Muthupet during the previous project. (See SPA 401)

Andhra Pradesh: In AP, systematic orientation and hands-on training are yet to start. The FD of AP has provided the list of trainees recently and given permission to restore an area of 25 ha of degraded mangroves as part of hands-on training. The participating village for the hands-on training has been identified. Manuals on Mangrove Ecology, Community Mangrove Nursery and Restoration Techniques have been prepared as resource materials for the training programmes. In addition, the *Atlas of Mangrove Wetlands of Andhra Pradesh*, which was released by the former Minister for Cooperation, Government of AP at Kakinada on 4th March, 2004, and a book on *Mangroves of Andhra Pradesh – Identification and Conservation Manual* will be used for the training. Apart from

these, an audio-video CD titled *Biological Paradise of Andhra Pradesh* has also been produced to help the trainees to understand the components and implementation strategies of JMM. The following activities, relating to enhancing the capacity of the FD personnel on mangrove conservation and management were carried out:

- One-day field training in Mangrove Ecology for 30 Foresters of the APFD, deputed from Forest College, Karimnagar
- A two-day field orientation for 25 forest officials at the level of DFO and Range Officers who participated in the national workshop organised by IWST on *Conservation, Restoration and Sustainable Management of mangrove forests in India* at Coringa Wildlife Sanctuary
- Training in ecological, geo-morphological and anthropogenic aspects of mangroves for newly recruited FD staff of Coringa Wildlife sanctuary.

Training programmes were conducted for the community and SHGs. A community banking programme for sustainable mangrove conservation was initiated in the demonstration villages of Godavari. Reorientation training was organised for SHG members and an appraisal of the importance of SHGs and their savings was made. The training focused on empowering SHG members in developing business plans and learning accounting to start market-linked micro enterprises. The whole exercise was made to ensure the sustainability of the micro enterprises even after the project is withdrawn.

The training programmes were organised with the support of JRD Tata Ecotechnology Centre of the Foundation. Based on the business plans, 13 women SHGs (137 members) from the three demonstration villages of the earlier project were provided with financial support to a tune of Rs 4,31,000 under the Community Banking Project of MSSRF for starting 10 different micro enterprises. In addition, 10 women were given training for two months on coir rope making with the support of a UNDP–Coir Board Project.

Assessment study: A study of the sustainability of village level institutions formed for JMM was conducted in the villages of Godavari mangroves with the support of UDRC of MSSRF. *New Concept Information Systems, Pvt. Ltd., Hyderabad*, identified by UDRC helped to conduct the study (See SPA 401). The report is being finalised.

101.3 Remote Sensing and Geographical Information System

The Remote Sensing and Geographical Information System (GIS) unit, which functions as a supportive unit to the Coastal Wetlands and Mangrove project, has prepared an atlas of the mangrove wetlands of AP and Orissa. In addition, a summary of the atlases of TN, AP and Orissa has also been prepared. These atlases comprise the following thematic maps: geomorphology, river basin and estuarine system, temporal remote sensing data of wetlands, floral distribution, biophysical properties, socio economic details of the

mangrove user villages, changes in land use practices and causes of degradation of mangroves.

Natural resource maps used in the atlases were prepared by analysing remote sensing data. Temporal remote sensing data of 1985/1986 and 2002/2004 were used for preparing maps of changes in floral distribution, land use and shoreline in and around mangrove wetlands. Biophysical and socio-economic maps were prepared using the primary data collected by the field staff of the mangrove project. Remote sensing data was analysed both visually and digitally and for digital analysis ERDAS Imaging was used. The analysis was enhanced with ground truth information collected. GIS mapping and analysis was done using Arc GIS software.

Tamil Nadu

Analysis of the data indicated that the mangrove forest cover of TN has increased from 2,092 ha in 1986 to 2,728 ha in 2002. In the Pichavaram mangroves, nearly 90% of the degraded areas have been restored, leading to increase in forest cover from 325 ha in 1986 to 618 ha in 2002. In Muthupet, an increase of 243 ha has been noticed between 1986 and 2003. Development of aquaculture farms is one of the major changes in the land use pattern around both the Pichavaram and Muthupet mangrove wetlands between 1986 and 2003. In the Pichavaram region, prawn farms are found in an area of about 200 ha whereas in Muthupet, prawn farms occupy an area of about 1570 ha. In both these areas no mangrove forest

was cleared for the development of prawn farms. In Muthupet, the area of the saltpans is gradually increasing.

Andhra Pradesh

The mangrove vegetation of AP has increased from 21,727 ha in 1986 to 26,712 ha in 2004. In Godavari wetland, a total increase of about 368 ha of mangroves is noticed between 1986 and 2004. Though the mangrove forest cover has increased by 3,988 ha between 1986 and 2004 due to restoration and natural regeneration, simultaneous erosion and degradation due to other land use activities such as aquaculture have resulted in the loss of 3,150 ha. Accretion along the Kakinada Bay contributed to natural regeneration of mangroves in about 500 ha. In Krishna mangroves, a total increase of 3,823 ha has been noticed between 1986 and 2004. The abundant increase in the mangrove area is due both to restoration and natural regeneration. Development of aquaculture farms is the major land use change between 1986 and 2004. The area of aquaculture farms in Godavari and Krishna wetland is 6,920 ha and 20466 ha respectively. Outside the Reserve Forest, mangroves are cleared for aquaculture farms in Godavari wetland; this has resulted in the loss of about 650 ha of pristine mangrove forest. Large areas of paddy fields around Krishna mangroves have been converted into aquaculture farms from 1992 onwards. No mangroves were cleared for this purpose. The Krishna wetland has a vast extent of mudflat area of about 14,340 ha within the reserved forest, which can be restored with mangroves.

Orissa

In the Mahanadi wetland area, the mangrove forest has reduced from 3,953 ha in 1985 to 3,306 ha in 1996. However, the 2004 remote sensing data shows an increase of 300 ha, contributed equally by restoration and natural regeneration in newly formed mudflats. In the Devi mouth mangroves, the mangrove area has increased from 258 ha in 1985 to 421 ha in 2004. The overall estimate indicates that the area of the mangrove forest cover has increased from 2,092 ha in 1986 to 2,728 ha in 2004. Development of aquaculture farms is one of the major changes in the land use pattern around both the Mahanadi and Devi mouth mangrove wetlands between 1986 and 2004. In the Mahanadi region, most of the prawn farms are close to mangrove forests. Aquaculture farms were not found in the early 1980s and were limited in 1987. But they increased to 1,843 ha in 1996 and further to 3,400 ha in 2004. About 900 ha of mangrove were found cleared for the development of prawn farms in Mahanadi mangroves. In the Devi mouth region, the area of prawn farms is 2,270 ha. There are no changes in the forest cover of Bhitarkanika between 1985 and 2004.

Sustainability Atlas of Food Security

The Remote Sensing and GIS unit was also involved in the preparation of different thematic maps for the Atlas of the sustainability of Food Security of India. The thematic mapping process included the natural break classification of the indexing parameters of each state of India in terms of socio economics and natural resources

such as food access, availability, net area sown, forest cover and wastelands. See SPA 403.1.

Sub Programme Area 102

Nuclear and Biotechnological Tools for Coastal Systems Research

The research project on nuclear and biotechnological tools for coastal systems research, a partnership programme between the Department of Atomic Energy (DAE) and MSSRF initiated in 1998, was primarily designed to integrate conservation of natural resources and sustainable development in the rural communities of coastal areas adjoining the nuclear power plants, through strengthening the livelihood security, by blending frontier sciences and technology with the traditional wisdom of the rural coastal communities. Both marine and land-based alternative livelihoods were developed to reduce the over-exploitation of already degraded coastal bioresources, thereby reconciling development with conservation in a mutually reinforcing manner. The primary objectives of the programme, undertaken in Kalpakkam, Chidambaram and Kudankulam regions of coastal TN, were to introduce nuclear and biotechnology tools for the sustainable development of agriculture, fisheries and animal husbandry in the regions through the evolution of grassroot level institutions, sustainable eco-enterprises and strengthening local

communities through capacity building and knowledge empowerment. The approach included strategic and anticipatory research, as well as participatory and adaptive research for addressing the problems of the coastal regions.

102.1 Identification and Isolation of Salt Induced Genes

This programme aims at isolation, characterisation and controlled expression of novel genetic combinations from mangrove species offering resistance to coastal salinity. Salinity is one of the major constraints in sustaining agricultural productivity in coastal regions. This problem has been magnified by the rise in sea level as a result of global warming. *Porteresia coarctata*, a mangrove associate species and a wild relative of cultivated rice, was selected as a target species for identification and isolation of salt tolerant genes.

A number of ESTs from *Porteresia coarctata* library were sequenced. Insert size in each of the clones was determined by Polymerase Chain Reaction (PCR) using the universal M13 forward and reverse primers. One of the genes isolated during the process showed homology to antiporters. Antiporters are membrane proteins that affect the active transport of a solute across a biological membrane. In addition to plasma membrane antiporters, vacuolar Na⁺/H⁺ antiporters are also known. The vacuole constitutes an important site for ion sequestration and over expression of a vacuolar Na⁺/H⁺ antiport promotes sustained growth and development in soil watered with up to 200mM

NaCl. This salinity tolerance was correlated with higher-than-normal levels of AtNHX1 transcripts, protein, and vacuolar Na⁺/H⁺ (sodium/proton) antiport activity.

Gene exploratory studies at the RNA level were done through northern hybridisation of total RNA from *Porteresia coarctata* roots and leaves and probed with antiporter genes. A single mRNA band was observed, indicating the expression of RNA transcripts for antiporter genes. The results obtained indicated that these were an upregulation of the transcript up to 48 hrs of salt treatment. Southern hybridisation studies using the genes as probes were carried out to obtain information on the copy number. The study will help in understanding and elucidating the function of this crucial gene in imparting tolerance to salinity. Several constructs have been made from this gene with the objective of transforming rice and blackgram varieties to develop location specific varieties for tolerance to salinity.

102.2 Activities being Undertaken at Kalpakkam

As described in earlier Reports, a model demonstration-cum-experimental plot was developed in 1998 at the IGCAR, Kalpakkam, based on the model of sustainable Natural Resource Management(NRM), with emphasis on critical water use efficiency, forward backward linkages, organic farming and low input agriculture. In order to facilitate more interaction with the local farming communities, this year a new site was identified within the IGCAR campus, near the entrance.

The aim of this demonstration plot is to include a number of activities in a single location that could form a facility for technology incubation and adoption. A major activity was the demonstration of the performance of mutant pulse crop varieties developed by the Nuclear Agriculture and Biotechnology Division of BARC. Large-scale seed multiplication of mutant blackgram, greengram and groundnut was conducted and evaluated by the farmers of the region in a participatory mode. The farmers involved in the participatory assessment were happy with the performance of these varieties, compared to the locally used varieties. The multiplied seeds were supplied to many farmers interested in adopting these mutant varieties in their region.

New interventions like horticulture, aquaculture and vermi-composting were also undertaken. The priority area for training and capacity building in the region included NRM, innovative agricultural practices and agricultural waste management. The focus has been to move from demonstration plots to the farmers' fields. Three villages in the adjoining regions have been identified for undertaking activities aimed at adding value to available bioresources. A number of visits were conducted for farmers and school children to give them exposure to various aspects of agriculture and resource management.

One of the objectives of the project has been to involve the farmers in a large way in cultivating the BARC mutant varieties in their fields. During the year, 37 farmers in Kilamanakudi region of Chidambaram

undertook a participatory evaluation of these varieties. Farmers in Manikulai region of Chidambaram have taken up large-scale cultivation of these mutant varieties, covering about 22 acres.

102.3 Activities Undertaken at Kudankulam

Kudankulam and adjoining areas are being covered under various interventions of this project since 1999, with the primary objective of linking NRM with ecological and livelihood security of the coastal communities around the nuclear power plant. This region is characterised by low rainfall and poor soil condition that have resulted in most of the area turning to waste lands. A detailed analysis of soil profile, texture and suitability for cultivation was one of the significant interventions carried out in three villages of Kudankulam region. The high intensity soil survey carried out in cooperation with National Bureau of Soil Survey and Land Use Planning, Nagpur, provided information to the local farming communities, about land quality as well as land suitability. Discussions are being conducted with farmers about options and opportunities for appropriate land use planning. An integrated farming system is envisaged, to include fodder grass, agricultural waste management and animal husbandry, in addition to identifying suitable crop varieties based on rainfall and the water retention capacity of the soil. The models developed by MSSRF have received overwhelming response from the farming communities.

The major concern this year was replicability of demonstration models in farmers' fields. Three villages with a total strength of 60 farmers were identified, based on land survey records, land use planning, soil management practices and crop patterns. Short duration mutant varieties of blackgram, greengram and groundnut seeds developed by BARC were supplied to farmers, covering about 15 acres of land. Different parameters like germination percentage, growth pattern, water requirement and yield data were recorded. Exposure visits were arranged for the farmers from nearby villages. Farmers have appreciated the result of BARC mutant varieties and many of them have shown interest in using the seeds in the coming year.

One of the highlights of this project has been the demonstration of green belt applicability in the water scarce region of Kudankulam. The green belt, developed in about 45 acres of land with more than 7,000 trees belonging to about 21 species, has been drawing the attention of local communities as well as the development agencies in the region. The green belt developed some two and half years ago has reached an average height of about 2.5 m, while the Urigam variety of tamarind has reached about 3 m. These plants have been surviving without any additional irrigation, with little input and care. This model has the potential of converting a large area of degraded land into profitable coastal land.

The Genetic Garden for fruit crops is one of the many successful interventions undertaken in the region. Many of the species have started yielding fruits and many farmers in the region

are now interested in replicating the model in their own fields. This year, various fruit crops, mainly cashew, cherry and amla, were provided to interested farmers, at a subsidised rate through the State Horticulture Department for cultivation in their own fields. Since Kudankulam falls under the export promotion zone for horticultural products, emphasis is being given to promoting fruits and flowers in the region.

Many exposure visits to the demonstration fields and to the fields of farmers who have adopted the technology, were organised on a regular basis so that the farming community can get the right type of intervention in their own fields. Many training programmes on participatory resource management, vermicomposting, fish and fish product development were conducted. Vermicomposting has been adopted as a viable enterprise by the farmers and more than 50 farmers have been trained for making vermicompost from agricultural waste. The technical training for this was provided by Sri Paramakalyani Centre of MS University, Tirunelveli. Market linkages for their products were also ensured. Many programmes aimed at capacity and skill development were organised with the help of various departments of the State Government, including Agriculture, Fisheries, Horticulture and Women Development Corporation. These activities have already led local communities to establish direct linkages with the State Government.

The project also concentrates on economic

empowerment of rural communities. During the year, 15 SHGs were formed, taking the total number of SHGs in the region to 31. These SHGs were able to generate a saving of about Rs 9.03 lakhs and have obtained loans of Rs 19.57 lakhs through the local banks. Efforts have been made to link these SHGs with viable micro enterprises.

Recent advances in information and communication technologies, combined with the contemporary instructional methods of open and distance learning, offer unprecedented opportunities for large numbers of people to gain access to education over an extended period of time. So far, six village knowledge centres have been established in Kudankulam and adjoining regions and these have helped substantially in developing location specific information databases as well as training a number of village girls in developing computer skills. The local information centres are being operated by trained individuals familiar with the local context and language and with adequate skills in communication, to provide information and knowledge services to rural families. These knowledge centres are providing valuable information for addressing problems of food, health, livelihood and agriculture security in the region.

The first phase of the project has come to an end. Based on the assessment of the work carried out during the first phase, the DAE has sanctioned the next phase of the programme with effect from April 2004 for consolidating the gains already made in the project.

Sub Programme Area 103

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

The Gulf of Mannar Marine Biosphere Reserve (GoMBR), situated between Rameswaram in the north and Tuticorin in the south, was once abundant in bioresources and biodiversity. The BR has been subjected to over-exploitation and bad fishing practices in recent years, leading to the near extinction of several marine species unique to the GoM. This has resulted in the gradual destruction of the marine ecosystem, adversely affecting the livelihoods of the coastal populations, especially the artisanal fishermen, leading to increasing poverty and conflicts among the coastal communities. The creation of sustainable, alternative or additional sources of income for them is one of the options for the sustainable management of GoMBR. Against this background, MSSRF and DHAN Foundation, Madurai, jointly implemented a programme on promoting alternative livelihoods, from April 2000 to March 2004. The DHAN Foundation dealt with promoting and strengthening SHGs and land-based alternative income generating activities in the coastal areas around GoMBR, while MSSRF dealt with promoting livelihood security through marine resource-based activities and establishing VKCs in fishing villages.

The main aims of the MSSRF component are - assessing the possibilities and demonstrating

models of marine resource-based commercial enterprises, establishing links between village level institutions and technical institutions for technology transfer, processing, marketing and management of the enterprises, and developing and demonstrating artificial reef as a marine bioresources enhancement tool.

With these aims, an agar production plant and a pearl culture farm were set up in Kunjarvalasai and Mundalmunai villages respectively in the Mandapam region. In the Tuticorin region, a fish pickle unit has been started in Vellapatti village and an artificial reef established in the coastal waters, with participation from the fishing communities of Therespuram village. In each of these villages, a village level society has been formed, consisting of a GB comprising members from willing families of that village and an EC with representatives from the community, MSSRF, technical institutions and government agencies. All these societies are registered under the TN Societies Registration Act, 1975. These village level institutions have prepared annual micro plans in consultation with the technical institutions, experts and MSSRF and have received funds. This approach has helped in empowering the community to manage large business enterprises and in linking responsibility with accountability.

The funding agencies of the project, the Ministry of Rural Development, Government of India and United Nations Development Programme, New Delhi, evaluated the project in February 2004 by sending a team of community members drawn from various States and a team of two experts. The evaluators reported that inputs

provided by the project had enabled poor fishing communities to access processing and value addition technologies that can enhance their living standards and help them compete in the larger market. They also said that the professional back-up and technical expertise that has been mobilised by the Project had done much to ensure that the different units are on the road to success and self-sufficiency, but further capacity building is necessary to ensure collective ownership and management by the community.

103.1 Establishing a Community-owned Agar Plant

The United Village Development Society formed in December 2001, is looking after the agar plant programme. This society created the infrastructure for agar production. A building with all facilities to produce both food grade and bacteriological grade agar has been constructed. All the machinery and equipment needed for agar production have been fabricated, installed and tested. The total cost of these facilities is about Rs 21 lakhs and the production capacity of the plant is 12 kg per day. Permission from the TN Pollution Control Board has been obtained and a new electrical transformer established in the village, to provide uninterrupted power supply to the plant.

Standardisation of production technique: During the current year, technology for production of both food grade and bacteriological grade agar was standardised through a number of trial productions. Experts from the CMFRI and consultants from PricewaterhouseCoopers Ltd

participated in the trial production to provide technical and managerial assistance.

Cost-benefit analysis: A detailed cost-benefit analysis was done to standardise the production cost as well as to project expected profit. It was found that about 120 to 150 kg of seaweed, depending on quality, is needed to produce about 12 kg of agar per day and the expected net profit per kg of food grade agar is about Rs 80 to 100. For bacteriological grade agar, it varies from Rs120 to 150 per kg. The profit goes to the society, which utilises it to provide loans to SHGs and start other income-generating activities. After a thorough cost-benefit analysis, working capital amounting to Rs 8 lakhs has been provided for one year.

Management of the plant: Currently, a former Project staff is working in the plant as Manager and assisting the society in managing the agar plant. Management of the plant will be handed over to the society once production is stabilised, marketing linkages are established and management personnel are trained. This may take another six months. It is envisaged that the factory will be managed by one Plant Manager-cum-Technician who will have multiple roles of supervising raw material procurement, marketing of end product and managing the production process. A management committee with at least 4 members will be formed to act as a bridge between the society and the plant .

Marketing: Marketing of agar is not a serious problem as demand is very high. Meera Traders, Chennai, has procured about 100 kg of food grade agar and 350 kg of bacteriological agar

from the society and is interested in buying food grade agar regularly. Bakers India, Coimbatore, has agreed to buy food grade agar in the form of 10 gram packets and their monthly requirement is about 150 kilograms.

103.2 Establishing a Community-owned Fish Pickle Unit

Vellapatti Women's Fish and Allied Products Producers' Association: This Association was formed in December 2001 and is taking care of the fish pickle unit established at Vellapatti, near Tuticorin. The functioning of the society is good. The executive members of the Association have been trained in accounting by the DHAN Foundation, Madurai and other professionals. The Association has built a fish and prawn pickle unit in the village, with freezing units to store raw fish and prawn, processing and cooking equipment, packing machines etc. The production capacity of this unit is about 20 kg per day.

Eleven members of the Association were trained in fish and prawn making by National Union of Fishermen, a NGO based at Nagercoil, for a period of 25 days. Three members of the Association also received training in fish pickle making, conducted by Fisheries College and Research Institute, Tuticorin. Procurement of fish, preprocessing of fish, preparation of fish pickle and other allied products, packing and marketing are some of the topics covered by both the training programmes. All the 11 trained members are working in the pickle-making unit. They have also been trained in various aspects

of personal hygiene and standards of hygiene adopted in food industries, with the help of a professional catering unit. Currently, a former Project staff is assisting the society to manage the unit. A tentative management plan, envisaging a Supervisor and Marketing Manager from among the 11 members, has been prepared for the fish pickle unit, with the help of a management consultant. This will be put in place and tested and based on the experience gained it will be suitably modified.

Marketing: Attempts have been made to establish a long-term tie-up with distributing agents such as M/S. Alcar Traders, near Tiruchendur, Sagar Marketers, Tuticorin and Farm Suzanne, a leading producer and marketing agent of Chennai. Currently, the unit is making fish pickle based on orders and selling a small quantity in the local market. Attempts are being made to diversify the products. A marketing and management specialist of MSSRF conducted a detailed cost-benefit analysis of the unit, involving factors such as cost of raw materials and other inputs, sales volume and selling prices, and concluded that the unit will be profitable if it is able to sell at least 10 kg of pickle every day.

103.3 Community-managed Artificial Reef

The artificial reef programme was initiated in the GoM to show that it can be used to enhance the bioresources, particularly fishery resources, as there is an urgent need to ensure the livelihood security of the fishers. This programme is being implemented with the

participation of the fishing community of Theresapuram, a village located near Tuticorin.

The *Theresapuram Artificial Reef Society* was formed in August 2001. 45 representatives of 18 fishers associations and representatives from local NGOs and voluntary organisations constitute the GB of the Society. An EC with 14 members looks after the day-to-day affairs of the Society. The Assistant Director, TN Fisheries Department, is one of the members of the EC.

A 5-day training programme on artificial reef was organised for the members of the Society with the help of CMFRI, Tuticorin. The trainees were given exposure to principles behind artificial reef, identification and construction of suitable reef modules, management of the reef etc. Four artificial reef modules, two for commercially valuable fish such as grouper and lobster and two for other fish and marine organisms, have been selected. About 30 individuals of each module were constructed using cement reinforced with iron rods. Scientists from CMFRI, personnel from the TN Fisheries Department, local engineers, architects and the fishing community were involved in designing and fabricating the modules. A total number of 120 individuals of the 4 modules were deployed in about 10 m deep coastal water near Theresapuram. The deployment site is located about 14 km from the coastline. This site was identified by the Society with the help of CMFRI. Before deployment, sea floor survey was conducted to collect baseline information. The *Indomer Coastal Hydraulics, Chennai*, deployed the modules.

Regular monitoring of the artificial reef was conducted. In February 2004, an underwater video of the artificial reef was taken with the help of local divers and photographers. It shows tangible success in terms of attracting a significant quantity as well as variety of marine life, just a year after being installed. The video shows that there is a good growth of barnacle and a variety of other marine organisms, including seaweeds, sponges, ascidians, soft corals and bivalves in all the modules. Grouper fish were also found in large numbers around the reef. A few individual lobsters were also observed. Small size fish belonging to the family *Lethrinidae*, *Lutjanidae* (snappers), *Teraponidae* (grunters), and *Balistidae* were found in large numbers around the modules. The underwater video was shown to the local community, government officials, the authorities of the GoM Biosphere Trust, TN Fisheries Department and TN FD.

The artificial reef is being protected by the Theresapuram Artificial Reef Society with the cooperation of various fishers' associations functioning in and around Tuticorin. The TN Fisheries Department and district administration are also involved in preventing illegal fishing around the artificial reef area. After assessing the success of the artificial reef, the TN Fisheries Department has developed a plan to replicate it in 10 other places.

103.4 Pearl Culture

The Mundalmunai Pearl Culture Society was formed in May 2002 for the purpose of demonstrating pearl culture as an income

generating activity to poor fishing families. It has a GB with 105 members and an EC with 14 members. DHAN Foundation, Madurai, provided training in accounts and bookkeeping.

Pearl culture has three steps: producing oysters in the hatchery or collecting them from the wild, implanting the nucleus into the oysters through a surgical procedure and farming the nucleated oysters in the sea. The first two steps require sophisticated facility and a high level of scientific skill, whereas the pearl farming requires only limited skill. Since CMFRI has agreed to supply nucleated pearl oysters to the Mundalmunai Pearl Culture Society, 10 families from the Society were given training only in pearl farming. This training was provided by CMFRI in its pearl farm. The families trained in pearl farming were involved in the selection and preparation of the farming site, construction of the farming facility, preparation of cages for holding nucleated oysters and management of the farm. These 10 families have also been selected as pearl farmers and profit from the pearl farming goes to them. However, they have to give a certain percentage of the net profit to the Society, which will be used by it to start other small enterprises. After training, a MoU was signed with CMFRI to supply one lakh nucleated pearl oysters and provide technical guidance in pearl farming and management.

A pearl farm that can hold about one lakh pearl oysters has been established near Mundalmunai village with the permission of the TN FD. Rack culture is the method being

followed to grow the nucleated pearl oysters. The total area of the farm which is about 500 sq. m, is divided into 10 compartments. Each compartment is further divided into 5 units. In each unit, 25 cages containing implanted oysters are placed in the water from horizontal bars. Each cage has about 80 implanted oysters and thus, a total number of 10,000 (125 cages x 80 oysters per cage) implanted oysters are reared in one compartment. So far, 70,960 implanted oysters have been introduced in the pearl farm since January 2003.

The yield of saleable pearls during the year from 28,300 surviving oysters was 2,322. Harvested pearls are segregated depending on their quality, size and colour with the guidance of technicians from CMFRI.

The results of the first three batches of pearl harvest show that the survival rate of oysters is good but occurrence of pearls and the number of saleable pearls are comparatively low. Analysis of the low percentage of occurrence of pearls and number of saleable pearls indicated that this might be due to stress during implantation and transportation of oysters from the CMFRI pearl culture unit to the Mundalmunai pearl culture farm. In order to avoid this, a new approach has been developed in consultation with CMFRI. In this method, the oysters will be implanted in the Mundalmunai farm itself and maximum care will be taken during implantation. Another advantage of this is that the villagers will get practice in implantation technique, which would reduce their dependency on CMFRI. CMFRI has supplied 30,000 oysters and nucleus for this approach. Facilities for on-the-spot

implantation were created in the Mundalmunai pearl culture farm itself. The Society has signed a contract with a consultant who has worked in the CMFRI pearl culture unit for implantation of oysters. So far 1000 oysters have been implanted by this method and these oysters are being reared in the farm.

Marketing studies of cultured pearls reveal that market demand for these pearls is comparatively low because of the availability of freshwater pearls in the market in plenty. Attempts are being made to develop marketing tie-ups with established jewellers in Bangalore and Chennai. Attempts are also being made to export the pearls through some of the companies that are involved in exporting ornaments and shells.

Sub Programme Area 104

Conservation, Inventorisation, Characterisation and Enhancement of Coastal Bioresources

Coastal ecosystems are productive and biologically rich. They are also the most endangered, due to the unsustainable development processes around them. In India, the livelihood security of millions of people is dependent on coastal ecosystems. Hence, the National Bioresources Development Board (NBDB) of Government of India initiated and funded an integrated programme on inventorisation, characterisation and

enhancement of coastal bioresources to develop action plans for the conservation of bioresources in selected coastal locations in the country, viz. Gulf of Kutch, Malvan tahsil, Vembanad Lake, Lakshadweep Islands, Pulicat Lake, Bhattarkanika Wildlife Sanctuary and Chilika Lake. During the previous year, the NBDB and MSSRF jointly published a detailed status report on bioresources in the seven locations. The Status Report details the state of the bioresources in these locations, the present and perceived threats to the ecosystems, potential bioresources and the status of conservation efforts in these locations.

Based on the status report, an integrated study was undertaken with the help of institutions/ organizations with prior experience of working in the selected sites to understand the dependency on bioresources at the local level. These participatory exercises were conducted to study the anthropogenic influence on bioresources, and to develop action plans for conservation, characterisation and enhancement, with the active involvement of the bioresource - dependent community. This study was conducted in two or three villages in each of the locations selected, based on the available bioresources, the importance of these bioresources for livelihood security and possible ways to enhance them through value addition. The overall objective of this exercise was to develop strategies and site-specific action plans for the sustainable management and effective utilisation of bioresources in the seven selected coastal locations, representing both East (Chilika, Bhattarkanika, Pulicat) and

West (Malvan, Gulf of Kutch, Vembanad) coasts as well as the island ecosystem (Lakshadweep). The study involved multi-sectoral participation, using the Participatory Rural Appraisal (PRA) method of including various stakeholders.

Based on the inputs and analysis of the responses of various stakeholders, it was found that concerted efforts are essential for creating an awareness and monitoring bioresources at the community level. The local population in all the sites rated lack of awareness and conflict in resources governance and utilisation as prime reasons for the depletion of biological resources in their respective regions. Based on these considerations, an action plan was developed for each location, focusing on either mangrove resources, fisheries, agriculture and livestock management or a combination of a few or several of these.

In the Gulf of Kutch, there is an urgent need to improve the knowledge base on characteristics, uses, threats and values of biological diversity as well as documentation of the vast traditional knowledge system. In addition, enhancing and improving the scope of community driven conservation efforts for bioresources like coral reefs and mangroves for community benefits have to be highlighted. In Malvan, multiple dependency on available bioresources necessitates the integration of agriculture, horticulture and fisheries based livelihoods in a sustainable manner. The study also pointed out that there is a need for a detailed scientific investigation regarding a large number of medicinal plant species, for wider popularisation

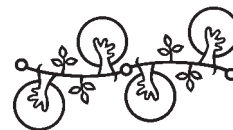
and commercialisation. In Chilika Lake region, the integrated action plan developed for the selected villages aims at multisectoral resource based alternate livelihood enhancement through implementation of the “biovillage concept” that would link ecological security with the livelihood security of the local communities. There is a need to alleviate the present pressure on the fishery resources through alternate agro-based intervention for sustainable utilisation of the bioresources. Large-scale plantation of elite aromatic plants available in the region e.g. Kewda (*Pandanus* sp.), in addition to several locally available medicinal and biofuel plants suitable to the agro climate of the region, hold promise of providing alternative livelihoods.

The study carried out in the Vembanad lake region points out that the livelihood strategy here could be focused around the most important resources of the lake - black clam (*Vellorita cyprioides*) and coconut. Mechanisation of the coir industry, with improvement of the byproducts, has potential of increasing the income of the local community. This site also has the potential for ecotourism since it serves as a waterway connecting many of the islands. The local community is of the view that commissioning

of the salt barrier, dividing the water body as southern fresh water part and northern saline water part, has created more problems than it has solved. The local community in the study villages has suggested that extended duration of opened shutters of the barrier in this region would increase the estuarine fish production and thereby the livelihood of the local communities. In Pulicat and Bhattarkanika areas, the study revealed that development of alternate livelihood options for the population requires an integrated approach of mangrove restoration, fisheries based activities, and marketing linkages for the products. The study was helpful in developing a framework for enhancing the livelihood opportunity of the coastal fishing and farming communities through the integration of new technology options for value addition and sustainable management of bioresources.

The studies conducted in these sites, it is hoped, would facilitate the development of biovillage paradigms for each location, integrating natural resources availability, community management systems and interaction with various user agencies at the grassroot level. A detailed report will be published by MSSRF and NBDB by the end of August, 2004.





Biodiversity and Biotechnology

A *Manual on Farmers' Rights has been prepared for use as training material. MSSRF and the Indian Farmers' Movement (INFAM) issued a joint declaration to transform Wayanad into an "Organic district" by 2007. The Review Committee on Genetic Manipulation (RCGM) of the DBT, Government of India, accorded permission for controlled field trials of the transgenic rice containing genes for salinity tolerance from *Avecennia marina*. The novel salt tolerant nitrogen-fixing and phosphate solubilising bacteria strain isolated from wild rice, *Swaminathania salitolerans* (gen. nov., sp. nov) is being field-tested at Chidambaram. Women SHGs in Karaikal region were trained to maintain a micro, vegetative and seed propagated bioenergy nursery of 70,000 plants, to be taken up for plantation in the coming year.*

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Sub Programme Area 201

Community Based Agrobiodiversity Conservation and Management

The activities carried out under the community based agrobiodiversity conservation programme are supported by the Swiss Agency for Development and Cooperation (SDC), the Ford Foundation (FF) and the International Fund for Agricultural Development (IFAD) and are being implemented in the Kolli Hills, Namakkal district of TN, Wayanad district in Kerala and the Jeypore Tract in Orissa. Food security initiatives supported by the World Food Programme are in operation in Namakkal and Jeypore. Following are some of highlights:

- Activities related to *Protection of Plant Varieties and Farmers' Rights Act* (PPVFR) and *Biological Diversity* (BD) Act during the year concentrated on the following: In collaboration with the UDRC, meetings were held for engendering the draft rules to the *PPVFR Act 2001* and the *BD Act 2002*. The recommendations for effective implementation have been submitted to the Ministries of Agriculture and Environment and Forests respectively. The proceedings of the workshop on *Farmers' Rights and Biodiversity: A Gender and Community Perspective* held on 27th and 28th February 2003, were released by Ms Lucy Maarse, Deputy Coordinator SDC/IC on 7th August, 2003. A manual in English on *Farmers'*

Rights was prepared and circulated during the International Year of Rice (IYR) Workshop held at Jeypore on 1st and 2nd, March, 2004. The manual is a simplified version of the PPVFR Act 2001 and prepared for use as training material for Panchayat Raj institutions and functionaries, farmers, NGOs, women's organisations and officials.

- Databases and Registers are assuming increasing importance in the creation of *prior art*, in view of international and national conventions, agreements and legislations. MSSRF has developed several databases, and hence a fair understanding of legal and technical issues in information and portal maintenance is essential. To arrive at a consensus, a series of meetings was held internally on Databases and Registers, to harmonise them into a common framework that will feed into the Farmers' Rights Information Service (FRIS) Database. The information on crops, seeds and varieties contained in the databases has legal implications under the PPVFR Act 2001.
- To commemorate 10 years of establishment of the Scarascia Mugnozza Community Gene Bank, a video film was produced and screened in the Italian Parliament in January 2004 by Prof GT Scarascia Mugnozaa.
- The Biodiversity Group in association with the HMRC organised the All India Radio Programme Executive (PEX) Workshop (TN) held in July 2003, at Chennai. The workshop aimed at communicating experiences learnt through project activities

to a larger section of the population, mediated through SHGs located in the field sites. This information sharing is expected to trigger similar efforts by rural communities.

- A Policy Makers Workshop on the theme, *Crop Diversity and Tribal Empowerment*, was conducted as part of the XIII Swadeshi Science Congress in Novemebr 2003 at the CAbC, MSSRF, Wayanad. Members belonging to various tribal groups aired their views on the subject. (See SPA 506)
- Details of training programme conducted during the year at different sites are given in table 5.3 under SPA 506

201.1 Kolli Hills and Namakkal

Activities were initiated in Kolli Hills, TN a few years ago, to develop models for the conservation of agro-biodiversity for food security, reduction of poverty and management of natural resources by widening the food basket. A model of commercialisation for conservation was created by making an attempt to increase the profitability of cultivating millet landraces through processing, value addition and marketing.

Marketing

Steps were taken towards marketing of millets and their commercialisation for conservation through Natural Resource Management (NRM), through a network of SHGs, who have been trained to process millets and make food products such as rava and flour from *samai* and *thinai*. As a part of the millet marketing model operation, a SHG is managing a de-husking mill with other processing facilities at Semmedu in Kolli Hills. The move has enabled the SHGs to increase their income. Prior to the MSSRF intervention, millets such as *samai* and *thinai* were bartered for other locally produced grains. Currently they are sold at the rate of Rs 33 per kg. The market demand which has increased to several tons per month, has encouraged farmers to increase the area under millets. During 2003-2004, an increase of 10-15% was observed in area under millet cultivation.

Table 2.1 highlights the employment and income generated during the year.

The district administration facilitated an outlet exclusively for Kolli Hills products at Namakkal. MSSRF helped the SHGs to set up a shop there

Table.2.1: *Wage days and income through millet products*

Products	Quantity (Kg)	Wage days	Income Rs			
			through Wages	through cultivation	through Processing	through value addition
Grain	12,755.50	255	12,750	25,511	0.00	0.00
Processed Grain	2,317.75	138	6,900	4,636	8,112.00	0.00
Value Addition	736.50	45	2,250	1,473	2,577.75	2,209.50

to sell processed millet, rice flour and health mix. An interest-free loan of Rs 60,000 was given to *Nanbargal Suyaodavikulu*, Kuchakiraipatti, to provide the capital cost for marketing. Around three tons of millets was marketed to Food World and local markets. Market linkage for millets export has been initiated with Ion Exchange Enviro Farms Pvt. Ltd (IEEF) and samples have been sent to BIOFAC, Germany for approval. Enquiries on millets availability have come from Salem, Erode and Kalvarayan Hills in TN and Hyderabad in AP.

Participatory conservation system

To sustain food production, activities have been conducted to revitalise the traditional grain storage system known as *thombai* into a community seed bank with necessary modifications, and have been institutionalized. This activity has enhanced seed storage and exchange and revitalized the cultivation of millets. Efforts have been made to train SHG members to maintain a stock and record of seeds of cereals, pulses, vegetables and horticultural crops and distribute them to people in need and collect seeds after harvest with interest. The number of millets landraces was increased for seed multiplication from six to fourteen in Kondichettipatti. 1183 kg of millets seeds were distributed to the *thombai* (*Seed bank*) maintained by SHGs to facilitate seed exchange. The sustainability of such mechanisms was further ensured through improved agronomic practices like seed treatment techniques, biofertilisers, biopesticides and quality seed production for

disaster management and environmental sustainability.

Increased production was promoted through participatory research in which traditional breeding and varietal selection were encouraged. Series of selections were made by the tribal community from more than 6,000 accessions of millets, drawn from different millet research stations. They were cultivated in controlled conditions and are currently being tested in their fields for identifying suitable varieties. The second cycle of participatory varietal selection, comprising 125 varieties, (65 Finger Millets, 36 Italian Millets, 24 Little Millets accessions) and 10 local land races was conducted and 31 varieties were selected. In addition 1,232 ICRISAT finger millet accessions were evaluated and demonstrated under mixed cropping and line sowing for enhancing the productivity, to optimise income through improved cultivation methods of nutritive millets.

Seed multiplication was conducted in the trial plot at Singilipatty, Namakkal, for 43 varieties (13 varieties of *samai*, 12 varieties of *thinai* and 18 varieties of *kelvaragu*).

As an anticipatory research, training in the production of *Trichogramma* parasitoid was imparted to *Sutru Sulal Padukappor Sangam*, Neduvalampatti, in Kolli Hills. This SHG has started trial production of parasitoid with one hundred trays. Marketing linkages have been negotiated in coordination with MSSRF site offices at Pudukottai and Kannivadi, with EID Parry, Pudukottai. A NGO, CHESS from Salem, visited Kolli Hills to learn from the SHG about *Trichogramma* production.

A seed driller was designed and developed by the site office for saving time and labour in sowing. Farmers of Kolli Hills and Namakkal received training in its operation. A seed drill was donated to Padasolai village, Thirupuli Nadu in Kolli Hills.

Biodiversity conservation and poverty reduction

Support to millet cultivation practices has led to a decrease in expenses in animal feed and brought about a net increase in income, thus reducing poverty. MSSRF has developed enterprise models such as community seed bank, community grain bank, organic pineapple collection centre, zero energy cool chamber for increasing shelf life of vegetables and information centre. Such infrastructure supports the cultivation of a variety of cereals, pulses, fruits and vegetables. Seven seed banks, developed in different regions of Kolli Hills, support more than twenty-five varieties of seasonal crops, which have helped to increase both wage labour and self-employment through processing and distribution and opened pathways for different agribusinesses through marketing. Several groups were encouraged to process millets using mini mills for de-husking, de-stoning and grinding. Linkage has been established with SHGs and the Horticulture Department to enable them to access various schemes. Training on compost heap making was imparted to SHGs. A model medicinal garden, compost pit and vermicompost unit were created, involving farmers at Kondichettipatti trial plot, for training purposes. Following

training in vermicompost, *Iyarkaivalam Padukappor* SHG established a vermicompost unit as an economic enterprise at Pananchattupatti, with the support of Rs. 45,000 from the Community Banking Project of MSSRF. SHG members of Kolli Hills and Namakkal were taken on an exposure trip to Krishna Vermibio unit at Namakkal. Organic farming training with DRDA and IEEF was organised for the organic pineapple growers. 133 tons of organic pineapples worth Rs 6.65 lakhs were exported to the USA through IEEF. SHGs supplying organic pineapple received an incentive of Rs 66,000 to get the organic product-marketing certificate from ECOCERT. Two SHGs in Thirupulinadu were facilitated to receive Rs 2.5 lakhs for organic pineapple cultivation through Indian Bank.

Training and capacity building

Training is imparted on a continuous basis to promote the cultivation and consumption of vegetables, pulses, nutritious millets and animal products like milk and eggs, by depicting their nutritive value. Fodder grass and vegetable seeds were distributed through SHGs to farmers at Kolli Hills in Thirupulinadu, Gundurnadu, Alathurnadu and Valavandhinadu. Medicinal plants from Nature Clubs were distributed to SHG members. The importance of consuming sufficient food, especially for pregnant women and nursing mothers, was also highlighted. During this year, 120 school children of Valvil Ori Higher Secondary School joined the MSS Nature Club. The medicinal plant nursery in the Nature Club has grown from 6 to 80 species of medicinal plants, besides maintaining the

Hill banana model. Under the Genome Club activities in Namakkal, 79 Government Higher Secondary school students (boys and girls) were trained. Trekking, awareness campaign and veterinary camp were conducted in collaboration with the Indian Bank, Semmedu and Department of Animal Husbandary. An exposure visit for SHGs at TNAU, Coimbatore was organised as part of Farmers' Day celebrations. Panchayat leaders of Kolli Hills were exposed to biodiversity conservation, NRM, poverty reduction approaches and biodiversity policies during the Panchayat Raj trainers' training programme conducted by the Block Development Officer, Kolli Hills.

A two-month training on Information Technology was organised for *Snehithi Suyu Uthavi Kulu* in Kondichettyatti, with the help of DRDA, and COMP-TECH International, Namakkal. Subsequently an information centre was opened at Vanigavalagam with the support of DRDA, Namakkal and is maintained by the SHG.

Networking and partnership building

Inter project exchange visit of women field staff to learn from each other was facilitated by UDRC. Ms Chitra spent a week understanding the Biovillage Project at Pondicherry. Subsequently, Ms Meenakshi from the Biovillage Project spent a week as resource person at Kolli Hills. An inter project meeting of the different projects operating in Namakkal and Kolli Hills was also facilitated by UDRC. (See 401.2)

Information on activities in Kolli Hills, was shared with the Director of AIR during the media

workshop held at Chennai and to representatives of SHGs and folk song singers were invited to perform. A brainstorming session on developing strategies for Namakkal district with special focus on Kolli Hills, in the context of the millennium development goals, was organised at Namakkal in December 2003. A follow-up meeting was held in April 2004 to draw up specific action plans.

Community feed banks for poultry development and strengthening nutritional security

The Community Feed Grain Bank (CFGB) is being promoted as a strategy to increase feed grain cultivation and develop poultry industry for livelihood and nutritional security, both at the household and community levels in Namakkal.

Increasing sustainable production of maize

Area selection: Maize is a crop that neither grows in wetland nor in dry conditions, hence a pilot study was undertaken with two women SHGs cultivating maize on leased land. Farmers were encouraged to grow maize in Parali and Tholur Panchayats of Namakkal in 2002. It was found that in the well-drained red soil areas, the performance of the crop was poor. The performance was better on black cotton soil. With this experimental intervention as a base, discussions were held with the TNAU and Government agricultural department on suitable areas for maize promotion. Varagur in Namakkal and Veerabayangaram in Kallakurichi were identified for creating a model for maize area expansion. With a view to

increasing area in the first phase, large land holding progressive farmers were approached and farmers' clubs were formed in the two villages under the concept of Vikas Volunteer Vahini (VVV club) of NABARD for CFGB activities.

Demonstration and training on maize cultivation: Maize cultivation was demonstrated at both farmers' fields and trial plots of MSSRF in Namakkal. Five different varieties of maize, with different cultivation patterns such as spacing and biofertiliser treatments, were demonstrated in both places. The farmers were given training in seed processing, sowing and spacing between rows and plants for different conditions. During the growing season a training programme was conducted to identify nutrient deficiencies, pest attack, and crop growth. At the end of the season the crops were harvested and post harvest training programmes were conducted. The farmers were trained in drying the crops for moisture maintenance, shelling and grading.

Seed distribution: The farmers' club in Varagur was given popular varieties of seeds as loan for cultivation. The cost of the seeds was paid back to MSSRF after harvest and the interest went to the club fund. One hundred acres of land in Varagur and three hundred and fifty acres of land in Veerabayangaram were put under maize on-farm demonstration for farmers by farmers in Namakkal and Kallakurichi. Scientists from MSSRF visited these plots periodically and provided guidance.

Confidence building measures: Meetings, workshops and brainstorming sessions were

conducted on the economics of maize cultivation and marketing. In this exercise, leading personalities from the poultry industry and banks had a dialogue with the farmers (See SPA 506). Public awareness was created through the local newspapers, magazines, pamphlets and meetings. As a result of the direct and indirect impact of these activities, around one thousand acres of land in and around Namakkal was brought under maize cultivation.

Operational model of CFGB: A feed grain bank model was developed, in which the farmers encourage groups of landless labourers (SHG) to take up hybrid seed production. A group of landless labourers was given a mini maize sheller designed at MSSRF, Namakkal. The residue from the shelling has been identified for making paper. The purchased grains are to be stored in the feed grain bank and sold to the poultry units when the price is favourable. Seven SHGs have been formed for operating the CFGB model. The Agriculture Department gave 50% subsidy for two hand-operated maize sheller machines designed by MSSRF, Namakkal. Maize seed production training was given to 6 farmers' club members and 6 SHGs at TNAU, Coimbatore.

Training was given to 50 SHG members from Pondicherry on maize cultivation and exposure visits were arranged to help them to understand the three stages in poultry rearing and the different ingredients in the feed mixture.

Backyard poultry promotion in Kolli Hills: SHGs in three villages of Kolli Hills were selected for promotion of backyard poultry and mixed

farming systems. Little millet, (*Sama*), Italian millet (*Thina*) and maize seeds were distributed from the seed bank at Kolli Hills to the farmers for cultivation and for feed. Farmers were trained to cultivate these crops in mixed cropping and intercropping with tapioca, as feed to the birds and in turn enhance their household nutritional security by consuming eggs and chicken meat. The SHG members were asked to feed the birds with the prescribed quantity and mixture of locally available millet grains as per the recommendations of the Nutrition Department of the Veterinary College. Weekly records were maintained on the feeding behaviour of the birds and their health.

Health cards were given for cross checking feeding behaviour, growth and diseases. Nutrient deficient symptoms were taught and tablets like B-complex given for appropriate use. Farmers were also trained to vaccinate their birds periodically. Three training programmes were conducted in which Lassota vaccine was fed to the birds through mouth, nose and eyes at an interval of twenty days. Farmers were also taught to provide preventive antibiotics to the birds when needed.

201.2 Wayanad

The Community Agrobiodiversity Centre (CAbC) held the Swadeshi Science Congress in association with the Swadeshi Science Movement from 6th to 8th November. The theme was crop diversity and tribal empowerment (See SPA 506). It has helped in strengthening partnership and networking with line institutions, NGOs and local administrative bodies in

capacity building for the sustainable management of agrobiodiversity. For building such a “bio-partnership” initiative, a plan of action and strategy was carefully developed and implemented under the guidance of the Programme Advisory Committee of the Centre, chaired by Prof M K Prasad.

Another significant development during the year was a joint declaration of MSSRF and INFAM (Indian Farmers’ Movement) to transform Wayanad into an “organic district” by 2007. Short-term placement of students from various institutions began during the year and helped the Centre to increase its information base. Inputs were given at two meetings held at the Arya Vaidya Sala, Kottakkal, to carry forward the work on *Njavara*, a traditional medicinal rice variety of Wayanad, and establish linkages with ongoing work.

Biodiversity conservation and integrated NRM for poverty reduction

Supported by the SDC, the project entered its fourth year, with core activities such as paddy ecosystem conservation, development of an NRM model village, networking and partnership building, women empowerment and collaborative research.

Paddy ecosystem conservation: The SRI-Madagascar technology was tested in selected areas in partnership with both traditional and progressive farmers for increasing the yield. An increase in the yield of 2 to 4-fold, compared to the conventional transplanting method, was reported. Traditional varieties like *Njavara*, *Veliyan*, *Gandhakasala* and *Chennellu* were

cultivated under this method. The yield variations were calculated scientifically and reported, notably by the print media. Seed purification of *Njavara* was continued. In order to sustain rice cultivation in the district, MSSRF helped the Department of Agriculture to submit a proposal to the State Planning Board.

Development of model NRM village: The concept of NRM model village, reported last year, is in progress. The ultimate aim of the NRM village is to develop a replicable model in village development, in line with the conservation of biodiversity and agricultural productivity. The integrated farming system involves cultivation of vegetables, mushroom, commercially viable plantain varieties and medicinal plants and vermicomposting. The villages now ensure water conservation, soil management and recycling of agro wastes. The activities include:

People's institutions for effective implementation of the development activities: Six institutions, Steering committee, Satellite committees, Farmer SHGs, Women SHGs, Water Users' Committee and Nature Conservation Corps were set up and are partners in the management plan of their village.

Farm survey and resource mapping: The household level farm survey completed during the year shows that the total agricultural land is around 250 ha, out of which 225.4 ha are used for cultivating coffee, pepper and other cash crops. Of the 24.7 ha of paddy field only 4.05 ha are used for rice cultivation, while the rest is used for banana, ginger and tapioca cultivation. Analysis of the survey results

revealed that the current NRM needs help in terms of agro-ecosystem sustainability. Decline in soil fertility due to top-soil erosion is a serious problem.

Training and capacity building for sustainable resource utilisation: Transfer of technology in rice intensification, composting methods, bio-pesticide production, herbal medicine preparation, sericulture and nursery techniques continued in the NRM village. The methodology adopted for the intervention included field visits, exposure visits, training and interface between scientists and farmers. A series of training programmes was organised for women SHGs to prepare herbal medicines for meeting their primary health requirements. Even though there is good market potential, the SHGs face many constraints like lack of proper marketing outlets. One SHG has started a nursery unit and is producing seedlings of areca nut, pepper, coffee, cardamom and medicinal plants.

Training was given in compost making. A handbook was prepared and distributed to farmers to explain the techniques of soil conservation. With the collaboration and financial support of the Spices Board, 25 vermicompost units were established in the village. More units are under construction. The target is a vermicompost unit for every needy household by 2005. Under the leadership of the water users committee, two vital water bodies were renovated. They also organised awareness and orientation on water conservation techniques. Efforts were made to conserve local varieties of banana, tubers, pepper, medicinal plants and vegetable crops. The seed

materials were distributed to interested farmers.

The Centre takes a keen interest in rewarding farmers who contribute to village sustainability by way of innovative approaches in conserving natural resources and crop diversity. At the 13th Swadeshi Science Congress, three farmers from different categories—Tribal Farmer Conserver, Traditional Farmer Conserver and Farmer Cultivator—were felicitated. This made an impact in their respective villages in promoting alternative methods of agriculture.

Seed exchange mela and vegetable gardens: In order to establish vegetable gardens in every household in the village, a vegetable seed exchange *mela* was organised. Seeds of more than 17 species were exchanged among 175 farmers as shown in Table 2.2.

Partnership building: Coffee and spices are the main crops cultivated in the NRM village. In the first stage of the intervention itself, efforts were made to provide links with institutions such as Coffee Research Station and Spices Board for technical guidance in cultivation, yield maximisation, organic farming and post harvest handling. Organic cultivation of pepper and vegetables was initiated in collaboration with the State Agriculture Department.

Networking and partnership building

INFAM – MSSRF joint programme on organic farming: MSSRF extended technical help to INFAM, Wayanad, in the area of organic farming. A training programme was held for 25 trainers, called “Organic Inspectors”, in order to transfer technologies from Lab to Land.

WARDA-MSSRF joint initiative for Agri Export Zone inclusive of Wayanad district: A multi-stake holder association named Wayanad Agriculture and Rural Development Association (WARDA) came into formal existence on 20th February. A report on the feasibility of agri exports of the district was prepared and submitted to the Ministry of Agriculture, Government of Kerala.

State Planning Board – MSSRF initiative: Building a partnership with the agriculture policy-making body of the State Planning Board formed an important strategy and approach. Two proposals on addressing the issue of low productivity in rice farming and herbal development under the Rashtriya Sama Vikas Yojana programme were submitted to the State Planning Board. Both were approved and the responsibility of implementation of the latter project was given to MSSRF.

Table 2.2: **Details of Seed Exchange**

Name of the area	No. of varieties exchanged	No. of farmers attended	Male	Female	Quantity (Kg.)
Bappanammala	17	47	9	38	3.5
Panthipoyil	17	42	12	30	2
Narippara	17	45	27	18	3.5
Alakandy	17	40	7	33	3

Women empowerment: 15 new SHGs were formed during the year in the NRM village and linked with Panchayat schemes. Two more SHGs in this village started herbal medicine preparations. A *Harithasangam* formed in collaboration with the Agriculture Department, initiated mass vegetable cultivation in 1 ha land. This year the Centre took the initiative to link the SHGs with financial institutions. Four more SHGs availed of interest free loans from the Community Banking project of MSSRF. With the financial help of Krishi Bhavan and the Municipality, one nursery unit was started in Puthoorvayal. In order to address violence against women and weaker sections of society, the SHGs formed by MSSRF organised a Police and Public Interaction meet at Chooralmala.

Sustainable use of medicinal plants

Revitalising the primary health care traditions through trained women SHGs continued as an important activity. Efforts were made towards value addition and marketing of some selected products. The highlight of the year was approval for the mega project on the development of 10 selected herbal products by the State Planning Board. Establishing community level nurseries was continued for important medicinal and spice plants used in primary healthcare needs. A medicinal plant cultivators' society named *JEEVANY* was formed to help small-scale farmers to cultivate and market medicinal plants. 165 farmers registered in this society were linked with KINFRA for large-scale cultivation of medicinal plants.

Other initiatives included conducting community level awareness programme and

SHG leaders training programme for uniform quality maintenance of products, arranging village level medicinal plant germplasm pool to ensure the continuous supply of some drugs, publication of a revised handbook on primary health care and medicinal plants, planting 26 *ganams* of medicinal plants based on *Charakasamhitha* in the CAbC campus, with partial support from the State Agriculture Department and revising a handbook prepared earlier on medicinal plants. MSSRF-friendly groups were formed with the purpose of enhancing the outreach of the Foundation's activities and messages to a wider community.

Building LEISA farms

LEISA farm intensification work continued with diversification of crops like turmeric and ginger and some tuber crops at the interspaces of coffee/ crops. To popularise the concept of agro-forestry, a new initiative, namely live collection of star plants, was initiated. 15 plants were collected and maintained in pots as exhibits. A manuscript on common bio-pesticidal plants and bio-pesticidal formulation is under preparation. Training in earthworm culture and azolla cultivation was provided to the farmers. Earthworms and azolla were supplied as nucleus culture.

Studies on wild edible foods and RET species

Information on 38 species of wild edible mushrooms was documented and 22 species were collected for *ex-situ* preservation. A booklet in the local language on wild edible greens was also prepared. For the purpose of

dissemination of information related to edible wild resources, a computerised database is being developed with the help of the Knowledge Centre team. Field trips to different parts of Wayanad were conducted in different seasons and 37 species of wild edible greens collected and planted in the CAbC garden. 18 species of edible mushrooms and 35 species of fish are maintained at CAbC as museum collection. Intensive education and awareness programmes were conducted for various groups like students, farmers and women.

A herbarium of 145 species of flowering plants, including edible species, was prepared. A new species of *Medinella* was described and an endangered flowering plant *Eugenia argentia*, a little known tree reported as possibly extinct, was relocated. 145 species of grasses were identified.

Every child a scientist

The biodiversity education programme under this initiative, started in January 2002 with the support of the DBT, Government of India continued in building the capacity of children and adults to use bio and natural resources in a sustainable and equitable manner.

- 100 children, including 60 belonging to Scheduled Communities, were trained in biodiversity conservation.
- Over 7,000 students were given orientation in various aspects of biodiversity through off-campus programmes.
- Quality resource material was prepared with the active involvement of experts. A

resource person was appointed for professional guidance.

- Dropouts were persuaded to re-enter school.

201.3 Jeypore

The projects under community-based agrobiodiversity conservation, natural resource management and food security are being implemented in the villages of Patraput, Tolla, Kasiguda, Boliguda, Pujariput, Nuaguda, Taliaguda, Bhaluguda, Balia, Bisoiput, Badapar, Kanjai, Maliguda, Chhemiaguda, Bedaguda, and Mahuli of Koraput district; Lavanyanagar, Betabadi and Murudimaha villages of Khandamal district and Routpada, Lineguda, Michashola villages of Kalahandi district.

Pallisamitis (village councils) in the villages now undertake activities like organising meetings, development planning and mobilisation of funds, in a transparent manner. The success of the efforts can be measured in monetary terms by the volume of contribution to the village development fund which has presently reached Rs 1,00,000.

In September 2002, the tribal communities of the Jeypore Tract received the Equator Initiative Award for Innovative Partnership for Sustainable Development in Tropical Ecosystems. Following this, a *Panchabati Gramya Unnanyan Samithi* (PGUS) consisting of 100 general body members, comprising 52 men and 48 women from 16 villages of the Boipariguda Block of Koraput District, has been constituted. The Executive Committee of the PGUS will operationalise activities related to

biodiversity conservation, its enhancement and sustainable use and equitable sharing of benefits. Participatory conservation activities continued at Jeypore, linked with the Community Gene-Seed-Grain Bank. Emphasis was laid on developing viable marketing strategies for *kalajeera*, a local scented landrace of rice chosen by tribal farmers for purification and commercialisation.

Participatory plant breeding for poverty reduction

Participatory improvement, enhancing commercial value of LRs: Participatory selection in people-preferred landraces (LRs) and their seed purification in contiguous seasons have consistently shown substantial improvement in realized yields and grain quality. This has spurred tribal farmers to select a highly scented LR, *kalajeera* for commercial exploitation as briefly reported last year. A few farmers from Patraput village allotted contiguous plots, totaling 2.6 ha, to produce pure seeds and quality grains of *kalajeera* on a large scale. MSSRF scientists trained the farmers and monitored field activities. Twenty-nine quintals of *kalajeera* pure seeds (equivalent to 'breeder seed') and 14 quintals of grain were deposited in the village seed bank. A *kalajeera* seed management committee, headed by a woman farmer, was constituted for managing seed and grain production, storage, marketing and equitable sharing of benefits. Farmers from a few other villages have also produced pure seeds of *kalajeera*. Seeds produced from the MSSRF-supervised seed plots have been stored in the seed bank

at Tolla while seeds from other villages are stored in their respective village seed banks. A market survey has defined several options of sale of grains: among fellow farmers in nearby areas, in local retail markets, to rice millers, and in markets in cities like Bhubaneswar. It is encouraging that there was demand for *kalajeera* (both seeds and grains) from various sources, including the Government of Orissa even during harvesting.

Conscious efforts were made for meticulous accounting of *kalajeera* seeds in seed banks. A passbook (in Oriya language) was given to each farmer to enter the quantity of grain/seed deposited by him/her in the seed banks. Exploratory sale of seeds and grains at the Orissa Government Exhibition and MSSRF – organised International Year of Rice 2004 meet has been encouraging. Seeds were sold at the rate of Rs 18 per kg and rice at the rate of Rs 22 per kg.

It is therefore clear that *kalajeera*, as a scented and preferred LR, can be commercialised more vigorously in future. At the same time, it was recognised that the rights of the farmers who produced seeds and grains of *kalajeera* should be protected under Act, 2001, the implementation of which is yet to begin.

Two interim measures were taken in this regard – to get a simple MoU signed by every purchaser of grain/seeds to the effect that the material would not be exploited in any undesirable manner like resale in a different name etc. and the prior informed consent of the farmers concerned (with the seed-grain bank

from where the material was purchased) would be sought as needed, and to initiate action to get an AGMARK in the name of *Basna Rani Kalajeera*.

The reach of PPB and PPB-based extension: The PPB programme was initiated and continued in only six villages near the MSSRF site office at Jeypore for operational ease. Over a period, the benefits of Participatory Crop Improvement (PCI) and participatory conservation system (PCS) began to reach farmers in several villages, essentially through farmer-to-farmer extension. MSSRF facilitated this process by building the capacity of PPB farmers through regular training programmes and knowledge transfer exercises. Purposive FAQs and Question – Answer sessions were built into every PRA that was conducted to enable farmers to raise good crops. It was found that more than 10 villages in 3 blocks and 2 districts (Table 2.3) became beneficiaries of the successful initiatives for sustainable livelihood from diverse LRs. This is evident from the high returns obtained by tribal farmers through LR cultivation in Jeypore (Table 2.4). Farmers finally selected six LRs for large-scale cultivation, two each for upland, medium land and lowland. But

the knowledge on improved practices of LR cultivation, seed purification and quality grains that contribute to accelerated economic benefit from LRs, spread very fast from farmer-to-farmer. The net result is the substantial increase in area allotted to LRs and the number of seed banks that have come up for storing seeds/ grains before disposal.

Participatory Conservation System (PCS)

Participatory Plant Breeding (PPB) has institutionalised the process of PCS right from the beginning. Farmers have realised the commercial value of their LRs and the need to conserve them. They have volunteered land and labour to conserve LRs. MSSRF provided seeds of LRs initially. Every year, after regeneration, farmers returned a good quantity of seeds, which were distributed the following year, leading to a self-sustaining cycle of PCS. Thus 45 LRs were regenerated in 2001, 64 in 2002 and 39 in 2004. An analysis of 17 common LRs across the years based on six productivity traits viz, plant height, number of tillers/plant, number of panicles/plant, panicle length, number of grains/panicle and grain fill index, has placed two LRs, *Alasikiba* and *Baramasi* at the top,

Table 2.3: **The reach of PPB and PPB-based extension**

Year	Villages	Gram Panchayats	Blocks	District
1998	13*	12	6	3
1999	6 [#]	4	2	1
2000	13	7	4	1
2001	13	7	3	1
2002	9	6	3	2
2003	10	6	3	2

Includes demonstration and voluntary extension villages * (Pre-PPB survey) [#](PPB Demos)

Table 2.4: **Status and benefits of Land Race cultivation in Jeypore Tract**

	2001-02			2002-03			2003-04		
	UL	ML	LL	UL	ML	LL	UL	ML	LL
Annual Income from LR cultivation (Rs. per acre)	2400	4800	7000	3800	7200	9800	5000	8000	9800
LRs conserved by people in FSB	24.00				29.00			20.00	
LRs cultivated by people in large plots	41.00				28.00			25.00 *	
Area under landraces (ac)	8.60				45.80			75.70	
Community Seed-Grain Banks	3.00				8.00			8.00	

* after selection and verification of variety characteristics UL-Paradhan; ML-Sapuri; LL-Kalajeera

with the rest aligned in medium (13 LR) and low (2 LR) performing groups. The top two LR will be further evaluated for their performance.

Large scale cultivation of LR: While planting *kalajeera* for sale of seeds and grains, farmers desired to cultivate other LR for consumption. This was just to ensure more income from expensive *kalajeera* through sale of grains and seeds. This voluntary option by farmers provides an indirect avenue of large scale conservation of several other LR.

An analysis of the performance of the LR jointly on grain yield and harvest index is given in Table 2.5.

An overall evaluation has shown that PPB is a path to plenty in the tribal tracts of Jeypore.

Community food banks (Gene - Seed - Grain bank continuum)

This project is in operation in 16 villages in Koraput district and three villages each in Khandamal and Kalahandi districts. Scientific

storage structures were constructed with technical guidance from the Save Grain Campaign. The food stock has grown by four or five times, to 24 and 30 quintals in most of the villages, the maximum stock of 70 quintals being recorded in Kasiguda over a period of two years. The grain banks are maintained by women SHGs, but the entire community helps the committee transact business and check defaulters. The food banks in the target villages are now seen as their security in lean periods. The seeds are no longer consumed during periods of scarcity as the grain bank is available. An effort has been made among all villages to network the Food Banks and make the surplus available to neighbouring villages. The contribution of ragi seed and grain to the food bank was minimum and hence not sufficient to fulfill all the demands of farm families. Therefore a synergy is planned between the CFB project and promotion of underutilised nutritious crops in this area to address the gaps.

Table 2.5: *Eleven LRs under large scale cultivation – Kharif 2003*

Rank	LR	Cultivation villages	Rating
1	Muktabali	Nuaguda	High
2	Sapuri	Nuaguda	
3	Kalajeera	Nuaguda	
4	Kalajeera	Pujariput	Medium 1
5	Barapanka	Nuaguda	
6	Gathia	Nuaguda	
7	Machhakanta	Nuaguda	Medium 2
8	Sapuri	Tolla	
9	Gathia	Baliguda	
10	Muktabali	Tolla	Low
11	Paradhan	Nuaguda	

Cropped area varied from 700 to 3000 sq.m.

A model CFB has been set up in Michashola village in Kalahandi district with contributions from the community and MSSRF. The food bank was started with 550 kg of food grain and now the stock has grown to 670 kg. 24 accessions were collected and deposited in the Gene Bank. The Community Seed Bank was established with a contribution of 155 kg of seeds by the community and now the corpus seed stock has increased to 297 kg. A storehouse for Community Seed-Grain continuum has been constructed.

Some of the problems encountered by the Seed Bank were lack of skill in quality seed production, rapid decrease in land races, loss of four or five varieties in each village, illiteracy and consequent difficulty in the maintenance of CSB records. But there has been a significant change in the seed-borrowing pattern, with many families becoming self-sufficient.

Dependence on seed banks is decreasing, as 40% of the farm families are confident of producing quality seed and storing them. They are skilled in using the right quantity of seeds for their cultivation. Farmers from other villages are purchasing seeds from these villages. Crops other than rice are also being maintained in the seed bank. Production of rice is increasing due to quality seed availability. There is a decrease in the dependence on village moneylenders for loans in all the villages.

Infrastructure for community food storehouse, water bank and soil conservation was facilitated in 5 villages in Koraput, 3 in Kandhamal and 2 in Kalahandi districts.

SHGs and micro enterprises: The SHGs in the project villages are now capable of maintaining records, preparing proposals, mobilising funds, approaching banks for assistance, raising their voice against social issues, organising

meetings, collecting monthly contributions etc. Market driven micro enterprises supported by micro credit, have been initiated by the self-help groups and by individual members. The SHGs are monitored by the *Pallisamiti* of the respective villages to enhance their efficiency and ensure repayment.

In Michashola in Kalahandi, two women SHGs received Rs 6,000 each from the concerned bank to initiate micro enterprises and one women group got Rs 5,000 as matching grant from ICDS.

Vermicompost as an enterprise was initiated and managed by 53 farm families from 10 villages. MSSRF and the Spices Board supported construction of 22 cement structures for vermicompost production, while the rest were of the bamboo basket type. In addition, three unutilised biogas tanks were taken over for vermicompost production.

Issues such as alcoholism, caste conflict, exploitation by moneylenders, education of children, domestic violence, child labour, wage-related exploitation, malnutrition and entitlement etc were raised by SHG members in different villages before the *Pallisamiti*. Many of the SHG members were able to release their mortgaged land from moneylenders. The *Pallisamiti* has become more empowered and vibrant by taking these issues to the local administration.

Other activities: Entitlement Cards, listing Government schemes for the poor, were printed in Oriya and dissemination workshops held in the project villages. Training programmes were organised on NRM, biofertiliser, biopesticide,

formal cultivation methods, seed purification, seed storage, breeding poultry and fish, mushroom cultivation, and value added products from rice and millet. Awareness camps were conducted in the villages on aspects like balanced nutrition, environmental sanitation, social issues and degradation of biodiversity. Community medicinal plant gardens were established by the community in many villages and backyard kitchen gardens were promoted. In Michashola, health awareness campaign and check up camps were organised twice in association with the Department of Health and Family Welfare, Government of Orissa. 217 cases were identified and treated with medicine supplied by the Department. The Department also gave some medicines for emergency treatment. A Biodiversity Fair was conducted for farmers belonging to 16 villages, to assess the diversity of the agricultural crops of the region.

Networking and capacity building

The focus was on strengthening the capacity of target groups like NGOs, GOs, farm families, SHGs, researchers and local people in improving soil fertility, bio fertiliser preparation and application, replication of activities by NGOs & GOs in the area of pure seed production, PPVR Act and seed and food banks. Network was established with the Spices Board, Koraput, with whose support, the construction of a vermicompost tank was possible with ATMA, Koraput, providing technical guidance and training. One state level workshop on community food bank and food security was organised, in which representatives from 50

NGOs and 16 Government Departments and Universities participated (See SPA 506).

Management of water resources

Three check dams were constructed in the villages of Tolla and Maliguda in Jeypore. The ponds are dependent on water percolating down from the streams, which were recharged after the intervention of the villagers. The two-percolation tanks at Tolla cover an area of 0.3 ha sq m in which water to a depth of 5 ft remains throughout the year. The pond irrigates on an average 7.3 ha, utilised by 20 families, in two seasons. In addition, it has protected more than 8.1 ha from sand casting. 2.03 ha of land was utilised for raising horticulture crops. At Maliguda, the tank covers an area of 0.0045 ha and the depth is 19 ft. Water from this pond was utilised throughout the year for vegetable cultivation and agriculture. It benefited 60 farm families, mostly from Mali communities, who are vegetable growers. These people were also successful with pisciculture activities.

The ponds have provided water to households as well as drinking water for livestock, which were saved from sunstroke. An area of 4.86 ha of a forest at Tolla is supported by this pond. Wild animals have come back to the forest due to easy access to water. Fish farming and horticultural activities initiated by the villagers are remunerative to the village committee. Resolution of conflicts in the village could be achieved due to mass participation in such activities. Construction of water harvesting structures with little expenditure has encouraged the people to undertake several

development activities that have helped the village as a whole.

At Gunduri village in Kalahandi, 6.07 ha of agriculture land was saved from sand casting during the rainy season due to the construction of check dams. 4.86 ha of agricultural land was irrigated. Although MSSRF has departed from these villages, the activities are being continued.

Enhancing the contribution of nutritious but neglected crops (millets) to food security and to incomes of the rural poor

The project is under implementation in Balia village of Jeypore. The activities undertaken are farmer participatory varietal trial on Finger Millet, Little Millet and Italian Millet, farmer participatory yield enhancement trial on nutritious millets, value addition, processing and marketing, creation of local capability for production and supply of good quality seeds of millets, survey on use, constraints and opportunities of millets, and documentation of local knowledge of millets.

The process adopted for carrying out the above activities includes village meetings, PRA on the agricultural status of the village, identification of interested farm families, linking with existing Community Gene-Seed-Food Bank, training and demonstration on formal methods of cultivation, participatory varietal selection, initiation of micro enterprises, awareness on including millets in the daily diet for nutritional security and training to SHG members on preparation of millet based nutritious value added products.

Farmer participatory varietal trial and selection:

The trial was conducted in two replications through RBD design (Table 2.6). Selection of preferred varieties was made in a participatory mode by 43 farmers (20 men and 23 women) and 5 scientists. The criteria for selection included duration, grain and fodder yield, taste, colour, time of maturity and land type (upland, medium and lowland). Women appeared to give more importance to grain colour, taste, fodder yield, time of maturity and local traditional varieties, while men considered grain yield, land type, duration, and market demand. 27 varieties were in this manner (Table 2.7).

Farmer participatory yield enhancement trial:

Two demonstrations were conducted, which improved agronomic practices such as use of quality seeds, optimising seed rate and sowing in time and in rows. Intercropping of millets (Finger Millet and Little Millet) with pigeon pea and niger was also introduced.

Value addition and networking: Exhibitions were organised during tribal fairs in the region, at which millets were sold. A booklet has been published in Oriya giving recipes using millets. Four SHGs (2 men and 2 women) established through the CFB Programme were facilitated to take up value added millet activities. Four NGOs of three districts have shown interest to replicate our activities. An orientation-cum-awareness training was conducted on the use of nutritious millets for urban housewives. A video documentation was done of millets grown in the demonstration village.

Creation of local capability for production and supply of good quality seed:

Seeds of 4 varieties of Finger Millet and 3 varieties of Little Millet (both local and improved) were multiplied during the kharif season to meet the seed demand of farm families. 181 kg of Finger Millet, 6.8 kg of Little Millet and 6 kg of Italian Millet certified seeds were provided to 50 farm families. More than 50 acres of land was brought under Finger

Table 2.6: *Farmer participatory varietal trial*

Millets	<i>Ex-situ</i> Collection	Local germplasm	Total
Finger Millet	100	9	109
Little Millet	25	4	29
Italian Millet	39	3	42
Grand Total			180

Table 2.7: *Participatory varietal selection*

Millets	<i>Ex-situ</i> Collection	Local germplasm	Total
Finger Millet	7	2	9
Little Millet	9	1	10
Italian Millet	7	1	8
Grand Total			27

Millet and Little Millet cultivation in 2003, as compared to four acres in 2002. This increased the possibility of availability of quality seeds at the local level. Seeds of 9 selected varieties of Finger Millets were multiplied during summer to meet the demands of the farm families of the demonstration villages.

201.4 Community Gene Bank

Community Gene Bank is one of the components of the integrated gene management system, which links *ex-situ* facility with *in-situ on-farm* conservation.

Plant biodiversity

The National Agricultural Technology Project on Plant Biodiversity (NATP-PB) extended the project period by nine months on its conclusion in March 2003. In addition to germplasm exploration, the project organised exposure visits for farmers from Galigattum village to Chidambaram, Pondicherry, Chennai and Thiruvannamalai. In Chengam, Pudupattu village seed bank distributed seed materials to needy farmers. Two women SHGs received a revolving fund from the SBI, Thiruvannamalai.

Under this project, the main focus was on exploration and characterisation of germplasm and on-farm conservation in TN and Wayanad. Overall, 474 germplasm were collected and deposited. The collection includes traditional cultivars, medicinal plants, minor fruits, sesamum and dye yielding plants. The project has undertaken *on-farm* conservation of medicinal plants by establishing herbal home gardens in Vadakku Pichavaram and

Keerapalayam, Cuddalore district. To boost the interest of the villagers, a free medical camp was organised with the help of Siddha Doctors. Training was arranged for women SHG members in home remedies. In Wayanad, three colonies were identified to focus on legumes and cucurbits cultivation and one women group was formed to monitor cultivation.

Germplasm exploration: Exploration activity was done in TN and Wayanad in Kerala. In TN exploration was conducted in Thiruvannamalai district, Tirupattur in Vellore district, Bhavani in Erode district, Rasipuram in Namakkal district, Sankari in Salem district and Chengalpattu district. A total of 48 germplasm were collected during the year and have been deposited with the NBPGR both at Thrissur and New Delhi. In Wayanad, exploration was conducted in Kartikulam, Pavagadda, Chandarathodu, Pannipatti, Tholpatty, Vellarimala, Noolpuzha, Kuttiyadi, Memmeni, Karragu, Alathur, Triunelli, Lakkidi, Puttumasla and Chooralmala.

Germplasm characterisation: IPGRI and NBPGR descriptors have been taken into consideration at the time of characterization for paddy and millet. Observation was done at the early and late vegetative stage, active tillering stage, panicle initiation stage, flowering stage and maturity stage. At Chengam, Thiruvannamalai district, from June to December, 60 paddy and millets collected under the Plant Biodiversity project were taken for characterisation. Out of the 60 materials taken for field trial, 40 germplasm have been characterised. In Wayanad, between January and August, 20 legumes and cucurbits which

were collected under the Plant Biodiversity project were given priority for characterisation. In addition to the morphological characters, protein estimation for 12 germplasm was completed with the help of TNAU. In Jeypore, Orissa, with the support of the SDC project, characterisation of paddy germplasm was taken up from June to December. 100 gene bank accessions collected earlier from Orissa were taken back to the field for conducting characterisation as part of the gene bank activities. Herbarium was also prepared in the field for each variety; they are yet to be deposited in the gene bank.

Germplasm conservation: A total of 474 germplasm accessions, along with the passport data, have been deposited with both NBPGR Thrissur and New Delhi. Cereals alone are stored at the MSSRF Gene Bank in Chennai. In addition to this, 105 gene bank accessions of vegetables, spices, cotton, grass, wheat, oil, rare, endangered and medicinal crop species have also been sent to the NBPGR, New Delhi. Voucher samples of seed materials received along with the data recorded from the field after characterisation were also sent for storage. NBPGR has allotted IC numbers for all the accessions sent for storage.

Community herbarium: The original voucher specimen of the plant materials with reference to the rare, endangered, medicinal and traditional cultivars have been housed at the Foundation. Voucher specimen for 100 traditional paddy germplasm accessions were prepared at the time of characterisation study conducted at Jeypore. The herbarium houses

a total of 733 classified voucher specimens. 500 pictorial diagrammatic representations have been added with the help of an artist.

Indigenous technical knowledge

The National Agricultural Technology Project on collection, documentation and validation of Indigenous Technical Knowledge (NATP-ITK) got an extension, from March 2003 to December 2004. The objectives of the project are to catalogue and characterise the information for developing a database, ascertain the extent and level of use of various ITKs by farmers in the management of their systems, validate ITKs through quick screening and formal experimentation, evolve mechanisms to protect people's property rights and facilitate the sharing of benefits by the farming community. All the documentation collected under the project, including the results of the validation, have been compiled and published by the ICAR, New Delhi.

During the extension period, priority is being given to continue validation based on the merit of the practices. An attempt was made to document disclosed information from Goa and Andaman and Nicobar Islands. A total of 143 disclosed information was added to the collection, which includes various agriculture and allied activities.

A suggestion was made, to extend validation for one or two seasons, both within and across the zones. Hence validation of 3 selected ITKs has been identified within Zone II, as well as validation of 5 ITKs selected across the Zones between January and December 2004.

Sub Programme Area 202

Molecular Mapping and Genetic Enhancement

Advances in the area of biotechnology and genetic engineering have opened up new avenues to enhance sustainability and stability in agricultural productivity. The coastal ecosystem, one of the most productive ecosystems, has been under various threats, including climatic changes, rise in sea level, increasing population and depleting natural resources. Over the last few years, MSSRF's effort in this area has been aimed at providing viable options to the fragile agricultural systems in the coastal regions through appropriate technology intervention. Hence, the primary focus of this programme has been:

- Analyses of diversity and species relationship among species of importance to the region, using molecular marker technology, and
- Isolation and characterisation of stress tolerant genes, both for salinity and drought, to develop pre-breeding material for crop varieties offering tolerance to abiotic stress.

Species relationship and diversity in Pennisetum

The genus *Pennisetum* includes approximately 140 species that are distributed in tropics and subtropics. Pearl millet (*Pennisetum typhoides* (L) Leeke.) belongs to section Paniceae. Pearl millet is the most important millet in India. The

principal areas of cultivation of this crop are Rajasthan, Maharashtra, Gujarat, TN, Karnataka and AP. In order to establish the diversity between genotypes and relationship between species, a detailed study was undertaken in 13 genotypes of *Pennisetum typhoides* and eight wild species of the genera *Pennisetum*.

13 accessions of *P. typhoides*, belonging to five geographical regions, were analysed for the genetic diversity existing across the geographical regions and the entire sample set. A combined analysis of eight primer combinations showed 156 of 435 AFLP bands being polymorphic across the primer combinations tested. The total number of AFLP loci recorded per primer combination varied from 32 in E-ACC x M-CAC to 70 in E-ACG x M-CAC. The percentage of polymorphism across the landraces ranged from 12.7% in E-AGC x M-CAT to 50% in E-ACC x M-CAG with an average of 35%.

The dendrogram revealed two major clusters, with accessions from Gujarat alone placed in one cluster with 94% similarity and the remaining placed in the other with 89% similarity. The second major cluster was again divided into two sub clusters, one with three accessions from Tamil Nadu and one from Andhra Pradesh and the other cluster consisting of all the other accessions, with the ones from Rajasthan forming a tight cluster with 93% similarity.

Eight wild species of *Pennisetum* were analysed using five primer combinations. Profiles

differentiating all the eight species were observed in all the primer combinations. The total number of AFLP loci recorded per primer combination varied from 54 in E-ACG x M-CAG to 78 in E-ACC x M-CAA. A combined analysis of five primer combinations showed 313 of 316 AFLP bands being polymorphic across the primer combinations tested. The combined percentage of polymorphism across the species was 99%.

To establish the relationship of cultivated *Pennisetum typhoides* with these eight wild species, AFLP analysis was done with primer combination E-ACC x M-CAA. One of the Rajasthan samples was used as a representative of the *P. typhoides* landraces as their contribution towards total polymorphism was less significant compared to other samples and they showed less population variation. The dendrogram showed *P. typhoides* more closely related to *P. mollissimum* than to the other analysed samples.

This is one of the first studies undertaken to analyse the genetic diversity within and between *Pennisetum* species using AFLP marker system. The potential of AFLP marker system to discriminate genotypes is demonstrated, providing the basis for the implementation of SSR markers in future. Polymorphic AFLP loci may be mapped and evaluated for linkage with genes and quantitative trait loci (QTLs) for the relevant target trait. Putative association with agronomic genes will also assist the selection of divergent potential parental genotypes for trait-specific mapping crosses.

Generation and analysis of expressed sequence

Salt-stressed leaf tissue from the mangrove *A. marina* was used as the RNA source for this library. The cDNA library was directionally cloned into the Sal I - Not I sites of pSPORT1. Individual clones picked at random from the plasmid library were sequenced using M13 reverse primer. Of 1821 sequencing reactions attempted, 1525 produced readable sequences. Each EST was compared against sequences in the non-redundant database (nr) at the NCBI using the programme TBLASTX, which compares translated protein sequences with nucleotide sequences. The result of each comparison was screened manually and 1525 ESTs retained after screening. Putative identification was attributed to each EST by considering the numerical cutoff values obtained along with additional analysis, using information from PubMed.

Of the 1525 ESTs, 1050 had significant homology to previously identified genes and these were grouped into 12 functional categories. The remaining 'unknown' genes (475 ESTs) refer to that subset of ESTs that show a significant similarity (high e-value) to genes reported in the public database but do not have an assigned function to date. Unknown genes form the largest category at 30%, followed by genes required for primary metabolism (13%). Genes involved in transcription and chromatin organisation, protein synthesis and processing, each represent 10% of the sequenced ESTs while those involved in membrane transport and

intracellular trafficking represent 9% of the ESTs. 8% of the ESTs relate to signal transduction while 7% are similar to previously reported stress induced genes. The percentage of redundancy was highest for cell wall structure and metabolism (24%) and lowest for membrane transport and intracellular trafficking (9.8%). Genes for transcription associated proteins and membrane transport form large groups (100 and 90 clones respectively).

The adaptive response to salt stress also involves the activity of water channel proteins, sugar transporters and ion transporters that transport water, sugar and ions/osmolytes respectively, through the plasma membrane and/or tonoplast to adjust osmotic pressure under stress conditions. While these genes have been classified separately in membrane transport and processing, they play an integral role in the response to water deficit such as that imposed by salt stress and include aquaporins (20 clones), proline/glycine betaine transporter and Na^+/H^+ antiporter. In addition, protein factors involved in the regulation of signal transduction events such as receptors, protein and lipid kinases, calmodulins and protein phosphatases which may have a role in stress signaling pathways, have been categorised separately. Transcription factors containing similar domains are present in the *A. marina* ESTs and could have a role in regulating the response to salt stress.

Isolation of the promoter from the mangrove species

Isolation of promoter and enhancer sequences is crucial for the study of regulation of gene

expression. For a number of applications, transgenes need to be expressed differentially or under specific abiotic stress conditions, which requires the use of a set of specific promoters to drive regulated gene expression. However, relatively few promoters are currently available for a specific or fine regulation of gene expression. Given the high amount of similarity between the *Porteresia* and rice genomes, an attempt has been made to isolate the promoter elements for transgenic applications.

Flanking regions of genes, containing these elements, are generally isolated through screening of genomic libraries using cDNA as a probe. However the screening of genomic libraries is a time-consuming process. TAIL PCR is a rapid and efficient method for genomic walking. PCR was carried with long gene specific primers and short degenerate primers of arbitrary sequence. An elaborate thermal cycling programme, composed of “supercycles”, each consisting of one low stringency cycle and two high stringency cycles, allows only sequence specific primers to be amplified.

For TAIL PCR, a set of three gene specific primers was used in combination with degenerate primers. For primary reaction, genomic DNA was used as template. Two successive rounds of PCR were carried out using the products of previous PCR as templates, employing a common arbitrary primer and a gene specific primer in a consecutive manner. The products of the primary, secondary and tertiary reactions were separated on adjacent lanes in a 1.5% agarose

gel, and discreet PCR products, showing difference in size corresponding to the relative positions of the gene specific primers, were identified. The results were confirmed by doing a southern blot analysis. A 1.9 kb band, which showed the strongest signal, was reamplified, gel purified and cloned. This clone was subsequently sequenced.

Lab testing of transgenic plants and field trial

Second generation seeds were collected from the transgenic rice plants transformed with AmSOD1 gene. Plants were raised from these seeds and tested for the presence of the gene, and confirmed using PCR, Northern hybridisation and Isozyme analysis. Southern hybridisation done with the transgenic plants showed that the copy number of the transgene in the transgenic plants was single copy insert. Two lines having single copy insert were chosen for subsequent analyses. Northern hybridisation of the transgenic plants revealed the expression of the transgene in the transgenic plants. SOD isozyme revealed the presence of an additional isoform of SOD that migrated just above the endogenous Cytosolic Cu/ZnSOD. This band was confirmed to be a Cu/ZnSOD based on the inhibition studies using KCN and H₂O₂. Salt stress analysis of the transgenics and the control plants revealed that the transgenics could tolerate upto 150 mM of NaCl concentration for about 7 days while the untransformed control plants started showing signs of wilting from the fourth day itself in the hydroponic medium.

Based on the results obtained from the tests done in the laboratory, it was decided to take up a field trial. The laboratory results were examined and permission for the field trial was given by the RCGM, (permit no: BT/BS/17/20/2000-PID) after which the field trial was taken up at Kalpakkam. One homozygous line isolated from the two lines at the T2 generation was taken up for the field trial. The field trial for the transgenics was done in an isolated field at Kalpakkam as per the guidelines of the Government of India. The approved plot design was 150 ft X 100 ft, with appropriate isolation distance. The study was conducted in six plots within the bigger plot. Every plot had 20 transgenic plants, with a total of 120 transgenic plants grown in the approved land. Each plot had a buffer zone, consisting of untransformed control plants surrounding the transgenics. Three of the six plots were treated with 50, 100 and 150mM of saline water (one time treatment). The biometric data of plant height and number of tillers was recorded systematically every fifteen days. The transgenic plants were found to have shorter height and higher yield per plant in comparison with the control. The grain yields across the transgenic and the control plants were calculated and found to be comparable. The grain yield per plot in transgenics was 1.9 kg while for the control it was 1.8 kg. However, larger field experiments will be undertaken to arrive at the definite yield pattern in the transgenic *vis-à-vis* control. Gene integration and transgene expression analysis were also done from the field-grown transgenic plants. Further analysis is being done to examine the on-field performance of the transgenics in saline soil environment.

Drought tolerance studies

Drought is the most important of abiotic stresses that affect crop productivity severely. In the Asian uplands, water deficit results in an estimated average annual loss of 190kg/ha, or 17% of production. With the aim of developing drought tolerant crop plants, we have undertaken research in *Prosopis juliflora* (Family Leguminosae), a widespread drought tolerant species as a donor species for isolation of candidate genes for drought tolerance.

Total RNA was isolated from the control and the stressed plants using the GITC method. A cDNA library was constructed using the total RNA from the water stressed plants using Clontech's Creator SMART cDNA construction kit. The cDNA with a size range from 500bp-3Kb was ligated to the vector and transformed to *E.coli* strain XL-10GOLD. The transformed

cells were selected using the appropriate antibiotic (chloramphenicol). Three such transformation mixtures with average transformation efficiency of 10^6 were pooled from the unamplified library, which was then plated on LB plates to form the amplified library. The cells were pooled and stored as glycerol stocks at -80° C.

Plasmids were isolated from isolated single colonies (from the library) and plated on LB-chloramphenicol plates. The size range of the cDNA inserts were checked by amplifying the insert from randomly selected colonies using forward and reverse primers. The average size was found to be 820bp.

cDNA inserts were sequenced from the 5' end using M13 forward primer. So far, 850 ESTs have been sequenced and categorised into 13 categories of which genes encoding proteins

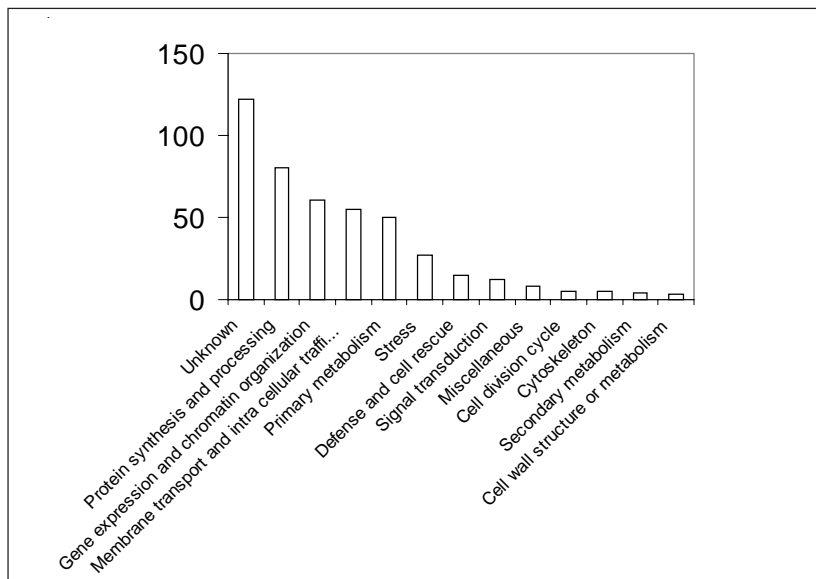


Figure 2.1: **Categorisation of ESTs from *Prosopis juliflora***

of unknown function were most predominant (27%) followed by genes encoding proteins involved in protein synthesis and processing (18%). Genes encoding proteins functioning in defense and cell rescue and stress coping mechanisms were found to be of 3% and 6% respectively. A graphical representation of the functional categorisation is given in Figure 2.1

Of the 850 cDNA inserts sequenced, 49 were full-length genes, of which about ten were previously reported to be functioning in stress tolerance. They include heat shock proteins, epoxide hydrolase, cytosolic ascorbate peroxidase, glutathion s transferase, vacuolar ATPase subunit c, metallothionine etc. Some of these genes are being cloned to expression vectors as a prelude to the creation of stress tolerant crop plants. A few full length genes, coding for proteins of unknown function, are also selected for further studies and characterisation.

Sub Programme Area 203

Monitoring Ecosystem Health using Microbial Diversity

Studies in the last few years focused on indexing and understanding the functional diversity in the niche areas, be it the agricultural soils in coastal systems with special reference to the rhizobacteria, or lichens for developing site specific ecological methodology to quantify the level of disturbances, if any. In the process of functional analysis, the focus had shifted to

prospecting the microbes for efficient beneficial microorganisms and also screening lichens for bio molecules. The leads established in this area of work have helped to bring in more funding to support it and diversify into other study sites and more application-oriented work. In relation to the studies on the beneficial microorganisms, the strains have been taken to the field, work has progressed from the agricultural soils to screening the rhizosphere of the mangroves and attempts are underway to set up biofertiliser units as local level enterprises in Kannivadi region. In the area of lichen research, work has intensified in terms of culturing and identification of bio-molecules which have potential for certain clinical applications.

203.1 Microbial diversity in coastal agri-ecosystem

In the consolidated analysis of the study on screening for phosphate solubilisers in the coastal agricultural rhizospheres, very low recovery of phosphate solubilizers was observed from the coastal region, especially from saline soils. In all, about 35 potential strains were shortlisted and screening using tri-calcium phosphate revealed that the isolates released 300-400 mm/ml from the initial 500 mm/ml inorganic phosphate supplied. From this lot of strains PS4, PS5, PS9, PS10, PA12 and PA51 were taken up for greenhouse level evaluation in black gram, groundnut and paddy. They were also tested for efficiency under different soil types (saline and non-saline). The parameters assessed were survival rates and the comparative effect on the growth under

control and treated conditions in terms of wt/P content in the plants.

Greenhouse trial: Paddy seeds (CO43 and Ponni) were sterilised and incubated for germination. After germination, the seedlings were transferred to cups filled with different soil samples, collected from the study sites at T.S pet (EC 1.08), Kuriyamangalam (EC 0.54) and Mettupalayam (EC 3.15) in the coastal agriculture region of Cuddalore district, TN. Broth cultures of 1 ml of the different isolates were diluted to approximately 10^7 cells ml^{-1} and used for inoculation (application). The plants were carefully uprooted from the soil 60 days after treatment and the roots were washed in a running stream of water. Then, the whole plant was dried and the total dry matter content was measured by weight. Mean plant height and dry weight from five replications were calculated for each treatment and the controls. Plant samples were analysed for the total phosphorus content. There was a significant increase of about 20-30% in the phosphorus content in the plant samples when compared with the control.

To analyse the shelf life of the strains, these isolates were taken up for study and tested over a period of time. Sterilised packets containing vermiculite were inoculated with cells at a concentration of $10^7/\text{gm}$ of carrier material and additional source of nutrition was provided. Samples were taken at an interval of 15 days and analysed for viable count for about 120 days. The count varied between $10^7/\text{gm}$ to $10^9/\text{gm}$.

Field trial: After successful shelf testing, the short-listed isolates were taken up for field-

testing. A trip was undertaken to Chidambaram to identify the sites to carry out the field level trials. After a participatory session with farmers from a SHG in Manikollai, a few farmers were identified to begin with for a participatory field evaluation.

Six-phosphate solubilising salt tolerant strains (PS 4,5,9 & 10 PA6 and PA51) were taken to the field on 20th November, 2003. The formulations in combination (4,5,9 & 10 – T1, 5&10 – T2, 6 & 51 – T3) in vermiculite were put under four sites (three paddy and one ground nut), and monitored. Control sites were also maintained. Provisions were also made to distribute the combinations (mixed cultures as stated above) to more farmers as part of a larger outreach, for them to use and give a feedback. These isolates have been distributed as biofertiliser to 23 farmers and about 38 acres have been covered so far. Analyses on the terms of yield and phosphorus content in the field trials have been variable among the strains. Strains PS5 and 10 have shown very promising effects. Studies have also been initiated in black gram and phosphobacteria. The new genus and a couple of *Azospirillum* strains were also taken to the field at the same time. Field trials will be repeated in the coming season with more farmers. Meanwhile, on request, packets of phosphobacter are being distributed. From the first trial it was observed that there is a need for timely intervention in terms of biofertiliser and biocontrol agents. There is also a need to increase the number of viable cells in the packs and to integrate other components of biofertiliser along with organic

amendments. These strains have now been submitted to IMTECH, the national culture collection facility.

Status of work on the novel strain: The results of work on the novel salt tolerant strain isolated from wild rice, which could fix nitrogen and solubilise phosphate, showed intensive colonization in Pokkali when compared with wild rice and Ponni. The results, which had been communicated to International Journal of Systematic and Evolutionary Microbiology, have now been finally accepted (Figure 2.2) and are in press. Type strains were submitted to Belgium Culture Collection Centre and the National Culture Collection Centre, India,

Swaminathania salitolerans gen. nov., sp. nov., and the accession numbers were obtained – LMG21291^T = MTCC3851^T.

PGPR and mangroves: Work has progressed in the new initiative on screening for PGPRs in selected mangroves and associated plant species. To understand the rhizosphere diversity (with special reference to plant growth promoting bacteria) in selected mangrove and associative plants, and to isolate the plant growth promoting bacteria from the rhizosphere regions and characterization for their functional roles, molecular tools were used in the Pichavaram mangroves, south India. Plant species which are chosen for this preliminary study are: *Avicennia marina*, *Rhizophora mucronata*,

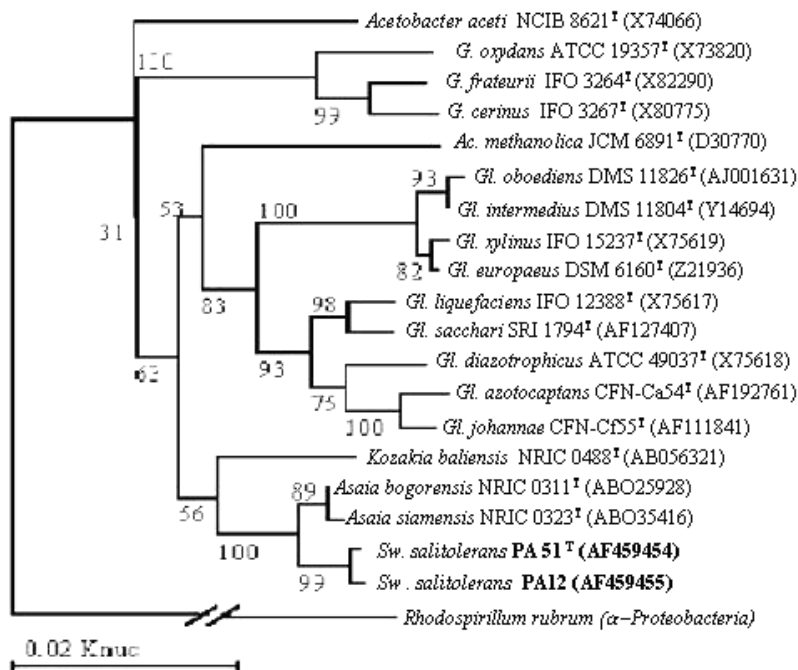


Figure 2.2: **Phylogenetic relationship between the isolates PA12 and PA51T and other species of the Acetobacteraceae family determined from 16S rRNA gene sequence similarities**

Excoecaria agallocha, *Porteresia coarctata* and *Sonneratia apetala*. Soil samples were also subjected to physico-chemical analysis.

As a first step to understand the diversity associated in the rhizosphere region of these plants, the total heterotrophic count was enumerated. Selective media were used to isolate diazotrophs and phosphate solubilisers. For isolation of diazotrophs, nitrogen free combined carbon source medium was used. All isolates have been given reference numbers and will be taken up for further characterisation. Preliminary attempts have been undertaken to extract soil DNA. Crude DNA extracts were stored at -20°C for further use. From the preliminary work done so far and the analysis of the results obtained, the following observations can be drawn: there are some common flora present in the rhizosphere of the species studied; a few are found specific to certain rhizosphere and there might be a few strains specific to this ecosystem. Inter-site and intra-site variability was also observed. It needs to be seen if this is also correlated in the molecular approach, which will be undertaken shortly. It was also observed that with an addition of 1% NaCl to the medium there was an increase in colony forming units. The salinity levels seem to vary between 16.9 – 21.4 E.C. mS/cm and a variation in the total organic content was also observed. It is still too early to establish a definite correlation between these parameters and the diversity.

Low cost biofertiliser units as an enterprise option: A new initiative of setting up low cost biofertiliser units as an entrepreneurial activity

for rural women has been sanctioned by DBT, New Delhi. It is hoped that demystification of such technologies at rural levels will address the problems of shelf life and availability of biofertiliser at the appropriate time to the farmers. This programme is being implemented along with the ecotechnology centre and is reported under that section (See SPA 301.3).

203.2 Lichen Research

Bioprospecting is a vital component of an effective conservation strategy to achieve sustainable development. Bioprospecting of lichen (fungi that live in an obligate symbiosis with algae or cyanobacteria) species from hitherto unsurveyed areas with novel compounds, biochemical and molecular attributes is even more crucial and requires highest priority today. The symbiotic association of lichens enables them to produce a great number of organic compounds commonly known as lichen substances, which are responsible for the successful colonisation and survival of these organisms in extreme environments with adverse light, heat, pathogens and herbivores. Globally only 700 compounds have been isolated from a small number of lichens out of 13,500 lichen species described so far and some of the compounds have been reported to possess anti-cancer and anti-HIV properties. Hence there is an upsurge in the research of the secondary chemistry of many of the tropical lichens for novel compounds with therapeutic potential.

The large-scale quantitative ecological data collection and characterisation of lichen

diversity from the Siruvani Hills in the Western Ghats facilitated the screening of some of the chemically rich lichens for their secondary compounds and their potential as anti-microbial agents. The anti-microbial activity was measured in the form of a zone of clearance in the disc-diffusion assay. Five fractions of lichen compounds from *Roccella montagnei* were screened against twelve different pathogens. The concentration levels of each of the fractions along with the positive and negative controls were tested and it was demonstrated that each of these extracts has significant anti-microbial activity. The HPLC profile of anti-microbial potential Fraction-1 of the Methanol extract from *R. montagnei* indicates the presence of 2 major and 1 minor compound, and these have been crystallised. Further chemical characterisation of the compounds is being done, using spectral studies and X-ray Diffraction Crystallography.

Fraction of *Parmotrema praesorediosum*

Extraction of secondary compounds from *Parmotrema praesorediosum* with organic solvents with different polarity, from hexane to water, facilitated the isolation of six different extracts. These extracts were subjected to anti-microbial assays using twelve different pathogens. The Dichloromethane (DCM) Fraction 1 instantly formed crystals indicating a very high level of purity. Further chemical characterisation of this fraction, using H-NMR, C-NMR and Mass Spectrum, indicated that the compound is a depside known as "Atranorin" ($C_{19}H_{18}O_8$).

Lichen culture

The mass production of lichen substances using lichen cultures is still a challenge due to the poor understanding of culture requirements including environmental conditions for lichen species. Hence standardisation of protocols for the mass multiplication of the isolated fungal, photosynthetic partners and whole thallus of *R. montagnei*, *Parmotrema* sp. *Porina mastoidea* and *Leptogium* sp. were undertaken. The photobiont *Trentepohlia* (Trentepohliaceae, Chetophorales) from *R. montagnei* and *Trebouxia* (Chlorophyceae, Chlorococcales) from *Parmotrema praesorediosum*, *Nostoc* of *Leptogium denticulatum* were successfully brought under culture conditions. Whole thallus culture of *Roccella montagnei* and *Parmotrema praesorediosum* were also standardised and cultured in the laboratory.

Lichen diversity and distribution pattern in the Madukkarai region of the Western Ghats and their correlation with the disturbance regime

Lichens with their intimate eco-physiological links with the atmosphere, are among the first to exhibit the ill effects, if any, of air pollution – a character that accords them a special value in air pollution level assessments. In India, there is still a dearth of data to assess the status of lichen diversity of unique ecosystems as well as the sensitivity or tolerance level of lichen species or lichen communities to various pollutants. This is true even in the case of diversity-rich forest lands close to pollution sources. Hence, as an immediate priority, a

study was initiated to assess the impact of cement dust on lichen diversity and distribution in the Madukkarai – Walayar region (part of Nilgiri Biosphere Reserve), through ecological sampling protocols for large scale quantitative data with reference to macro habitat conditions (Habitat and climate characteristics), micro habitat variables, lichen diversity and distribution pattern, and data on pollution sources and distribution. Currently, the major vegetation type “Discontinuous thickets to low scattered shrubs”, close to the pollution source, are under survey and the following trends were observed:

- A total of 39 species has been recorded so far – species area curve suggests the need for further sampling in the forest sites.
- A large number of lichens have been found to be locally distributed and rare in the survey area.
- Lichen *Bacidia* sp. prefers only cement infested *Pounthazhi* trees.
- 77% of lichens are crustose, 15% are foliose and the remaining 8% are gelatinous.
- Photobiont *Trentepohlia* (moist & shade loving) occurs in 26% of the species; *Trebouxia* (dry and light loving) in 69% and in the remaining 5% cyanobacterial lichens colonise sheltered unpolluted areas.
- This study also indicated a lower total and mean species richness in polluted sites compared to unpolluted adjoining similar forest sites.

Sub Programme Area 204

Bioresources Conservation and Bioprospecting of Endangered, Medicinal and Mangrove Species

This programme has established methodologies for large-scale plantation of bioenergy crops through women SHGs of micro, vegetative and seed propagated plants. A number of leads have been obtained from compounds isolated from *Excoecaria agallocha*.

204.1 Bioprospecting studies

Helicoverpa armigera larvae collected from the cowpea fields were reared to three generations. Moths were mated in captivity inside earthen pots for oviposition. Disease free 1st instar laboratory generation larvae were chosen for the experiment and some of them were maintained for further studies. Extraction of the phytochemicals from the dried leaf powder (4.5 kg) of *E. agallocha* was done to obtain crude extracts for the bioassay.

Bio efficacy of crude hexane, ethyl acetate, methanol and water were tested against third instar larvae. The larvae were observed for juvenomimetic effects. Crude hexane extract (20 gm) was subjected to column chromatography (SiO₂, 100-200 mesh) with hexane and ethyl acetate as mobile phase to obtain 10 fractions. Anti-feedant activity was calculated for the crude extract and fractions using leaf area meter. Bioactive fractions were further fractionated by chromatography (SiO₂, 60-120 mesh) and purified

in Preparatory HPLC-Luna 15U Silica (2) for hexane fractions and Luna 15U C (18) reverse phase for aqueous extract.

The extraction procedure was scaled up with 10 kg of leaf material to meet the requirements for the field trials. Aqueous extract was subjected to specific isolation procedure employed for glycosides.

Field trial

Several formulations were done to check the uniformity and stability of the crude hexane extract. Emulsions made with IPA and THF were found to be most stable. A restricted field trial was performed to test the efficacy of crude hexane-IPA and aqueous extract formulations in lady's finger crop.

Crude hexane and aqueous extracts of dried leaves of *E.agalloacha* from Pichavaram mangroves, Tamil Nadu, exhibited larvicidal activity (98.5%) against 4th instar larvae of *Helicoverpa armigera*. 1% aqueous extract reduced the moth emergence to 0%, while 10% reduced hatchability of the eggs to 0% when compared with the positive control (93.3%). 5% hexane extract reduced pupation to 0%. There was no significant change in the weight of the pupae in the above treatments.

However 2% dry leaf powder exhibited reduced pupation (63.4%) and moth emergence (3.3%) with a drastic reduction in the pupae weight (168.5 mg) compared to the positive control (399.66 mg). TLC analysis indicated the presence of terpenoids. An unknown compound of 99% purity was obtained from the modified

aqueous extract and was further analysed by FT-IR, Mass spectrum and C₁₃ NMR. The compound exhibited larvicidal activity of 2nd instar larvae by 70%. HPLC purification of column fraction-1 of hexane extract yielded an amorphous compound that was inseparable from the pigments. Further analysis by NMR, Mass spectrum and COSY revealed the presence of carboxyl and amine groups.

Large scale extraction for multi-location field trials in chick pea, cowpea, lady's finger and cotton and characterisation of the anti-pest principles are under way.

204.2 Bioenergy and Biofuel Crops

Field bioenergy plantation and nursery management

During November and December 2003, mangrove plantation was undertaken in Kelavelzhi, Karaikal region. About 25,000 saplings of *Avicennia marina*, 4,000 of *Ceriops decandra* and 4,000 micropropagated and 2,000 vegetative propagated plants of *Excoecaria agalloacha* were taken up for planting, covering a total area of 3 ha at Kelavelzhi (October to January). Four species, viz. *E.agalloacha*, *A. marina*, *C.decandra* and *R.mucronata* were chosen and planted as 1.5 to 2 feet saplings with 2 x 2 m spacing with regular tidal inundation.

Both field and bioenergy nurseries are being maintained by women SHG members. This year 70,000 plants are being maintained at the bioenergy nursery, including micro, vegetative

and seed propagated plants, for bioenergy plantation to be taken up in the coming year. Fresh water availability is very scarce for nursery management due to the failure of monsoon and lack of Cauvery water inflow during 2003. Hence the SHGs are maintaining the nursery using bore well water.

Jatropha curcas germplasm collection and evaluation

The selection of land was done with women SHG members and seed material was collected from various agro climatic conditions, based on agronomic and yield performance characters. Micropropagation studies were initiated for mass propagation and a training programme was conducted for the SHG members on *Jatropha* nursery management and plantation trials in community land.

Salicornia brachiata seed collection and cultivation

Land selection was done with women SHG members and seed materials were collected from wild clones. Seeds were separated from plants and stored for cultivation in salt affected coastal areas.

Genetic fidelity studies of propagated plants

Plants were selected for genetic fidelity studies from wild mother clones, tissue culture plants, vegetative propagated plants and field-transferred plants. Total genomic DNA was extracted from all selected and propagated plants for genetic fidelity in *Excoecaria agallocha*.

Stevia rebaudiana

There is increasing interest among farmers in the cultivation of *Stevia* as a plant substitute for sugar. Micropropagation protocols have been standardized for large scale cultivation in agricultural lands. Various parameters like agronomic characters, yield and ecological adaptability are being studied before undertaking large-scale cultivation. Some indicators like the yield need to be analysed, based on results of large-scale cultivation in fields at specific locations.

204.3 Isolation of CAM form of PEPC from *Sesuvium portulacastrum*

CAM (Crassulacean Acid Metabolism) plants whose enzyme levels vary temporally have additional photosynthetic pathway. These types of plants, which are found widely in stressful environments, have evolved to efficiently fix CO₂ using the enzyme PEPC at night when stomata are open. *Sesuvium portulacastrum* (CAM plant) is a mangrove associate which grows under a wide range of stresses. Since water use efficiency is related to effective fixation of CO₂, which in turn is related to NaCl and/or drought tolerance, understanding of the enzymes involved in additional photosynthetic pathways like CAM would help in developing stress-tolerant crop plants that harbour such pathways.

Full-length gene for Phosphoenolpyruvate carboxylase (PEPC) was obtained using RT-PCR methodology by designing degenerate

primers for CAM form of PEPC. The resultant PCR fragment was cloned into *E. coli* and the sequence was read. Database search for the sequence showed high homology to CAM form

of PEPC. cDNA library screening for the gene with flanking regions is being carried out to characterise the gene.





Ecotechnology

MSSRF and SBI are jointly facilitating a credit linked biovillage programme in Kodathur village, Pondicherry. An agriculture training centre has been set up at Manikollai village, Chidambaram by the farmers' association. The SRI method of cultivation has been mainstreamed in the extension programme of the State Agriculture Department, Pondicherry. The annual turnover of Kulumai – federation of SHGs in Kannivadi was Rs148.7 lakhs. 19,752 trainee days were organized by them benefiting 661 individuals. The ICT-enabled functional literacy model developed by VKCs in Kannivadi has been accepted as viable and cost-effective by the State Resource Centres working on non-formal education. A SHG of landless women agricultural labourers in Kannivadi region was given training and facilitated to take up production of Pseudomonas fluorescens, a biopesticide, as an enterprise activity.

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Sub Programme Area 301

JRD Tata Ecotechnology Centre

The Centre strives to operationalise sustainable agriculture and rural development by promoting job-led economic growth, based on a pro-poor, pro-women and pro-nature orientation to technology development and dissemination. On the basis of the Biovillage paradigm, which encompasses of sustainable ecoenterprises, the Centre is focusing on blending natural resource management and livelihood security.

Participatory research and development, capacity building and grassroot institution building are the strategies adopted by the Centre to strengthen the process of sustainable development. Through its operations in different agro-climatic systems in TN, Pondicherry and Orissa, the Centre is evolving models of biovillages for sustainable development and

policy advocacy with the Government, NGOs, private sector, banks and international development agencies. The JRD Tata Ecotechnology Centre has been continuing its activities in the same locations, as shown in Table 3.1.

The following are the highlights of the Centre's activities during the year:

- The grassroot institutions in the field centres have enhanced their development perspectives and capacity to facilitate decentralised sustainable development at the local level; so the role of MSSRF has changed from that of active project implementer to facilitator.
- The total annual transaction of the 400 SHGs in the various field centres is around Rs 40 million, including their cumulative savings, credit from bank and government organisations and business turnover.

Table 3.1: *Regions and focal themes of JRD Tata Ecotechnology Centre*

Region	Area	Focus
Coastal	Chidambaram, TN Pondicherry Kendrapara, Orissa	Water use efficiency, soil conservation, alternate cropping and livelihood pattern and disaster management
Hill	Thonimalai near Kannivadi, TN	Agro-biodiversity and food security, organic farming, linking conservation and development through ICT
Semi-arid	Kannivadi, TN	Value addition to time and labour of rural poor, increasing agricultural productivity, modern ICT-based extension
For all the above	Chennai	Coordination, land-lab linkages, laboratory studies

- The biological management of *Hydrilla verticillata*, a notorious aquatic weed, using the grass carp (*Ctenopharyngodon idella*) was successfully replicated in the infested pond of Annamalai University, Chidambaram.
- More than seventy farmers in the Cauvery tail end region have replicated the Integrated Intensive Farming System (IIFS) models with the support of the local farmers' association. A comprehensive directory that provides the details of individual farmers has been prepared for this region.
- Group farming has been adopted by 108 farmers to optimise the available water resources through the lift irrigation method, covering 440 acres of gross cropped area at Manikollai village in Chidambaram.
- A training centre has been set up at Manikollai village, Chidambaram, by the farmers' association for demonstration and training on various issues like effective water management, alternate cropping systems, IPM, farm - pond approach etc., which are specific to the region.
- Commercial banks such as the State Bank of India and Indian Bank have adopted the MSSRF's 'biovillage model' for effective rural credit management and initiated a project at Kodathur in Pondicherry with the support of MSSRF and Biocouncil, Pondicherry, with an initial allocation of Rs 25 lakhs.
- The successful demonstrations of System of Rice Intensification (SRI) method in the last two years resulted in mainstreaming the SRI method in the extension programmes of the State Agricultural Department, Pondicherry. In Kannivadi in the state of Tamil Nadu also, the method has been successfully tested and demonstrated to the farmers.
- The Reddiyarchatram Seed Growers Association (RSGA), a local farmers' association, has successfully completed nearly 2,500 trainee days. Modern ICT has been effectively used to reach farmers in the Kannivadi region. The association has prepared several theme-based training materials in the form of print, CD and audio cassettes to facilitate active learning.
- Information from the decentralised medium range weather forecasting system has been helping the farming community to take important decisions related to crop planning and agronomic practices.
- Oddanchatram vegetable merchants have entered the export market. Products are being exported to Southeast Asian and Gulf countries. The traders are working on a market-based cropping plan with RSGA for buyback arrangements to meet the export requirements. The merchants association of Oddanchatram vegetable market and RSGA are jointly managing the website www.Oddanchatrammarket.com.
- The ICT-enabled functional literacy model developed by the VKCs in Kannivadi region has been accepted as viable and cost-effective by State Resource Centres working on non-formal education.

- The *Pulayans* of Thonimalai received community certificates, which will help them to prove their legal identity and social status.
- Women SHGs with semi-literate members have started new ecoenterprises such as production of biofungicides like *Trichoderma viride* and *Pseudomonas fluorescens* with market tie-ups with private companies.

301.1 Coastal Region

301.1.1 Chidambaram

The Centre has been continuing its activities in evolving suitable models for sustainable development in the coastal region while focusing on issues such as efficient water and soil management, diversification of the cropping pattern and creation of multiple income generation avenues for livelihoods.

Aquaculture: As part of the aquaculture activities, the biological management of *Hydrilla verticillata* by grass carp (*Ctenopharyngodon idella*) was carried out in a pond at Annamalai University, Chidambaram. Hydrilla is a major aquatic weed, posing a perennial problem by deteriorating the quality of water. Two infested ponds were selected, one for treatment (with grass carp) and another for control (without grass carp); the ground area of the selected ponds was 23,000 m² each. Grass carp with an average weight of 243.41 g were stocked in the experimental pond on 1st January 2003, at the rate of 400 individuals/ha, the biomass density of Hydrilla (kg/m²) at the experimental and control ponds was 3.0 and 4.8 respectively. Six months after the commencement of the

treatment, the biomass load was reduced to zero in the experimental pond, whereas in the control pond the biomass load increased from 4.8 kg/m² to 5.13 kg/m². The parameters like water temperature, water pH, dissolved oxygen, soil pH and soil organic carbon were monitored weekly in the control and experimental ponds. There was not much difference in water and soil quality between the control and experimental ponds, except for the dissolved oxygen content and organic carbon load. In the control pond, the organic carbon load increased from 0.74% to 1.2%, whereas in the experimental pond it ranged from 1.02% to 1.6%. Higher dissolved oxygen content was observed in the experimental pond.

Integrated Intensive Farming System: Since 1997, the Centre has been demonstrating and studying the viability of the Integrated Intensive Farming System (IIFS) blended with Precision Farming techniques at Keelamanakudi village, Cuddalore District, TN. This has now been replicated by farmers in the region, and grassroot institutions such as the Sethiyathope Anaicut Farmers' Welfare Association (SAFWA) have taken the lead in further strengthening the development activities in the region, based on the approaches adopted by MSSRF. A Directory that gives details of nearly 70 farmers who have adopted IIFS principles in their farms has been prepared. One of the clusters of SAFWA at the tail-end region, Water Users' Association at Manikollai, had approached MSSRF for help in identifying suitable precision farming techniques which could be adopted in their region. Group

meetings, PRA exercises and baseline studies were conducted with the help of SAFWA. Based on the findings it was suggested that water for irrigation could be lifted from Paravanaru River¹ for assured irrigation. It was also decided that pulses, maize, cotton and other crops requiring less water could be cultivated in the second and third season. The project intends to bring about effective changes in the cropping pattern, based on the availability of water.

As part of the facilitating process, the farmers and landless labourers have been mobilised into SHGs and federated as Manikollai Small Farmers Lift-Irrigation Federation (MSFLF), which is the local apex body for the implementation of the project at Manikollai Village. Federating the SHGs provides the necessary institutional structure for accessing bank loans and government schemes and monitoring and strengthening the multiple livelihood opportunities for landless agricultural labourers. At present, 108 farmers, belonging to 6 SHGs, have been involved in the project covering about 178 ha of gross cropped area. The total project cost is estimated at Rs.13.58 lakhs of which Rs 11.52 lakhs was availed of as loan from Canara Bank. The remaining amount was met by the SHGs and an interest-free loan of Rs 1 lakh was given from the Community Banking Programme of MSSRF.

This project ensures that the farmers will be able to cultivate paddy in the proper season

¹ *Neyveli Lignite Corporation Limited (NLC) drains the seepage water from its mines into this river, hence there is an assured water supply from this river throughout the year. It is estimated that the water can be used for irrigating 500 acres of paddy even in the dry season.*

with reduced dependency on canal irrigation and rains. Another advantage of this project is that the farmers will be able to go in for second and third season cultivation, a practice which has been discontinued for more than three decades. The farmers participating in this scheme have evolved rules and regulations for efficient utilisation and sharing of water through a participatory process. The project has already established the infrastructure in the field and the first paddy crop has been harvested. It may be noted that the lift-irrigation scheme has enabled the farmers in harvesting paddy from their fields in spite of the lack of canal water irrigation and rainfall during the critical phase of growth.

For implementation of this lift-irrigation project, a strong network has been developed between the farmers and various organisations/institutions, like DHAN Foundation, Madurai, Public Works Department and Agriculture Department. Annamalai University is also helping the project in determining the quantity of water required for the cultivation of each crop in different seasons through its Civil Works Department. Data is also being collected from the farmers who are participating in this project and other farmers who are dependent on canals and rain. The group's approach to accessing and sharing of water for irrigation has reduced the infrastructure cost, thereby benefiting small and marginal farmers. The project is providing inputs for managing the lift-irrigation system so that it can be used efficiently.

Two new practices were introduced in paddy cultivation in this region during the year, namely

effective micro-organism (EM) for improving the soil condition and *Trichogramma japonica* for control of paddy stem borer. While the results of EM trials conducted on a one-acre plot were inconclusive, the feedback from the farmers on *Trichogramma* application has been encouraging, since there has been a reduction in the number of dead hearts after the release of the parasitoids. The *Trichogramma* trials were conducted on a 15-acre plot. The possibility of production of *Trichogramma japonicum* parasitoids by SHGs as a local enterprise is being explored.

A new initiative taken up by the MSFLF is the establishment of a Training Centre at Manikollai village. During the year, 207 trainee days were completed on topics related to water management, environmental impact assessment, soil sampling and fish farming, and 432 trainee days on SHG-related activities required for institutional development. The Centre is being developed to train farmers in precision farming techniques and sustainable agricultural practices and provide need-based information. It will provide space for carrying out field trials and setting up micro enterprises, as well as the necessary market linkages for the farmers. The proposed functioning of the Training Centre would be similar to an Agriculture Extension Centre-cum-Agribusiness Centre. It is also proposed to establish a school for farmers to provide need-based courses on water management, IIFS, Integrated Crop Management, post harvest techniques and seed production, thereby enabling horizontal transfer of knowledge among the farmers.

301.1.2 Pondicherry

Biocentre: The activities at the Biocentre focused on strengthening the partnership between the village communities, Biocouncil, commercial banks and government institutions. The Biocentre at Pillayarkuppam continued to focus on training and capacity building programmes in mushroom cultivation, spawn production, fodder production, raising seedlings for horticulture crops, vermicompost, integrated aquaculture, *Trichogramma* parasitoid production, enterprise development, institutional development and conflict management. In the demonstration farm, about 5,000 *Crossandra* seedlings were produced to help 20 SHG members to start floriculture. Quality fodder slips were supplied to the local farmers to the tune of 20 acres.

Kodathur biovillage: One of the major initiatives of the year is the Kodathur biovillage programme. MSSRF and State Bank of India are jointly facilitating a credit-linked biovillage programme with the support of men and women SHGs of Kodathur village. The programme covers around 730 households with a population of 2,885 in all the five settlements of Kodathur village (two Scheduled caste settlements and three multi-caste settlements). The available natural resources and the gender differential needs and concerns were identified through a series of Participatory Rural Appraisals. A benchmark survey was also carried out. MSSRF helped to develop a perspective plan in which threshold levels of operations were defined. Dairy management was preferred by most of the SHGs. Dairying

is not seen as an isolated activity, but integrated with other activities such as biogas, vermicompost and fodder cultivation. The Hatsun Agro Products Limited has been identified to provide market linkage and veterinary services. Hence, a tripartite agreement has been made among State Bank of India, Hatsun Agro Products and the SHGs.

Other group-based ecoenterprises which have been identified are the production and marketing of *Trichogramma parasitoid* and *Pseudomonas fluorescens*, a biofungicide. The initiative taken by women SHGs was appreciated by the District Industrial Centre (DIC) which provided a subsidy to the tune of 25 percent of the unit cost. Similarly, Indian Bank has extended financial support to the SHGs at Thirukanchi to start group-based enterprises like dairying and acquiring a tractor.

System Rice Intensification (SRI): Experiments on SRI continued during Samba (Sep 2002- Feb 2003), Navarai (Feb- May 2003) and Swarnavari (May-Aug 2003) seasons. The Navarai and Swarnavari seasons showed severe scorching as the tender seedlings (8-14 days old) transplanted with more spacing and minimal stand of water (1-2 cm height, wettings and drying method) were not able to withstand high temperatures. After four trials, it has been decided that for Pondicherry region, the SRI best suits the samba season (Aug-Feb) and not Navarai or Swarnavari seasons.

The biovillage farmers from Kannivadi and Chidambaram visited the Biocentre and nearly

200 trainee days were devoted to capacity building on the SRI method of paddy cultivation. The farmers from Auroville involved in organic paddy cultivation also participated in the training programme. The officers of the Pondicherry Agriculture Department and Krishi Vigyan Kendra (KVK) witnessed the trials. Further, as an extension activity, the Government of Pondicherry replicated the SRI for demonstration purposes. This resulted in about 20 farmers adopting SRI methods in field plots of 10-25 cents. An exposure visit was arranged for the farmers to help them understand the techniques of SRI. As a result, the Pondicherry Farmers Discussion Club arranged for training at the Biocentre in SRI for about 100 leading farmers.

The Biocouncil has formed its own cultural group with SHG members. The group staged the play *Thullal* on the occasion of the International Women's Day at Pondicherry and during the Annual Review (2003-2004) at MSSRF in Chennai. MSSRF has been helping the Government of Pondicherry to develop perspectives and design and implement development programmes in keeping with the Millennium Development Goals declared by the United Nations.

The Biocouncil has been consciously involved in strengthening its activities. It has been decided that in future, importance would be given to training in institutional management and capacity building for Biocouncil members. The responsibilities of Biocentre management will be gradually transferred from MSSRF to the Biocouncil.

301.1.3 Kendrapara, Orissa

The project concentrated its activities in Manitiri, Niyamatpur and Padagayaspur villages of Rajagarh *Grama Panchayat* (GP) in Mahakalapara Block. Activities were initiated in 3 new villages viz. Balia, Narendrapur and Nembera of Kuhudi GP in Marsaghai Block of Kendrapara district. The focal points of the activities were the organisation of grassroot institutions and their linkage with credit institutions, introduction to and training in alternate agricultural activities, micro enterprise development, training and capacity building, initiatives to address food and water security, disaster management and networking.

Organising SHGs and their linkage with financial institutions for availing of credit to initiate micro enterprises has gained momentum. Twenty-three SHGs were organised in 6 villages with a total enrolment of 337 members of whom 289 (85%) were women, with a financial transaction of Rs 4.89 lakhs. A sum of Rs 2.34 lakhs was sanctioned to 2 SHGs under the Swarna Jayanti Swarojgar Yojana (SJSY) scheme.

On-farm interventions: Demonstrations on organic practices in rice and sunflower cultivation on rice fallows were taken up. The outputs were striking and encouraging. The yield of rice following organic practice was about 42.0 qtls./ha which is quite comparable with the result of the recommended practice (44.0 qtls/ha) and about 40% higher than that (30.0 qtls/ha) at local practice. The yield of sunflower, a new introduction on rice fallow, was 17 qtls./ha. The rice variety Co-43 brought from TN and grown in 14 cents of land under the seed multiplication

programme, produced about 54 qtls/ha. Demonstrations on vegetable crops were taken up in two villages. The crops cultivated were bitter gourd, ridge gourd, lady's finger, spinach, tomato and green leaves in Narendrapur unit and banana, lady's finger, tomato, chilli and cowpea in Padagayaspur unit. One SHG in Padagayaspur planted the tomato variety BT-10 in 15 cents of land with seeds the group had retained from their demonstration crop last year. They harvested about 8 qtls (135 qtls/ha). About 1 kilogram of annual moringa seeds was distributed among the SHG members in the three new villages under the nutrition programme.

Off-farm activities: Agro-based activities such as pisciculture, backyard poultry and backyard mushroom culture were the three important micro enterprises taken up at the community level. Pisciculture has been identified as the most potential enterprise for the region. Non-agro based activities like trolley rickshaw pulling, dealership in fertilisers, turmeric powder, rice, domestic consumables, paper packets and snacks are being tried at the group level in different villages.

Resource personnel from government departments, universities, banks and NGOs and experienced farmers, imparted training on topics relating to field crops, vegetable and fruit crops, preservation techniques, IPM, INM, dairy, pisciculture, mushroom culture, grain storage, SHG linkage and managerial capacity, record maintenance and accounting, suitable micro enterprises etc., with demonstrations. Under the food and water security programme,

about 27 qtls of paddy was given as loan to 37 households in Khardasahi from the community grain bank. Also an old silted village pond in Manitri which usually becomes dry soon after the monsoon ceases, was renovated and now water is available for the domestic use of villagers throughout the year.

The cyclone-shelter cum vocational training centre (Mallikapur) and multipurpose building (Gayaspur) in Orissa are always kept ready to mitigate the ravages of natural calamities at any time. The building at Gayaspur is also extensively used for activities like training and demonstrations, meetings of the community, Government organisations and NGOs, village recreational activities etc. throughout the year. The project staff and the women SHGs of Manitri, Padagayaspur and Neeyamitapur took an active part in flood relief activities and distributed food and clothes to the affected families in Mahakalapara Block.

The project has initiated activities in Mahakalapara Block of Kendrapara District for preparation of the baseline survey and PRA exercises to determine the resource base and plan for future activities.

The problems associated with this region are water logging and floods during the rainy season. In general, the cropping pattern consists of paddy being cultivated mostly under rainfed conditions and a few farmers cultivating green gram as a second crop.

The project has initiated training and demonstration at the project site. As flooding is common in this area during the monsoon

season and it would be difficult to carry out controlled demonstration of precision farming techniques, the project has started focusing on improving the cultivation practices of the post-monsoon crops in order to create the necessary impact. Training has been given in banana cultivation, vermicompost and organic composting, mushroom production and pisciculture. These trainings are SHG-based and are being carried out to enable the interlinking of these activities following the IIFS concepts. Meanwhile, the project is also facilitating the SHGs in taking up the community ponds on lease from the village Panchayat. This will enable the SHGs to store water that would be required for post-monsoon cultivation. During this period 237 trainee days were completed.

Networking and linkages with various Government Departments and banks have been established and information about the various Government schemes is being collected. As part of the post-harvest value addition for paddy, the project is jointly working with Paddy Processing Research Centre (PPRC), Thanjavur, in improving the existing techniques of paddy parboiling. PPRC has developed low-cost prototypes that ensure uniform hardening (gelatinisation) of the paddy in the parboiling process. This system will be field-tested and if accepted by the community, necessary support for establishing parboiling as an SHG enterprise will be initiated.

301.2 Hill Region

301.2.1 Thonimalai

Thonimalai is located in the western slopes of

the Kodaikanal hills in Dindigul district, behind Kannivadi in Reddiyarchatram block. The area receives an annual average rainfall of nearly 1,100 mm from both the southwest and northeast monsoons. The soil texture varies from red sandy to clay and humus soil depending upon the adjacent vegetation, parent material and topography. The soil pH varies from 4-6.5. Millet-based subsistence cropping system has given way to commercial plantation system during the recent past and by default it is under organic condition. The region consists of 90 households; nearly 37% of the farmers have less than one ha of land; 40% of them have 1–2 ha and about 23% of them hold more than 2 ha of land. Multi-tiered plantation is the main livelihood, supplemented by backyard goat and horse rearing.

The school constructed last year at the initiative of the villagers is functioning smoothly and in the second year, the total strength of the school has almost doubled. The VKC has been focusing on meeting the information needs and imparting functional literacy to nearly 50 participants. The video conferencing facility has been used for information sharing as well as training programmes. But the full potential of the facility could not be used regularly due to frequent technical problems.

Organic farming: Efforts were continued to identify markets and start the marketing process. Discussions were initiated with three export agencies and based on their request, initial appraisal and quality tests were carried out on coffee and lemon. A farm survey was completed and a report prepared. Similarly PRA

exercises were conducted to learn about the production methods, especially soil management and pest management in the plantations. Around 85 small and marginal farmers in the region have been brought together to form a formal group to ensure scale advantage in the market. An Internal Control System (ICS) or regular monitoring mechanism which consists of documents on farmers' contracts, farm entrance form and risk assessment status for each field unit. was initiated, with technical inputs from IMO (Institute for Marketecology), Bangalore, an international organic certifying agency. Discussions were held to overcome the constraints through agronomic management and a training plan was prepared. Apart from these, the post-harvest management practices in coffee had to be improved to get cleaner products. The farmers have registered society and availed of assistance from the Coffee Board to set up a community-based post-harvest processing unit. The community provided the land for the same and the Coffee Board provided the necessary technical, financial and instrumental support to establish the facility. The availability of such infrastructural facility for post-harvest processing within the production zone will help the farmers to maintain the organic nature and quality of the coffee bean.

Strengthening traditional skill through Apiculture: In the forest area, the *Pulayans* have been traditionally involved in honey collection for the market as well as for subsistence. Due to the decline in forest resources, they are finding it difficult to spot honey combs and engage in

honey collection. Hence, it was decided to start apiculture as an income generation activity. Subsequently the tribal men were mobilized as a SHG. The members developed the proposal and submitted it to Tamil Nadu Adidravidar Development Corporation (THADCO) for financial assistance. THADCO approved the proposal and released an amount of Rs 1.57 lakhs as a grant for training and establishing the production units. The members were trained in the different techniques of apiculture, resource inventory and planning, extraction methods and quality control by the Keystone Foundation, Kothagiri, Nilgris, a premier institute in apiculture.

Community certificate: At the Pulayan colony in Thonimalai village, 15 families have received community, nativity and income certificates for the first time. This will help them to get their legal identity and prove their social status. It will also pave the way for them to receive the special provisions meant for SCs and STs.

301.3 Semi-Arid Region

301.3.1 Kannivadi

Kannivadi region is located in Reddiarchatram block of Dindigul district in TN. The total population of the block is 87,788 with a sex ratio of 1: 0.98 male to female population. The literacy rate among the male population is nearly 52 percent, whereas among the women it is only 40 percent. About 12 percent of the households are Below Poverty Line and almost 20 percent of the total households belong to socially disadvantaged sections of the community. The majority of the population is

involved in agriculture with 55.56 percent of the total area under agriculture and 29,568 households directly depending on it. More than fifty percent of the farm households are small and marginal, while 17.80 and 11.40 percent of the households belong to medium and large landholders. The cropping pattern includes vegetables, cotton, sugarcane, pulses, maize, chickpea, lowland paddy and millets. Agricultural labour is the main livelihood source for the non-landholding families.

Grassroot institutions as development agencies

Reddiarchatram Seed Growers Association (RSGA): The activities of RSGA include linkages with various seed and marketing companies to get quality seeds and other inputs, fixing prices, regulating payments, organising training programmes, mobilising capital and negotiating with universities and other institutions for breeder and foundation seeds and field demonstrations. The Association has been focusing on networking and forging appropriate linkages with various marketing, financial, technical and developmental agencies. Through these processes the Association is developing the skill to negotiate and enhance its bargaining power.

Gradually, the Association has developed its own perspective on poverty alleviation and sustainable development. It organised need-based training and capacity building programmes for farmers as well as agricultural labourers, and 2,250 trainee days were

completed. The multimedia database on crops generated last year, was further updated by adding plantation crops like coffee, pepper and lemon that are grown in the nearby hills. Also new training materials in print form as well as CD form, on weed management, soil management, water management, SRI, biofertilisers, nutrient management and climate and weather forecasting were developed and circulated among the farmers. Two audio cassettes were produced on the best case studies from the farmers in the region, covering current issues pertaining to sustainable agriculture. The association regularly arranges programmes on All India Radio, Madurai.

Demonstrations were part of the capacity building process of RSGA. Two demonstrations were organised on SRI and IPM practices in cotton.

In the Kannivadi region paddy is cultivated using both well and tank irrigation and water is the critical input in the irrigated farming system. The experiences from different parts of the

region indicate that SRI can increase the grain yield by more than 30% with considerable reduction in the quantum of water. It was decided to carry out demonstration trials in two different regions of Kannivadi. Due to poor monsoon only two farmers could be identified to carry out the demonstration. The necessary technical details were given to the farmers and the trial was carried out through close monitoring and guidance, using the paddy variety called ADT 38. Farmers from the Vannampatti village as well as rice growing farmers in other regions were taken to the field during the different phases of crop growth. Finally farmers evaluated the SRI paddy in comparison with conventional cultivation. The results are given in Table 3.2. The Table shows that in both the fields the SRI method was found superior to the conventional cultivation method. An increased yield of more than 35- 50 percent was noticed, along with decrease in seed rate as well as field duration. The nursery management, as well as related cost, was also very low compared to the farmers' practice. This

Table 3.2: *Comparison of SRI and conventional method of paddy cultivation*

Parameters	SRI Farmer I	SRI Farmer II	Conventional practice
Total number of tillers	28	45	18
Total number of productive tillers	24	38	13
Number of grains per plant	230	275	220
Yield /(Kg/ha)	7500	9750	4056
Labour requirements-			
Planting		40	25
Weeding		30	25
Harvesting		20	20
Seed rate (kg/ha)	5	6	30

system has gained momentum among the farmers and nearly 45 farmers have shown interest in trying out this new method in their own fields in the coming season. The agricultural extension officials and farmers from neighboring states visited the fields and appreciated the method and efforts.

Pest management has been a critical factor in cotton cultivation. The price rise in the market motivated several farmers to take up cotton cultivation. But the need for heavy application of pesticides raised the cost of production and consequently reduced the profitability in cotton cultivation as well as caused irreversible damage to the environment. To tide over this, an IPM approach in cotton has been demonstrated, following the combination of cultural, biological and other non-chemical methods. It enhanced awareness and helped to develop a positive approach among the farmers on the use of IPM strategies.

The access to information was further strengthened by initiating a local community cable audio-video programme at T Pudupatty, in collaboration with the local cable operator. It was decided to start with a one-hour programme per day on the cable network. The Association has been developing the contents for the telecast. The local VKC helps to identify the needs of the villagers for that week by organising need assessment regularly. In the process it was learnt that the telecast interval can be increased from daily to once in three days due to the difficulty in developing content as well as the nature of the needs of the community.

A local fortnightly *Seithisolai*, which covers a wide range of topics of local interest, is being published. It covers aspects like farming practices, weather forecast, tips for pest and disease management, employment opportunities etc. The VKCs, farmers' associations and *Kulumai* conduct need assessment periodically for the content. It is distributed to the people in the region through the members of SHGs and farmers' associations. A content analysis made for the past eleven months reveals that SHGs, micro enterprises and rural ecopreneurship need to be given more importance.

The Association manages a market website which provides information on Oddanchatram vegetable market trends in terms of quality, stock, price and traders on a daily basis. The objective is to expand the trade in the Oddanchatram vegetable market and attract buyers from national and international markets, thereby enabling the rural community to get better prices for their products. So far, it has attracted business worth Rs 70 lakhs. The recorded daily data on various vegetables is being analysed and will be used in market-based crop planning for the region.

With the objective of expanding the market network at the international level, workshops were organised at Chennai and Dindigul for merchants of Oddanchatram with the support of RSGA members. Experts from EXIM bank and professionals from export agencies explained the steps in accessing the export market. Now, traders are marketing their products in South-East Asian and Gulf

countries. Subsequent to the meetings, the commission agents formed a group to intensify the export business. They have also agreed to extend financial support to host a website and it was decided to establish a knowledge centre in the market itself to hasten the process.

RSGA has been effectively managing the B-type observatory established at Kannivadi. The details of locale specific forecast for the next four days are communicated to the villagers through VKCs and bulletin boards regularly, in addition to the local cable network. The Association has generated a training module in print form which is being shared with other farmers' associations in the district, KVKs, private plantations, sugarcane mills and extension officials. Consequently many of them are seeking forecast information from RSGA for planning and decision-making. A small user's survey was organised to find out the extent of awareness and relevance of the forecast to the different sections of the community. The results revealed that 96% of the informants are aware of the forecast information and 57% mentioned that their source is the bulletin board. Regarding its usefulness, 25% have rated this as highly useful, 68% useful to some extent and 4.9% have responded negatively. The response on reliability also differs; 4% regarded the forecast to be well correlated, 81% as correlated to some extent and 16% as not correlated at all. Based on the feedback, necessary steps have been taken to create awareness on the availability of the information in remote villages. In order to find the correlation between the predicted versus observed over the spatial scale, three sites were identified in three directions and

steps taken to install a simple non-recording rain gauge. Also climatological analysis and variability studies were carried out using rainfall data for the last 20 years and based on that, simple computer-based training material was prepared and used in the training programmes.

The Association shared their experiences and trained farmers from Kendrapara district of Orissa in training and decentralised and distance learning methods, developing print and computer based crop specific and theme based training materials for horizontal transfer of knowledge and networking with other farmers' associations in the region.

Kulumai – Federation of SHGs: Kulumai is strengthening its capacity to act as a community bank apart from acting as a forum for social mobilization for collective action, capacity building and social and economic empowerment. It consists of 111 SHGs, with a strength of 1,512 members. Nearly 62 percent of them belong to women's groups, 30 percent belong to men's groups and nine percent are from mixed groups. The annual turnover of the federation is Rs 148.7 lakh. During the last year 19,752 trainee days were organized, benefiting 661 individuals. The focus was on SHG management, ICT, health and nutrition, grassroot institution building, ecoenterprises, functional literacy, export marketing, organic farming etc. The intragroup transactions were mainly for the purposes of agriculture, children's education, medical expenses, house construction and remodeling, purchase of livestock, village festivals and other ceremonies. The federation is expanding and

strengthening its network with the help of local commercial banks, DRDA and NGOs. These organisations help in the grading of SHGs by the DRDA and forwarding applications to the bank to avail of loans. In this context, an area of concern is the suitability of the SHG template to mobilise the poorest among the poor rural families. Within the last two years almost thirty SHGs have become defunct due to their inability to make the regular repayments and adhere to other norms.

Community informatics: The hub of the VKCs, located at Kannivadi, continued to function as an active centre for information access and computer-based training in sustainable agriculture. The dynamic information database, which covers various aspects, was updated periodically in all the four centres. The centre provides information on commodity-based market trends, government schemes, educational opportunities, simple remedies based on locally available medicinal plants, agriculture, pest management and input details. On an average nearly 390 members visited the centre for various purposes in a month. Nearly 77% of the total visitors (4,671) approached the centres to seek information. The knowledge centres were actively involved in training the farmers on quality literacy, especially *Codex Alimentarius* and Sanitary and Phyto Sanitary (SPS) measures of WTO, and food and nutritional security. Computer based training materials have been prepared and used in the training programmes. Many of the students in the villages used the centres to learn the basic computer skills.

Computer-based functional literacy: After the evaluation of the project by external evaluators, a new set of participants was identified and given training in reading and writing. It is acknowledged that the programme is cost effective, unlike conventional government-sponsored non-formal education programmes. National level agencies working on non-formal literacy have accepted the model and a proposal has been submitted to strengthen the model for wider replication.

Replication of Variable Rate Technology: In order to disseminate the *Variable rate Application Technology* (VAT) under the pulse village programme at Srirampuram, Dindigul District, studies were carried out in the use of Remote Sensing (RS) technique in determining correlations between soil properties (macro nutrients, organic carbon and pH) and spectral values derived from satellite imageries. The soil samples collected in November 2003 were compared with the RS data of May 2000. The results have shown that there is significant correlation for available phosphorus and the pattern of soil nutrients was closely related to the spectral index. This experiment will be repeated with simultaneous remote sensing and field data in the coming year, to fine tune the decision support system being developed for farmers, in collaboration with Space Application Centre (ISRO), Ahmedabad.

Food and nutritional security: The results of the initial baseline study conducted during the previous year were analysed to elucidate the exact nutritional status of the people at Samiarpatty and Thonimalai, Kannivadi region,

Dindigul. A long-term analysis was planned to obtain a deeper perspective of their nutritional status. Data regarding age, sex, physical activity for the day and the intake pattern was collected from selected households in each village every day and was subjected to analysis. The analysis was done using a database created in Visual Basic 6. Daily results were tabulated and subjected to analysis on a weekly and monthly basis. The results showed that there was a wide deviation between the iron consumption and recommended allowance, leading to chronic iron deficiency; the consumption patterns of other nutrients were better, though they were not up to the recommended levels.

In order to address the core problems and to reduce nutritional deficiency, training programmes were chosen as the preliminary step. Training programmes on basic nutrition, health and hygiene, contamination, maternal and foetal nutrition, and some other demonstrative training programmes were conducted. After each programme, feedback was collected from the villagers and used for improving subsequent programmes.

Paper and board from banana waste: The Jansirani women's SHG has been involved in identifying new market linkages and expanding their capacity to meet market needs. Need-based training programmes were organised to enhance their skill in paper production and reducing wastages. The group members participated in district, state and national level exhibitions and shared their experiences with bank officials, NGOs, farmers' associations and

developmental workers. In order to expand and sustain the market network, the unit has advertised in a web page, with the support of Trade India Infocom network. This resulted in getting new market linkages. The group has been formally registered and acquired the PAN card as well as export-import license to export their products. The group repaid the loan amount of Rs 25,000 to Canara Bank, Kannivadi as per the repayment schedule. The unit has been facing constraints such as water scarcity during summer months but has a consistent market demand.

Trichogramma biopesticide production: Three different SHGs have been involved in the production of *trichogramma* biopesticide. The first two groups viz., Poomani and Kavikuyil SHGs are acting as resource persons to other SHGs in the district and state. The third group, Chinnammal SHG has recently started a production unit. Land has been purchased and registered in the name of the SHG. The three groups have been collectively involved in marketing. The Kavikuil and Chinnammal group received a loan with subsidy from DRDA, Dindigul, to expand their unit. They produced nearly 2200cc of pesticide and marketed it to sugar companies and local farmers. Each group generated nearly 800 labour days and the production has covered around 450 acres. The major constraints in production are pest and disease management. The incidence of *Tribolium* and a fungal disease are major challenges to the production. The rate of production per tray was also very low (6.78 cc/tray) as compared to its potential (average

25 cc/tray), and resulted in low income. The major reasons for the reduction in production and pest and disease management strategies were discussed and necessary remedial measures are being taken to overcome the problems.

Trichoderma viride: The production unit at S Pudur has refined and stabilised its production technology. During the initial period, the production rate was very low (on an average 100 kgs/month), but gradually the group developed skills in the various processes of production. Due to the painstaking and meticulous efforts of the group, the production cost, as well as the rate of production, has improved considerably. They were able to reduce the cost by nearly 40% over a period of six months. The unit generated 600 labour days and produced 2.2 tonnes last year. The group had entered into a marketing agreement with a biofertiliser dealer to sell their produce but due to poor monsoon and continuous drought all over the state, the company could not lift the product as per the agreement. It was able to market only 50% of the product. From this the group members have learnt that there is a need to identify multiple market sources to sustain their production. The group members are actively involved in exploring additional market linkages.

New initiatives

Decentralised production of Pseudomonas fluorescens: A SHG with landless agricultural women labourers was identified by Kulumai to initiate the production of *Pseudomonas*. It is

a biopesticide, which protects plants from harmful fungi, bacteria and nematode. It is useful against fungal and bacterial leaf spot, root rot of paddy, vegetables, pepper, groundnut, grain legumes, banana, betel vine and cotton. It helps plant growth through the production of growth hormones, multiplies quickly in the soil and prevents the growth of harmful microbial species. The faculty of the Department of Plant Pathology, TNAU, Coimbatore, trained the group on production methods as well as quality control techniques. The group prepared the business proposal and submitted it to the bank under THADCO assistance scheme. The bank sanctioned the loan and the group established a production unit with a capacity of around one ton per month. The group has entered into a market agreement with a private agro-input dealer, based at Trichy. It is planned in such a way that the unit can generate 1,200 labour days with an additional income of Rs 800 per member per month.

Integrated scientific dairy: Fifteen SHGs came together to take up the business. The group organised a study on the availability of resources to support the additional livestock population. Initial discussions were carried out with Hatsun Agro Products for market linkage as well as technical support for scientific dairy management.

Low cost production of biofertiliser: Developing a model of decentralised low-cost biofertiliser production unit at the village level would help to harness the benefits and promote the use of biological software in promoting sustainable

agriculture. The problems faced in using these inputs are timely availability, the quality of the biofertiliser and the effectiveness of the strains being used. To address these issues it was planned to evolve a low-cost production unit for *azospirillum* and phosphobacteria, which can be taken up as an ecoenterprise by women SHGs at the village level. A preliminary discussion was held with the RSGA and *Kulumai* and the concept was presented to them. The general feedback from the group was obtained on the appropriateness of such an initiative in this area. The farmers were asked to assess the availability of the products and prevailing usage pattern. Further discussions with *Kulumai* will be held in identifying the probable SHG, which will take up this activity. RSGA has agreed to promote awareness in using biological inputs and help in identifying farmers to carry out the field trials at the appropriate time.

301.4 National Network of Biovillages and Community Banking

The programme aspires to become the epicentre of a SHG revolution, focusing on initiating market driven enterprises supported by appropriate credit. The aim is to ensure that the SHGs become economically sustainable and develop self-replicating models. Through its network, the programme has extended the concept of Biovillage to other states such as Chattisgarh, Madhya Pradesh, Gujarat and Rajasthan.

The Programme continues to facilitate the network of grassroots institutions like SHG Federations and Farmers' Associations with banks, government departments, educational institutions and universities, to enable them to understand the potential of sustainable natural

Table 3.3: *List of Ecoenterprises started in various project areas*

Project Area	Enterprises	Number of units	Members involved
Chidambaram	Lift irrigation	6	98
Jeypore	Agriculture and goat rearing	3	40
Kakinada	Fish, milk, rice vending	6	60
Kannivadi	Biopesticide & banking	2	23
Karaikal	Trading	1	9
Kendrapara	Community pond, tricycle, tailoring,	4	50
Kolli Hills	Trading, vermicompost, millets	3	35
Kudankulam	Trading, communication & poultry	8	76
Nagapattinam	Cashew nut & coconut processing	7	74
Pondicherry	Eco-transport, bio-fungicide, dairy and biogas	14	144
Wayanad	Book binding, goat rearing, dairy	3	41
Total		57	650

resource management and to introduce various livelihood opportunities.

Ecoenterprises were started in many project areas as shown in Table 3.3

301.5 Chennai

The Ecotechnology laboratory at Chennai concentrates on exploring little-utilised indigenous plants and is engaged in mass multiplication of laboratory host of *Trichogramma*. Basic biochemical characteristics of the pest, *H. armigera* were studied before taking up bioassay.

Pesticide degradation using leaves of indigenous plants

A study on pesticide degradation, using four plant species namely *Clausena dentata*, *Cipadessa baccifera*, *Melia dubia* and *Dodonaea angustifolia* was carried out. The powdered leaves of these plants (with and without *Trichoderma*) were incorporated in soil fortified with recommended doses of pesticides (acephate, endosulfan and quinalphos). The physical parameters (pH and moisture content) and biological parameters (total bacteria, fungi and actinomycetes count) showed an increase, 40 and 60 days after incorporation. The chemical parameter (organic carbon and available nitrogen) though less in the initial stage, increased gradually thereafter. The most interesting observation of pesticide residues of acephate, endosulfan and quinalphos in soil samples (0 and 60 days after incorporation) showed non-detectable in the case of acephate and satisfactory reduction in endosulfan and

quinalphos. For example, the pesticide residue in soil with pesticide+*Cipadessa baccifera* decreased from 0.99 on zero day to non detectable on the 60th day in the case of endosulfan, and pesticide+*Trichoderma*+*Melia dubia* decreased from 0.21 to non-detectable in the care of endosulfan. It was the same in the case of Quinalphos where soil+ pesticide+*Dodonaea* proved effective in reducing the pesticide residue.

Bioassay

Clausena dentate, locally called *Aanai thazhai*, is a well-known multi-purpose plant used by *Malayali* tribals of Kolli Hills. Research was carried out to identify the pesticidal characters if any, as well as biochemical and genetic changes in *Helicoverpa armigera* treated with the extract. Different solvents (hexane, petroleum ether, chloroform, acetone and water) in extracts of the test plant affected the pupation and adult emergence of *H. armigera*, the most effective being chloroform and hexane extracts. In second generation adults, the number of fertile eggs laid and hatchability were considerably reduced in petroleum ether extract.

Mass production of Corcyra cephalonica

The Unit was involved in the mass multiplication of rice moth, *C. cephalonica* to maintain inoculum source as well as to supply fresh eggs to SHGs based at Kannivadi and to the Biocentre, Pillayarkuppam. This supplementary source of host eggs helped the field centres to produce *Trichogramma*.

Training

Training was given to Tamarai SHG based at Kodathur, Pondicherry, to establish and maintain the *Trichogramma* unit. Awareness on IPM and biocontrol methods coupled with interactive training sessions, helped them to maintain the unit. The staff and farmers of Jeypore, Orissa and Wayanad were trained in IPM and biocontrol particularly, *Trichogramma*.

New initiative at the field level

Paddy stem borer, *Scirpophaga incertulas* was managed through the use of *T. japonicum* in a participatory mode with the local farmers of Manikollai, Chidambaram. The slow spread of awareness and periodical demonstration of the usage of *T. japonicum* has opened the doors for further experimentation.

Soil, water and plant analysis

Before sowing a new crop, it is necessary to screen the nutrients left behind in the soil by the previous crop. Identification of soil health problems and need-based application in the form of nutrients would help to minimise the loss in crop yield. Nearly 492 soil samples from various field sites such as Kannivadi, Kolli Hills, Pondicherry, Chidambaram, Villipuram and Chennai were analysed for major nutrients, namely N, P, K and organic carbon for the recommendation of exact nutrients required by the succeeding crop. Compost (4 samples) from Chidambaram and Kolli Hills were analysed for total NPK, moisture and organic carbon. Vegetables kept in zero energy cool chamber were analysed for total soluble solids, reducing

sugar, total sugars and other biochemical parameters. In addition to this, the nutrient profile of *Panchakavya*, a local growth promoter, was also analysed.

Networking and partnership building

The Centre has been collaborating with several organisations to meet project needs and to address their requirements. It also plays the role of facilitator in developing linkages between development agencies and the local grassroot institutions. The list includes government departments, NGOs, banks, educational and research institutes, extension departments, the corporate sector and grassroot institutions.

In collaboration with State Bank of India Rural Development Institute, Hyderabad, the Centre organised two training programme for SBI officials representing 15 different states of India on *Credit Linked Biovillages*. Another training programme was conducted for Extension officials of Agriculture and Horticulture on *ICT Enabled extension approaches* jointly with TNAU. In another programme the officials of the Public Works Department of TN government were given training on rural development, with water as the central theme. The Central Planning Commission has involved the Centre in the preparation of the State Development Report for the state of Pondicherry, in collaboration with Madras Institute of Developmental Studies (MIDS) and Institute for Financial Management and Research (IFMR), Chennai. The Centre has helped Women's Indian Association (WIA) and Krishnamurthy

International Agricultural Foundation, Chennai, to implement low cost greenhouse for vegetable cultivation at the Government Leprosy Rehabilitation Home located in Maneripatty village of Thanjavur district.

Sub Programme Area 302

Sustainable Management of Natural Resources for Food Security

The MSSRF-OSU project on sustainable management of natural resources, funded by Sir Dorabji Tata Trust, is being implemented in 3 project sites *viz.*, Pudukottai, covering the red soils; Narasinghpur and Hoshangabad districts of Madhya Pradesh, covering the black soils and Nawanshahar and Faridkot districts of Punjab, covering alluvial soils. The project operates through the demonstration-and-training mode for disseminating improved agricultural land and water management practices that enhance food security and environmental quality. This is the third year of operation of the project.

302.1 Pudukottai, Tamil Nadu

Demonstrations

The programme at Pudukottai is being implemented directly by MSSRF at Ariyamuthupatti village and at Kannivadi in Dindigul district.

At Ariyamuthupatti, due to insufficient rainfall during the Kharif season (267 mm), the main crop of redgram suffered and the yield was low.

The number of rainy days in the year was only 39. However, the total rainfall during Kharif and Rabi was 632 mm. The effect of mulching along with land treatment was demonstrated in the farmers' fields under such sub-normal rainfall conditions. As against the yield of 63 kg and 168 kg per ha of greengram and redgram respectively, obtained under farmers' practice, the effect of land treatment through ridges and furrows and tied ridging along with mulching and application of enriched compost, improved the yield to the extent of 180 kg and 526 kg per ha of greengram and redgram respectively.

To demonstrate better water use efficiency, a gravitational drip system of irrigation was installed with a syntex tank of 400 ltr capacity in a farmer's field with tomato as test crop. Every day 800 ltr of water was used for irrigation through drip, totaling 58 times of watering during the crop period and a yield of 19.2 tons / ha of tomato was obtained. Saving of about 74% of water under drip system as compared to the normal method of irrigation was convincingly demonstrated to the farmers. Another demonstration was laid out at Kannivadi where there was 62% deficit in rainfall last year with the chillies variety Namdhary.

Women Self Help Group activities

The Mangayi Amman SHG at Ariyamuthupatti scaled up the *Trichogramma* parasite cards with market tie-up with EID Sugar Factory. A SHG at Maringipatti was also initiated into the production of *Trichogramma* with a loan of Rs 1.2 lakhs arranged through DRDA.

Benefit under the Wasteland Development

Project was extended to Maringipatti village in 20 ha area by planting both sapota and mango grafts. Moisture conservation measures such as pitcher irrigation and mulching for the establishment of saplings are being demonstrated.

Training

During the year 14 training programmes were organised, involving 347 trainees on different topics such as vermi-composting, micro enterprises, Government assistance, soil testing, bio-fertiliser use, tricho card production and turkey rearing. A soil testing campaign was organised in collaboration with the Soil Testing Laboratory, Kudimianmalai and 60 Soil Health Cards were distributed to the respective farmers.

302.2 Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

In the black soil areas of Madhya Pradesh, receiving more than 1000 mm of rainfall, inadequate land and water management practices affect crop production to a great extent. The field trials conducted in farmers' fields demonstrated the superiority of improved

land management and agricultural practices such as integrated nutrient management and integrated pest management. An average of 5 field trials in farmers' fields, comparing the ridges-and-furrow method of sowing and flat bed system of sowing produced 16.7 and 8.0 qtl/ha of soybean respectively.

In major black soil areas in Madhya Pradesh, the Haveli system of cultivation is being practised, whereby the fields are kept impounded with water during Kharif rain and after draining the excess water, wheat or gram crop is grown during Rabi. With the collaboration of the Regional Centre of the Central Institute of Fisheries Education, the practice of fish culture in the water-logged fields during Kharif was demonstrated. as profitable proposition as detailed in Table 3.4

Similarly, the planting of wheat and gram in raised-sunken bed system of cultivation was more than planting in flat beds. The system consists of an array of raised and sunken beds of 8 m width with an elevation difference of 30 cm.

Table 3.4: *Result of fish-wheat /gram rotations*

Treatment	Production (q/ha)	Cost of cultivation (Rs.)	Gross income (Rs./ha)	Net return (Rs./ha)
Fish-wheat rotation				
Fish	11.0	12,576	27,500	14,924
Wheat	24.8	7,092	14,880	7,788
Total		19,668	42,380	22,712
Fish-gram rotation				
Fish	11.0	12,576	27,500	14,924
Gram	18.5	6,616	21,737	15,121
Total		19,192	49,237	30,045

Intercropping of soybean with pigeon pea is being promoted in the predominantly monoculture area with soybean as the main crop. Four lines of soybean and two lines of pigeon pea were sown and demonstrated as a more profitable intercropping system in 6 farmers' fields. The net return from sole crop of soybean, sole crop of pigeon pea and soybean intercropped with pigeon pea was Rs 12,155, 19,330 and 28,210/ha respectively.

Training

A total number of 950 trainee days were completed during the year, covering various aspects of improved agricultural and land and water management practices.

302.3 Punjab Agricultural University, Ludhiana

The major field problems in this region are excessive use of ground water and energy for irrigation in rice-wheat rotation and crop residue management.

Alternate cropping systems for rice-wheat were tried at 4 locations in Nawanshahar and 2 locations in Faridkot district. The demonstrations brought out the possibility of going in for alternate cropping systems such as American cotton-wheat or Desi cotton-wheat/gram in Faridkot district and maize-wheat or

maize-toria-gobhi/sarson in Nawanshahar district which demand less water than the rice-wheat cropping system. A district-level survey showed that in Nawanshahar district the area under rice cultivation has decreased by 9.7% and area under maize has increased by 13.2%. In Faridkot district the area under cotton has increased by 20%.

Intercropping trials with gobhi/sarson and peas in sugarcane showed the possibility of higher income from the total cropping system as against the cultivation of sugarcane alone as the main crop.

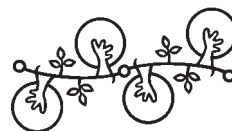
Similarly, intercropping in poplar plantations with wheat/moong/maize and sugarcane have demonstrated the benefit of the agro-forestry system in areas predominantly used for cultivation of annual crops.

A demonstration on inland fish culture in a farmer's field is being continued at village Nathawala Nawan in district Faridkot. During the year 26.3 quintals of fish were harvested from a pond of one ha area.

Training at Langroya and Faridkot

A total of 14 training programmes at Langroya KVK Centre, 12 programmes at Faridkot Regional Station and 1 training programme on making compost from rice straw at Ludhiana were conducted during the year .





Reaching the Unreached

*U*DRC for Gender and Development coordinated an Orientation/Refresher Course on Rural Development in June 2004 to help staff understand MSSRF approaches to rural development. Voicing Silence facilitated in the formation of an all-woman rural theatre group drawn from SHG members in the Pondicherry Biovillage project area and provided them theatre training. The group was helped to develop a musical play 'Thullal' (Leaping), to tell their story. The President of India Dr. APJ Abdul Kalam, released the Atlas of the Sustainability of Food Security in New Delhi on February 5 2004. Moving from analysis to action, a series of State level consultations are planned this year under 'Mission 2007: Hunger free India'. The Resource Centre for Community Food and Feed Banks initiated work on Fodder Banks in Ladakh.

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Sub Programme Area 401

Uttara Devi Resource Centre for Gender and Development

The Centre continues to function in the partnership mode, with reference to both the external and internal mandates.

401.1 External Mandate

Agricultural curriculum

In partnership with Kerala Agricultural University (KAU), MSSRF has been working for some time to introduce the gender dimension in the curriculum of Agricultural Universities. As part of that process, a 2-credit 16-unit module on Gender, Agriculture and Rural Livelihoods was developed for the undergraduate level. Dr Sara Ahmed, distinguished scholar and formerly on the Faculty of the Institute for Rural Management (IRMA), worked on this assignment in her capacity as Visiting Fellow for 2003-04 at the UDRC at MSSRF.

An outline of the draft module prepared by Dr Sara Ahmed was circulated in July 2003 to several gender specialists and experts from different disciplines, including the KAU faculty, with the support of Dr Geethakutty, Coordinator, Centre for Studies on Gender Concerns in Agriculture (CSGCA), KAU. As per the plan, a one-day workshop was convened by UDRC in September 2003 at MSSRF to consolidate the feedback from all sources and enable Dr Sara to strengthen, refine and finalise the module. Participants for this workshop were drawn from

different disciplines like agricultural sciences, environmental sciences, gender, and social work, including nine faculty members from KAU along with Dr Geethakutty and Professor K N S Nair, former Vice Chancellor of KAU. This feedback workshop not only helped to sharpen the objectives and restructure and refine the content but also led to certain key decisions. Importantly, it was decided to opt for a generic module and not a KAU-specific module, thus giving all Universities the option of adapting the module to their context. Next, it was agreed that it should be a core course at the undergraduate level, with optional segments, which could also be extended to the postgraduate level if needed.

At a meeting of the Academic Council of KAU in February 2004, Ms Mina Swaminathan made a presentation of the module and KAU has agreed to introduce it as an optional subject at the undergraduate level. The restructured module is likely to be ready by June 2004. It has been planned to have the first orientation for the teaching faculty of KAU in January 2005, by which time the final version of the module will be published.

The CSGCA, KAU, invited UDRC in April 2004, to help facilitate the Expert Consultation to develop a training module and manual for engendering research and extension (KAU-NRCWA project). A presentation was made with critical analyses along the gender dimension of the present approaches and programmes of KVK, taking the Kasargode KVK as an example. A few suggestions were made on how to enhance the efficiency of the team before

starting the exercise. KAU has also decided to jointly organise a state-level Gender Workshop for KVK faculty in Kerala with the technical support of UDRC.

New Linkages: Gandhigram Rural University (GRU) and KVKs: A new linkage was established with GRU towards engendering the agricultural curriculum. As a first step, a one-day gender orientation programme for the senior Faculty of GRU was organised on 25th July 2004. The Heads of various Departments, including Home Science, Extension Education and Development Studies, participated. The Vice-Chancellor Dr G Pankajam inaugurated the programme and participated throughout with great interest. The need to integrate gender concerns in the curriculum of the different courses and sensitize the faculty to understand their importance was highlighted. After the deliberations it was apparent that gender sensitisation was required more at the level of extension services and needs to be initiated at the KVK. The ICAR has been approached for financial support and formal acceptance, in order to put this in practice and make the process systemic and replicable across the country.

Research partnership

Dr Martina Padmanabhan, Faculty of Agriculture and Horticulture and Post-Doctoral Fellow, Humboldt University, was at MSSRF from 16th to 23rd August 2003, to work out a joint proposal on Institutional Innovations and Biodiversity Conservation. UDRC organised a series of in-house discussions with the

personnel of various disciplines including Resource Economics, Biodiversity, Plant Breeding, Sociology and Anthropology at the Chennai office. A seminar was organised on 20th August, 2003, in which she made a presentation on Gendered Knowledge in Agriculture. A trip to Wayanad was also arranged, to help her to understand the rich biodiversity of the Western Ghats and the culture and role of the people in conserving it, through interaction with the communities and discussions with the field team at CABIC. The jointly drafted proposal is awaiting approval.

401.2 Internal Mandate

The Centre is receiving demands for collaboration from various projects within MSSRF in keeping with its internal mandate. There has been steady progress in mainstreaming the gender process and various initiatives have emerged. Institutional mechanisms to integrate gender concerns are being evolved in the form of regular inter-project meetings, networking among projects and action plans for partnership and training.

Orientation for women field staff

At the special session on gender issues at the Staff Council Meeting in January 2003, the discussion led to some changes in personnel policies with regard to recruitment and support services for women staff as a strategy to encourage and sustain employment of women. It was also realised that a better understanding of the field situations and gender-specific needs of field workers was essential to sustain the women

staff. To facilitate a lateral learning process, UDRC organised an orientation for the women field staff on 4th August, 2003, to understand their perceptions of their roles and responsibilities, women's issues and women-specific problems in their areas.

The meeting helped to identify certain common concerns and constraints faced at the work place by women field staff and to plan for exchange visits. Ms K Chitra from Namakkal was sent to Pondicherry Biovillage Project for a week to study the formation and management of SHGs and to understand the role of the facilitator. This visit enabled her to understand the problem-solving techniques in SHGs and gave her a better perception of gender-related issues. It also helped her to guide SHGs in identifying viable enterprises and gain knowledge on organic cultivation. In February 2004, Ms Meenakshi from Pondicherry spent a week at Kolli Hills as a Resource Person to strengthen the SHGs with specific reference to the livelihood patterns of the tribal community.

Gender and biodiversity

The Swadeshi Science Movement, Kerala, organised its 13th Congress in collaboration with the CAbC Centre of MSSRF from 6th to 8th November, 2003, at Kalpetta, Wayanad, on the theme of *Crop Diversity and Tribal Empowerment*. On this occasion, UDRC helped to organise a session on 'Gender and Biodiversity' on 7th November 2003 to understand the perception of women in the conservation of biodiversity and frame a policy

that would be sensitive to women. Dr Krishna Srinath, Central Institute of Fisheries Technology (CIFT), Cochin, chaired the session and representatives from NGOs working among tribal and fishing communities, research institutions, agriculture universities, activists and tribal men and women, took part. They demanded attention to gender concerns such as the role of women in the conservation and management of bioresources, the role of tribal women and fishing women in biodiversity conservation and sustainable usage, the need for recognition and reward for women - as gatherers, cultivators, conservers, homestead gardeners, etc. and their needs and constraints. The conclusions and recommendations that emerged from the workshop have been forwarded to the authorities to evolve gender sensitive development strategies in the conservation and management of bioresources. (See SPA 506)

Gender orientation

A Gender Orientation Programme was arranged in January 2004 in response to several requests from the Site Coordinator, Namakkal to help the field team in understanding and integrating gender concerns in the projects implemented at the field site. It included a brain-storming exercise on the goals of the Foundation, to understand the key concepts like development, discrimination, equality and the relations between caste, class and gender.

Subsequent visits to Namakkal helped to identify the following weak areas: team building, perspective, conceptual clarity and project

mode of functioning. An Inter Project planning meet for the Namakkal field site was held in March 2004 to work out strategies for strengthening the teams and creating synergy at the field centres. The meeting helped to evolve certain institutional mechanisms namely, setting up a Technical Advisory Committee for the Namakkal site, a periodic site-based inter-project collective planning and review process, integration of capacity building of the community and staff in future projects, recruitment of social scientists for field projects, orientation for staff and annual refresher programmes. (See SPA 201.1)

Accordingly, the in-house Staff Training Committee has recommended that as many of the staff represent science disciplines and have to play dual roles both as researchers and project implementers, it is very important for them to be oriented on social and gender perspectives and the MSSRF approach to development, for the realisation of project goals. An Orientation/Refresher Course on Rural Development was held in June 2004, for the field staff to help them understand the vision and mission of the Foundation, and MSSRF's approaches to rural development.

Study of wild edible foods

The centre supported CAbC to complete the report on the study of wild foods from a gender perspective, and it is now ready for publication. A database on the diversity of wild edible mushrooms and fish resources has been developed at CAbC. Documentation of the collection and management mechanisms of wild

edible foods is being continued to track the available gendered traditional knowledge systems. Feedback to the communities through a series of meetings is helping to work out feasible plans for interventions that will be useful to the communities. (See SPA 201.2)

Sustainability and gender impact analysis

At the Strategic Review meet last year UDRC had reiterated the importance of mainstreaming gender at different stages in the projects: planning, recruitment, implementation and monitoring and evaluation and offered its support in this regard. One of the responses was from the ICEF-supported Mangrove Conservation Project which sought assistance in conducting a Sustainability and Gender Impact Study of the project. After preliminary visits to project sites and development of study tools, external consultants were identified to carry out the study in TN and AP, Orissa being omitted for logistic reasons. The reports, besides suggesting strategies for sustainability and replication, also give some useful insights. One of these is that the areas covered were often miniscule in size, and hence the local communities are not powerful in influencing decisions at the community/Panchayat level, indicating the role of scale in replicability and sustainability. The importance of networking among grass-roots institutions was also emphasized. (See SPA 101.2).

In-house research

UDRC has taken the initiative to assemble a team of in-house social scientists and field researchers to conduct a participatory study

on the differential impact of the grassroots structures established during the course of MSSRF work, namely SHGs, farmers' groups and others, on men and women. Other objectives include training the staff on basic skills of social research and acquainting them with gender analytical frameworks. Following a discussion and orientation programme for Staff Council members during the Annual Review in March 2004, methodologies to be adopted for the study and the tools for data collection have been developed. The fieldwork is to be carried out in six sites, four in TN and one each in Kerala and Orissa during July and August 2004.

Gender workshop

Taking into consideration that many women-centred projects are being implemented in the field, it was felt that it would be useful to have a better understanding of the concept of empowerment of women. A one-day Gender Workshop on *Empowering Rural Women: Actors, Approaches and Advocacy* was conducted on 1st September 2003 by Visiting Fellow Dr Sara Ahmed. The workshop began with group exercises on the definition and meaning of the concept of empowerment at different levels: self, in relation to others (family and workplace) and in relation to work (programme, projects and policies). This helped the participants to arrive at a common understanding / definition of empowerment. Later the concept of power was taken up for discussion from four broad viewpoints: power over, power to, power with and power within. The interactive sessions helped the participants

to take a stand on working for women's empowerment.

Other joint activities

To commemorate the International Year of Rice 2004, MSSRF has planned a series of events including regional and technical workshops in Kerala, Orissa and the Northeast and a national seminar at Chennai on the broad theme of 'Gender, Rice and Food Security'. UDRC has been involved in preparing the concept paper, designing the workshop with a gender perspective, identifying resource persons and participants and documenting the outcomes. The first workshop was held in Orissa in March 2004. The technical session that focused on participatory breeding and farmers' rights included discussions on the role of women as conservers, breeders and cultivators and their rights under the Protection of Plant Varieties Farmers' Right Act (2001). (See SPA 506)

Public seminars

Two public seminars were organised by UDRC on gender-related issues. The first was a public lecture delivered by Dr Sara Ahmed, Visiting Fellow on 5th September 2003 on *Mainstreaming Gender Equity in Water Management in India with focus on the Role of Women in Participatory Irrigation Management*.

Another public lecture was jointly organised with the U S Consulate of South India to observe the International Women's Week on 6th March 2004. Two eminent women speakers Dr Josie A Bass, President, ALVA Consortium, Washington DC and Ms C K Gariyali, IAS,

Secretary to Government of Tamil Nadu, Directorate of Social Welfare and Noon Meal Programme, spoke on the theme of *Women's Political Empowerment*.

Sub Programme Area 402

Voicing Silence

Voicing Silence is a seasonal, small-scale activity, without full-time staff, run mostly with the involvement of resource persons drawn upon for short periods at a time. Recognising the strengths and the limitations of these features, this year's programme was consciously planned to maximise the advantages. Importantly, it was planned to focus on working with different communities of women, putting other objectives aside for a while.

Women's struggles for development

In accordance with the policy of greater internal networking and synergy, initiated after the Strategic Planning Review held in March 2003, it was decided to work more closely with other programmes / units of MSSRF and explore common themes through the modality of theatre.

A new link was established with the Biovillages in Pondicherry, from which an all-woman rural theatre group has emerged. Members of SHGs in Pondicherry, working with MSSRF support, had heard about our work in theatre and approached us for help in

setting up their own cultural group (music, dance and theatre). In October 2003, this proposal was discussed in detail at a meeting held with 23 women Biovillage Council members eager to start the cultural group and a plan of action emerged. The women expressed a desire to use theatre to "tell their story": their own achievements through the Biovillages, along with the difficulties experienced on the way and some of the gender issues and social problems faced by women in their communities. The group would enrol members, set up its own rules and function independently; our role was to provide theatre training and guidance, while the Biovillages unit would bear the training expenses and provide space and facilities.

Accordingly, a five-day workshop was held in December 2003, in two phases of two and three days, including a series of theatre exercises, experience sharing and music sessions, at the end of which a short musical play of about 20 minutes duration, titled *Thullal* (Leaping) was evolved, encapsulating some of these ideas. The play was then rehearsed and polished for performance through fortnightly rehearsals in January and February 2004 and a couple of informal shows, almost like dress rehearsals, were held in nearby villages. The show was "premiered" at the annual gathering held at the Biocentre to celebrate International Women's Day in the first week of March 2004, to an appreciative audience of about 800 women. Regular performances in surrounding villages are planned, the success of which will determine the future evolution of the group.

Performances

Interest in plays developed earlier with / for traditional women performing artistes continues, as indicated by Tables 4.1 and 4.2. There is still a modest demand for this kind of theatre in urban areas, but special efforts need to be made to create an awareness about the specialised art form. The women meanwhile, are returning to their roots and to their own audiences.

Another step forward in the journey

An interesting and unexpected development was the revival of the plan for the traditional women performing artistes, with whom we have been working for the past four years, to set up their own autonomous theatre company. This had indeed been our own dream too, but at the end of the third year, it had seemed unlikely, since the women themselves expressed doubts and reservations and did not have either the confidence or the financial backup to undertake such a risky venture. Among other reasons, a major one was the lack of a repertoire of the full-length (all-night) plays required by rural

audiences. The idea had hence been dropped, but it now seems that it had only been dormant, and the women themselves revived it at a meeting held in early December. It was decided that to begin with, they would function as a seasonal company, without withdrawing from their parent companies, and performing only when they were all free from their regular commitments at the same time. This would provide them the experience to manage their own company and establish their existence in the performing circuit, though it might not bring in much income, since performances would mostly be in the off-season. It was agreed to polish up one popular full-length play, with the help of a musician skilled in the genre, and perform it under their own banner. It was agreed that 10-15 performances would be given during the coming year, mostly towards the end of the year. This would help them to decide whether they could go in for a permanent company by next year.

After five days of workshops with the musician in January 2004 and equipped with the appropriate costumes, the *arangetram* or formal

Table – 4.1: **Performances of Manimekalai**

Date	Place	Sponsoring Organisation (s)	Occasion	Audience
20.12.2003	Museum Theatre, Egmore Chennai	<i>Ulaga Tamizh.com</i> , Shriram Group of Companies, Chennai	<i>Naveena Nadaga</i> <i>Vizha</i>	Literary & theatre group, general public
13.02.2004	Chellammal Women's College, Guindy, Chennai	Chellammal Women's College, Guindy, Chennai	College Cultural Programme	Students

Table – 4. 2: *Performances of Pani-t-thee*

Date	Place	Sponsoring Organisation	Occasion	Audience
07.01.2004	Dr.G.R.Damodaran College of Science, Coimbatore	Dr.G.R.Damodaran College of Science, Coimbatore	Communication Fest	Students
05.03.2004	Bio-centre, MSSRF, Pondicherry	Bio-centre, MSSRF, Pondicherry	Women's Day Celebration	Members of Women SHGs

launch was held on 6th February, in a village about 100 km from Chennai. The women have since been preoccupied with regular seasonal activities, which may continue at high pressure till June, and will begin performances of this play only after that.

Transcending gender

An exploratory visit was made in August 2003 to the headquarters of a new organisation formed to protect the rights of *aravanis* (eunuchs), at their invitation. Some members of the group had heard about our work in theatre and wondered whether we could help them to develop a theatre piece for performance at the annual Koothandavar temple festival held in Koovagam every year in the month of March, an important occasion for *aravanis*. The visit was made to get to know each other better and clear doubts and apprehensions. Frank recognition and open discussion of the grounds for mutual suspicion and distrust helped to build good rapport. Possibilities in the field of theatre, terms and conditions for working together on a project, and needs and conditions for funding were discussed. It was agreed that both parties should raise funds to contribute to the expenses so that the end result could be “owned” by the

aravanis, our role being recognised as facilitators. It was also realised that this would take some time and that both sides would make efforts and take up the project when ready.

The group reestablished contact in early March 2004 and plans were made to help them develop and perform a play on their concerns which could be used for advocacy on the human rights issues of a deeply marginalised segment of society. At the end of an intensive five-day workshop held in the last week of April with a group of nine *aravanis*, a 45-minute play titled *Manasin Azhaippu* (The Call of the Heart) was developed, based on the experiences, struggles and aspirations of the group, and performed on the last day to a small audience of friendly critics. In the ensuing interaction, the actors and the audience spoke about the powerful cathartic impact of the play, the ‘shock’ of awareness that they had experienced, and the need to spread this awareness through theatre. Support was spontaneously offered, and follow-up activities for an advocacy campaign are now being planned.

Research

After a gap of several years *Voicing Silence*

re-entered the area of research on gender and performance. A proposal from a young woman scholar, Perundevi Srinivasan, for a short-term study titled “Imagining and Performing Gender by *Mahabharata koothu* artistes” was welcomed. Herself a Tamil writer, critic, and poet, involved in Tamil parallel theatre both as performer and as scholar, she is currently doing her doctoral research at George Washington University in the USA, from a multi-disciplinary perspective, including religion, anthropology, gender studies, literature and performance studies. She wished to explore the discourse about gender among *koothu* artistes, especially those playing female roles or *penn vesham*, as well as audiences for traditional Tamil theatre. She particularly wished to study how they conceive and internalise gender roles, constructions, relations, and equations, both within and outside the home and on stage, incorporating their experiences and their subjectivities. Having become familiar both with the geographical and cultural context through her previous researches on the goddess cult in Northern and Western TN, and with a number of theatre artistes in those areas, she wanted to use the summer vacation for intensive field work to gather the necessary data. *Voicing Silence* was able to provide modest funds to cover the expenses. Using an ethnographic methodology, she was able to collect oral narratives from nearly 30 artistes of whom 22 were *koothu* artistes while the others belonged to different Tamil performing genres. These narratives in turn grew out of wide-ranging conversations with the researcher, structured around ten major research questions clustered

into five theme areas — the processes by which the actors come to perform female and male roles, the choices, criteria, training and other influences; modeling and staging performances “of” and “for” women; conceptualising, internalising and exteriorising gender categories; beliefs and non-beliefs; and the interrelation between stage and life. The narratives have been interpreted, commented on and understood by the researcher in terms of post-structural feminist theory and post-modern performance studies, while at the same time leaving ample scope for the reader to interpret the findings differently.

The final report, which was submitted in April 2004, and copies of the original tape-recordings of all interviews, have been preserved and are available in our office. The research materials are available to bona fide scholars, who are free to access the material at any time and to use or quote it with appropriate citation and without referring to the names of the informants.

Documentation

Two brochures, one summarizing the work of *Voicing Silence* over a decade, and the other our video film archive, were updated. Two activities were documented on film. The first, *Thodar Payanam* (Ongoing Journey) filmed on the opening night (*arangetram*) of the first play by the all-women professional company, captures a moment in their lives, articulating and illustrating their art, activities and aspirations. The second *Thullal* (Leaping) highlights a joyous moment in the lives of the women’s cultural group from the Biovillages,

exploring what led to and lay beneath it, and hinting at future possibilities. This film was made in collaboration with *The Hindu* Media Resource Centre. All films are available on CD, in English and Tamil versions.

Sub Programme Area 403

BV Rao Centre for Sustainable Food Security

403.1 Food Security Research

One of the main activities of the BV Rao Centre was the preparation of the *Atlas of the Sustainability of Food Security*, undertaken jointly by MSSRF and the UN World Food Programme (WFP). Three Atlases have been brought out, using chosen indicators to map the relative standing of the States with regard to food insecurity. The book on the sustainability of food security is the third and the last in the series. It was released and presented to the President of India, Dr A P J Abdul Kalam on 5th February, 2004, at Vigyan Bhavan, New Delhi.

Atlas of the Sustainability of Food Security

Sustainability of food security has two aspects. First, the country has to become food secure now, from the point of view of food availability, food access and food absorption. Next, there should be a comfortable position in terms of the natural resource endowments that will help food production and livelihoods of rural people in future and contribute to clean water and air.

Natural resources should be sufficient to meet the economic and ecological needs of local livelihoods, including crop production, livestock, fisheries and forestry. If natural resources are destroyed, it is not possible to sustain life for long. Hence sustainability is very important.

Highlights

- The percentage decadal growth rate of the population varies widely between the States. However, density of population has increased over a decade to exert pressure on natural resources. The total fertility rate in some States like Kerala, TN and Goa is below the replacement level, whereas in Meghalaya and Bihar it is above 4 percentage points.
- The percentage of grazing land has come down over the years, though decline in forest area is not apparent. The change in net sown area is surprisingly negative in the past five years in some States like Karnataka and TN, perhaps because prime agricultural land has been shifting to non-agricultural uses. Cropping intensity and irrigation intensity have been increasing. Cropping pattern has diversified to include non-food crops. Land degradation has been fairly high in Gujarat and Nagaland. In some of the northeastern States, wasteland is as high as 50 percent of the total geographical area.
- The ratio of rainfall to half of the potential evapo-transpiration shows that, in States such as Orissa, Bihar and Uttar Pradesh, two crops may be grown with the available

rainwater. However better utilisation of rainwater for crop growth requires moisture conservation techniques. This aspect needs further research. Smaller rivers show more utilisation levels, close to 100 percent. Watersheds of river basins have degraded considerably, leading to a decline in the water flow.

- Groundwater exploitation has increased in the past decade, reaching the danger levels of over-exploitation in States like Punjab, Haryana and TN. There is an urgent need to control this situation.
- Though forest cover appears to have increased marginally in recent years, fruit crops and plantations have encroached on forestland. It is important to conserve prime forests.
- The increase in air and water pollution from chemicals and greenhouse gases has been causing a decline in agricultural production in recent years. Climate change is projected to have adverse effects, particularly in developing countries, and, in the case of India, the impact is expected to be severe in the coastal areas. Fluctuations in rainfall may increase, causing floods and droughts more often than before. These will have negative effects on agricultural production.
- There are variations in food access and livelihood access across the States. In some, poverty levels are very high but there are sufficient natural resources to sustain livelihoods in the future, as in Madhya Pradesh. There are other States (such as Punjab, Haryana and Kerala) where the present level of livelihood access is very good yet the natural resource endowments required for future sustainability are below par. Maharashtra, Bihar and Orissa suffer on both counts: low livelihood security at present and low sustainability in the future. There is an urgent need to diversify livelihoods to non-crop and non-agricultural enterprises as in Gujarat, Kerala and Karnataka.
- There is a large scope for improvement in agricultural yields, given the variations across States in natural resource endowments and adoption of technology. Market forces influence the use of natural resources. In India, though input and output prices are instrumental in determining total agricultural production, there are a number of other non-price factors that play an important role.
- Strategies of sustainable livelihoods will have to be chalked out for each State to achieve the path of sustainable food production and sustainable livelihood security. Poverty alleviation, by using the existing natural resource potential, is the key issue for Madhya Pradesh. Similarly, the requirements of Orissa, and to some extent Bihar, are in increasing land productivity, diversification of agriculture, improving infrastructure and basic amenities, and providing market linkages. Removing pressure on land and water and conserving natural resources for sustainable water supply are essential in TN and restoration of forests and protection of natural resources in AP, Rajasthan, and Gujarat.

Recommendations

It is proposed that a *Food Security Compact* be developed and implemented in every State/ Union Territory, to enable the governments to formulate and introduce integrated programmes of natural resources conservation and enhancement, augmentation of food production, generation of sustainable livelihood/ employment opportunities, provision of clean drinking water, environmental hygiene, primary health care and primary education. Such a Compact should take action on the ten points mentioned below:

Population stabilization, Encouragement of a child-friendly village/town movement, Land resources conservation and enhancement, Establishment of a water security system, Management of forests, Preservation of biodiversity, Atmosphere and climate management, Administration of common property resources, Sustainable intensification and diversification of farming systems and value-addition and Formation of a State Coalition for Sustainable Food Security.

“The State Coalition for Sustainable Food Security, recommended in this Atlas, can review concurrently issues relating to the environmental, social and economic sustainability of the freedom from hunger movement. A systems approach is needed at both the planning and implementation levels. Above all, the programmes must be people-centred and driven, so that transaction costs can be kept low and success assured. *Think, plan and act locally, and support at the State and national levels*, should be the motto.

If the recommendations made in all the three Atlases are implemented in an integrated manner, *food for all and forever* will become a reality, not just a desirable objective.” — Prof MS Swaminathan in the Preface to the book.

Research on sustainability of farming systems

A macro-perspective research study of the sustainability of food security for all the States in India was initiated in 2002, and resulted in the publication of the *Atlas of Sustainability of Food Security in India* in 2004, as detailed above. Several indicators were developed as part of the study to address the relevant issues pertaining to the sustainability of food security in all the States. The need was strongly felt to undertake the study at the level of the farming system and fill the research gaps identified. The project on sustainable farming systems is an effort in this direction.

New Delhi, has agreed to fund this research project on Sustainable Farming Systems, leading to a PhD degree. The duration of the project will be three years (2004 – 2007).

The research work on Sustainability of Farming Systems is based on the broad framework that farming systems are sustainable if they are diverse, productive, stable and profitable. Conservation and enhancement of the natural resource base is central to sustainability. The research proposes to offer strategies for sustainable intensification and diversification with adequate crop-animal integration and value addition. The primary survey covers some selected villages in TN.

State-level report and consultation on Jammu and Kashmir (J&K)

A report on the Food Insecurity situation in the state of J & K has been brought out. It has two sections — one on J & K regions and the other on Ladakh region. The report was prepared following a visit to the State in May 2003 for collection of information and field experience. A State-level Consultation was held on 30th September 2003 in Srinagar where the reports were presented along with an action plan to make J & K food secure by 2007. The honourable Chief Minister of J & K, Mufti Mohammad Sayeed, the honourable Governor of Jammu and Kashmir, Shri S K Sinha, and the chairman of the Ladakh Hill Council, were present at the Consultation. In addition, the State Minister of Agriculture and the Vice Chancellors of the Agricultural Universities of Kashmir and Jammu attended the meeting along with various other State officials and dignitaries.

State-level consultations for hunger-free India, 2007

The analyses of the different aspects of food security studied in the three Atlases will assist policy makers at the Central, State and local levels, to prepare specific action plans to achieve the goal of making India hunger free by 2007. The Prime Minister set this goal when he released the first Atlas in April 2001.

The sacred mission of a 'Hunger Free India' needs the cooperative efforts of the Central and State Governments, local self-government bodies, non-governmental organisations,

international agencies, and, above all, our citizens. While the Atlas series is an important tool for policy makers and researchers alike, it is imperative that this work is translated into direct action so that India may achieve food security for all the citizens by 2007, which will mark the sixtieth anniversary of our Independence. Though every State has its particular problems, it also has unique assets that can be harnessed to achieve the goal of sustainable food security for all.

To bring the issues of food security to the fore and to initiate action by the respective State Governments, MSSRF in collaboration with WFP has decided to hold State-level consultations in various parts of the country. Detailed State-level reports on food security, along with the appropriate policy recommendations, will be prepared for each State and will be presented at these consultations.

The consultations will be held between August 2004 and June 2005 for all the States of the Union of India. A total of six consultations are being planned, by clubbing neighbouring states together at each consultation.

Asia-Pacific hunger hotspots

The UN Task Force on Hunger commissioned MSSRF to prepare two papers on *Hunger Hotspots in the Asia-Pacific Region*. Prof M S Swaminathan of MSSRF and Prof Pedro Sanchez of Earth Institute, Columbia University, are the Chairpersons of the Hunger Task Force. These papers would become a part of the Task Force Report to the UN. The first

paper identifies the hunger hot spots in the Asia-Pacific Region along with the reasons for the prevalence of hunger in some of the countries in this region. The second paper discusses the principal needs and challenges that Asian countries, outside India, are facing to reduce the number of hungry people with special reference to China. The objective is to examine how China was successful in reducing the number of hungry people. China will be used as a case study to identify the most important strategies of reducing hunger that could be replicated in Asia. The study also examines what political, economic and social changes had to take place for these strategies to work, be effective and have a positive impact.

Ford Foundation Chair on Women and Sustainable Food Security

A consolidated research study on *Gender Dimensions of Food Insecurity* is under preparation. The in-depth study of gender dimensions of food security in rural and urban areas and sustainability of food security, undertaken in the past four years, form the basis of the present work. In all the three aspects of food security, consisting of food availability, food access and livelihood access and food absorption, women are more vulnerable than men. The study highlights the problems faced by poor women in rural and urban areas. Food shortages and natural calamities affect availability. Their adverse impact is more on women than men. Discrimination in livelihood access is quite common in villages and towns. Discrimination in school enrollments, achievements in education, labour force

participation, unemployment levels and wage earnings are well documented in urban as well as rural areas. Deteriorating female-male ratio, differential infant mortality rates and adverse juvenile sex ratio are seen at the average level in almost all the states in rural and urban areas. Some states are worse off than others. Social taboos and lack of access to timely health care could be the major reasons for adverse juvenile sex ratio, though we lack macro data to support household level discrimination in health care.

Women play an important role in agricultural production and its sustainability. The extent of time and effort that women spend on unrecognised and unpaid work like fetching water, collection of fuel/firewood and collection of fodder illustrates the fact that their involvement and contribution is much more than what the work participation statistics show. The current statistics, despite being underestimates, show that agriculture is slowly getting feminised. There were more women workers in agriculture in 2001 than a decade ago. However, even in agriculture, women are pushed to marginal lands and marginal work as casual labour.

UDRC, jointly with Ford Foundation Chair for Women and Food Security, is in the process of organizing a National Seminar in Chennai from 2nd to 4th September, 2004. (See 401.2) The focus will be on gender concerns and food security issues in rice-based livelihoods in India. The main aim of the project is to highlight the problems of women in rice-farming systems. A paper on *Critical aspects of women's role in rice farming systems* is being prepared for the seminar by the Ford Foundation Chair.

403.2 Resource Centre for Community Food and Feed Banks

The field activities of the Centre at Namakkal – Kolli Hills (Food and Feed Banks) and Jeypore (Food Banks), Orissa, have been reported under 201.1 and 201.3 respectively. In addition, CFBs have been set up in five villages in Boipariguda block of Koraput in Orissa through Sewa O' Mamata, a local NGO, and in three villages in Malkangiri district through Nababharat, another NGO, with both of whom we have a MoU. MSSRF staff monitor the work periodically and conduct training programmes in these villages.

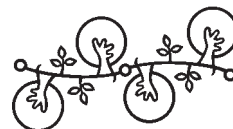
The Centre initiated two CFBs in Melvazhapady and Talvellar villages in Kalrayan tribal block of Villupuram district. The banks were formally inaugurated in December 2003. Work here has been initiated in collaboration with the Kalrayan Hills Area Development Programme of World Vision India. The CFBs are managed by women SHGs. The members were taken on an exposure trip to the CFB in Kolli Hills and given training in operating and managing a CFB. The initial corpus of food grain was provided under the project, with voluntary contributions from the members and this has been disbursed as loan. World Vision has undertaken the responsibility for the construction of the CFB storehouses. PRA has been conducted in the two villages and a tripartite meeting, of the State administration, World Vision and MSSRF, is to be held soon to determine and activate possible linkages with Government programmes.

Twelve members, along with three MSSRF and

World Vision staff, underwent training in millet seed production and value addition technologies at TNAU. TNAU is going to set up on-farm demonstrations on farmers' fields to the extent of 30 acres during the current season, bearing an input cost of Rs.1000 per acre. A programme on foodgrain storage and preservation was conducted for the CFB members by the Save Grain Campaign of the Government of India from 20th to 29th April, 2004. At the end of the programme, the participating members received certificates and metal bins of 300 kg capacity. The cost of the bins, Rs 1,100, was subsidised to the tune of Rs.650 and the balance was met by members' contribution (Rs 150) and World Vision (Rs 300).

The Centre has entered into a Letter of Agreement with the NGO, Agravamee in Orissa to initiate Panchayat level CFB. Following a preliminary survey visit to Ladakh in May 2003, a MoU has been entered into with an NGO, CENSFOOD, to implement Community Fodder Banks in two villages. The members of CENSFOOD visited Chennai and our Site office at Jeypore for orientation and training on initiation, operation and management of Fodder Banks, in March 2004.

The Centre engaged the services of a fresh law graduate on contractual basis to document the history and recent developments in India on the Right to Food. The paper was discussed at an in-house seminar in September 2003 and included as a background paper for the National Food Security Summit held in New Delhi in February 2004.



Education, Communication, Training and Capacity Building

The MSSRF-TATA National Virtual Academy for Food Security and Rural Prosperity forged a National Alliance of 41 organizations to work for Mission 2007: Every Village a Knowledge Centre. A major initiative of THMRC was the tie-up with AIR for the 52-week programme 'Mannin Manam' aimed at taking science to the masses. The National launch of Fish for All movement in Kolkata in Dec 2003 and the National Food Security Summit in New Delhi in Feb 2004 were among the major workshops organised during the year. The Every Child a Scientist Programme decided to conduct theme-based short-term training programmes to reach more children. The first on biodiversity conservation was conducted in Feb 2004. A vacation-training programme was organised for school children on Bioresources and Biotechnology as part of the year of Scientific Awareness

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Sub Programme Area 501

National Virtual Academy for Food Security and Rural Prosperity

MSSRF has been working since 1998 in twelve villages in Pondicherry, where Informatics has set up Rural Knowledge Centres (RKC) with the generous support of International Development Research Centre of Canada (IDRC) and Canadian International Development Agency (CIDA), Canada. These knowledge centres are connected through a hybrid wired and wireless network and provide information on agriculture, health, employment, weather, education, government entitlements, micro enterprises training, etc. Although a variety of technologies were used, the focus is on the people, their context and their needs. From the experience with RKC the new initiative of “Virtual Academy for Food Security and Rural Prosperity”, which aims to bring together experts and grassroots level people in two-way communication has emerged.

National Virtual Academy for Food Security and Rural Prosperity

On August 23, 2003 the MSSRF-TATA National Virtual Academy for Food Security and Rural Prosperity (NVA) was launched. The Academy enables farmers’ organisations and village women to easily access the scientific and technical knowledge that they need to solve local problems and enhance the quality of their lives, as well as to communicate their own insights and needs back to scientists. The NVA

aims at reaching frontier technology to resource-poor rural women and men and enabling them to become masters of their own destiny. It will help to create large numbers of knowledge managers in our villages, most of whom will be women.

The NVA emphasises the critical role of ICTs in achieving the UN Millennium Development Goals in the areas of hunger and poverty elimination as well as in gender equity and health security. The aim is to build a family of Fellows of the Virtual Academy, with the help of a large number of partners in different parts of India, who will be the torchbearers of Knowledge for a Hunger and Poverty-Free India Movement and to achieve a substantial reduction in hunger and poverty by 15th August, 2007, the 60th anniversary of India’s independence.

National Virtual Academy Fellows

In August 2003, six outstanding rural women and men working in our RKC were elected Fellows of the NVA for Food Security and Rural Prosperity by a committee headed by Prof M Anandhakrishnan, a former UN official and Vice-Chancellor. The Fellows are: Ms E Ambiga, a 27-year-old social worker from Kalitheerthalkuppam in Pondicherry; Mr H Bagadoor, a 33-year-old progressive farmer from Sriramapuram in Kannivadi; Mr K David, a 37-year-old physically challenged person from the fishermen community of Thangatchimadam in Ramanathapuram; Ms B Kasthuri, a 36-year-old social activist from Embalam in Pondicherry; Ms N Sridevi, a 21-year-old innovative teacher

from Samiarpatti in Dindigul district specialising in adult and functional literacy using computer technology, and Ms D Usharani, a 34-year-old from Embalam in Pondicherry, an expert in organising health camps and having good computer skills.

Ms D Usharani was invited by Global Knowledge Partnership (GKP) and OneWorld International to take part in the ICT4D events that took place as an adjunct to the World Summit on Information Society, Geneva in December 2003. Ms D Usharani spoke at the launch of the Open Knowledge Network (OKN) and gave away two GKP Awards to winners at a function. She played an active role in the One World stall and was interviewed by many media persons.

Namma Ooru Seithi (News of our village) – Community Newsletter

Namma Ooru Seithi, a community newspaper, was started on 18th February, 2002. The newspaper is published twice a month and is distributed free. It carries information that people can use in their daily life.

This year the community newspaper network was extended to 35 villages, based on the demand. The pages have been increased from 4 to 6. Several new columns (such as readers' views, NGOs section, cartoons, etc.) have been introduced. Project staff and volunteers use telephones and RKC's to clear readers' doubts. The government departments and AIR have included *Namma Ooru Seithi* in their list of media channels for dissemination of news along with regular newspapers. The newspaper

works closely with KVK, Pondicherry, in sharing the contents. The KVK brings out a monthly newsletter called *Vellan Parvai* and the KVK has given permission to the community newspaper to use its contents.

The Ariyankuppam coconut farmers' association regularly shares content related to coconut cultivation, intercropping and farmers' success stories.

Self Help Group Accounting Software

NVA has developed accounting software for SHGs to report to both the DRDA and banks. The computers in the knowledge centres are used to maintain the accounts and transactions of the SHGs. The software helps the DRDA and banks to analyse their monthly and annual reports and plans. The software was released on 18th April, 2004. After one month it was found that several SHGs were not maintaining accounts properly. Now they are scrutinizing their accounts and several SHGs have requested that their accounts be maintained in the system.

Open Knowledge Network

In November 2003, the OKN was launched in collaboration with OneWorld International, UK. OKN is a human network which collects, shares and disseminates local knowledge about health, local culture and practices, education, agriculture, government schemes, jobs and markets. Two other hubs are located in East and West Africa. Through this network, access points from India and Africa share their local news through World Space Satellite and Internet.

The local news is produced in Tamil and Swahili and the Meta tags are in English.

In 2003, OneWorld carried out OKN pilot projects in East and West Africa. The next step is to bring all the pilots together and build an inter-continental network for exchanging relevant knowledge among southern partners. From April 2004, information from OKN is being included in the community newspaper and from May 2004, it is also being relayed through AIR. So far more than 3500 items have been uploaded.

Integrated Health System

One of the Millennium Development Goals is “Control of HIV/AIDS, Malaria, TB, Leprosy and preventable blindness”. There was a partnership with Aravind Eye Hospital, Pondicherry, to initiate the movement of preventing blindness in villages. Village level awareness meetings were organized with the help of paramedical staff. At these meetings, the different eye diseases, their prevention and treatments were explained through diagrammatic presentation. The hospital provided training to the village knowledge workers to identify common eye defects after which they conducted a survey in the villages and sent the electronic records in the prescribed format to Aravind Eye Hospital along with digital photographs. NVA has signed an MoU with Aravind Eye Hospital for sharing education materials, providing training for village volunteers to conduct periodical examination of diabetic patients to detect eye problems and examine school children and

prescribe glasses with simple field equipment.

The Tuberculosis Research Centre (TRC) provides training for village knowledge workers on identifying TB patients. Two experts have been nominated for this purpose and all the education materials provided. These will also be disseminated through NVA.

Potential Fishing Zone Electronic Board

The Indian National Centre for Ocean Information Services (INCOIS) has provided a Potential Fishing Zone (PFZ) electronic bulletin board. It was set up at the Veerampattinam knowledge centre in January 2004. The board displays information on potential zones of fish aggregation including latitude, longitude, depth, direction and distance from the landing centres and light houses.

Watershed Technology and Management Institute (WTMI), Pune

NVA and WTMI have signed an MoU for the effective dissemination of knowledge relating to watershed development and management through Water Shed A-Z software. In April 2004, WTMI provided the training for MSSRF staff in Water Shed A-Z software.

Training in animal husbandry

A training programme was arranged for cattle owners in partnership with Rajiv Gandhi College of Veterinary and Animal Sciences (RGCVAS) for 10 villages between July and October 2003. More than 300 cattle owners took part in the training programme, and found the training very useful. RGCVAS has developed touch screen

animation modules on maintaining cattle and protecting them from disease. Now the modules are available with NVA.

Regional hubs and data providers

Initially NVA will cover three districts, namely Pudukkottai, Thanjavur and Dindigul. In Pudukkottai and Dindigul the major partner is Gandhigram Rural Institute (GRI), a Deemed University. With the help of the Department of Political Science and Development Administration of GRI, NVA has started the basic village survey in 20 villages. Gandhigram University and MSSRF organised a one-day local needs assessment meeting at Pudukkottai on 14 February, 2004. Panchayat leaders, SHG members, agricultural officers, project officers, youth club members and block development officers took part. Some of the panchayats are willing to provide space and electricity and allot paid staff from the panchayat to look after the knowledge centre. In Thanjavur, the major partners are Tamil Nadu Rice Research Institute and Soil and Water Management Institute. NVA has also partnered with TNAU, PPRC, AIR, Central Research Institute for Dryland Agriculture, Chennai Base of Fishery Survey of India, Dhirubhai Ambani Institute of Information and Communication Technology and several experts, regarding technical advice and content. In the past four months, India Meteorological Department has been regularly sending All India Agromet Advisory Bulletins. TNAU has kindly provided the Rainman Climate Management software which provides the crop advice index and a link with all important

meteorological web sites. With the help of Azim Premji Foundation, NVA has initiated the Computer Assisted Learning centres for rural children. In April 2004, MSSRF and Azim Premji Foundation provided training for 200 school teachers in operating scientific educational CDs.

Internet Radio & Cable Radio

The radio has played a major role in the rural community in the last 50 years. However in the last 10 years, cable TV has become very popular even in rural areas. A survey in rural Pondicherry (1998) showed that the reach of electronic media, especially television, is reasonably high, despite the prevalence of poverty in the villages surveyed. Until recently the Government of India had not given permission for starting a community radio service.

To overcome these problems and cover a larger audience, the Internet Radio was started in January 2004 with technical support team One World South Asia. Internet Radio is a way of receiving streamed radio programmes through the PC and Internet connection. It provides interviews with experts, experiences of rural successes, information on rural products, farming techniques, etc.

Cable Radio is already functioning in Boodikote, Karnataka, implemented by VOICES, with financial support team UNESCO. The technical group of VOICES trained two MSSRF staff and two village volunteers. In April 2004, cable radio was demonstrated in Pondicherry.

Sub Programme Area 502

The Hindu Media Resource Centre for Sustainable Development

Free access to emerging knowledge and open discussions on various sensitive scientific issues lead to right public policy and informed public opinion. With this vision MSSRF created *The Hindu Media Resource Centre (THMRC)* in 1998 with generous financial support from *The Hindu* group of publications. Millennium lectures, media workshops, public fora and documentary films are the various strategies adopted as shown in Table 5.1

Millennium lectures

To provide an in-depth understanding of sustainable development issues like poverty eradication, food security and the environment, experts and policy makers of international repute present their views on alternative options for development.

Sixteen lectures have been organised till now. In August 2003, there was a special Millennium Lecture by His Excellency Mr Ranil Wickremesinghe, Prime Minister of the Democratic Socialist Republic of Sri Lanka. The Prime Minister proposed forming a single integrated market in the South India-Sri Lanka sub-region, to benefit the economies of both nations, as Sri Lanka and India working as an integrated marketplace could offer strong opportunities for potential investors.

In March 2004, Shri M Russi Lala, Former Director of Sir Dorabji Tata Trust, delivered a special Millennium Lecture on *The Role of Purpose in Life*. It was a thought-provoking talk, useful to the audience largely comprising MSSRF staff from all the sites.

Global Warming: A Threat to our Shores by Sir David Anthony King, Chief Scientific Advisor to the Government of UK, also in March 2004, highlighted the serious problems caused by climate change. He stressed the need for North-South exchange of science and technology to

Table 5.1: ***Activities during the year 2003-2004***

Millennium Lectures:	Special Lecture – His Excellency The Prime Minister of Sri Lanka, Mr Ranil Wickramasinghe, 23 August, 2003 The Role of Purpose in Life – Sri Russi Lala, 10 March, 2004 Global Warming – A Threat to our Shores - Sir David Anthony King, 19 March, 2004
Media Workshops:	Jal Swaraj –Facing the Water Emergency, 16 April, 2003 AIR Workshop – Radio and Sustainable Agriculture, 14 & 15 July, 2003 Strategies for Efficient Water Demand- World Habitat Day, 6 October, 2003 Strategies for Efficient Water Demand- World Habitat Day, 6 October, 2003 Science and Sustainable Efforts to End Hunger – World Science Day, 28 February, 2004
Public Forum:	Biotechnology and Shaping the Future of Rice, 12 March, 2004

address the problem in a collective spirit.

Media workshops

Media workshops offer a great opportunity for intensive interaction between media professionals and scientific experts. This forum provides a platform not only for detailed discussion but also for clearing apprehensions and doubts.

Taking science to the masses being the motto of this media resource centre, a workshop for AIR was organised. The Honorable Minister for Agriculture Thiru R Jeevanandham, Government of TN inaugurated the *Radio and Sustainable Agriculture* workshop. Mr N Ram, Editor In Chief, *The Hindu*, and Mr B R Kumar, Deputy Director General (South Zone) AIR, Chennai, gave guidelines to take the message forward. Scientists from MSSRF suggested strategies on covering the entire State. This workshop paved the way for broadcasting a 52-week programme called *Mannin Manam* in Tamil every Monday, between 7.30 and 8 pm, from 15th September, 2003. Public information and not public relation was the guideline in choosing the case studies and success studies for broadcast. A special feature of *Mannin Manam* is giving voice to the normally excluded. The programmes are made as per the requirement of the communities. Latest information on science and technology is given by MSSRF scientists to keep the listeners updated. THMRC and the AIR recording team visited the field sites and interacted with the community to learn about their needs and interests for making suitable changes in the programme.

Nearly 25 programmes have been broadcast and the second phase will concentrate on documenting the feedback. To achieve the best impact through the media, programmes broadcast by the AIR state network were converted into audio compact discs for replaying before the community. The recapitulation and reinforcement, along with personal clarification from the site offices, help to take science to the masses.

A Media Workshop on *Science and Sustainable Efforts to End Hunger* demanded dynamic information about the market at the right time in addition to inputs on increasing productivity. The workshop urged the conversion of the commitment to achieve hunger-free India into political action. So far eighteen media workshops have been organised.

Public Fora

MSSRF takes advantage of the presence of leading scientists and development thinkers at the Foundation to organise public fora. Fourteen public fora meetings have been conducted at different venues in Chennai.

In commemoration of the International Year of Rice, a Public Forum on *Biotechnology and Shaping the Future of Rice* was organised in March, 2004, to focus attention on the important role of rice in the diet of over 40% of the human population. While many panelists favoured the introduction of GM seeds for increasing food production, the dissenters felt that the cost of the new technology was higher than the benefits. Prof. MSSwaminathan stressed the importance of efforts to increase rice production to meet

the food needs of the growing population in the face of the current stagnant and even declining trend. Dr M K Bhan, Secretary, DBT, Government of India, Dr Suman Sahai, President of Gene Campaign, Delhi, and Prof. Williams James Peacock, Chief, CSIRO, Canberra, Australia, spoke at the Forum.

The following documentary films were added to the existing collection:

- Biological Paradise of Andhra Pradesh
- Scarascia Mugnozza Community Gene Bank
- Vision, Progress and Prospects - A Film on JRD Tata Ecotechnology Centre
- A Way to Prosperity – A Kudankulam Experience
- *Thullal*

Sub Programme Area 503

Design and Development of Databases and Provision of CD-ROM Services

The Informatics Division has been working to enhance capacity building and information networking by collecting, collating and disseminating actionable information through database services at different levels. Most of the databases are in the public domain. The Informatics Division shares technical resources with universities, research institutions and

individuals. This year it introduced a Linux-based web server, Internet proxy server and domain name server. Firewall and Anti virus server were also installed. This open source informatics reduces software cost.

Bioinformatics Centre and CD-ROM Library

The Bioinformatics Centre, supported by the Department of Biotechnology, Government of India, serves as a vehicle for access to and dissemination of databases. This year the Bioinformatics Centre started work on developing a web-based research output database for India. This is a bibliographic attempt to cover all research papers published by Indian Scientists in the areas of classical and new biology, agriculture, horticulture, veterinary science and medicine.

The Centre also supports a CD-ROM library which offers CAB Abstracts searches free of cost. This year more than 1,300 researchers from 20 universities, 15 research institutions and 52 colleges used the CD-ROM library.

Sub Programme Area 504

Every Child a Scientist Programme

The *Every Child a Scientist* Programme was started in 2001, with tribal children as the target group, at the Community Agro-biodiversity Centre (CAbC) at Kalpetta, Wayanad. In Chennai, economically and socially underprivileged children are the main participants in the programme, which was

initiated in August 2002. Effort is taken to provide opportunities to children to nurture their inherent creative talents. The new information technologies are used extensively, as audio and visual aids help the learner to understand things better. The Centre is equipped with seventeen personal computers and multimedia learning material to make learning a joyful experience, and works closely with school teachers and non-formal educators in the choice and development of the content of the curriculum.

The objective is to spread knowledge on biodiversity conservation, sustainable and equitable use of our bio-resources, basic health and hygiene, and environmental issues. Animated experiments, web page, computerized quiz programmes, games, interaction with experts, animated CDs and field visits are some methods adopted to facilitate learning.

The programme was initiated in Schools of the X Zone of Chennai Corporation. During the course, children were exposed to several important subjects: plant morphology, soil, water, energy, forest biodiversity, leaf litter biomass, butterfly diversity, adaptations in birds, wild animals and snakes, pollution, common diseases, sky watch, traffic rules etc. So far, about 150 children from Corporation schools and Seva Samajam Illam have participated and 24 student projects prepared.

To commemorate the completion of one year, Annual Day was celebrated and participation certificates were issued to all the students. This

occasion gave an opportunity to get direct feedback from teachers about the impact of the programme. A total of 96 students were honoured on this occasion.

The children of standards 6 and 7 conducted a chart exhibition. 10 students prepared 75 charts under the theme of *Panchabootham*, (water, air, land, sky and fire). Nearly 300 students from nearby schools visited the exhibition.

It was decided to conduct theme-based short-term intensive courses to reach more children. The first short-term training programme was conducted in February 2004 with 25 children, in various subjects including bio-resource diversity and conservation, in Tamil. MSSRF scientists gave lectures on biodiversity, agro-biodiversity and national regulation. There was an exposure visit to Guindy National Park and Snake Park. Children did group projects on agro-biodiversity in Chennai, a survey of general awareness about local medicinal plants, dead wood ecosystem, tree diversity in GNP and inter-dependency of animal and plant life in GNP.

Workshops for teachers

The second interactive workshop was conducted in January 2003. It was inaugurated by Prof Bruce Albert, president, US National Academy of Sciences. The participants included school headmasters and science teachers, to assess the impact of the programme and to get direct feedback from the teachers. Teachers felt that such programmes are much needed for the children, to give them an opportunity to widen their

knowledge base. They also expressed a desire to attend a training programme during the annual vacation.

Touch and Smell Garden

The Touch and Smell Garden has been developed to help visually impaired people to experience the joys of nature and learn by exploration, through the senses of touch and smell. The Honorable Chief Minister of Tamil Nadu inaugurated the Touch and Smell Garden on 7th August, 2002.

Children from the three main blind schools in the city visit the garden regularly. They are very happy to learn about plants through the senses of 'touch' and 'smell' and get information through Braille boards in Tamil, the local language, lining the path of the garden, about various plants species and their economic importance. They are greatly enthused with general topics like "Importance of Ozone layer", "Biodiversity", "Sacred Groves" etc. that are also covered in these Braille boards.

One block which has plants like lilies, lotus and eichhornia species, gives an opportunity to the visually impaired to 'feel' and 'learn' about these plants, which is otherwise not possible. A seed album is now being developed for children to learn about the different types and shapes of plant seeds and their characteristic features.

Visually impaired adults from various NGOs visit the garden from time to time. The visually challenged cricketers from various countries who participated in the World Cup at Chennai also visited the garden.

Genome Clubs

Genome Clubs have been started in schools and rural areas to create a cadre of young men and women with a functional knowledge of genetics and legislation pertaining to biodiversity and rights of farmers on seeds.

In Orissa, the genetic literacy programme at the grassroot level was started on 17th October 2003 at Jeypore. The aim of the Genome Club was explained and two levels were identified to form the club and disseminate proper information to the stakeholders. One is at the Panchayat level for panchayat leaders and other one is at the school level, to educate school children.

Accordingly, a panchayat level workshop on genetic literacy was organised from 2nd to 4th November, 2003, at Jeypore. The participants were exposed to *kalajeera* rice field, millet field, community gene/seed/grain bank, community rain water harvesting system and vermi composting.

A two-day workshop was organised for students at which they learnt about Biodiversity Conservation practices and were exposed to the Patraput forest where they collected information on plant diversity.

A five-day genome summer camp for school students was organised from 10th to 14th April, 2004. The chief guest Dr Natesh from NBDB, New Delhi, inaugurated the programme at Atithi Bhawan, Koraput. Activities included visits to fields, the forest, the museum, essay writing, stories, songs, making posters on environ-

mental issues and a rally on environmental awareness.

Vacation Training Programme for School Children on Bioresources and Biotechnology (19th –30th April, 2004)

The Government of India has declared the year 2004 as the Year of Scientific Awareness with the objective of making people scientifically literate, and to inculcate in them the habit of putting scientific awareness to practical use in day-to-day life. Health and nutrition, conservation of biodiversity, empowering people through IT and sustainable agricultural practices have been identified as broad issues and areas of concern. Progress in the field of biotechnology has immense implications for the conservation and enhancement of vast bioresources. Judicious application of biotechnological tools for sustainable management and enhancement of bioresources will therefore hold the key for our future. For this, it is essential that a critical scientific and technical pool of competent researchers be developed in the country.

It is in this context that a vacation training programme for school children of standard X was organised from 19th to 30th April, 2004, with the support of the NBDB. Twenty-two students from different schools in TN were selected. The course was designed to expose them to various aspects of Bioresource Management through interaction with experts, field visits to the bioresource hot spot regions as well as hands-on practical training in the field of Biotechnology. Laboratory experiments

included DNA isolation from plants, lichens and bacteria, secondary metabolite profiling from medicinal plants and lichens and tissue culture propagation methods. The course included a 3-day field visit to Pondicherry, Chidambaram and Pichavaram where the participants were exposed to the concepts of Biovillage, Knowledge Centres, Mangrove Forests and their importance, Sacred Groves, Integrated Pest Management Systems, Organic Farming and Eco-friendly micro enterprises.

Sub Programme Area 505

Library and Information Services

The Library has a collection from different disciplines, relevant to the on-going research at the Foundation. It caters to the needs of in-house staff and a great number of external users.

The collection comprises books, journals, back volumes, reports of other organisations, project reports of the Foundation, dissertations and CDs.

In order to disseminate accurate and relevant information to the staff, Internet search services are undertaken. Apart from this, the library provides document delivery service to better the needs of the staff and to support their work at the Foundation.

Sub Programme Area 506

Workshops, Conferences and Training Programmes

Workshop on Poultry Feed, Crop Management and Marketing (18 September 2003) and Expert Meeting on Poultry Feed Crop Area Expansion and Marketing

(1 December 2003) Namakkal

The workshop brought together all the major players in the poultry industry, viz farmers, associations, unit owners, veterinary college faculty, government agriculture department, bankers and media - to discuss the issues involved, the challenges and prospects. A follow-up meeting was organised on 1 December, 2003, and chaired by Prof Swaminathan, who proposed the formation of a consortium of "Poultry for Prosperity", involving all the major stakeholders.

ICT Policy-Makers Workshop – Rural Knowledge Centres: Harnessing Local Language via Interactive Media (8-9 October 2003) Chennai

The aim of this workshop was to sensitise policy makers to critical issues in the use of ICTs to promote human development in rural areas. There were more than 60 participants, representing IDRC, Bhoruka Charitable Trust, TN Corporation for Development of Women Ltd., NABARD, VOICES, ICRISAT, OneWorld, Governments of TN and Pondicherry, Central Government departments, ISRO, Ambuja

Cement Foundation, Indian National Centre for Ocean Information Services (INCOIS), SBI, WHO, Digital Partners, Azim Premji Foundation and hardware / software companies. This workshop was supported by IDRC and CIDA.

The issues discussed included regional priorities; information, knowledge and skill empowerment of SHGs; the concept of a knowledge centre in every village; domestic software development and application; community radio; technology upgradation in villages; content creation; women and ICT; participatory knowledge system; sustainability and replicability, role of Panchayat Raj institutions; promoting job-led economic growth; servicing and maintenance and political commitment; public action and investment priorities. The detailed recommendations were brought out as a booklet and sent to several agencies.

National Workshop on Science and Technology for Sustainable Water Security in India (27-28 October 2003) Chennai

All estimates show that the availability of water for domestic, agricultural, industrial and ecosystem maintenance needs is likely to be the most serious constraint to economic prosperity and human health in the coming decades. Hence, there is a need for developing and introducing a water security system based on science and technology, which will be environmentally, economically and socially sustainable.

The workshop was organised in collaboration with the Office of the Principal Scientific Advisor

to the Government of India and the Confederation of Indian Industry. Dr R Chidambaram, Principal Scientific Advisor to the Government of India, inaugurated the workshop, which was attended by scientists, technologists, grass root level institutions and local institutions involved in water conservation and management.

The participants recommended that a Sustainable Water Security System should pay concurrent attention to the following aspects:

- Augmenting supplies through rainwater harvesting, aquifer enrichment and management, treatment and recycling of all industrial and domestic waste water, sea water farming and where economically, ecologically and politically feasible, inter-basin transfer of water
- Managing demand to ensure maximum economy and efficiency in the use of every drop of water in every sector of water use
- Monitoring and improving the quality of water in rivers, lakes, wells and aquifers
- Harnessing new technologies, particularly in the areas of linking energy security with water security, bioremediation, and breeding crop varieties tolerant to drought and salinity.
- Revitalisation of traditional water harvesting and sharing procedures and improving mini-hydel plants in the Himalayas through integration with new technologies
- Knowledge Management and dissemination relating to the conservation and sustainable and equitable use of water in the different agro-ecological regions of the country.

The participants further emphasised that India

should lose no further time in harnessing leading edge technologies in the areas of water and energy. They also called for the establishment of *Efficient Water Use Parks in Water Scarce Areas*. These Parks, operated by SHGs of women and men, will be designed in such a manner that the rain water infiltration capacity of the soil is improved through mulching; high value but low water requiring crops like pulses and oil seeds are cultivated and the efficiency of water use is enhanced through micro-irrigation, fertigation and precision farming technologies.

The participants also appreciated the effort of the Govt. of TN and suggested that all State Governments could emulate the TN example of mandatory rainwater harvesting and watershed and wasteland development. There is a need to generate synergy among the academic, public and private sectors in developing sustainable water security systems for the hill, coastal, arid, semi-arid and irrigated regions of the country. They also emphasized that *Water for all and for ever* should be the national goal.

Workshop on ICT-enabled development: South-South Exchange through Travelling Workshop (30 October – 6 November, 2003) Chennai

In tune with the Foundation's philosophy of sharing knowledge and expertise and learning from the experience of others, an annual travelling workshop is organised every year. Development activists involved in ICT-enabled development programmes from Asia, Africa and

Latin America are invited to participate. This year there were 20 participants from 14 countries including Bangladesh, Egypt, Vietnam, Kenya, Uganda, Philippines, Bolivia, Western Somalia, Bhutan, Mexico, Malaysia, Thailand, Sri Lanka and India.

UNESCO and SciDevNet Workshop for Women Communicators on the use of ICTs for the Reporting of HIV/AIDS Research (5-12 November, 2003) Chennai

The aim of the workshop was to help communicators produce timely and accurate reports, press releases, news stories and features about HIV/AIDS research that is appropriate for different readers and audiences. MSSRF provided the technical support. In the midst of the workshop, during 9-11 November, the participants attended the 4th International Conference on AIDS-India, Chennai. The workshop provided training in ICT skills for more effective communication about HIV/AIDS research. This included the use of email and the Internet for finding news, stories, background facts, information and resources, contact details of independent experts, scientific abstracts and publications, and events calendars. Mr Joe Thomas, moderator of the AIDS-India eForum and AIDS-Timor eForum and project manager for the National HIV support programme in East Timor, Ms T V Padma, science journalist, Mr M Somasekhar, head of *The Hindu Business Line* Bureau, Hyderabad, Ms Julie Clayton, freelance science journalist and consultant to SciDevNet, were the resource persons. The topics discussed included the basic internet skills, HIV biology

online, understanding the spread of HIV, the science of HIV vaccines, ethics and the role of the community in HIV vaccine trials, the science of microbicides, accessing research literature online, selling the story to the editor, HIV/AIDS journalism in South Asia: highlights and obstacles, strategies and resources for finding an HIV/AIDS story, shaping the story and selling the story to the editor, story development and use of internet resources, coping in the workplace and how to fight discouragement.

Knowledge sharing and interactive learning among the workshop participants, the villagers, and the staff and volunteers of MSSRF were the basic objectives of the workshop. The participants visited various project sites in Pondicherry and Kannivadi areas to gain first hand knowledge of the impact of ICT-led endeavors and interact with the villagers through group discussions and multi-media presentations from volunteers managing the knowledge centres. For the most part, the discussions were very informal. Formal presentations by the volunteers and staff focused on processes, lessons and impediments involved in various ICT projects.

The workshop was jointly organised by the Informatics group and the JRD Tata Ecotechnology Centre, with the support of GKP and HIVOS.

On the last day of the workshop the participants had a video conference with a group in Kampala, Uganda who were involved in another South-South exchange workshop held with the support of IICD. A few of the participants at

the Uganda workshop were participants of the South-South Conference held at MSSRF in October 2002 and they were eager to know about the progress made since then. The workshop revealed that the essential components of a good ICT programme are a clear concept and vision, a committed group of people, local champions, good social mobilisation and people who can bring international connectivity.

13th Swadeshi Science Congress, (6-9 November 2003) Kalpetta

MSSRF and the Swadeshi Science Movement (SSM) jointly organised the 13th Swadeshi Science Congress at CA&B of MSSRF, Kalpetta. The focal theme was Crop Diversity and Tribal Empowerment. The Congress provided a forum for people working in the area of Science & Technology, particularly in relation to agriculture, to discuss innovations, skills, knowledge and policies used for improving agricultural productivity and awareness of the importance of conservation and sustainable management of biodiversity. The discussion was centred on the themes of Crop Diversity and Tribal Empowerment; Gender and Biodiversity; Health Science and Health Foods; Poultry Farming for Livelihood Security; and linking Science and People.

Around 200 participants from research institutes, Universities, NGOs, and the farming community attended the Congress and discussed the latest developments in all disciplines of science. The Congress also acted as a forum for the researchers to disseminate

their ideas, technologies and innovations to the grassroots level farming community.

Keynote speakers who participated included Prof M S Swaminathan, Dr P Pushpangadan, Dr Suman Sahai, Prof K I Vasu, Dr K K N Kurup and Dr M A Kuttappan, (Hon'ble Minister for welfare of backward communities, Govt. of Kerala) and other eminent scientists, activists and community workers.

There were parallel paper presentation and workshop sessions. An exhibition on the importance and value of tropical forest biodiversity and field trips were organised. The highlights of the Congress were the contest for Young Scientists awards, the Sir C V Raman Memorial lecture, and Swadeshi Award to Prof K S Manilal for eminent plant taxonomist of the country.

National Consultation on Food Parks, Agri Business & Quality Literacy (24 November, 2003) Virudhunagar

The consultation was convened at the Indian Food Park, Virudhunagar, TN, under the auspices of the Indian Association for Agribusiness Development (IAAD), jointly with CFTRI, Mysore and MSSRF, Chennai. The event was sponsored by the Ministry of Food Processing Industries (MFPI), Agricultural & Processed Food Products Export Development Authority, (APEDA) and Indian Overseas Bank (IOB). It was attended by more than 140 officials and delegates from Food Parks all over the country, Government Departments of the various southern State Governments, research & technology institutions like CFTRI, DFRL,

NRCB and MSSRF, commercial banks and financial institutions and representatives from the industry.

The consultation was designed to share experiences and develop a road map for achieving nutrition security and rural prosperity through the food processing sector. The role of technology, services and public policies in stimulating and nurturing a food processing revolution in the country was discussed. The technological, financial, institutional and policy constraints responsible for the gap between plans and practical achievements in the food processing sector were also discussed.

The Consultation urged all concerned to redouble efforts, not only in the production phase of farming, but also in the post-harvest phase, thereby generating urgently needed opportunities for skilled employment in the on-farm and non-farm sectors of the rural economy. Recommendations were made for appropriate follow-up action to give a fillip to the Food Parks movement in the country, so that they can cater to the large home market and also compete successfully in global markets.

The Consultation, held under the Chairmanship of Prof M S Swaminathan, sincerely hoped that the Government of India, the various State Governments and institutions like NABARD, MFPI, NHB, APEDA etc would initiate appropriate steps to strengthen policies to help agri-business and agro-processing in India. Through the *Virudhunagar Declaration*, it called for all-out efforts both in the production phase and post-harvest processing phase, to usher in an era of *Brown Revolution* in India.

Community Food Banks for Food Security(28th November 2003) Koraput

This one-day workshop was held in Koraput, Orissa. There were about 120 participants from NGOs in the region working in the area of food security, representatives from MSSRF project villages and other villages, the district administration, ATMA, ORMAS, CSWCRTI, WFP, KPG Bank and academia. About 50 percent of the participants were from the villages of Orissa which frequently face problems of food scarcity and even starvation during parts of the year. The proceedings were conducted primarily in Oriya to facilitate greater participation. It was a useful exercise in experience sharing and discussion on the sustainability of CFBs.

Fish For All: National Launch (17-18 December 2003) Kolkata

To harness the potential that exists in the country for the development of fisheries and aquaculture and contribute to the nutritional and economic security of the country, a two-day *Fish For All* meeting was launched at Kolkata, West Bengal. The meeting was attended by more than 200 participants, including Ministers and senior government functionaries from the Centre and the States and Union Territories, scientists and experts, representatives from the industry, academic institutions, farmers, members of the fishing community and the media.

To achieve the goal of fish for all and forever, the participants made specific recommendations for:

Public policy and action, Implementation of programmes for sustainable management of marine resources, Strengthening institutional mechanisms and capacity building, and Public awareness & partnerships to promote fish for all forever.

National Food Security Summit (NFS) (4-5 February 2004) New Delhi

The NFS was organised jointly by MSSRF and WFP on the three aspects of food security viz, availability of food, access to food and absorption of food. Three parallel sessions were organized on these three themes on 4th February, 2004 at the National Academy of Agricultural Sciences, New Delhi. The Minister for Agriculture, Mr Rajnath Singh, inaugurated the workshop and a large number of academicians, government personnel, public and media representatives participated.

The themes of the workshop were as follows:

- No time to relax on food production — the need for an evergreen revolution in irrigated and rain fed agriculture
- New deal for self-employed — pathways of economic access to food
- Lifecycle approach to nutrition security at the individual level – from know-how to do-how.

The President of India, H E Dr. A P J Abdul Kalam gave the valedictory address at the concluding session held at Vigyan Bhavan on 5th February, 2004. *The Atlas of Sustainability of Food Security* was released on the occasion. Members of the UN Millennium Hunger Task

Force participated in the session. Dr Jeffrey Sachs of Columbia University and chair of the UN Millennium Development Goals delivered the Coromandel Lecture. The Summit Statement urged all political parties to include a firm commitment to ending poverty-induced nutritional deprivation in all parts of the country by 15 August 2007, in their manifestos for the forthcoming national elections.

Study Tour of UN Millennium Hunger Task Force (9-12 February 2004) Chennai

The UN Millennium Hunger Task Force of which Prof Swaminathan is the co-chair held its annual meeting in Chennai under the aegis of MSSRF. A field trip to MSSRF biovillage and information village projects in Pondicherry was arranged on 10th February, 2004. A meeting was organised on *Pondicherry and the Millennium Development Goals* that was graced by His Excellency Shri N N Jha, the Governor of Pondicherry.

Conservation of Rice Biodiversity (1-2 March, 2004) Jeypore

This was the first of the regional workshops organized by MSSRF to commemorate the International Year of Rice, under the broad theme of "Rice, Gender and Food Security". It was organised in collaboration with the district administration of Koraput. The meet reiterated the importance of conservation and enhancement of traditional varieties of rice germplasm and threw light on the need for commercialisation and gender concerns in rice farming systems. The participants were from diverse backgrounds, 76 from different NGOs

in the State, 32 from the District Agricultural Department, 20 from research institutions, 12 rice millers and 303 farmers of whom 228 were women. The workshop served to bring together scientists, researchers, government officials and farm men and women on the same platform and brought home the need for inter-cultural and inter-disciplinary dialogues.

MSSRF-World Youth Bank Regional Conference on Adequate Food for All (9-11 March, 2004) Chennai

The workshop brought together 80 participants from 7 different countries, including India. It was organised with support from the UN Interagency Group on Rural Development, Food Security and Nutrition, Soka Gakkai International, Japan, International Food Policy Research Institute, USA and Science City, Chennai.

The participants worked out a five-point action plan:

- A National Youth Bank (NYB) should be established in each country with support from the Government, business, industry, society and media, with the objective of achieving employment, food, drinking water and health security for all.
- Mainstreaming of youth and involving them in productive activities in the primary, secondary and tertiary sectors relating to food and agriculture and natural resource management, should become a national policy. Poverty and food insecurity are two of the root causes for violence and crime in society and initiating action to address them

through positive approaches is important for sustainable human security.

- Youth camps, workshops, meetings and interactive seminars may be among the means employed to reach across to youth groups as part of awareness generation and motivation on social responsibility and bridging the divide between urban and rural youth. The media (both print and electronic) can be used effectively for greater outreach in this effort. Grounding in core human values should also be emphasised to equip youth to deal effectively with the dilemma of finding an optimum balance between traditional and modern value systems.
- National / Regional Fora should be organised periodically to identify and elaborate the role of youth in society for achieving food security for all and to share knowledge and experiences at the national, regional and international levels.
- Opportunities should be created for youth to learn and bring knowledge to the field for better and effective technology transfer, institutional innovation, policy implementation, and monitoring and evaluation.

National colloquium on Molecular Breeding and Shaping the Future of Rice (12-13 March 2004) Chennai

MSSRF organised the National Colloquium along with FAO of the UN, DBT, Government of India, XV Genetic Congress Trust and the Mahyco Research Foundation, to discuss the potential impact of molecular breeding in enhancing the productivity, quality, profitability

and sustainability of rice farming systems. Dr M K Bhan, Secretary, DBT, Government of India and Smt Radha Singh, Secretary, Agriculture and Cooperation, participated in the inaugural session. Leading biotechnologists from India and abroad, representing both the public and private sectors, attended the workshop.

Some of the major recommendations pertain to:

Bridging the productivity gaps, Priority setting in genetic engineering research in rice, Bioinformatics, Gene development and deployment for facing the impact of global warming and climate change, Bio-fortification, Participatory genotype development, promoting Private – Public sector partnership, Animal nutrition and Breeding for stress tolerance.

Workshops on Open Access (2-4, 6-8 May, 2004) Chennai

The objective of the two workshops was to enable higher educational institutions and government laboratories to set up interoperable institutional archives and populate them before the end of the year. 48 participants from higher educational institutions and government research laboratories (under the different Councils and Departments) were trained in the workshop. Prof Leslie Chan of the University of Toronto and Bioline International, Dr Leslie Carr of the University of Southampton, Dr D K Sahu of MedKnow Publications, Mumbai, and Dr T B Rajashekar of the Indian Institute of Science, Bangalore, were the resource persons. They helped participants learn to use Eprints software and to set up and maintain an Open

Access institutional archive. They discussed the global scientific and scholarly communication issues that Open Access addresses and explained how to create awareness among the local scientific community. The need for appropriate institutional policy and other organisational requirements for a successful, sustainable Open Access institutional archive were also emphasised. Thanks to the workshop each one of the participants is now able to set up a server independently. Prof M S Swaminathan and Prof P Balaram delivered guest lectures. This workshop, held under the auspices of the MSSRF Bioinformatics Centre, was sponsored by CSIR, British Council, Open Society Institute and IDRC.

Jamsetji Nusserwanji Tata Consultation on forming a National Alliance for Agenda 2007: “Every Village a Knowledge Centre” (19-20 May, 2004)

One of the recommendations of the Policy Makers workshop (October 8-9, 2003) was “Every village a knowledge centre: There is a need for developing a master plan coupled with a business plan for extending the benefits of ICT to all the 600,000 villages in India by 2007, which marks the 60th anniversary of our Independence. The master plan should help to link technology-knowledge-rural women and men in a symbiotic manner. The investment needs will have to be estimated and business plans prepared. A National Alliance for ICT for Poverty Eradication may be established for launching the Every Village a Knowledge Centre movement. Such an alliance should include the

private sector, cooperatives, NGOs, R & D institutions, women's associations, mass media and appropriate government agencies.”

Following up on the recommendation, we organized a consultation on forming a National Alliance for Agenda 2007: Every Village a Knowledge Centre, on May 19th and 20th, 2004.

After the consultation, the partners [41 institutions] of the alliance have formed six task

forces namely, Connectivity, Content, Space applications, Policy issues, Organization, management, evaluation and monitoring, training, capacity building and election of Fellows of MSSRF-TATA National Virtual Academy for Food Security and Rural Prosperity, and Resources (Technical, Management, Training and Financial).s

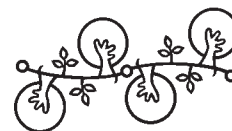


Table 5.2: *Training programmes conducted by the JRD Tata Ecotechnology Centre*

Details	Trainee Days		
	Men	Women	Total
Accounts & Book keeping	956	2,759	3,715
Ecoentrepreneurship and micro enterprise	778	2,463	3,241
PRA, micro planning, gender and PAME	70	21	91
Precision farming and ecoagriculture/ Awareness training on IPM, INM and Biovillage programme	1,157	1,693	2,850
SHGs, Federations and micro financing	1,091	3,057	4,148
Training for field officers and Government officials	87	36	123
Training for University staff and research scholars	26	26	52
Training organised by grassroot organisations in collaboration with MSSRF	6,534	3,652	10,186
Village knowledge centre management/ Conflict resolution and skill management training	134	720	854
Total	10,833	14,427	25,260

Table 5.3: *Training and networking activities at Kolli Hills, Wayanad, Jeypore and Chennai under the project Biodiversity Conservation, Integrated Natural Resources Management and Poverty Reduction*

Particulars	Male	Female	Trainee days
Millet Growing Area meeting at 5 villages (Kolli Hills)	62	125	187
Exposure visit to Chennai, MSSRF-Kannivadi site, AFPRO Field Unit at Jalna, Farm Technology Exhibition, TNAU, Huston Chilling Unit, dairy farm, vermicompost units, mushroom, azolla and vanilla cultivation areas, and land and water management	265	220	64
Orientation on agricultural biotechnology, crop diversification, medicinal plants and pollution (Wayanad)	240	190	37
Training on vermicompost, fodder production, herbal plants nursery, coirpith composting and organic farming	425	356	73
Training on mushroom cultivation and product diversification, azolla and vanilla cultivation (Wayanad)	311	225	50
Panchayat Raj Meeting at Kolli Hills	25	10	29
BDO Meeting to give orientation on Government Schemes, Village meetings, PGUS meetings	3,707	2,672	141
Folk song training for Aadi 18 Festival (Kolli Hills)		8	7
Biopesticide training	11	20	22
Training on improved method of minor millet cultivation, millet packaging and marketing	9	43	58
Millet seed production training (Kolli Hills)	6	6	12
Training on organic millet cultivation (Kolli Hills)		28	42
Orientation-cum-awareness on nutritious millets to urban housewives (Jeypore)	16	90	7
Capacity building and training on ledger and account maintenance	15	242	269
Nature Club Training (Kolli Hills)	60	40	200
Orientation to Genomic Club members, Higher Secondary School (Namakkal)	86	86	6
Participatory Varietal Selection of millets (Kolli Hills & Jeypore)	67	102	46
Farmers Club training (Kolli Hills)	43		86
Computer literacy training (Kolli Hills)	17	10	20
Seed driller operation training (Kolli Hills)		20	20
Maize seed treatment, improved cultivation, intercropping with tapioca, post harvest technology, maize sheller operation and grading, market tie-up and linkage to banks (Kolli Hills)	237	75	352
Learning visit to poultry industry, vaccination training for backyard poultry and market linkage of poultry farm owners with banks and agricultural experts (Kolli Hills)	80	140	170
Orientation on Importance of poultry feed grains and maintenance of poultry	10	50	20
Training on quality seed production and purification (Jeypore)	204	216	28
Improved method of paddy cultivation (Jeypore)	84	37	22



Special Projects

The Foundation was commissioned to prepare a paper on Ethics of Economic Development by UNESCO. The office of the Scientific Advisor to the Government of India has entrusted a study on impact of S&T on agriculture and rural development. Rice Bio parks are planned in major rice growing regions of the country. MSSRF proposes to set up one in the Women's Biotech Park in TN.

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Sub Programme Area 601

Ethics of Economic Development

MSSRF had been commissioned by the Regional Unit for Social and Human Sciences in Asia Pacific (RUSHSAP) UNESCO, Bangkok, to prepare a paper on *Ethics of Economic Development* in the Asia Pacific Region. This is part of an exercise to develop a policy framework for ethics of S&T for the Asia Pacific region. The MSSRF paper, a collaborative effort with inputs from several staff members, was presented and discussed at a three-day meeting in Bangkok in November 2004. The other papers commissioned are on Bioethics, Ethics of Nanotechnology and Ethics of ICT. The paper was revised, based on the comments received, and will be published by UNESCO as a working paper.

Sub Programme Area 602

Measures of Impact of Science and Technology in India: Agriculture and Rural Development

The office of Dr R Chidambaram, Principal Scientific Adviser to the Government of India, has initiated studies on the development of indicators to measure the impact of science and technology on human well-being and different sectors of the economy. The first study in this series, in collaboration with MSSRF, is

on the impact of science and technology on agriculture and rural development. This study is being initiated in the context of UNDP's Human Development Report 2001, ranking India in the 63rd position out of the 72 countries studied, with reference to Technology Achievement.

This study will take into consideration all the components of agriculture such as crop husbandry, animal husbandry, fisheries and forestry, as well as non-farm employment and income generating avenues opened up by science and technology. In addition, sectors of development vital for human health and well-being, education, nutrition, water, sanitation, communication, energy, health care and ecosystem management will also be taken into consideration for measuring the impact of science and technology on rural development. The study will provide a State-wise analysis of technological achievement across these major sectors and cover a time span of over three decades, from 1965-66 to 2000-2001.

Work on this study began in March 2004. The first meeting of the Project Review and Monitoring Committee was held on 27th March 2004, followed by a methodology workshop on 18th and 19th June, 2004. By October 2004, the draft 18th and 19th reports relating to crops, fisheries and water will be presented to the members of the Project Review and Monitoring Committee.

Sub Programme Area 603

Rice Bio Park

In the International Year of Rice MSSRF proposes to set up a Rice Bio Park for Women at the Golden Jubilee Bio-Park for Women Society, TN, to help women entrepreneurs to set up enterprises based on value addition to different parts of the rice crop – grain, bran, straw etc., and tap the market for the same. The Rural-Urban Park will function with strong linkages with rural areas. The proposed Park will also showcase the traditional aspects of “rice” in the lives of people as part of this rich cultural diversity. This Park will form an integral part of the Food and Nutrition Park being proposed at the Biotech Park as its second

phase with the support of MSSRF and CFTRI with financial support from the Ministry of Food Processing and the DBT, Government of India, and land from the TN State Government.

Towards this end, a Project Design Workshop sponsored by the Rural Technology Action Group (RuTAG), was held on 20th March, 2004 at MSSRF. It was decided that such Rice Bio Parks should be set up in the major rice growing regions of the country. While the Rice Bio Park in Chennai will be exclusively for women entrepreneurs, the ones in other areas will be open to both men and women. It was also decided that the Business Plans would be prepared for individual commercially viable projects. RuTAG has provided financial support for the same and the Business Plan is under preparation.



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- Parida, A. 2003. GMOs and Food in Developed and Developing Countries. *Study Seminar: GMO-Threat or Hope?* Pontifical Council for Justice and Peace, Vatican, Rome. November 10-12.
- Parida, A. 2003. Biodiversity Characterization: User Response. *National Seminar on Biodiversity Characterization at Landscape Level*. Department of Biotechnology and Department of Space, New Delhi. December 31.
- Parida, A. 2004. Biotechnology and Bioprospecting: Why and How? *National Seminar - Herbal Focus*. Srimad Andavan Arts and Science College, Trichy. January 10-11.
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Senthilkumaran, S. 2004. Using ICTs for Reaching the Unrached. *Conference on Health and Development: Challenges for the 21st Century*. Barcelona, Spain. June 9-10.

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Arivudai Nambi, V. 2003. *Workshop on Water*. Madras Institute of Development Studies, Chennai. October 8.

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Seenivasan, R. 2003. *Workshop on Farmers' Day Programme*. Tamil Nadu Agriculture University, Coimbatore. May 31.

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Selvamukilan, B. 2003. *Training Programme on Coffee Culture*. Coffee Board, Thandikudi, Dindigul. September 1-9.

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Subbiah, Vijay R. 2003. *Interactive Workshop on Adaptable Models for Food and Agri-Business Growth*. Confederation of Indian Industry, Chennai. September 26.

Awards/Honours

Arivudai Nambi, V. 2003. *Member, Tamil Nadu Medicinal Plants Board, Health and Family Welfare Department, Government of Tamil Nadu*.

Arivudai Nambi, V. 2004. *Member, Text Book Committee for Environmental education*. Universitu of Madras, Chennai.

Geetha Rani, M. 2004. *Capacity Building IFAR Fellowship Grant to Work on Characterization of Genetic Diversity of Finger Millet – Eleusine coracana*. IPGRI, Italy.

Nair, Sudha. 2003. *Member, Board of Directors, LEAD India*.

Parida, A. 2004. *Overseas Biotechnology Associateship to Work at International Rice Research Institute, Manila, Philippines*. Government of India, New Delhi.

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Ravishankar, T. 2004. *Member, International Society of Tropical Agriculture*. Kerala Agriculture University.

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United Nations Environment Programme
Nairobi, Kenya

UNDP - Global Environment Facility,
New Delhi

UNESCO, Bangkok

List of Acronyms

AFLP	Amplified Fragment Length Polymorphism
AIR	All India Radio
AP	Andhra Pradesh
APEDA	Agriculture and Processed Food Products Export Development Authority
ATMA	Agricultural Technology Management Agency
BARC	Bhabha Atomic Research Centre
BD	Biodiversity
BR	Biosphere Reserve
BSNL	Bharat Sanchar Nigam Limited
CAbC	Community Agrobiodiversity Centre
cDNA	Complementary De-oxy Ribo Nucleic Acid
CFB	Community Food Bank
CFGB	Community Feed Grain Bank
CFTRI	Central Food Technology Research Institute
CIDA	Canadian International Development Agency
CIFT	Central Institute of Fisheries Technology
CMFRI	Central Marine Fisheries Research Institute
CSB	Community Seed Bank
CSGCA	Centre for Studies on Gender Concerns in Agriculture
CSWCRTI	Central Soil and Water Conservation Research and Training Institute
DAE	Department of Atomic Energy
DBT	Department of Biotechnology
DFO	District Forest Officer
DFRL	Defence Food Research Laboratory

DRDA	District Rural Development Agency
EB	Executive Body
EC	Executive Committee
EST	Expressed Sequence Tags
FAO	Food and Agriculture Organisation
FD	Forest Department
FF	Ford Foundation
FRIS	Farmers' Rights Information Database
GB	General Body
GEAC	Genetic Engineering Approval Committee
GIS	Geographical Information Systems
GKP	Global Knowledge Partnership
GO	Government Organisation
GoM	Gulf of Mannar
GoMBR	Gulf of Mannar Biosphere Reserve
GRU	Gandhigram Rural University
ICAR	Indian Council for Agricultural Research
ICDS	Integrated Child Development Service
ICEF	India Canada Environment Facility
ICRISAT	International Crop Research Institute for Semi Arid Tropics
ICT	Information and Communication Technology
IDRC	International Development Research Centre
IEEF	Ion Exchange Enviro Farms Pvt Ltd
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute

IGCAR	Indira Gandhi Centre for Atomic Research
IGNOU	Indira Gandhi National Open University
IIFS	Integrated Intensive Farming System
IMTECH	Institute of Microbial Technology
IOB	Indian Overseas Bank
IPA	Isopropyl Alcohol
IPGRI	International Plant Genetic Resources Institute
IPM	Integrated Pest Management
ISRO	Indian Space Research Organisation
ITK	Indigenous Technical Knowledge
IWST	Institute of Wood Science and Technology
IYR	International Year of Rice
JMM	Joint Mangrove Management
KAU	Kerala Agriculture University
KVK	Krishi Vigyan Kendra
LEISA	Low External Input Sustainable Agriculture
LJSS	Luna Jungla Samrakshyana Samiti
LR	Land Race
MFPI	Ministry of Food Processing Industries
MMU	Mangrove Management Unit
MoU	Memorandum of Understanding
MSFLF	Manikollai Small Farmers Lift Irrigation Federation
NABARD	National Bank for Agriculture and Rural Development
NASSCOM	National Association of Software and Service Companies
NATP	National Agriculture Technology Project

NBDB	National Bioresources Development Board
NBPGR	National Bureau of Plant Genetic Resources
NEDCAP	Non-Conventional Energy Development Corporation of Andhra Pradesh
NHB	National Horticulture Board
NRCB	National Research Centre for Bananas
NRM	Natural Resource Management
NSS	National Service Scheme
NVA	National Virtual Academy for Food Security and Rural Prosperity
OKN	Open Knowledge Network
ORMAS	Orissa Rural Marketing Society
OSU	Ohio State University
PB	Plant Biodiversity
PCI	Participatory Crop Improvement
PCS	Participatory Conservation System
PPB	Participatory Plant Breeding
PPRC	Paddy Processing Research Centre
PPVFR	Protection of Plant Varieties and Farmers' Rights
PRA	Participatory Rural Appraisal
RCGM	Review Committee on Genetic Manipulation
RET	Rare Endangered and Threatened
RFPC	Regional Forest Protection Committee
RGCVAS	Rajiv Gandhi College of Veterinary and Animal Sciences
RNA	Ribo Nucleic Acid
RS	Remote Sensing
RSGA	Reddiyarchatram Seed Growers Association

SBI	State Bank of India
SDC	Swiss Agency for Development and Cooperation
SGC	Save Grain Campaign
SHG	Self Help Group
SRI	System of Rice Intensification
SSHG	Sustainable Self Help Group
SSR	Simple Sequence Repeats
THADCO	Tamil Nadu Adi Dravidar Development Corporation
THF	Tetrahydrofuran
THMRC	The Hindu Media Resource Centre
TLC	Thin-layer Chromatography
TN	Tamil Nadu
TNAU	Tamil Nadu Agricultural University
TRAI	Telecom Regulatory Authority of India
UDRC	Uttara Devi Resource Centre
UL/ML/LL	Upland / Medium Land / Low Land
UNDP	United Nations Development Programme
UNESCO	United Nations Educational Scientific and Cultural Organisation
VKC	Village Knowledge Centre
VLI	Village Level Institution
VVV	Vikas Volunteer Vahini
WFP	World Food Programme
WTO	World Trade Organisation