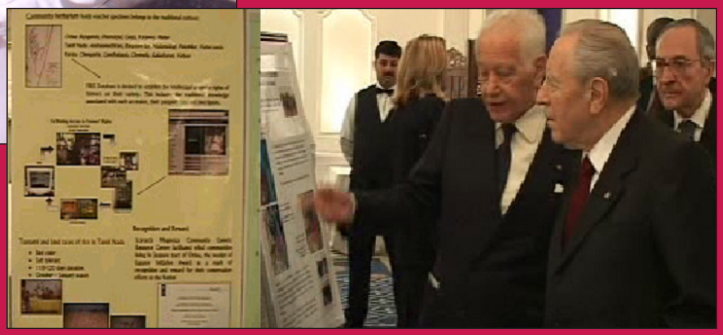
M. S. SWAMINATHAN RESEARCH FOUNDATION

2004-2005
FIFTEENTH ANNUAL REPORT

CENTRE FOR RESEARCH ON SUSTAINABLE AGRICULTURAL AND RURAL DEVELOPMENT, CHENNAI



M S Swaminathan Research Foundation

Centre for Research on Sustainable Agricultural and Rural Development

Third Cross Road, Institutional Area
Taramani, Chennai 600 113 India
Telephone : +91 (44) 22541229
+91 (44) 22541698
Fax : +91 (44) 22541319
Email : executivedirector@mssrf.res.in; msswami@mssrf.res.in
Visit us on the World Wide Web at **http://www.mssrf.org**

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Chairman's Introduction

In 2005, MSSRF will be completing 15 years of work in the areas of research, education, capacity building, mentoring, policy advocacy and networking. In retrospect, the decision made in 1990 to choose integrated coastal zone management for priority attention, with a view to linking the ecological security of coastal areas and the livelihood security of coastal communities (both fisher and farming families) in a mutually reinforcing manner has proved to be a wise one. The Coastal System Research (CSR) programme (PA 100) of MSSRF was designed to give concurrent scientific attention to sea and land surfaces along the shoreline. The CSR programme was initiated in anticipation of potential adverse changes in sea level as a result of global warming. An early scientific step in this process was the conservation of mangrove genetic resources and the rehabilitation of degraded mangrove wetlands in Tamil Nadu, Andhra Pradesh, Orissa and West Bengal. These mangrove forests served as "bio-shields" during the tsunami attack on 26 December, 2004. They had also served a similar purpose during the super cyclone in Orissa in 1999. These observations have helped to generate interest in the development of bio-shields along the shoreline at both the political and public levels.

The following are among the major contributions of the CSR programme from 1990 to 2005.

- Restoration of degraded mangrove wetlands along the east coast of India: the area restored by MSSRF scientists with the help of 5,240 families organized in 33 village mangrove councils comes to 1,475 ha of degraded area. Nearly 7 million saplings have been planted
- Conservation strategy for mangrove genetic resources in the Asia–Pacific Region and the establishment of a Genetic Garden for meeting the challenge of sea level rise at Pichavaram, TN
- Genome mapping of mangrove species (*Avecinnia marina*) and the identification and transfer of genes for sea water tolerance from *A.marina* to rice, mustard and pulses
- Development of a trusteeship mode of management of the Gulf of Mannar Biosphere and helping to create the first Biosphere Trust in the world, with the support of the Global Environment Facility and the Governments of TN and India
- Development of integrated Bio-shield – Biovillage – Village Knowledge Centre Programmes in coastal areas.

- Development of a code for the participatory management of mangrove ecosystems, involving cooperative action among fisher and farm communities and Forest and Fisheries departments
- Development of a comprehensive strategy for the rehabilitation of tsunami- ravaged coastal areas in TN, Pondicherry, AP, Kerala and the Andaman and Nicobar Islands
- Drawing national and international attention to the urgent need for conserving mangrove wetlands and promoting the adoption of a *Charter for Mangroves*
- Organizing national and international training programmes for creating a cadre of well- trained mangrove forest managers
- Preparation of comprehensive atlases of the mangrove forests of TN, AP and Orissa
- Standardization and popularization of mangrove propagation methods, based on both vegetative and micro-propagation techniques; helping local communities to undertake the raising and planting of mangrove forests
- Preparation of a Tool Kit for raising bio-shields in coastal areas
- Establishment of the first community developed and managed artificial reef in the Gulf of Mannar area, based on the technology developed by the Central Marine Fisheries Research Institute
- Developing eco-agriculture strategies for coastal drylands through participatory evaluation and propagation of varieties of pulses developed at the Bhabha Atomic Research Centre (BARC) through mutation breeding, and the establishment of green belts and genetic garden of horticultural crops for sustainable food and livelihood security
- Launching the Fish for All movement at Kolkata in December, 2003 in association with the World Fish Centre (ICLARM) located in Penang, Malaysia, to promote sustainable capture and culture fisheries movements
- Advocacy for the adoption of aquarian reform measures designed to promote harmony between artisenal and mechanized fisheries as well as aquaculture and agriculture.

The CSR approach helped MSSRF to propose a comprehensive and integrated strategy for launching a "Beyond Tsunami" programme, based on concurrent attention to ecological, livelihood, agronomic, psychological and educational rehabilitation. The experience gained by MSSRF in developing integrated coastal zone management procedures helped a National Committee set up by the Ministry of Environment and Forests under my Chairmanship to review the Coastal Regulation Zone Notification of 1991, to propose 12 basic guiding principles for the sustainable and scientific management of the Coastal Zone. Some of them are given below:

- Ecological security, cultural security, livelihood security and national security should be the cornerstones of an integrated coastal zone management policy.

- The coastal zone would include the area from territorial limits (12 nautical miles), including its sea-bed, to the administrative boundaries or the biological boundaries demarcated on the landward side of the sea coast. The coastal zone management should also include the inland water bodies influenced by tidal action and the land area along such water bodies. This area should have an integrated, cohesive, multi-disciplinary and multi-sectoral coastal area management and regulatory system.

- Regulation, education and social mobilization should be the three major components of a participatory and sustainable Coastal Zone Management strategy. Panchayati Raj institutions in coastal areas should be fully involved in the educational and social mobilization programmes.

- Coastal regulation needs to be based on sound scientific and ecological principles and should safeguard both the natural and cultural heritage. Heritage sites need particular care and should be conserved in their pristine purity. These include areas of environmental significance, rich in biodiversity and scenic beauty. Bird sanctuaries, parks and breeding grounds of migratory birds should be protected.

- *The precautionary approach* should be used where there are potential threats of serious or irreversible damage to ecologically fragile critical coastal systems and to living aquatic resources. Scientific uncertainty should not be used as an excuse for the unsustainable exploitation of coastal resources – both living and non-living.

- Ecological economics should underpin economic activities, so that present day interests and future prospects are not antagonistic. Significant biological, cultural and natural assets should be considered incomparable, invaluable and irreplaceable and should receive overriding priority in the allocation of resources for coastal area protection and conservation.

- Coastal policy and regulations should be guided by the principles of gender and social equity as well as intra-generational and inter-generational equity, (i.e., the interests of future generations). They should be based on Mahatma Gandhi's dictum, "Nature provides for everyone's needs, but not for anyone's greed". All stakeholders should be involved in decision making. Precious biological wealth, coming under Marine Biosphere Reserves, should be managed in a Trusteeship mode, with all the stake-holders protecting the unique natural wealth of biosphere reserves as Trustees and not as owners. A case study should be made on how the Gulf of Mannar Biosphere Trust is functioning, so that the Trusteeship pattern of sustainable management by the principal stakeholders can be replicated.

- The regeneration of mangrove wetlands, coral reefs and sea grass beds as well as the promotion of coastal forestry and agro-

forestry will confer both short and long term ecological and livelihood benefits. Carbon sequestration through coastal bio-shields will make an important contribution to promoting a balance between carbon emission and absorption, in addition to offering protection during coastal storms and calamities like tsunami. An important lesson taught by the tsunami disaster is that the rehabilitation of degraded mangrove forests and the raising of coastal plantations of Salicornia, Casuarinas, *Vetiver* and appropriate species of halophytes will represent a "win-win" situation, both for nature and coastal human habitations. No further time should be lost in initiating a national coastal bio-shield movement along the coasts of the mainland of India as well as islands. This can be a priority task under the National Rural Employment Guarantee and Food for Work Programmes.

- The severe loss of life and livelihoods as well as property caused by the tsunami in Andaman & Nicobar Islands and in the coastal regions of TN, Kerala, AP and Pondicherry, teaches us that short term commercial interests should not be allowed to undermine the ecological security of our coastal areas. Human memory tends to be short and neglecting the lessons of the tsunami will be equivalent to writing off the future of coastal communities.

Based on the experience gained during the last 15 years, it is proposed to establish a *Resource Centre for Integrated Coastal Zone Management* in Chidambaram for imparting training in the erection of bio-shields, the development of biovillages and the establishment of Village Knowledge Centres. Tool Kits for these activities have already been prepared.

In addition to the above, steps have been taken, in association with the Tata Relief Committee and the World Fish Centre (ICLARM), to establish a *Fish for All Training and Resource Centre* at Akkarapettai village near Nagapattinam, for imparting training in all aspects of capture and culture fisheries through the principle of learning by doing. The Centre will give attention to capacity building of fisher women and men in every step in the chain of capture/culture to consumption.

This year, MSSRF's strategic and participatory research to meet the challenges of climate change, which had so far been confined to the coastal zone, was extended to the arid and semi-arid areas of AP and Rajasthan, with the financial and technical help of the Swiss Agency for Development Cooperation (SDC), in partnership with Action for Food Production (AFPRO) and the National Institute of Agricultural Extension Management (MANAGE). This project will help to study vulnerability to adverse changes in temperature and precipitation and develop mitigation and adaptation strategies. Such proactive measures are essential to prevent human suffering, resulting from agricultural collapse during drought and flood. The climate change programme will take into account the impact of radiation, carbon dioxide concentration in the atmosphere, temperature and precipitation. It will also help

to understand and chronicle traditional coping mechanisms, so that these can be conserved and strengthened. Computer simulation models on the impact of variations in temperature and precipitation will be developed and contingency plans to mitigate the adverse impact of climate change will be formulated.

Besides developing a methodology for conserving the Gulf of Mannar Biosphere Reserve for posterity through a multi-stakeholder trusteeship system of management, MSSRF has, during the last 15 years, evolved three major institutional innovations in areas of significance to sustainable food and livelihood security and poverty eradication. These are described briefly below.

1. *Community Nutrition and Water Security System:*

This system introduced in the Koraput district of Orissa, consists of organizing field gene banks (*in - situ* on-farm conservation), seed banks, genetic enhancement through participatory breeding, water banks (i.e., water harvesting and saving in farm ponds), and Grain Banks, as shown in Figure1.

This system helps to enlarge the food basket by facilitating the inclusion of millets and other under-utilized but nutritious crops in the Community Grain Bank. Such a decentralized, community managed, Nutrition Security System helps to foster concurrent attention to conservation, cultivation, consumption and commerce. The tribal community of Koraput pioneering this system was given the Equator Initiative Award by UNDP at the World Summit on Sustainable Development held at Johannesburg in 2002.

Currently there are 2,34,676 village Panchayats in 31 States and Union Territories. In addition, there are traditional councils in Meghalaya, Mizoram and Nagaland. Each of these Panchayats/local bodies can spearhead the Community Food and Water Security movement. This will be the fastest sustainable method of making hunger history.

2. *Fostering job-led economic growth:*

The most serious challenge facing India is overcoming the famine of jobs or providing sustainable livelihood opportunities in rural India. MSSRF, whose mandate is imparting a pro-poor, pro-nature and pro-woman

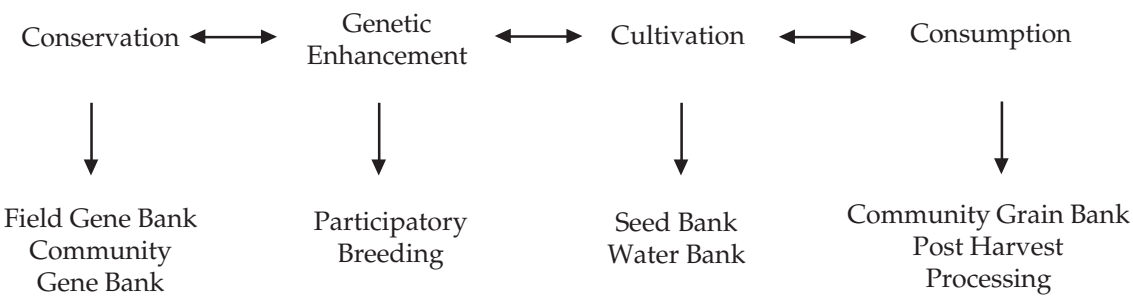


Figure 1. ***Community Nutrition and Water Security System***

orientation to technology development and dissemination, designed and developed the biovillage model of sustainable human well being for this purpose in 1992. The biovillage concept involves the technological upgradation of agriculture and agro-based enterprises in villages, through ecotechnologies developed by blending frontier technologies like information and biotechnologies as well as space, nuclear and renewable energy technologies, with traditional ecological prudence. Thus, the biovillage, based on the economics of human dignity, capitalizes on the benefits conferred by ecotechnology on both the environment and the rural economy. By giving simultaneous attention to on-farm and non-farm employment, the biovillage promotes job-led economic growth and helps to transfer poor families from the primary to the secondary and tertiary sectors of economic activity. This model is now being adopted both in other parts of India and other countries like Bangladesh and Mozambique.

The principal features of the biovillage model of sustainable and equitable rural development are shown in Figure 2.

With the help of the Technology Information Forecasting and Assessment (TIFAC) programme of the Govt. of India, a Business Plan was prepared for establishing Rice Bio Parks. A wide range of economically viable business activities were identified for

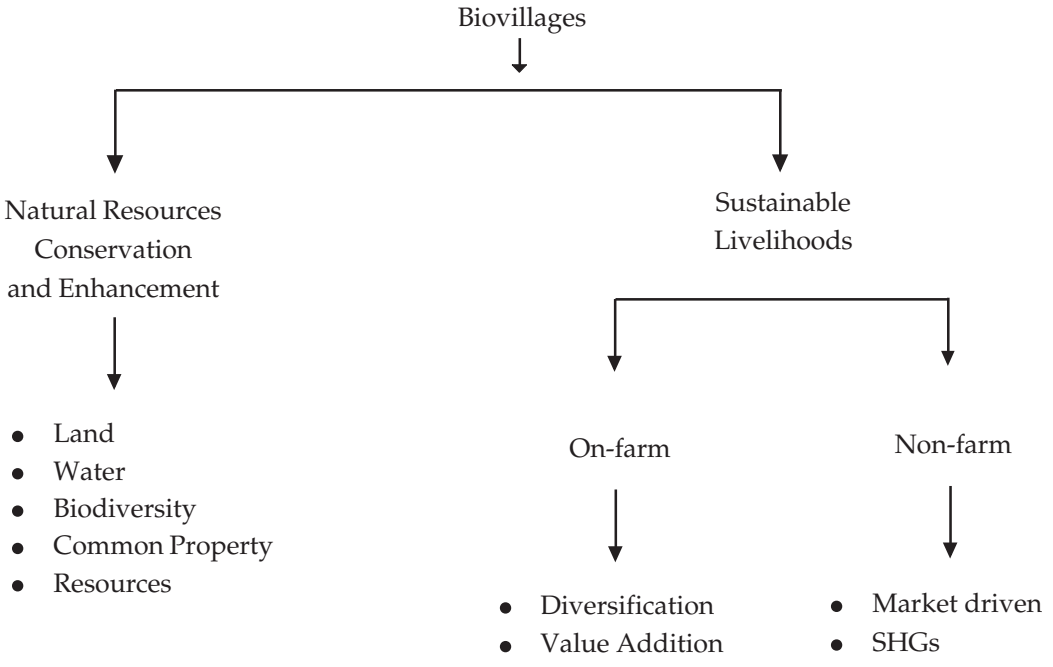


Figure 2. ***Biovillages***

producing value-added products from rice straw, husk, bran and grain. Business plans were prepared for nearly 28 different enterprises.

Thus, the biomass of cultivated plants can provide opportunities for new enterprises. Similarly, the production and marketing of the biological software essential for sustainable agriculture such as biofertilizers, biopesticides and vermiculture could help self help groups (SHGs) of women and men to enhance their income. MSSRF organized a workshop for sharing the experiences on SHGs. It became clear at the workshop that SHGs can become economically sustainable only if they have backward linkages to technology and credit, and forward linkages to markets and management. MSSRF has developed an accounting software for helping SHGs to maintain both accuracy and transparency in accounting.

With the help of the Central Food Technology Research Institute (CFTRI), Mysore, training in post-harvest processing was given to trainees from Ladakh to help them prepare value-added products from apricot and seabuckthorn. Similarly, technical advice was given to the Sher-E-Kashmir University of Agricultural Science and Technology of Kashmir in Srinagar, for establishing a Womens' Biotechnology Park at Srinagar on the lines of the one functioning in Chennai.

Under the International Year of Rice Programme, consultations were held at Koraput in Orissa, Pattambi in Kerala and Shillong in Meghalaya, for reviewing the current status of research on medicinal and aromatic types of rice. Detailed scientific strategies were developed for the improvement of the *Navara* rice of Kerala and *Kalajeera* rice of Koraput through participatory breeding and knowledge management. In all such programmes, the role of women in conservation and enhancement of genetic resources was given specific attention.

3. Towards a Rural Knowledge Revolution: Every Village a Knowledge Centre:

The third major institutional innovation developed by MSSRF for transforming the rural economy is the computer-aided and internet-connected Village Knowledge Centre (VKC).

The work undertaken by MSSRF in setting up community centred and managed VKCs in some villages in Pondicherry since 1998, based on modern information and communication technologies (ICT), with financial support from IDRC of Canada, has shown that ICT helps to improve the timeliness and efficiency of farm operations and enhances income through producer-oriented markets. Also, experience has shown that bridging the digital divide is a powerful method of bridging the gender divide. Knowledge connectivity therefore confers multiple economic and social benefits. The VKC operates on the principles of social inclusion and giving voice to the voiceless. The information provided, which includes location-specific data on entitlements to different Government schemes, is demand-driven and is in the local language. For example, in Pondicherry there are over 150

schemes designed to help the poor; yet nearly 20 % of the families are below the poverty line. After the onset of the digital age, knowledge of entitlements and access to them has grown rapidly. The VKC will be a powerful instrument for operationalizing the provisions of the Right to Information Act (2005).

Encouraged by the ability of rural women and men to take to ICT like fish to water, MSSRF initiated two major steps in 2003, to take ICT to every one of the over 6,00,000 villages in India by 15 august, 2007, which marks the 60th anniversary of "our tryst with destiny", to quote Jawaharlal Nehru. The first is the organization of a National Alliance for *Mission 2007: Every Village a Knowledge Centre*, which provides a platform for partnership to all those committed to the cause of extending the power of ICT to rural India. The National Alliance has now over 150 members comprising Central and State Government agencies, business and industry, academia, and non-governmental and mass media organizations.

The second is the establishment of the Jamsetji Tata National Virtual Academy for Rural Prosperity, with generous support from the Tata Education Trust. The Internet – community radio combination is a powerful method of reaching the unreached in terms of delivery of dynamic information. Public policy in promoting the use of community radio should be based on the following principle enunciated by the Supreme Court in its judgment delivered in December1995: "Air waves constitute public property and must be used for advancing public good". This is the same principle enshrined in the Dandi March movement of Mahatma Gandhi in relation to sea water, which is the basis of MSSRF's programme on sea water farming for coastal area prosperity.

At a recent meeting held at MSSRF, Panchayati Raj leaders have assured that space, electricity and telephone connection will be provided for establishing VKCs in the Panchayat premises. Thus, all the 2,34,676 Village Panchayats in the 31 States and Union Territories, as well as Traditional Councils in the NE States, can be brought together under the umbrella of the National Alliance. A hub-spokes model will help to reach all villages from Panchayat VKCs. Such Centres can be operated by ICT-Self-help Groups of rural women and men. MSSRF will assist NABARD to organize about 10,000 ICT – SHGs in 10 States of the country, in 2005-06.

In addition to connectivity and content, capacity building is also essential for ensuring local ownership of VKCs. This is where the Jamsetji Tata National Virtual Academy (NVA) of MSSRF hopes to play a key role. The President of India, H E Dr A P J Abdul Kalam inducted the first 137 Fellows of the NVA drawn from 15 States on 11 July, 2005 at New Delhi. Microsoft is providing generous support for capacity building under its Unlimited Potential programme.

The Fellows of NVA are rural women and men who have studied upto the tenth class or upto the first degree. They serve as Master Trainers and undertake the training of other rural women and men as well as children. These

grassroots academicians will be the torchbearers of the rural knowledge revolution. Another significant development in taking the benefits of the space age to the rural poor was the inauguration by the Prime Minister of India, Dr Manmohan Singh, on 18 October 2004, of an ISRO – MSSRF joint initiative in setting up Village Resource Centres (VRCs) which can link rural families to the best available sources of knowledge in medicine and health care, education, agriculture, markets and government programmes. This programme, which initially linked MSSRF (Chennai) to VRCs in Thiruvayaru, Sempatti and Thangachimadam in TN, is being extended to Chidambaram, Pudukottai, Pondicherry, Nagapattinam and Kanyakumari this year. With the help of the ISRO, additional centres are being opened in tsunami affected areas and in Farmers' "distress hotspots" in Kerala, AP, Maharashtra and Karnataka. These are areas where farmers were driven to suicide. Those operating the computer aided knowledge system at such Centres will be either the wife or children of those who were driven to take their lives. This will help to provide a sense of realism and urgency in achieving a match between content and the need to save livelihoods and lives. While the VKC operates at the village level, the VRC is designed to cover a Block and thereby serve as a resource centre for all the villages in the Block. The design of a VKC is shown in Figure 3.

The Prime Minister of India has announced a well-funded *Bharat Nirman* programme to accelerate progress in providing urban amenities in rural areas and to bring an additional ten million hectares under assured irrigation. Knowledge connectivity should be the backbone of the *Bharat Nirman* programme, since it is fundamental to deriving maximum benefit, in terms of a better quality of life in villages, from the investment on roads, telephone and other forms of physical connectivity. The involvement of Panchayats

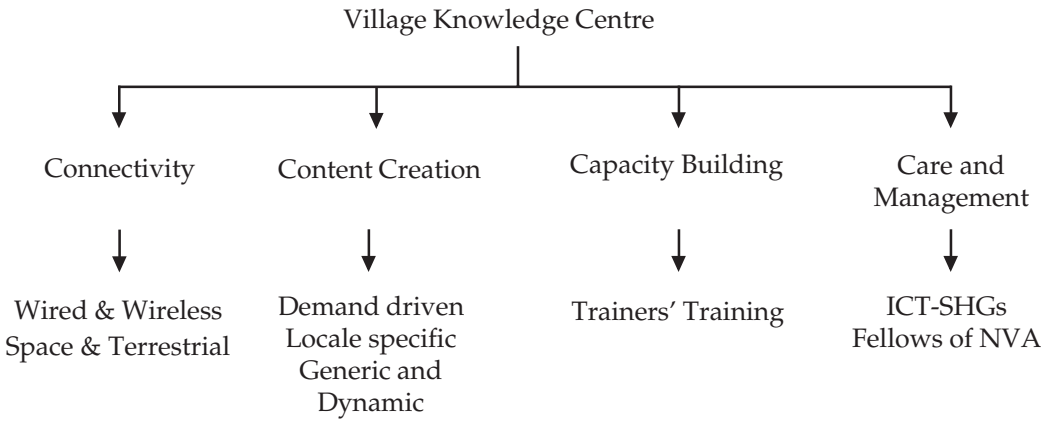


Figure 3. ***Village Knowledge Centre***

and Gram Sabhas in providing the needed logistic and policy support will ensure the efficient functioning of VKCs. To begin with VKCs should be tools of information, knowledge and skill empowerment of rural families, particularly of the economically and socially under privileged sections of society. This is a fundamental responsibility of the Government. Hence, the initial expenses should be met from the *Bharat Nirman* Programme and the Universal Service Obligation (USO) Fund. By the end of this decade (i.e., by 2010), the VKCs will become vibrant centres of economic activity and will provide opportunities for outsourcing of assignments from urban to rural areas. They will then become not only economically self-reliant but will also help to create a wide range of skilled jobs for the youth in villages. A VKC-centred *Bharat Nirman* will be the most effective method of fostering rural and agrarian prosperity and arresting the unplanned migration of the rural poor to urban areas, resulting in the proliferation of urban slums. Therefore, knowledge connectivity through VKCs should be the corner stone of a New Deal for Rural India.

Community Conservation of Plant Genetic Resources:

The tenth anniversary of the G T Scarascia Mugnozza Community Genetic Resource Centre and Gene Bank was celebrated in February 2005. An Indo-Italian seminar was organized in the premises of the National Academy of Agricultural Sciences (NAAS), New Delhi, to review the work done during the past 10 years and to prepare a plan of action for strengthening the community conservation movement and for spreading the Community Gene Bank concept in areas and countries rich in agro-biodiversity, but confronted with serious anthropogenic pressures. The highlights of the Tenth Anniversary commemoration included the organization of a function in New Delhi which was addressed by the President of Italy, H E Carlo Azeglio Ciampi and the organization of a Symposium in the Italian Parliament in Rome. Prof G T Scarascia Mugnozza, President, Italian National Science Academy, has requested MSSRF to help in spreading the Community Gene Bank concept in African countries, particularly in the Rift Valley Region.

The G T Scarascia Community Gene Bank has 1,134 accessions, including strains of rice which remained unaffected during the tsunami attack on 26 December 2004. These strains are now being evaluated for their ability to withstand sea water intrusion. The Community Gene Bank and Herbarium are also important tools for bringing primary conservers their due recognition and reward under the Protection of Plant Varieties and Farmers' Rights Act (PPVFR - 2001) and the Biodiversity Act (2002). It is a matter of satisfaction that the first drafts of these two Acts were prepared by MSSRF. Detailed engendered procedures for the implementation of the Acts have also been prepared and forwarded to the concerned Ministries of the Government of India.

Concurrently, education programmes have been initiated, including the organization of Genome Clubs in schools, for spreading legal and genetic literacy relating to both conservation and the entitlements of the conservers under the PPVFR and Biodiversity Acts.

Strengthening the Research and Training Infrastructure:

During the year, two important additions were made to the research and training infrastructure. First, a new building was constructed at the Pillayarkuppam village for housing the hub of the VKC programme in Pondicherry and for establishing a Community Radio Station. The building was inaugurated by Shri M M Lakhera, Lt. Governor of Pondicherry, in the presence of Dr Lennart Bage, President, International Fund for Agricultural Development (IFAD), Rome. It is located next to the bio-centre building and will thereby facilitate closer interaction between knowledge empowerment and livelihood security. The other important addition was the establishment of the Biju Patnaik Medicinal Plant Garden and Conservation Centre at Jeypore, Koraput District in Orissa. Shri Navin Patnaik, Chief Minister of Orissa performed the Bhoomi Puja on 16 November 2004. The State Government has provided about 6 ha of land on a 99 year lease. A unique feature of this Genetic Garden will be the cultivation of the medicinal plants conserved and used by the predominant tribes of the region, like *Paraja, Bonda, Kandha, Kutia Kandha, Dongaria Kandha, Koya, Saura, Langia Saura, Gadaba, Bhumia and Bhatra*. The aim is to preserve the conservation traditions of these tribal families for posterity. It will also help to validate scientifically the traditional wisdom of the tribal families and get them recognition and reward from the Farmers' Rights provisions of the PPVFR and the benefit sharing provisions of the Biodiversity Act. The Garden will also help to generate an economic stake in conservation. This will be the first *ex - situ* Tribal Gene Bank in the country.

Breeding for Resistance to Abiotic Stresses:

Nearly 14 years ago MSSRF initiated anticipatory and strategic research for developing genetic material for resistance/ tolerance to abiotic stresses like salinity and drought in important food plants. The aim of this research is the development of novel genetic combinations and using them in participatory breeding programmes with farming families. Thus, MSSRF will function as a pre-breeding centre and work together with farm families in the development of strains possessing resistance to salinity/ drought. *Avicennia marina* and *Porteresia coarctata* were chosen as donors for tolerance to coastal salinity. *Prosopis juliflora* was used for identifying genes for drought resistance. So far 36 full-length genes and many partial sequences have been isolated for abiotic stress tolerance. The unique pre-breeding cum participatory breeding methodology fostered by MSSRF helps to continue genetic efficiency with genetic diversity as shown in Figure 4.

The transgenic rice variety having genes from *Avicennia marina* has shown a tolerance level

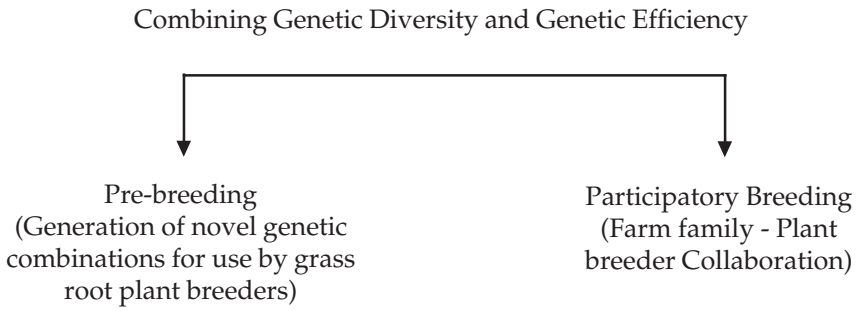


Figure 4. ***Participatory Genotype Development***

of 150mM NaCl. The Review Committee on Genetic Manipulation, Govt. of India has approved limited field trials of three transgenic rice lines during 2004-05. Large scale sequencing and functional genomic approach have also been adopted in *Prosopis juliflora*. These novel genetic combinations will be subjected to rigorous biosafety examination. Thus, a new chapter in breeding strains of rice, mustard and pulses has been opened up, thanks to transgenic technology. This is the first time in the world that a mangrove species has been used as donor of salinity tolerance, and a species widely regarded as a tenacious weed, i.e., *Prosopis juliflora*, has been mobilized for providing genes for drought tolerance. The *Outlook* Magazine (18 July 2005) listed this piece of research carried out by a young team of scientists led by Dr Ajay Parida, among the ten most important pieces of scientific work carried out in India during 1995-2005, which can change our lives for the better

International Collaborative Projects:

The MSSRF – Ohio State University (OSU) – Jawaharlal Nehru Krishi Vishwavidhyalaya (JNKVV) - Punjab Agricultural University (PAU) project on Sustainable Management of Natural Resources for Food Security entered the final year of Phase I. This project has resulted in the development of soil health management and enhancement procedures which can help to enhance productivity in perpetuity without ecological harm. Phase II of this project is currently being designed in partnership with OSU, JNKVV and PAU.

The India-Nepal project on the conservation and use of underutilized crops is also entering its final year. This project has demonstrated the significance of agro-biodiversity in achieving the UN Millennium Development Goals in the area of hunger and poverty elimination.

Policy Advisory Activities:

MSSRF scientists continued to provide their expertise to State and Central Governments as well as to international agencies in areas of mutual concern. Thus, assistance was extended to the Government of Cambodia in preparing a Food Security Atlas in association

with the World Food Programme. Assistance was extended to the National Commission on Farmers in several areas, such as preparing a strategy for providing a New Deal for Women in Agriculture and for engendering the National Rural Employment Guarantee Act. NCF was also assisted in developing a strategy for the rehabilitation of tsunami affected areas and for fostering knowledge connectivity in rural India.

Help was extended to the Andamans and Nicobar Administration for developing a strategy for a post-tsunami New Andamans. Assistance was extended to the UN Millennium Development Goal Task Force on hunger for preparing a road map for reducing hunger by half by 2015.

MSSRF continued to host a wide range of workshops, consultations and symposia in association with national, bilateral and multilateral organizations. The topics covered ranged from nano-biotechnology on the one hand, to sustainable self-help groups on the other. Numerous training programmes were also organized for both grassroot workers and policy makers. A series of regional consultations were held across the country on initiatives for Hunger-free India. *The Hindu* Media Resource Centre for Sustainable Development organized several media workshops and produced films for awareness creation, dissemination of knowledge and advocacy on a range of topics. The Centre also provided technical inputs to AIR for a 52-week half-hour radio programme for the rural audience on agriculture and sustainable development, collating information from both in-house and external Resource Persons.

All this work would not have been possible without the support of the National and State Governments, a wide range of donors – national, bilateral and international – and partner organizations from civil society and academia. We are particularly grateful to Dr Geeta Mehta and Ms Anna May Feige for organizing "A Friends of MSSRF" programme in Australia, in addition to the one which has been functioning for several years in Japan. Above all, the advice and encouragement of rural women and men have been fundamental to the effectiveness of all the field activities of MSSRF. Thanks to the support and guidance of all these organizations and individuals, MSSRF has become, during the last 15 years, a centre for humanistic science and scientific humanism.

Our gratitude goes to Dr Sudha Nair and Ms R V Bhavani for coordinating the preparation of the report and ensuring its timely publication. Particular thanks are also due to Dr Nandhini Iyengar for efficient editing and to AMM Screens for printing this Report.

TN witnessed two major tragedies during 2004. First, on 16 July 2004, a devastating fire in a school building in Kumbakonam led to the loss of many young lives – school children in the prime of their youth. Second, a titanic tsunami on 26 December, 2004 led to extensive loss of life and property. MSSRF staff and scholars, supported by many donors, moved into action within hours of these tragedies and

did their best to provide immediate relief and begin long term rehabilitation. The tsunami rehabilitation programme was initiated not only in TN, but also in Pondicherry and Andaman and Nicobar Islands. Often tragedies bring out the best in the human spirit and we were moved by the spontaneous response of national, bilateral and international donors – both individuals and organizations. Two films were produced to pay homage to those who lost their lives and to spread a "we shall overcome" spirit.

The scientific and social relevance of a research institution depends not on brick and mortar, but on the dedication and professional competence of its scientists, scholars and staff. In this context, MSSRF has been fortunate to attract and retain outstanding young scientists and scholars. As mentioned earlier, Dr Ajay Parida and his young team were cited by *Outlook* magazine for their work, which can change the agricultural destiny of farmers in coastal and dry farming areas. Dr Ajay Parida has already received several prestigious awards, including one from the Indian Science Congress Association. Drs Sudha Nair and M Lakshmi are recipients of the outstanding Women Scientist Award instituted by the DBT.

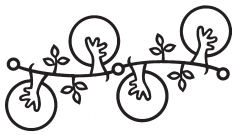
What motivates the scientists and scholars of MSSRF are the words of the Poet Rabindranath Tagore:

"With your mind intent, cross this sea of chaos
And sail to that shore of new creation"

M S Swaminathan
Chairman

It is with much sorrow that I have to mention the sad demise of Dr K N S Nair, Trustee, MSSRF on 24 July 2005, at Thiruvananthapuram. Dr Nair played a key role in the development of the research priorities and programmes of MSSRF from its very inception. In particular, he gave meaning and content to the Biovillage concept and helped to organize the first few biovillages in Pondicherry. He also played a major role in developing our gender-sensitive curriculum for Agricultural Universities. We will miss his mature advice and guidance. Our sympathies go to Mrs Nair and the bereaved family.

Programme Area 100



Coastal Systems Research

Three NGOs trained by MSSRF on the technique of mangrove restoration have restored nearly 210 ha of degraded mangroves in the Godavari and Krishna deltas. Activities carried out under DAE have moved on from the demonstration phase to the replication phase and a total of 84 ha of land have been brought under diverse crop cover. Photographs of the artificial reefs show that most of the modules are covered with a variety of seaweed, sessile organisms and soft corals and that there are large numbers of juvenile fish, indicating that they are becoming a breeding and feeding place. Remote sensing and GIS data were used to record the impact of the tsunami near Pichavaram.

Sub Programme Area 101

Coastal Wetlands: Mangrove Conservation and Management

This year's focus was on facilitating replication of Joint Mangrove Management (JMM) through Training and Policy Advocacy in TN and AP.

The evaluation committee of the JMM project, implemented from 1996 to 2003, recommended that capacity-building programmes on large-scale replication of JMM models should be organized for the stakeholders. It also suggested that the policy support needed for replication should be mobilized and attempts made earlier to get separate JMM guidelines from the government should continue. Keeping this in view, a new project was implemented in TN and AP from September 2003 to January 2005. The project concentrated on the following activities.

Orientation to Forest Department officials

Orientation programmes on JMM were conducted for the field staff of the Forest Department (FD) of TN and AP to enhance clarity on the issues relating to mangrove restoration, conservation and management as well as mobilization and organization of the community. Modules, covering technical and community participation aspects were developed for the programmes, with the help of the FD and academic institutions. (See Modules I - IV)

In AP, three orientation programmes were conducted and a total of 64 field staff, including Range officers and Foresters, participated. In TN, one training programme, attended by 22 field staff, was conducted. The AP Forest Academy, Hyderabad, provided technical inputs and faculty for the programme. It also provided infrastructure facilities at its headquarters for the training. In TN, the Research and Training Division of the TN Forest Department identified trainees. Experts from MSSRF, Forest Department, academic institutions and NGOs were invited as resource persons. The training modules were evaluated and refined with the help of the participants.

Manuals on the *Ecology and Biology of Mangroves*, *Mangrove Plants of TN*, *Mangroves of AP – Identification and Conservation*, *Mangrove Forest Restoration in AP* and *Mangrove Nursery Techniques* were prepared and provided to the participants.

Hands-on training to Forest Department officials

An innovative programme, consisting of seven modules, has been developed for hands-on training on JMM, as shown in Table 1.1

Selected field staff of the Forest Departments of TN and AP were trained in a village selected for this purpose. The training was not continuous. The trainees went back to their respective area after each module and returned to the same village for subsequent training. During this process, the trainees and residents of the villages were expected to jointly restore about 50 ha of degraded mangroves.

Module I: ***Ecology of mangrove wetlands***

Theoretical orientation	• Ecological factors influencing mangrove health and wealth • Ecological classification of mangrove wetland • Ecological and economical use of mangroves • Natural and human induced threats to mangroves • Mangrove wetlands of India
Field activities	• Zonation in mangroves • Measurement of tidal flushing and its influence on mangroves • Measurement of micro topography • Soil analysis

Module II: ***Biology of mangrove wetlands***

Theoretical orientation	• Morphological and anatomical adaptation to saline and waterlogged conditions • Physiological adaptation: salt tolerance mechanism • Reproduction: vivipary and dispersal • Animals in mangrove wetlands • Fishery resources in mangrove wetlands
Field activities	• Identification of mangrove species • Morphological adaptation • Different types of propagules and seeds • Identification of fauna in mangroves

Module III: ***Mangrove restoration techniques***

Theoretical orientation	• How to identify causes of degradation • Canal method of restoration • Other methods of restoration • Nursery establishment and management • Use of remote sensing and GIS tool for planning and monitoring
Field activities	• Training in restoration techniques

Module IV: ***Joint mangrove management***

Theoretical orientation	• Community participation • Partnership development • Building peoples institutions for JMM • PRA and identifying elements for the micro plan • Micro planning, implementation and monitoring • Gender issues
Field activities	• Interaction with the community involved in JMM

Training to leaders and members of Village Mangrove Councils

In TN, 3 training programmes were conducted to enhance the leadership and membership qualities of the general body and executive committee members of the Village Mangrove Councils (VMCs). A total of 82 leaders and members participated in these training programmes, which covered the following topics: *Concept of Self-help; Life giving forces of VMCs; Qualities of leaders, Responsibilities of leaders and members; Conflict resolution; Building vision for the future* and *Planning, implementation and monitoring.* SPARKS, a training institution identified by the Uttara Devi Resource Centre for Gender and Development (UDRC), MSSRF, played a key role.

A training programme was conducted to improve the financial management capacity of the leaders of the VMCs of the Pichavaram and Muthupet regions. An in-house training programme conducted by the Gandhigram Rural Institute, Dindigul, was attended by 21 leaders.

Training for SHG's

There are 85 SHGs in the Pichavaram and Muthupet regions of TN. A two-day training programme was organized to improve the capacity of these SHGs, in which 21 members participated. The programme included sessions on *Concept of development; Constraints for rural development; Concept of Self-Help; Benefits from SHGs; Responsibilities of leaders and members of SHGs; Framing rules and regulations for the smooth functioning of SHGs and Vision building, planning and implementation.*

In AP, training programmes were organized for 13 SHGs in developing and implementing business plans and accounting. The training helped 13 women SHGs to submit their business plans for running micro-enterprises, for which an amount of Rs 4,31,000 was sanctioned from the project Friends of MSSRF, through the JRD Tata Eco-technology Centre. An amount of Rs 2,34, 850 has been repaid by them. A total of 137 women belonging to these 13 SHGs are currently engaged in 10

Table 1.1: ***Modules for hands - on training on JMM***

Module	Theme	Number of days
I	Orientation to JMM	4
II	PRA of mangrove conservation and management	5
III	Establishing Village Mangrove Councils	4
IV	Mangrove Management Unit	4
V	Micro planning, implementation and monitoring	4
VI	SHG formation and alternative income generating activities	5
VII	Mangrove restoration, conservation and management	4
	Total	**30**

different kinds of micro enterprises. In the Godavari region, 30 women underwent training on coir rope making under the Mahila Coir Yojana programme with the support of the Coir Board of the Government of India.

Media workshop

A workshop on JMM was conducted for media persons with the objectives of

- Mobilizing the support of the media and public for JMM
- Providing accurate and updated information to the media and public about JMM and the impact of such management and
- Rekindling media interest in mangrove conservation and management.

The workshop was conducted separately in TN and AP with the help of The *Hindu* Media Resource Centre, Chennai. Representatives from leading Tamil, Telugu and English newspapers participated in the workshop, visited mangrove sites and interacted with the villagers. This workshop has resulted in wider publicity for the need for JMM guidelines, success stories of JMM activities implemented in Pichavaram mangrove wetlands and issues and concerns of the participating communities. (See SPA 604)

Replication of JMM by other NGOs

Three NGOs namely Coastal Community Development Program (CCDP) Machilipatnam, Sangamithra Service Society (SSS) Vijayawada and Sravanthi in Rajhamundry, trained by MSSRF on the technique of mangrove restoration and JMM, have restored nearly 210 ha of degraded mangroves in the Godavari and Krishna deltas. All these NGOs have also raised mangrove nurseries with *Avicennia marina, A. officinalis* and *Bruguiera gymnorrhiza* and the nursery raised saplings were used for plantation. The CCDP is now involved in the restoration of another 200 ha of degraded mangroves in the Krishna region with the support of Finnish International Development Agency (FIDA).

Tsunami Relief

The tsunami lashed the Indian coast on 26th December 2004. The coastal districts of three States, TN, AP and Kerala and the Union Territories of Pondicherry and Andaman and Nicobar islands were inundated. TN was the worst affected in terms of human loss, natural resources and basic livelihood assets. Immediately after the devastation, multiple agencies like Government departments, NGOs, civic organizations, corporate companies and local communities became involved in relief measures.

MSSRF took the initiative to provide immediate relief measures, conducted a rapid assessment of the situation and organized community cooking. It collected and distributed medicines and extended support to organize medical camps in 25 villages, benefiting more than 6,000 injured people (See SPA 703.2).

Future plan

MSSRF has been sharing responsibilities with other stakeholders and contributing innovative models for the restoration, conservation and

management of the mangrove wetlands of India for more than a decade. Though MSSRF's initiatives such as developing and demonstrating a science-based, community-centered and process-oriented approach for JMM has increased the momentum of sustainable management of mangrove wetlands, a number of technical and societal questions relating to long-term conservation remains unanswered, reduction in freshwater flow, the economic stake of the local community in JMM and consolidation of the gains made so far in JMM.

In order to address the above issues, and to enhance the technical and social skills of the stakeholders, there is a need to establish a *National Resource Centre for Mangrove Wetlands.* In the coming year, attempts will be made to establish such a centre in MSSRF with the support of partners and stakeholders.

Sub Programme Area 102

Nuclear and Biotechnological Tools for Coastal Systems Research

The first 5 yr phase of the DAE-MSSRF project has provided significant leads in many areas of intervention, with immense implications for strengthening the agricultural and livelihood security of the coastal farming and fishing communities. The results obtained during the first phase have been according to plan. In addition, a few activities which were not originally envisaged, were undertaken, based on the felt-needs of the local communities. The project has been able to demonstrate viable options for productive agricultural practices in dry regions, develop income generation activities through SHGs and micro enterprise initiatives, usher in computer literacy and involve local communities in planning and strategy for natural resource management. It has also generated basic scientific understanding of the molecular mechanism of stress tolerance, documentation of diversity in soil types and land use planning and understanding the interaction of seawater and freshwater interface. The work done so far indicates that a new window of opportunity exists for eradicating poverty and for promoting prosperity among the rural coastal communities. These studies have to be consolidated to realize the full benefits and ensure ecological and livelihood security for the coastal communities.

The DAE has approved an extension of the project for the next four years in order to consolidate the gains already made, extend the gains to other areas and make new gains through advances in nuclear science and biotechnology.

The objectives of the second phase of the project include:

- Development of ecoagriculture and models based on farming systems
- Anticipatory research and development using biotechnological intervention to address the problem of coastal salinity

- Strengthening the livelihood of rural communities and
- Establishment of VKC for livelihood security.

Natural resource management with ecological and livelihood security of the coastal communities around the Nuclear Power Plant has received special attention in the DAE-MSSRF projects at Kudankulam and Kalpakkam. The detailed soil survey and in-depth soil analysis report is aimed at studying the sustainable long-term approach for land use planning.

Developing suitable models for replication

The approach has been to demonstrate suitable models in the area, which is characterized by scanty rainfall and diverse soil conditions, in a participatory way. Local farmers were involved in the soil profile study to help them understand the problems faced in cultivation. The model developed by MSSRF has received a great deal of attention from the local farming communities. This helped the project to progress from the demonstration phase to the replication phase. Large-scale seed multiplication of mutant varieties of blackgram, greengram and groundnut was conducted and evaluated by the local farmers in 36 ha of land, under different soil conditions, in three villages. The farmers were involved in the participatory assessment of pulse and oilseed varieties developed by BARC and were satisfied with the performance of these varieties in comparison with the locally used ones. Table 1.2 shows the area covered by different crops.

Table1.2 : ***Area covered by different crops at Kudankulam***

Crops	Area (ha)
Pulses	26
Ground nut	9
Cumbu	6
Fodder grass	24
Fruit crops	19
Total	**84**

Seed multiplication of mutant blackgram and greengram was undertaken in the Chidambaram region of TN in association with four grassroot level institutions – Sethiyathope Anaicut Farmers Welfare Association, Thenkoodu Federation, Adhivaraganatham Farmers Welfare Association and Manikollai Small Farmers Lift Irrigation Forum. Some farmers were trained in pulse seed production, including agronomic practices, integrated nutrient management and integrated pest management. Pulse seed was distributed to 35 farmers in the region for cultivation in 32.67 ha of land, of which 522 kg of blackgram was sown in 13.43 ha of land while greengram was sown in 19.23 ha. The BARC mutant seeds showed about 25 % higher yield compared to the best available cultivated varieties of pulses. Seeds produced in the region were also used for distribution in other regions like Kalpakkam and Kudankulam in TN and Kendrapara in Orissa.

Performance test for minor millets was carried out in the demo-plot. Four different varieties released by TNAU, Coimbatore, and six accessions provided by the All India Coordinated Project on Millets, were sown and

the growth parameters and yield data were recorded. The first trial performance of Samai was found satisfactory. Further studies are being conducted to assess the possibility of raising the minor millets under rain fed condition in coastal areas.

Integrated Farming Practices

Many of the farmers adopted integrated farming practices to improve their land. Major interventions practised by the farmers include:

- Improving soil health by using vermicompost
- Increasing micronutrient availability to the plant, increasing organic carbon content and retaining more soil moisture
- Raising short duration crops, adopting BARC mutant varieties of groundnut, greengram and blackgram.
- Establishing drought resistant, high-value, horticultural crops and intercropping with pulses and oilseeds
- Proper livestock management
- Growing improved varieties of perennial fodder grasses and fodder legumes.

This year KKM1 fodder slips were distributed to farmers, covering an area of about 24.20 ha of land. Farmers are interested in growing nutritious perennial fodder grass as they are satisfied with the increased yield from their milch animals. The performance test of a few potential fodder grasses was undertaken in the demo-plot. Kerala Livestock Board, Palghat, supplied the certified seeds. Fodder Grasses like *Stylosanthus* (two varieties) Lablab and Gamba Grass performed well. Farmers have expressed interest in growing them in their fields during the coming years.

The IIFS technology adopted in the demo-plot has yielded good results, as reflected in the soil analysis report. The organic carbon percent has increased from 0.11 % to 0.36 % between 2000 and 2004.

Farmers trained in vermicomposting have now taken this up as an enterprise and have got a contract from NPCIL to convert kitchen waste to biowealth. This model has become so successful that NPCIL has also entered into an agreement with the SHGs to start such units in their townships. SHG members have experience in vermicomposting, as they have attended various training programmes organized by the state agriculture department. The District Collector, Tirunelveli, has recommended developing vermicompost in every farm after observing its success in a water-scarce area like Kudankulam. Five pits are supplying earthworm at the cost of Rs 500/ kg, to meet the basic requirement to start vermicomposting.

Many of the farmers have adopted watershed practice in their fields and are keen to adopt it at the village level in the coming years. MSSRF, in association with the NPCIL, is carrying out a detailed survey in the Vijayapathi Panchayat, for developing a location-specific model of watershed in the rainfed areas to enhance water recharge. Before conceptualizing the entire approach, a one-day training programme was organized with the help of the state agriculture-engineering department. The

importance of watershed and its role in natural resource conservation were explained. Many people volunteered to undertake this activity. Contour mapping of the identified area has been done so that earthwork can be started.

Capacity building

Capacity building and skill development have been given priority. Regular interaction programmes with various state department officials, group meetings and field visits to various research stations were organized to persuade farmers to replicate the model in all the villages. The discussions centred on watershed, soil health and micronutrient availability.

A training programme on mass propagation and nursery management was organized with the support of the tissue culture laboratory of MSSRF. About 60 members of SHG's groups were trained in different methods of mass propagation of fruit crops and flower plants. As a result one group proposes to start a nursery in Kudankualm, while another group obtained a loan from a local bank to start a nursery.

Another important dimension of the programme is to create a suitable environment for knowledge based economic empowerment among coastal communities. During the year, 15 SHGs were formed in three different villages, taking the total number to 46. They have saved Rs 16 lakhs and received more than Rs 23 lakhs from local banks. Two of the SHGs obtained more than 80 % marks in the rating system developed by *Mahallir Thittam*, Government of TN and are eligible for subsidized loans.

Under the regular training programme for SHGs, a ten-day training programme was organized on different topics for more than 820 people. Emphasis was given to topics like *leadership development, micro enterprise development, animal husbandry, micro-watershed, vermi-composting, nursery development and sanitation programmes.* Under the low-cost sanitation scheme of the state government, more than 30 houses were covered. Sustainable enterprises like dairy, poultry, goat rearing, nursery and vermi composting were identified and started with financial support from local banks and community banking of MSSRF. Next year some of the farmers are planning to take fodder grass as an enterprise to fulfill the local fodder demand.

After the tsunami, the coastal SHGs received a loan of Rs 18 lakhs at 50 % subsidy from the state government and various rehabilitation programmes have been initiated, NABARD and DRDA supported the livelihood training programme – "Beyond tsunami" - on fish based, value-added products in three coastal villages, covering 160 selected participants from 20 SHGs. Some of the groups are ready to take this as an enterprise and DRDA is willing to support them by providing a retail outlet at Valliore.

Village Knowledge Centres

Knowledge centres are being run (See SPA 601) in four coastal villages, providing

computer and information technology to poor rural communities through an interactive learning process. More than 50 students are attending regular computer classes in the current batch. Two summer batches were held on with a 60 hr course module. Basic science-based educational CDs are used to teach the students. Baseline data of Kudankulam village was updated and an attempt made to create a separate web page for Kudankulam. The centres are actively participating in preparing Village Development Reports for the Vijyapathy Panchayat. The data is available in CDs and floppies for the users. The centres are linked through the internet to disseminate accurate and relevant information. These activities have been intensified during the year through the adoption of a Hub-and-Spoke model for information development and dissemination. Initially, four villages have been selected and linked with high broadband connectivity using wireless technologies. These facilities have the potential of linking many more villages in the coming years.

Genome clubs

These have been formed in three coastal schools and 65 students in standards 8 to 10 have become members. A one-day training programme was organized to explain their role and the purpose of the clubs. They also participated in an exposure visit to nuclear power plants to learn about the production and safe use of nuclear energy. They visited the Environmental Survey Laboratory and reverse osmosis plant at Chettikulam Township. A trekking camp was organized for them at Mundanthurai Reserve Forest to learn about biodiversity and the importance of conservation. They were briefed about various aspects of natural resources through a mobile exhibition van (See SPA 605).

Action plan for Pokhran

The DAE also requested MSSRF to develop an action plan for ecological and economic empowerment of the local communities of the Pokhran region in Rajasthan. A brain storming session was organized to decide on an action plan for the Pokhran region, resulting in organizing a consortium of institutions for the Pokhran initiative. The members of the consortium include MSSRF; BAIF Development Research Foundation, Pune; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur; ICRISAT; CAZRI and URMUL Marusthali Bunkar Vikas Samiti, Jagran, a leading NGO in the Pokhran region and Jodhpur University. The major initiatives recommended by the discussion group include the augmentation and sustainable management of water, and the development of crops and fodder suitable for semi-arid agriculture. The following activities have been identified on a priority basis:

- Desilting traditional water tanks for harvesting rainwater
- Construction of “kunds” (underground water storage structures)
- Revitalization of traditional agricultural crops such as *bajra, guar, moong, jeera, dhania* etc. and introduction of small and big ruminants to develop *semi-arid zone mixed*

dynamic organic agriculture farms. Fodder grasses (e.g. Napier and Savan) will be included.

- Biological software such as vermicompost, *Trichogramma* egg parasitoid to manage the lepidopteran insect borers, vermicompost and composting will be concurrently developed so as to popularize Low External Input Sustainable Agriculture (LEISA).

It is also proposed to develop a genetic garden of suitable food and fodder crops for the region. This will help local communities to select plants adapted to their ecological, economic and social needs. Conservation of locally adapted shrubs and trees, which provide fodder and medicine, would be another major activity.

Sub Programme Area 103

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

In order to avoid overexploitation of bioresources and reduce pressure on marine biodiversity in the Gulf of Mannar Biosphere Reserve, attempts have been made in the last four years to demonstrate alternative livelihood options for poor fishing families, by establishing various marine resource based and community owned business enterprises. In the Mandapam region, an agar plant and a pearl culture farm have been established in Kunjarvalasai and Mundalmunai respectively, while in the Tuticorin region, a modern fish pickle unit run by women has been started in Vellapatti village. A village level society owns the enterprises. Demonstration of artificial reef as a tool to enhance fishery resources has also been initiated in Therespuram village.

External evaluation of the activities by the UNDP was completed in February 2004, and an evaluation by the local community, which is essential to formalize withdrawal, was conducted in November 2004. Representatives of the General Body of the societies of the four villages where these enterprises are established, staff of the commercial units and MSSRF staff together conducted this evaluation. The following criteria were used for evaluation: the time taken to establish the infrastructure facilities, the number of local people employed in these units and their monthly wages, permanent marketing linkages, the net profit and how much of it is given to the Societies which own these commercial enterprises and degree of ownership by the societies. The results of this evaluation and follow up action are given below.

103.1 Community owned agar plant

The agar plant, which started production in December 2003 with all modern facilities, established marketing linkages in the middle of 2004 and break-even has already been achieved. The community team has evaluated this intervention as neither a success nor a failure. Further analysis indicated that two major problems, lack of interest by the community in taking ownership of the plant and

low net profit, might affect the sustainability of the plant. Discussions with the members of the society indicated that they are not interested in taking up the management of the plant as the risk involved in running the plant is high, due to uncertainty in getting sufficient raw material, fluctuating market price and technical issues involved in the maintenance of the machinery. It has also been repeatedly conveyed that the society has no funds to revive the agar plant, in case it is closed due to technical reasons or due to continuous loss. In order to sustain the plant, the society suggested that the management of the plant may be given to an interested person/firm on condition that there should not be any reduction in the number of employees and their monthly wage; a share of the net profit should be given to the society; and at the end of the agreement period all the infrastructure including machinery should be returned to the society. Since this seems to be a viable method to sustain the agar plant, it has been agreed upon. At the same time the possibility of increasing the interest and skills of the society to collectively manage the agar plant is also being explored.

103.2 Community owned fish pickle unit

This commercial venture is also considered neither a success nor a failure, though it started marketing its products in the middle of 2003. Over-involvement of the society in the day-to-day affairs of the unit and establishing permanent market linkages are the two problems that need to be tackled to sustain the unit. The first problem has been solved through constant discussions and negotiations. However, the issue of establishing a permanent marketing linkage remains unsolved. Successful negotiation of regular orders would solve this problem. Direct selling to retail shops by the society is also being explored.

103.3 Community managed artificial reef

Artificial Reefs are man-made structures deployed in the sea, to increase coastal productivity in the long run by providing hard-bottom habitat for the growth of sessile organisms and establishing food chains. They increase the chance of post larval settlement of many invertebrates and fish larvae and also the survival of juveniles. The holes, crevices, vertical relief, and ledges of the artificial reef structures increase habitat space for marine organisms. Artificial reefs are generally created for the following purposes:

- To provide habitat or shelter for fish and other marine organisms
- To serve as a nesting, feeding, breeding, spawning and nursery ground
- To act as a deterrent to bottom-trawling and other destructive gear
- To help create fishing grounds
- To create recreational fishing areas.

About 45 countries are at present engaged in establishing artificial reefs in their coastal waters. In the past, scrap materials, wooden and bamboo structures, used tyres, broken ships, etc were used in the fabrication of artificial reefs. However, due to environmental

pollution from some of these materials such as tyres and decay of some materials such as wooden and bamboo structures, many countries now use concrete with steel and high-density polythene materials for the construction of artificial reefs.

In the Gulf of Mannar (GoM), fish production is declining because of over-exploitation and habitat degradation. Bottom trawling, exploitation of berried females and juveniles, coral mining and pollution are the major reasons for the degradation of fish habitats. This has resulted in reduced catch/effort ratio. In order to reverse this situation, and increase the productivity in the GoM, an artificial reef, with four different modules, each 30 in number, was deployed about 14 km offshore from Therespuram village. The fishing community of Therespuram participates in the development, deployment, monitoring and management of this artificial reef.

Both the external evaluation and the evaluation by the participating community showed that the artificial reef programme could be considered a successful intervention as it has achieved all the planned results. Monitoring of the artificial reef using underwater photography showed that most of the modules were covered with a variety of seaweed as well as sessile organisms, including soft corals. Adults of various species were also found taking shelter in the reefs. In addition, the local community has also noticed the presence of large shoals of juvenile fish of different species. All these clearly indicate that the artificial reefs are gradually becoming breeding and feeding places. The Therespuram Artificial Reef Society manages the reefs in collaboration with other fishing societies, the district administration and Fisheries Department.

Replication of the present artificial reef module has already been started by the TN Fisheries Department. It deployed an artificial reef about 25 km north of Kombuthurai coast near Tuticorin. The Fisheries Development Mission of the TN Fisheries Department provided financial support and MSSRF provided technical expertise in the development of this artificial reef, which has three modules. The Gulf of Mannar Biosphere Trust has also allotted funds for the establishment of the artificial reef.

103.4 Pearl culture

This business enterprise is considered a failure because of insufficient pearl production due to poor technique, inherent weakness of the oysters of the GoM and problems of environment. Marketing is also a problem because the market is flooded with cheaper artificial pearls. This has been reported to local communities and all agencies concerned.

Lessons learned

The following facts have emerged as a result of these endeavours.

- Alternative employment opportunities can be created for poor fishermen in the GoM region, by establishing commercial production units, utilizing locally available resources. The local community is not yet ready to manage these units on their own.

- The local people are more interested in a wage rather than managing commercial units because of the risk involved in terms of investment, marketing and maintenance of sophisticated machinery.
- Artificial reefs can be utilized to address the issue of depleting fish resources, which seriously affects the conservation and management of the marine biodiversity of the GoM. Multicluster artificial reef can be established at appropriate distances from natural coral reefs as alternative fishing grounds for poor fishermen to avoid fishing in the reef area, which is another major problem in the management of the GoM.

Sub Programme Area 104

Remote Sensing and Geographical Information System

The GIS division, which started as a supportive unit to the Coastal Wetlands and Mangrove project, has been assisting different departments and divisions with mapping and analysis of remote sensing data.

Mapping the impact of Tsunami near Pichavaram

The area inundated and devastated by the tsunami near Pichavaram mangroves was delineated, using remote sensing data (See SPA 703.2). The physical structure of the beach that separates Pichavaram mangroves and the Bay of Bengal has changed considerably. The mouth of the mangrove estuary near a place called Chinnavaikkal has widened from 150 metres to 1,500 metres. The shoreline of a lagoon located just south of the Pichavaram mangroves and near T S Pettai village has been breached in 5 places along its 2 km length. As a result, Pichavaram mangroves now receive tidal water directly from the sea through this lagoon, instead of the Coleroon estuary, located about 3 km south of the mangrove wetland. The sea has inundated about 54 sq km of area from the Vellar estuary in the north to the Coleroon estuary in the south. The inundated areas include beaches, mudflats, mangroves and the backwater system; some agricultural lands have also been affected.

Assessment of the impact of the tsunami on the vegetation in Nancowry and Car Nicobar Islands

Indian Remote Sensing Satellite (IRS 1D LISS III and IRS P6 LISS IV) data of Nancowry group of islands (February 2004 and January 2005) and Car Nicobar (April 2004 and February 2005) islands were visually interpreted to delineate the impact of the tsunami (inundation, submergence and total destruction) on coconut plantations, mangrove forests and other vegetation. The change analysis of the temporal data shows that there is a submergence of land in more than 3100 ha in the Nancowry group of Islands and 300 ha in Car Nicobar. These details were utilized to prepare an action plan for *New Andaman*, submitted to the A&N administration for consideration (See SPA 703.6).

Application of Geographic Information System in farm level planning and management

The spatial database of a village, showing individual farms and cropping details, is necessary for preparing a farmland development and management plan. Such a database was prepared for Thonimalai village of Reddiyarchatram block, Dindigul district. (See SPA 401.2).

The following methodology was used to prepare the above database:

A cadastral map was procured from the Survey and Land records, Chennai.

GPS Control points were used to geocode the cadastral map and enter it in GIS.

The cadastral map was further improved with the updated field boundaries and survey numbers available in the Field Measurement Book (FMB).

FMB and *Adangal* records were taken from the Village Administrative Office, with permission from the taluk office.

Adangal records were linked with the updated cadastral map.

The farm level spatial database of Thonimalai contains the following information: survey number, new survey number, farmer's name, total area, crops cultivated and area under each crop.

This database which will help to plan and improve farming practices, is also being updated with soil types, water availability and climate data, to provide appropriate water harvest and storage structures. Similar maps are being prepared for Palayakannivadi, Kodalvavi, Palakkanuthu and Kamatchipuram villages of Reddiyarchatram block.

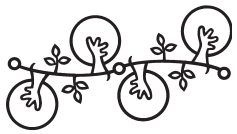
Maps showing the details of land use/ land cover, soil types, watershed, contour, infrastructure and other details have also been prepared for Reddiyarchatram block, Dindigul district, TN and Mahakalpara block, Kendrapara district, Orissa, to develop the Village Information System. (See SPA 401.1.3)

Mapping indicators for the Food Security Atlas of Cambodia

For the Food Security Atlas of Cambodia (See SPA 502.2), thematic maps under three major groups, namely Food Availability, Food Access and Food Absorption, have been prepared, using natural break classification in Arc View GIS.

Deficit in the production of food grains, food production, rainfall, forest cover, land use, soil and water availability were considered as indicators of Food Availability. Poverty, total and female literacy, unemployment, education and access to electricity were taken as indicators of Food Access. Indicators such as access to safe drinking water, toilets, infant mortality rate, sex ratio, percentage of stunting and underweight children were included under Food Absorption. Index maps of each main group and the final Food Security Index map have also been generated. These thematic maps are being used in the preparation of the Food Security Atlas of Cambodia.

Programme Area 200



Biotechnology

Bioprospecting of novel genes, compounds and organisms have resulted in 36 full length genes for abiotic stress tolerance and a few bioactive compounds from lichens. Three transgenic rice lines have been taken to the field for limited trials. 147 Jatropha curcas *accessions have been collected from various agro-climatic conditions, of which seven have been identified to have more than 30 % oil content. 61,000 saplings of mangroves have been produced and maintained at the community nursery. Salt tolerant beneficial strains, which were tested in the field, have led to product formulations.*

Sub Programme Area 201

Ecological Restoration and Ecosystem Monitoring

Advances in the field of Biotechnology have opened up new avenues of research for addressing pressing problems of food, nutrition and ecological security. The work carried out at MSSRF during the last 10 years has contributed immensely in developing reproducible *in vitro* protocols for rare and endangered plant species in the Western Ghats as well as mangroves; documenting diversity among the mangrove species using molecular marker systems; assessing ecosystem health using microbes and lichen species; identifying and characterizing novel genetic combinations from mangrove species and developing transformation systems for select crop species for generation of location specific crop varieties offering tolerance/ resistance to abiotic stresses.

While the focus of the programme has remained unchanged over the years, a few interventions in key areas have been initiated, keeping in view our priorities, as well as technological advances in the field of biotechnology. Over the years, the focus of the biotechnology programme at MSSRF has been bioprospecting for novel genes, compounds and organisms for addressing the ecological and economic security of the coastal communities.

Demonstration of efficient energy plantation in coastal regions of TN with community participation

Over the last few years, successful protocols were established for mass multiplication of mangrove species, using both micro-propagation and vegetative propagation methods. The objective of this programme was to train local communities in developing and maintaining mangrove nurseries. Both field and bioenergy nurseries are maintained by Women Self Help Group (WSHG) members at Keelavanjore village in Karaikal. During the year 61,000 plants were produced and maintained at the community nursery through micro, vegetative and seed propagation methods. They included about 10,000 saplings of *Avicennia marina*, 4,000 of *Ceriops decandra*, 40,000 of *Rhizophora,* and 5,000 micro-propagated and 2,000 vegetative propagated plants of *Excoecaria agalloacha*. A total area of 5 ha is under plantation in Pondicherry.

The WSHGs are playing a major role in raising community mangrove nurseries and plantations in their respective areas as an employment generating opportunity. WSHGs at Keelavanjore raised about 2,00,000 mangrove saplings of *Rhizophora*, *Avicennia*, *Ceriops*, *Bruguiera* and *Excoecaria*. They received a grant Rs 4,02,675 from the Government of Pondicherry during the year for planting mangrove species in degraded mangrove areas on Chunnambar River and Thenkithittu. The SHGs will take care of the plantation sites for one year. The Pondicherry Government has entered into a contract with

the SHGs for monitoring the mangrove plantations on a year-to-year basis. MSSRF provides the technical support.

Genetic fidelity studies of propagated plants

Total genomic DNA was extracted from a set of micropropagated plants belonging to the same batch of culture and the source plant from which explants were taken. Genetic fidelity studies were carried out using RAPD and AFLP markers. Micro-propagated plants showed 100 % genetic similarity to the source plant in RAPD, while the similarity was almost 80 % in AFLP marker systems.

Salicornia brachiata cultivation

Twenty genotypes with distinct morphological features were collected from the east coast of TN. Fifteen of them were screened and trials were conducted in 15 plots of degraded saline soil. Total yield was quantified from each plot after the first harvest.

Seed oil was extracted from *Salicornia brachiata* using two solvent systems *viz.* petroleum ether and hexane at a level of 100 g seed per 100 ml of solvent over a 24 hr period.

Hexane extraction gave higher oil yield (22.4 %) compared to extraction with petroleum ether (10.5 %) in all the three populations studied. High ester (538.32 mg/g) and saponification (547.52 mg/g) were present in the oil. Further analysis on oil characteristics is under progress.

***Production and demonstration of high quality material of* Jatropha curcas**

Jatropha curcas, popularly known as ratanjyot, is of immense potential for producing *Jatropha* oil, which has large-scale industrial uses. It is a large shrub, 3-4 m high, which occurs throughout India, including the Andaman islands. In India, it flowers from September to December. With about 175 million ha of wasteland, *Jatropha curcas* could be a well-suited species for reclamation, since it is a wild-growing hardy plant, well adapted to harsh conditions of soil and climate.

During the recent years, there has been a growing interest in large-scale cultivation of this species in our country. However, technical constraints such as availability of quality seed material (genotype) and appropriate method of cultivation (propagation methods) hold the key for success of *Jatropha* plantations.

The programme at MSSRF aims to identify location specific genotypes (in relation to oil content and yield) and develop vegetative and micro-propagation technologies for the species. It also intends to carry out demonstration trials in partnership with local communities in four locations (Kudankulam, and Pudukottai in TN; Karaikal in Pondicherry and Jeypore in Orissa) which have diverse agro climatic conditions.

A total of 147 *Jatropha curcas* accessions were collected from various agro climatic conditions in TN including TNAU, Annoor and Sengapalli in Coimbatore District (57 clones); Dharapuram, Moolanur and Kangeyam in Erode District (68 clones); and Maycharry and

Eddapadi in Salem District (22 clones). These collections are now being maintained at Kudankulam, Jeypore and Karaikal as genetic resources for *Jatropha* collections. Fifty genotypes were analyzed for their oil content and of these seven collections were identified with high oil content (> 30 percent). These collections have been selected for mass multiplication. About 20,000 saplings were available at each nursery site for plantation.

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

Lichens respond first to the ill effects of air pollution, due to the absence of protective, conductive and assimilatory tissues as well as their intimate eco-physiological links with the atmosphere. The large-scale data on lichen diversity and their distribution pattern, provide vital information on the levels of ecosystem health, diversity status and productivity. In the Madukkarai region of the Western Ghats, the sources of pollution (cement factory and limestone mining) are present close to the biodiversity "hot spot" area. Hence as an immediate priority, the impact of cement dust on lichen diversity and their distribution in the Madukkarai–Walayar region (46 km^2), a part of Nilgiri Biosphere Reserve in the TN–Kerala border was studied, through ecological sampling protocols for large scale quantitative data, with reference to macrohabitat conditions (habitat and climate characteristics), microhabitat variables, lichen diversity and distribution patterns, and data on pollution, its sources and distribution.

Elemental content and its distribution within lichen thalli for selected species were also carried out to understand the impact of pollution, with particular reference to cellular and tissue level damage. Pollution damage to the lichens of this region was also assessed using the efficiency of the photosynthetic partner in terms of pigment vitality. This data provided the basis in understanding the impact of cement dust pollution on lichen diversity and the distribution pattern in this region. The highlights of the study are as follows:

- Within the dry deciduous forest types of the region, 86 species, under 30 genera and 18 families have been recorded.
- The lichen *Bacidia* sp. colonises within a 500 metre radius of the Malabar cement factory and exhibits a preference for *Gyrocarpus Americana* trees.
- *Bacidia* sp., *Heterodermia dissecta var. koyana*, *Physcia tribacoides*, *Parmotrema grayanum* and *Parmotrema planatilobatum*, exhibited morphological degradation symptoms, depending upon the exposure to pollutants and proximity to the polluting source.
- Ultra structural studies of the lichen species *Heterodermia dissecta var. koyana,* conducted through Scanning Electron Microscopy (SEM) coupled with Energy Dispersive X ray spectral analysis (SEM-EDAX) for qualitative elemental profiles, indicated a high level accumulation of calcium around the photosynthetic partner.

This accumulation can be attributed to the lethal morphological changes that were noted on this species when it grows close to the pollution source.

- SEM – EDAX elemental quantification data reveals the increased deposition of the element calcium to an amount of 94.54 % weight/ 200 mm scanned surface area in the reproductive parts of lichen *Bacidia* sp that thrives in calcium-contaminated sites, whereas the control samples collected from the adjoining Bolampatti forest revealed a calcium elemental profile of 43.05 % weight/ 200 mm scanned surface area. The colony size and number of reproductive structures of this species which were growing close to the cement pollution source, are significantly larger compared to the samples collected from unpolluted areas. It may be concluded that this lichen species exhibits a clear preference towards calcium-contaminated sites.

Sub Programme Area 202

Molecular Mapping

Genetic diversity analysis of mango cultivars

The genus Mangifera, a pantropically cultivated species, has a large number of cultivars mainly distributed in tropical Asia. In India alone the number of cultivars is over one thousand, with different vernacular names in different areas. The common mango *Mangifera indica* is believed to have originated in Assam.

Genetic diversity studies in the species of the genus *Mangifera* using DNA-based marker systems are very limited. Leaf samples of 40 mango genotypes were collected from a wide distribution range across the eastern region. Genomic DNA was isolated from these genotypes by using modified method of CTAB (Cetyl Trimethyl Ammonium Bromide) protocol. The purity of the genomic DNA was tested on 0.8 % agarose gel electrophoresis and used for further analysis. The genetic diversity in these genotypes was analyzed using RAPD (Random Amplified Fragment Polymorphic DNA) and SSR (Simple Sequence Repeat) markers. The genomic DNA was analyzed with 10 different RAPD primers and three SSR primers. Between three to ten bands were observed in each primer of RAPD analysis. The total number of bands and percentage of polymorphism among the 40 mango genotypes were calculated. The maximum number of polymorphic bands was observed with primer D11. The percentage polymorphism across the genotypes ranged from 29 to 45. The average percentage polymorphism across the ten primers is 40 %.

In SSR, three primers of $(GTC)_5$, $(CA)_8$ and $(CAG)_5$ were used in the study. All the three primer combinations gave unique profiles in all the cultivars. This is one of the first studies to analyse the genetic diversity of mango cultivars, using two different marker systems. Many more samples are being collected across various geographical regions and analysed. The genetic diversity analyses will help to identify the unique genetic stock for better varieties through breeding programmes.

Sub Programme Area 203

Bioprospecting for Novel Genes

Field trial of AmSOD1 transgenic plants

Last year, a single location trial was held at Kalpakkam for one line of rice plant transformed with the *AmSOD1* gene. This study was extended to two more sites *viz.* Chidambaram and Karaikal, this year. Homozygous lines from two independent transformation events (line 12 and 13) were used in the study. The transgenic and control plants were tested for salt tolerance in the presence of three concentrations of salt: 50 mM, 100 mM and 150 mM. The studies were carried out in a random block design. Three replications for each treatment were maintained; water treated plots served as controls. Transgenic plants showed greater survival in the presence of salt.

Analysis of the copy number of the *AmSOD1* gene in the *A. marina* genome confirmed that the gene exists as a single copy in the genome of *A. marina*. Southern hybridization of *A.marina* genomic DNA restricted with four different enzymes that do not cut the cDNA gave single hybridization signals of different sizes, ranging from less than 3 kilobase to greater than 10 kilobase pairs. Gene expression studies were carried out with two-month-old *A. marina* seedlings to analyze the expression pattern of *AmSOD1* in the presence of various abiotic stresses such as salt, hydrogen peroxide, excessive light and iron with a gene specific probe. With excessive iron, *AmSOD1* gene expression was induced within 30 minutes of transfer of the seedlings to iron excess medium and on withdrawal of the iron stress, the *AmSOD1* transcript levels decreased. With hydrogen peroxide treatment, the seedlings showed a decrease in the transcript levels till about 12 hrs following which the transcript level increased and was maintained at a constant level through the entire period of 36 hrs of hydrogen peroxide treatment and the withdrawal period of 6 hrs.

***Analysis of transgenic tobacco plants over-expressing a catalase,* AmCat1**

Catalase is a reactive oxygen species-scavenging enzyme that promotes the conversion of hydrogen peroxide, a powerful and potentially harmful oxidizing agent, to water and molecular oxygen. *AmCat1* isolated from *A. marin*a was cloned in the binary vector pCAMBIA 2301 under the control of the CaMV 35S promoter and transformed into tobacco. Catalase activity assays were carried out with kanamycin positive tobacco regenerants. The activity assay measures the rate of degradation of hydrogen peroxide, which is reflected in the decrease in absorbance at 240 nm with time. Experiments were conducted by taking leaf samples of the same age and size and absorbance readings were taken every 15 seconds. Line CatS2 showed 1.42 times more catalytic activity compared to untransformed plants, while Line CatS15 showed 1.51 times more catalytic activity compared to control untransformed plants. This suggests enhanced catalase activity in transgenic plants.

AmCat1 was transformed into *Vigna mungo*. Cotyledonary explants from six-day-old *V. mungo* seedlings were co-cultivated with *Agrobacterium* LBA4404 strain carrying *AmCat1* cloned in the binary vector, pCAMBIA 2301. The explants obtained were transferred to a regeneration medium containing BAP, Kanamycin and Cefatoxime for multiple shoot formation. Once the shoots attained 2-3 cm height, they were transferred into a rooting medium with IBA. Out of the 16 regenerated plantlets, 6 were PCR positive.

AmCat1 transcripts were found to be constitutively expressed in *A. marina* leaves with relatively higher expression in younger leaves as compared to mature leaves. The transcripts for *AmCat1* were moderately expressed in stem and less in roots. Changes in expression levels were observed when the plants were shifted from day-night cycle to dark entrainment. *AmCat1* levels were high in dark treatments that decreased with exposure to light. In contrast, Northern blots with *AmGLO* glycolate oxidase, another peroxisome localized enzyme as probe, showed that the expression levels were basal in dark treatments but increased with light treatment. With 500 mM salt stress, *AmCat1* transcript levels increased upto12 hrs in leaves; however, transcripts for *AmCat1* decreased at 24 and 48 hrs of salt stress. Upon withdrawal from the salt stress, *AmCat1* expression returned to basal levels. It was found that with Fe-overload, transcripts for *AmCat1* increased and peaked by 6 hrs. However, mannitol treatment (osmotic stress) resulted in a decline of transcript for *AmCat1* with 6 hrs.

Co-expression of Active Oxygen Species (AOS) scavenging genes in rice and evaluation of the same for increased salinity tolerance

Rice is grown in submerged conditions and so salinity is a major problem while cultivating rice in coastal regions. In the coming years, there will be an urgent need for improving its resistance against biotic and abiotic stresses that cause significant damage to the yield. Most stress resistance related traits, which are mediated by a number of biochemical reactions/ physiological processes and methods for co-integration of multiple transgenes into the plant genome, are not well established. The cloning and pyramiding of two reactive oxygen-scavenging (ROS) enzymes *viz.* catalase and superoxide dismutase in the same binary vector pCAMBIA 1301 are in progress. In addition, the full-length sequence of two other ROS genes, namely ascorbate peroxidase (APX) and monodehydroascorbate reductase (MDAR) have been obtained from *A. marina*. APX is 1,079 bp in length while MDAR is 1,916 bp in length. Cloning of both APX and MDAR in the binary vector is underway.

Analysis of transgenic rice over-expressing Ferritin

Ferritin is an iron binding protein and its over-expression in rice seeds will enhance the nutritional content of the grain. Ferritin gene was cloned into the binary vector pCAMBIA 1,300 ahead of the endosperm specific glutelin B promoter. Six independent segregating lines expressing AmFer were analyzed in the T3

generation. One of the lines, 12-10 was homozygous and was confirmed by PCR and Southern blot analysis. More than 20 plants were used for each analysis. Integration of both the left and right borders of the T-DNA was also confirmed by southern analysis. Histochemical analysis on T3 seeds of line 12-10 was carried out to study the qualitative iron content in transgenic rice grains. The results clearly revealed that there is an increase in iron content in transgenic ferritin seeds compared to un-transformed control seeds and this iron was localized in the seed endosperm. Further expression analysis (western) and iron quantification studies are in progress.

The *A. marina* ferritin (*AmFer*) open reading frame coding for protein was cloned in the *E. coli* expression vector pROexHTa fused to a His-tag and expressed in *E. coli.* IPTG induction revealed a band size of 28 kDA in a Coomassie stained protein gel that was absent in un-induced cells. The protein was purified by nickel column chromatography and found to be immuno-reactive with anti-pea ferritin antibodies in western blots. Northern analysis with *A. marina* total RNA isolated after subjecting the plants to different abiotic stresses was carried out with *AmFer* cDNA as probe. There was an increase in the *AmFer* transcript level after 30 minutes of iron stress, which kept increasing upto 6 hrs. When the plants were reverted to an iron free medium, the transcript level did not decrease. With salt stress, there was an increase in *AmFer* mRNA after 12 hrs; mRNA levels decreased at 24 and 48 hrs of salt stress. When the plants were reverted to a normal growth medium, normal transcript levels were restored. Mannitol stressed plants showed the same transcript levels as un-stressed plants at 12 and 24 hrs.

Over-expression of a Na+/H+ antiporter for enhancing salt tolerance

In salt tolerant plants, sodium extrusion from the cytosol and compartmentation in vacuoles are key processes for Na^+ detoxification and cellular osmotic adjustment. These plants accumulate Na^+ in vacuoles through the activity of a tonoplast trans-membrane protein called Na^+/H^+ antiporter. A full length clone, bearing significant homology to the OsNHX1 (*Oryza sativa* Na^+/H^+ antiporter) gene was obtained from the cDNA library of *Porteresia coarctata* by library screening and RACE. Northern analysis revealed that the expression of *PcNHX* is upregulated by salt and ABA. The isolation of the *PcNHX* promoter has already been mentioned in the previous report. A series of binary vector constructs were generated using the *PcNHX* gene and its endogenous promoter and/or the CaMV 35S promoter. These binary vectors were used for transformation into tobacco as well as rice. Two cultivated varieties of Indica rice, Pusa Basmati and IR-20, were used for transformation. Transformation of rice calli was carried out using both the *Agrobacterium* method and biolistic technology. A number of positive plants were obtained for each construct in tobacco and rice. For each construct, at least 10 tobacco plants, rooted in media containing hygromycin, were subjected to analysis. Total genomic DNA was isolated from all the

transformants. Primers designed on the UTR region of the gene were used for amplification. Plantlets of rice varieties Pusa Basmati and IR-20, transformed and regenerated, were transferred to the field. Twenty-five Pusa Basmati plants were obtained for the *PcNHX* construct driven by the 35S promoter. These plants were allowed to set seeds. The seeds of the T1 generation were tested for the reporter gene GUS which is part of the T-DNA. Eight lines were found to be GUS positive. Further analysis needs to be done to confirm their transgenic nature.

Two GUS positive tobacco plants were obtained for the *PcNHX* promoter driving GUS expression. Thirteen plants were GUS positive for the *PcNHX* construct driven by the 35S promoter in tobacco. Eight plants for the antisense construct were also GUS positive. Southern analysis of these GUS positive plants is underway.

Drought tolerance studies

Studies are being conducted on *Prosopos juliflora*, a widespread drought-tolerant plant, as a donor species for isolation of candidate genes for drought tolerance. Eight hundred and fifty ESTs had been sequenced till last year and this year another 900 clones were sequenced, taking the total to 1,750. Comparisons with genes in publicly accessible databases suggest that 20 % of the 1,750 EST code for unknown proteins and are therefore a good starting point for the isolation of genes conferring stress tolerance. In this EST list, 96 genes that have been reported to have a documented role in abiotic stress are also present. Among these genes, Glutathione-S-transferase (*GST*) and RAB *7D* gene were selected for further characterization. Salt (500 mM) and mannitol (800 mM) treated *Prosopis* seedlings showed up-regulation of both these genes with Northern analysis. Both genes were then fully sequenced and cloned in binary vectors for plant transformation. Two constructs were prepared for each gene, one in pCAMBIA 1301 under the control of the Cauliflower Mosaic Virus (CaMV) 35S promoter for transformation into tobacco and the other in pCAMBIA 1300 driven by the ubiquitin promoter for transformation into the local Indica rice variety ADT43. For the tobacco plants, DNA was isolated after three rounds of selection and 90 % were found to be PCR positive for the respective genes. A GUS assay was also done on these plants to confirm the results. In rice, DNA isolated from rice plants regenerated from callus after three rounds of selection were analyzed by PCR and found to be positive. The Putative transgenic positive rice plants have now been used for seed multiplication.

***NaCl tolerance studies in* Sesuvium portulacastrum L**

Sesuvium portulacastrum, commonly called Sea Purslane, is a halophyte that grows all along the coastal regions, including areas where mangrove plants are found. The plant has a remarkable ability to survive under different stress conditions that include salinity, drought and heavy metal contamination. Studies were conducted to understand NaCl tolerance in *Sesuvium* at whole-plant and

cellular levels. Though *Sesuvium portulacastrum* can be propagated very easily through stem cuttings, tissue culture methods are good scientific tools to understand processes at cellular levels. Two sets of studies were conducted: rooted stem cuttings exposed to different NaCl concentrations to study responses at whole-plant level, and undifferentiated callus cultures exposed to different concentrations to study the response at the cellular or tissue level.

Experiments carried out indicate that whole-plant response differs from cellular or tissue level responses to NaCl stress in *Sesuvium*. Rooted stem cuttings, when grown hydroponically in NaCl containing half-strength MS nutrient medium, were able to tolerate concentrations of NaCl up to 350 mM (approximately 50 % of seawater). Callus cultures raised from nodes when grown in NaCl containing MS nutrient medium under sterile conditions were able to grow normally, only upto 200 mM of NaCl. Though many factors could be attributed to the differences in tolerance, it was observed that NaCl tolerance at the cellular level might prove to be helpful in discerning unique mechanisms that operate in this plant. Having obtained the gene for the probable CAM isoform of PEPC from this plant, it is possible to study the levels of expression of this photosynthetic enzyme in different tissues, including the callus. This in turn might provide clues on the regulation of the enzyme at various developmental stages in relation to NaCl stress. Studies in this direction are being conducted.

Over expression of Type II Metallothionein in transgenic systems for phytoremediation of soils contaminated with heavy metals

Phytoremediation is the process of using plants for removing pollution from contaminated soils or water. Some plants such as *Brassica juncea*, *B. napus* and *B. oleracea*, *Populus*, Yellow poplar and cord grass (*Spartina* spp.) yield a high biomass and are more amenable to heavy metal accumulation. Of these, *B. juncea* can be transformed more easily compared to other species. There are various naturally occurring proteins present in plants that are known to sequester and /or chelate heavy metals such as phytochelatins, gluatathione-s-transferase and metallothioneins. Metallothioneins (MT) are cysteine-rich proteins that are involved in metal homeostasis and are of three types: I, II and III. Type I is predominantly present in roots, while type II and III are present in shoots. Metals like Cu, Cd and Zn induce type II proteins. Hence the rationale is to choose type II MTs for transforming plants for phytoremediation. The Type II MT isolated from the *P. juliflora* cDNA library during EST sequencing is 618 bp in length. It has an ORF of 238 bp coding for a protein of 78 amino acids. The genomic clone isolated for this gene has one intron of length 372 bp, while the total length of the genomic clone is 990 bp. The full-length cDNA for the *Prosopis* Type II MT has been cloned into the binary vector pCAMBIA 1301 under the control of the CaMV 35S promoter for constitutive expression. This construct has now been transformed into tobacco and the plantlets are currently under regeneration.

***Isolation and characterization of Am244, a salinity-induced gene from* Avicennia marina**

As has already been mentioned, large-scale EST sequencing of the *A. marina* library was undertaken. A few ESTs (comprising unknown sequences) from the library were selected and analysed by Northerns using total RNA isolated from salt stressed leaves and roots. One of the EST clones, *Am244*, was shown to be up-regulated in roots of *Avicennia marina* seedlings upon treatment with 500 mM of sodium chloride. The induction was seen to occur after six hrs of salt treatment and maintained for 48 hrs. Withdrawal of salt stress was accompanied by a drop in transcript level. This suggests that *Am244* has a possible role in the response to salt stress in *Avicennia marina*. *Am244* exhibits extensive similarity to deduced low-temperature- and/or salt-induced proteins from *Arabidopsis*, barley, wheat grass and strawberry and to predicted proteins from bacteria, fungi, nematodes and yeast and belongs to the uncharacterised upf0057 family of putative plasma membrane proteins. *Am244* is a putative plasma membrane protein and its transcript is expressed in both leaves and roots. The cDNA has been sequenced completely and consists of 610 bp. The deduced ORF encodes for a highly hydrophobic protein comprising 57 amino acids ($M_{t=}$ 6229), which is predicted to contain two membrane-spanning domains. It is interesting that all *Am244* homologs reported from plants so far appear to be rapidly induced by salt or low temperature stress. Also, in yeast, deletion of Am244 homolog led to NaCl sensitivity that resulted from a higher intracellular Na^+ concentration. This suggests that they have some role in the early minimal protection against sudden stress, the exact nature of which needs further examination. As part of characterization of the *Am244* gene, the ORF was fused with plant codon optimised GFP as the N-terminal fusion partner, using Splicing by Overlap Extension (SOE) PCR. The fusion product was cloned into a plant binary vector pCAMBIA 1301 under the control of the constitutive CaMV 35S promoter and transformed into tobacco via *Agrobacterium* mediated transformation. The regenerated plantlets were screened using the GUS assay. Two GUS positive plants that were also PCR positive, were obtained. Western blotting of leaf extracts of both plants using anti-GFP antibodies gave a band size of 33 KDa, which is the size of the fusion product. Confocal microscopy on a Zeiss LSM 510 Meta, using the 488 nm argon laser, revealed intense green fluorescence at the cell periphery in guard cells, trichomes and root hairs. This fluorescence was not visible in control-untransformed plants. The plasma membrane localization of the fusion product was confirmed by placing a tobacco leaf peel section in 0.8 M mannitol for about 40 minutes. The trichomes clearly showed shrinking of the green fluorescence away from the cell wall.

***Generation and analysis of expressed sequence tags from the salt tolerant mangrove* Avicennia marina**

Construction of a salt stressed cDNA library from salt stressed leaves of *A. marina* has been

mentioned in previous Annual Reports. Random EST sequencing of 1,841 clones produced 1,602 quality reads. These clones were classified into functional categories. Clustering of the 1,602 ESTs using the CAP3 program produced a total of 292 contigs, encompassing 814 ESTs resulting in a 51 % redundancy. Contig analysis reveals the number of times a given gene occurs in the sequenced database. The remaining 788 ESTs were singletons, that is, they did not cluster with any of the other ESTs. The largest contig contained 18 ESTs while 186 contigs had two ESTs each. The 447 'unknown' ESTs could be assembled into 80 contigs and 247 singletons. BLAST comparisons revealed that 113 clones that were homologous to genes earlier implicated in stress responses and dehydrins, predominate in this category. 30 % of the analysed ESTs showed homology to previously uncharacterised genes in the public plant databases. Of these, 52 clones were selected for reverse Northern analysis. Twenty six of these were up-regulated and 5 showed down-regulation. Results obtained by reverse Northern analysis were confirmed for 3 clones. Reverse northern for PR541 showed up-regulation, while the data for the remaining two clones, PC2 and PC40 suggests down-regulation at 48 hours. PR541 shows strong homology to the precursor form of the polypeptide hormone phytosulfokine. The full length cDNA is 681 base pairs coding for an ORF of 77 amino acids. Phytosulfokine-a (PSK-a) is a tyrosine sulfated mitogenic pentapeptide, first isolated from *Asparagus* mesophyll cell cultures. It was secreted into the medium and found to induce cell proliferation at low density. PSKs with identical structures were subsequently identified in the conditioned medium of rice, zinnia and carrot cultures. Northern kinetic analysis (salt induction) for PR541 showed maximum expression in the leaf at 48 hrs of salt stress. While the increase in the transcript was gradual in the leaf and peaked at 48 hrs of stress, up-regulation in the root was more rapid, peaking at six hrs and remaining constant thereafter until withdrawal of the stress. Northern data for PC2 and PC40 for leaf tissues showed a decrease in the transcript at 48 hrs and elevated expression as compared to control in root tissues, falling off gradually. The PC2 cDNA consists of 1,295 base pairs and encodes a putative protein of 336 amino acids. TBLASTX results revealed significant similarity to the hypothetical *Arabidopsis* protein At1g16520. Domain analysis using SMART, identified a coiled coil region closer to the N-terminus of the putative PC2 ORF. The coiled-coil protein oligomerization motif is found in a number of functionally distinct proteins which are often involved in attaching protein complexes to larger cellular structures such as the Golgi, centrosome, centromere or the nuclear envelope. The PC40 cDNA (964 base pairs) was also sequenced completely and found to encode a 207 amino acid protein, showing high homology to the putative *Arabidopsis* C3HC4 RING zinc finger protein AT5g01520. Domain analysis with SMART suggested the presence of a RING finger domain at the C-terminus of the protein while at the N-terminus there was a potential hydrophobic region. Numerous

members of this protein family occur in eukaryotic organisms and participate in diverse functions such as signal transduction, vesicular transport, cell proliferation and embryonal patterning. The EST data is the first for *A. marina* and can be used to establish this mangrove species as a model system for the molecular genetic studies of plant salinity tolerance. Expression patterns for the 'unknown' genes provide a starting point for isolation of salt tolerance candidate genes and further functional analysis will elucidate the role in salt tolerance.

Sub Programme Area 204

Bioprospecting for Novel Compounds

Lichens

The main focus of this programme is to harness the bioprospecting potentials of selected lichen species (symbiotic fungi with algae or cyanobacteria for nutritional requirements) for their secondary compounds. The secondary compounds from selected species viz. *Roccella montagnei, Parmotrema praesorediosum Dirinaria consimilis, Pyxine nilgiriensis, Ramalina celastri, Usnea* sp., were extracted and screened for novel antimicrobials. The novel compounds were further chemically characterized with the help of Sophisticated Analytical Instrumentation Facility (SAIF) and the Organic Chemistry Laboratory, Indian Institute of Technology, Chennai.

Qualitative and quantitative extraction of lichen secondary metabolites of *Roccella montagnei* and *Parmotrema praesorediosum* and subsequent antimicrobial screening provided the basis for the identification of two novel compounds, one from each species. The methanol extract ($CHCl_3$: MeOH) bioactive fraction of *Roccella montagnei* was purified and crystallized as b crystals. These b crystals were analyzed using X-Ray Diffraction Crystallographic characterization methods. The chemical structure obtained through this procedure indicated a novel chemical compound. This structure has been deposited at the Cambridge Crystallographic Structural Database.

Extraction of secondary compounds from *Parmotrema praesorediosum* with organic solvents such as hexane, dichloromethane and methanol, with different polarity, facilitated the isolation of six different extracts. Column chromatography of the dichloromethane extracts obtained from this species yielded bioactive fractions. These fractions exhibited a very significant inhibition zone when compared to the broad-spectrum antibiotic used against the human pathogen *Candida albicans*, the causative agent of Candidosis. The active fractions were crystallized and chemically characterized through spectral data and X-ray crystallography analysis. Crystallographic data analysis resulted in the elucidation of a novel anti-fungal secondary compound. Molecular data confirmation is being carried out.

Lichen species *Ramalina celastri, Usnea* sp., and *Dirinaria consimilis* were screened through quantitative TLC and yielded four bioactive

compounds. Further screening for anti-microbial properties as well as chemical characterization of these compounds is in progress.

Lichen culture for secondary compound production is considered a vital component of the conservation of the lichen species in its habitat and sustainable utilization of these novel resources industrially. On these lines, the protocols for *in vitro* culture for the production of secondary compounds through lichen whole thallus, fungal and photosynthetic partners for *Roccella montagnei, Parmotrema praesorediosum, Pyxine nilgiriensis* were standardized.

Excoecaria agallocha

Hexane and aqueous extracts of *E. agallocha* (a mangrove associate species) were found to be active against the third instar larvae and the moth of *H. armigera* in the laboratory assays. Fractionation and subsequent purification of the hexane extract yielded bioactive compounds that were confirmed as terpenoid by spray reagents. FT-IR, Mass spectrum and NMR results suggested 99 % purity of the compounds and confirmed the presence of isomers that are very closely associated. ^{1}H and ^{13}C NMR spectral data suggested that either one of them could be 8 or 13-epoxylabdane diterpenoid ($CHCl_3$: MeOH (9:1) R_f-0.5) or its isomer. As the compounds were amorphous, crystallization is under progress for molecular confirmation. Crystallization of the active molecule using X-ray Diffraction Crystallography (XRD) is being done. Efforts are on to obtain single crystal growth by supersaturating the compounds using hexane, diethyl ether, ethyl acetate and chloroform. COSY and NOESY analysis of the isomers are underway to confirm the molecular structure.

Formulation of the crude hexane extract was tried with various solvents. A 5 % ethanol formulation i.e. 830 mg of triton X-100 dissolved in 20 ml of ethanol and made up to 500 ml of water, was found to be stable for many days at room temperature.

Two native formulations were obtained by soaking dried leaves in *gomium* (*Vrkshayurveda* manuscripts) and formulating it with “Panchagavya”- a cow-based pest repellant that is used widely in organic farming practices. Okra (*Arka anamika*) was chosen for this field study. Eight treatments were given and 3 replications were maintained for each treatment. One hundred plants were fixed per replication. Two spray doses were given and the observations for pest incidence, larval reduction, crop revival and the overall health of the crop were noted. The second field trial was done using the most promising combinations in the first trial, along with the methanol extract of *E. agallocha* as an independent treatment. Measuring the yield in all the treatments further validated the laboratory assays.

Organic farmers generally employ a 3 % solution of Panchagavya as a prophylactic measure against various pests. The dosage varies for cereals, pulses and vegetable crops. Seed treatments were also done to prevent seed-borne diseases. As the experiments were

focused on *Helicoverpa armigera*, after the Economic Threshold Level (ETL), a 10 % solution of Panchagavya was used. The combination of Panchagavya and *Excoecaria agallocha* was found to be effective, both as dry powder and as hexane extract. The revival of the plant was comparable to Vijay Neem (3 %). Multilocation field trials are under progress for checking the efficacy of the formulations in various regions in India.

Sub Programme Area 205

Bioprospecting for Novel Micro-organisms

Studies concentrated on consolidating the leads established and taking them to the next stage of product development, especially with reference to the potential biofertilizer strains, initiating the field evaluation of the potential bio-control strains and conducting awareness programmes for the farmers on the use of biological software.

Basic research continued in the area of microbial diversity, to understand the mechanism of salt adaptation in the beneficial bacterial strains. Molecular tools like PCR-RFLP, PCR-SSCP and RFLP-SSCP were employed to study the diversity among soil-bacteria in the mangrove rhizosphere ecosystem. The osmolyte and salt shock protein profile in *Pseudomonas fluorescens* was studied using advanced biochemical tools.

205.1 Field Testing and Product Development of Plant Growth Promoting Bacteria in the Coastal Agri-ecosystem

Potential biofertilizer strains (*Azospirillum*, *Phosphobacteria*, *Swaminathania salitolerans*) were tested under multi-locational trials in nearly 100 acres of land and their efficacy evaluated. Up to 30 % increase in the yield in biofertilizer treated plants over control was observed. There was 14 – 70 % increase in the number of tillers in the bacterized plants compared to the non-bacterized control. Farmers were impressed with the outcome of the field trials.

An MoU was signed with a private entrepreneur for the formulation of these tested strains. The 14 strains formulated were *Azospirillum* spp. (strains, MSA-148, MSA-160, MSA-274, MSA-289), *Rhizobium* spp. (strains GR55, GR57, GR59), *Swaminathania salitolerans* (strains PA-6, PA-12, PA-51) and Phosphobacteria (strains PS-4, PS-5, PS-9, PS-10). These products are now ready for large-scale release.

Biocontrol trial at Aduthurai Rice Research Station

The trial was carried out with 4 strains of *Pseudomonas*, which had been tested and proved efficient in the greenhouse. The experiment was carried out for two major diseases of rice, Bacterial blight (*X. oryzaea*) and Bacterial leaf streak (*X. oryzicola*). The seed treatment was carried out by soaking the seeds in the bacterial suspension overnight. The germinated seeds were sown in the nursery and after 25 days they were

transplanted to the field after root treatment with the respective bacterial cells. After 20 days in the field, the plants were given the second dose of biocontrol application as foliar spray. Two days after the application of *Pseudomonas* strains, the plants were challenge inoculated with the virulent pathogens, *X. oryzae* and *X. oryzicola* in the respective fields by the clip inoculation method. The plants were again sprayed with the biocontrol agents and the disease was scored after two weeks. The *Pseudomonas* strains imparted up to 60 % disease suppression against bacterial blight. The trial needs to be repeated for consistent results, before release to the farmers.

Mechanism of salt tolerance in* Pseudomonas *using protemics and genomics tools

Basic studies were carried out in order to understand the mechanism of salt tolerance in the biocontrol strains of *Pseudomonas*. Greenhouse studies revealed that the root colonization potential of the strain was not hampered with higher salinity in soil. As a means of salt tolerance, the strain *de novo* synthesized the osmolytes, Ala, Gly, Glu, Ser, Thr, and Asp in the cytosol, as revealed by HPLC-Amino acid analyzer profile. Accumulation of Aspartic acid and Glutamic acid was found to be nearly 5 fold in cells with increasing concentration of salt, while concentration of Serine increased more than 7 fold. Among the compatible amino acids synthesized by the strain, concentration of Aspartic acid was the least (up to 500 nM), while that of Glutamic acid was nearly up to 25,000 nM.

The protein profile (SDS-PAGE) of the normal and induced bacterial cells showed that there is one newly induced protein, five over-repressed and six repressed proteins. One newly induced and a repressed protein were observed in the SDS-PAGE profile carried out for the membrane proteins. In order to understand this phenomenon better, proteome analysis of the bacteria was carried out, employing 2D gel electrophoresis and MALDI-TOF. This technique was used to investigate the regulation of gene product expression of *P. fluorescens* MSP-393 grown under high osmolarity and peptide mass fingerprinting and *in silico* investigation done to identify those proteins with altered expression. With peptide mass fingerprinting and using bioinformatics tools, function was assigned to 13 induced proteins and two repressed proteins. All proteins identified had molecular weights between 12 and 77 kDa and isoelectric points between 4 and 7 pI respectively. The majority of proteins identified were homologous to stress proteins in prokaryotes.

Differential Display (DD) gene expression profiling for salt stress carried out using random primers, revealed an array of up-regulated and down regulated-genes that are being characterized.

205.2 PGPRs and Mangroves

The functional population of rhizosphere microbes has been addressed with respect to nitrogen fixation, phosphate solubilization and

biocontrol potential. It showed that the phosphate solubilisers were too low and that it could be because of the low content of phosphate in the mangrove soils, as reported by many researchers earlier. The diversity among the nitrogen-fixing organisms was studied. The nitrogenase activity of the strains (based on ARA) ranged from 10.3 to 32.34 nmole/ml/hr. Molecular detection of *nif* genes was also carried out. Strains that can effectively fix nitrogen (10.3 to 32.34 nmole/ml/hr) were isolated. There were also certain antagonistic microbes, which showed good activity against chilly pathogen, C*olletotrichum capsici*. Detailed studies have to be undertaken in order to understand the functional role of these microbes in mangrove rhizosphere. A novel filamentous fluorescent endophytic *Bacillus* has been isolated from wild rice, *Proteresia coarctata* and 16S rDNA partial full length sequence, deposited in NCBI (Acc. No. AY 941162). The strain needs to be characterized further.

Diversity analysis with soil DNA for the non-culturables

Fifty different samples of soil DNA were extracted from five mangrove plants, *Avicennia marina, Rhizophora mucronata, Excoecaria agallocha, Porteresia coarctata* and *Sonneratia apetala* rhizospheres. All the extracted DNA samples were subjected to PCR for amplification of *16S rDNA*, *nifD* and *nifH* genes of soil microbes. After the PCR amplification, these genes were analyzed by PCR-RFLP-SSCP to understand the genetic diversity among the DNA samples. The bands need to be cloned, sequenced and characterized to assess the microbial diversity.

The amplified products were digested with six four-base recognizing enzymes. The restriction enzymes used were *Csp 61, Hae III, Msp I* and *Taq I* (Amersham Pharmacia Biotech, UK). All the enzymes gave polymorphic banding patterns. With each enzyme, 4 to 7 restriction fragments were resolved. *Msp I* and *Csp 61* produced 10 and 8 restriction patterns. The *Hae III* showed least polymorphism, with 4 restriction patterns. In the Cluster analysis (UPGMA), 50 % of major genetic similarity could be identified based on the number of restriction sites in the 16S rDNA. In the dendrogram, there were two major clusters at the similarity co-efficient value of 0.50 and each cluster consisted of two clusters and many sub clusters at different co-efficient values. Currently, SSCP-heteroduplex analysis is being performed to study the sequence similarity and dissimilarity in the 16S rDNA,*nifD* and *nifH* genes of 50 DNA samples.

205.3 Low cost biofertilizer unit as an enterprise option

In order to understand the distribution of the plant growth promoting rhizobacteria in Kannivadi region and to tap the effective local strains, soil samples were collected and *Azospirillum* and *Phosphobacteria* isolated for screening. Awareness classes were conducted for 430 farmers and training on biofertilizer production was provided to the representative members of *Kaliyammal* SHG (See SPA 401.3).

Programme Area 300

Biodiversity

Farmers growing organic pineapple earned Rs 15.5 lakhs during the year and the SHG involved in the export of organic pineapple earned Rs 1.15 lakhs. The Barwale Chair was shifted to the CAbC at Wayanad. The Centre also played a key role in constituting a permanent body, Wayanad Agriculture and Rural Development Association, to prepare various developmental programmes related to agriculture. The participatory plant-breeding model in Jeypore has moved on to villages other than the ones where it was implemented. Biju Patnaik Medicinal Plants Garden and Research Centre is being set up adjacent to Jeypore town. The tenth anniversary of both the G T Scarascia Mugnozza Community Genetic Resource Centre and the Gene Bank was held this year.

Sub Programme Area 301

Community Based Agrobio-diversity Conservation and Management

Having paid special attention to the area of community based agro-biodiversity conservation and management activities over the last fifteen years, it seemed appropriate to report the activities carried out under the Biodiversity Programme in a separate Programme Area. The conservation strategies being followed include linkages between *in-situ* and *ex-situ* approaches, bridging the gap between institutional (formal) and community systems (informal). The different aspects being considered are conservation, revitalization, and sustainable use of the bioresources, community empowerment and benefit sharing.

These activities are being implemented in Wayanad, in Kerala, the Kolli Hills and Namakkal in TN and the Jeypore Tract of Orissa. Efforts are on to assess the impact of the project activities in the sites using measurable indicators, as the funding support for major activities is coming to an end early next year; strengthen the leadership and organizational capacities of SHGs in the field sites, to build self confidence and transparency, which form the basis of sustainable self help and to undertake self evaluation of the activities carried out. As each site has its own focus of work, the activities are reported under the different site offices.

301.1 Kolli Hills and Namakkal

Ensuring quality seed stock, demonstration of enhanced production and productivity in millets, upscaling and creating awareness on processing and value addition, streamlining marketing of millets, chronicling and documentation of traditional knowledge associated with minor millets were taken up during the year.

Ensuring Quality Seed Stock

Millet Seed Multiplication and Cultivation: As a part of participatory conservation, 510 kg of little millet seeds were produced and given to seed banks in Sembothuvalavu, Aripalapatti, Alathur and Nariankadu at Kolli Hills. About 35 % of the seeds was borrowed from the seed banks, and the rest was distributed to farmers at the *Adi*18 festival. A comprehensive gene-seed-grain bank continuum plan was developed and the process initiated by having discussions with the SHGs in Padasolai, Sembothuvalavu and Thuvarapallam at Thirupuli Nadu. The president of the Panchayat has offered a piece of public land for locating the bank.

Maize F1 hybrid seed production

As a part of the community feed grain bank programme, landless women labourers produced maize hybrid seeds (CoHM4) in leased land, with the support of farmers'clubs at Varagur and Veerabayangaram. After receiving training at the various stages of seed production, landless women SHGs produced 616 kg/ acre in Varagur and 292 kg**/ a**cre in Veerabayangaram. Seeds worth of Rs 40,000

have been produced and tested by the Seed Certification Office. SHGs were trained in seed grading, treatment and packing, and seeds were marketed by farmers' clubs at a nominal price of Rs 50 per kg.

Seed distribution: Farmers of Varagur were provided with popular varieties of seeds on loan, for maize cultivation in their region. Members of the club borrowed Rs 2 lakhs from the Indian Bank, Erumapatty, for procuring the seeds. With this venture, three hundred acres of land in Varagur was placed under maize. This year an additional fifty acres were brought under maize cultivation from the hybrid seed produced by the SHGs.

Participatory demonstration of improved agronomic techniques Participatory Variety Selection: As a result of the three successive cycles, 36 accessions of finger millet, Italian millet and little millet, including 5 local landraces, have been chosen according to qualitative and quantitative parameters. Further selection was carried out with the participation of tribal farmers in Kolli Hills and the results are being analyzed. A demonstration on differential yield of millets under traditional broadcasting and line sowing is being conducted over the last two years. Results reveal that under traditional broadcasting, the agronomic cost is Rs 5165/ha whereas in the line sowing method of cultivation, the cost is Rs 3,098/ha reducing the cost by about 40 %. The performance in yield in line sowing is about 1,255 kg/ha whereas in the broadcasting technique it was observed that the yield was only about 783 kg/ha. The yield has increased over 60 % due to broadcasting. This demonstration trial has created an awareness about the improved agronomic technique of line sowing among the local farmers.

Inter cropping with tapioca: An improved intercropping technique of millets and tapioca was demonstrated for additional income. These demonstrations showed that there is an opportunity for increased income ranging from Rs 3,000 to Rs 6,000, through the line sowing technique, as well as 10 % additional income through intercropping. Several training programmes were conducted on variety selection, improved agronomic techniques, inter cropping and value addition to build the capacity of tribal people.

Sesame programme: To increase the area under the cultivation of sesame, several demonstrations were organized, through which the operational area of sesame has been increased by 12 %, and productivity from an average 303 kg/acre to 408 kg/acre.

SHG and Income Generating Activities

Value addition of Millets: Men SHGs owning millet processing mills processed about 3,980 kg of little millet and Italian millet with the support of Millet-Growing Farmers and Marketing SHGs. They earned Rs 0.66 lakhs through millet marketing by Food World. This effort has resulted in increasing interest among the tribal community in cultivating traditional millets. Efforts have been initiated for export market linkages with Ion Exchange Enviro Farms Ltd.

Promotion of organic farming: Data collection, mapping and compilation of data on fruits like pineapple and guava and crops like millets and pepper, have been carried out for organic certification. Ecocert has certified the organic nursery, and the organic pineapple cultivating farmers received NOP (National Organic Programme,USA) certificates. In addition, about 35 ha of fallow land has been put under organic pineapple farming, with a financial subsidy of Rs 5 lakhs from DRDA, Namakkal. Several buyers have shown interest in purchasing organic farming products, especially traditional millets. Pineapple farmers have earned Rs 15.5 lakhs during the year and the SHG involved in organic pineapple export has earned Rs 1.15 lakhs. A study on the scenario of pineapple export and the impact on the farmers, was carried out. The case study highlighted the effectiveness of the SHGs in procuring pineapple for export, and pointed out to some of the emerging requirements, like the effective adoption of organic agricultural techniques, documentation, demonstration and internal control mechanisms.

Backyard poultry development: SHGs were trained in rearing country chicks procured from the Veterinary College and Research Institute, Namakkal and taken on exposure trips to Auroville, Pondicherry. Groups were identified for backyard poultry micro enterprise and a methodology was evolved for sustainable rearing in Kolli Hills, Namakkal and Villupuram.

Community feed and grain banks: A network marketing system was created among CFBs to reduce exploitation by middlemen. With the financial support of Rs 2 lakhs from the Indian Bank, Erumapatty, Varagur Farmers' Club procured grains from the Veerabayangaram farmers' club and marketed 150 tons of maize with a special label, including the name of farmers' club, the weight and moisture content, directly to the poultry feed units. Through this enterprise, farmers learnt techniques of marketing such as grading and preservation. Training was provided to farmers on the use of moisture meters and grain quality.

Chronicling Traditional Knowledge

Documentation of traditional knowledge has been a part of the programme since its inception in Kolli Hills. About 103 local medicinal plants and their uses have been documented through the barefoot taxonomist programme supported by FRLHT, Bangalore, as well as traditional recipes of 110 preparations, published as resource material in English and Tamil. Seven individuals have been trained under the village botanist programme of FRLHT.

Capacity building and training

Members of farmers' clubs were taken to Agri. Index to learn about post harvest processing, micro irrigation methods and machinery. Farmers learnt the System of Rice Intensification (SRI) techniques from the bio-village in Pondicherry and TNAU, for the sustainability of grassroot institutions and pipelining government programmes (Tables 3.1 and 3.2). Two clusters namely Pasumai and Pothigai were organized in Varagur and Veerabayangaram. As a result of these activities, around five thousand acres of land

Table 3.1: ***Training programmes conducted for the Farmers***

Title	Male	Female	Trainee Days
Training on organic farming for Varagur farmers in collaboration with SEVA	20	20	80
Maize Frontline Demonstration at Rasipuram	30	-	30
Training on Backyard Poultry, Milk byproducts and Egg recipes at Veterinary Collage, Namakkal	74	78	312
Training on vermicomposting at TNUVAS, Karur	10	8	18
Training for Organic Pineapple farmers at Kolli Hills to clarify the ongoingprogramme and issues related to setback in payment	30	30	60
Training organized for farmers from AP on maize cultivation and poultry units in Varagur	25	-	25
Training Programme for Kolli Hills Tribal Farmers and Students of Hotel Management and Catering Technology on Samai & Tinai Recipes	37	27	256
Biodynamic Spraying Training at Thirupuli Panchayat, Kolli Hills	8	2	150
Training on maize cultivation to Varagur farmers with the help of District Agriculture Department	40	-	80

Table 3.2: ***Training programmes conducted for SHGs***

Title	Male	Female	Trainee Days
Value addition of Millets for SHGs of Kolli Hills at UAS, Dharwar	2	5	28
Exposure visit for SHGs and Farmers' Club in Veerabayangaram and Varagur to Agri Index,CODISSIA, nurseries, farm machineries and KVK of TNAU	16	8	24
On farm training of Maize Hybrid Seed Production	-	15	75
Training on Gender in collaboration with URDC in Kolli Hills	3	34	37
Exposure visits for SHGs from Kolli Hills and students to Auroville	13	8	60
Maize hybrid seed production training to SHGs at TNAU	-	10	10
Training on organic farming and ethno medicine for human beings and animals conducted with the help of SEVA	-	80	80
Facilitation of Village Botanist Programme in collaboration with FRLHT,Bangalore and Training of six barefoot taxonomists	6	-	36
Harvest Day Celebration of Maize Hybrid Seed CoMH4 produced by Velan Mahalir SHG in Varagur	10	15	25

is under maize cultivation in and around Namakkal and Villupuram districts.

301.2 Wayanad

The Community Agro-biodiversity Centre (CAbC) at Kalpetta has as its focus agrobiodiversity and associated components like medicinal plants, and documentation of traditional knowledge of tribal communities. The activities have been more in the area of Policy Advocacy at the local and regional levels, awareness, education, networking and capacity building, which have provided a distinct edge for CAbC. This year the Barwale Chair was shifted to this centre. Policy research and advocacy in the area of biodiversity and legislation related to it, training and creating of awareness on the implications of such legislation will be coordinated by the Chair.

Policy advocacy at the regional and State level

MSSRF took the initiative to form a pressure group, consisting of elected members of local bodies, political leaders, government officials, farmers, NGO representatives and social workers, to invite the attention of regional policy makers to implement the recommendations suggested in the two reports submitted to the Government of Kerala. As a result, the Government of Kerala declared a special agriculture package for Wayanad district. Wayand has been selected for implementing the Rashtreeya Sam Vikas Yojna Programme (RSVY) worth Rs 45 crores. This programme is intended to address the issue of low productivity in agriculture. MSSRF also motivated experts to constitute a permanent body to prepare various developmental programmes related to agriculture. The Committee which has a legal standing, is known as the Wayanad Agriculture and Rural Development Association (WARDA).

Project proposals have been prepared in line with the objectives of the RSVY programme, focusing on conservation and commercialization of special rice varieties of Wayanad, establishment of a community herbal processing unit, chronicling and documentation of traditional knowledge and bio-resource based micro enterprises. These programmes are designed to carry forward the initiatives already being implemented in the area.

Natural Resource Management Programme

The focus was on water conservation activities against the background of the severe drought faced last year. A special effort was made to renovate damaged water bodies, conserve a natural stream and develop it as a perennial source of water for the tribal communities, who depend exclusively on it for all their water needs. The local community was mobilized to renovate two ponds situated at ecologically strategic locations close to the settlements. They also helped to build a series of six check dams to develop the stream as a perennial source, retarding the process of drying up of the stream. In the last two years, the stream dried up by the end of February, causing a shortage of drinking water for three months. This year, though there was no rain in summer, water was available until the end of April. This prompted the Paniya and Kattunaikka tribal

communities to offer labour free of cost for building the check dams.

The construction of check dams also resulted in the collaboration of the Centre for Water Resource Development and Management (CWRDM), Government of Kerala, for intervention at the Panthippoyil biovillage project site. The experts of the CWRDM suggested some measures that would improve water supply.

In order to boost water conservation in individual farms, handouts of various water conservation methods suitable to each locality were distributed. For educational purposes, a rainwater harvesting structure was installed in the MSSRF campus.

Capacity building efforts in the areas of organic farming and soil conservation continued during the year. A soil testing camp was organized in Panthippoyil biovillage, based on the results of which, farmers made changes in soil conservation methods. With the support of the Spices Board, 25 vermicomposting units were established. Training was conducted on effective application of *Trichoderma*, *Pseudomonas*, and neem products

Biodiversity Conservation

The thrust was on *in-situ* conservation of native varieties of food and cash crops. Native pepper varieties were multiplied and distributed in the village. Banana plants were also distributed; two farmers are conserving 12 varieties each in their farms. Eight varieties of tuber crops were distributed among 100 families. Cardamom seedlings were distributed to 365 farmers as a part of promoting crop diversification.

Organic pepper cultivation has been extended to another 250 ha by the District Agriculture Department. Cultivation of cover crops and NFPs like *Daincha*, *Sesbania rostrata*, Sun hemp and various leguminous crops was encouraged in the village. Fodder grass seedlings were also distributed. A vegetable seed exchange programme was conducted for promoting vegetable cultivation.

Income generating activities

In order to alleviate poverty among the landless, various income-generating activities were promoted through self-help groups. The SHG activities are concentrated in the three villages of Chooralmala, Puthoorvayal and Panthippoyil. The activities include bookbinding, bakery units, floriculture, goat rearing, cattle rearing, catering unit, poultry, handicraft and market outlets. A two-day residential programme was conducted on income generating activities with the support of the State Planning Board. SHGs were linked with commercial banks for starting income generating activities.

Capacity Building

Training was given in organic farming and sustainable utilization of bio resources. As a part of strengthening the Knowledge Centre established at Panthippoyil village, an exposure visit was organized to the Information Villages in Pondicherry. Training programmes on composting methods, herbal medicine preparation, fruit preservation and value

addition, organic cultivation of spices and coffee, and water and soil conservation were conducted.

Education of Tribal and Rural Youth in Biodiversity Conservation, inventorisation and sustainable utilization

Under the *Every Child a Scientist* Programme (See SPA 605), about one hundred children, belonging to tribal and rural communities of the district, were introduced to conservation and sustainable management of key bio-resources like medicinal plants, wild food plants and beneficial insects in agriculture.

The tribal children have improved in reading, writing and computer skills and gained confidence and self-respect. A consolidated report highlighting the process, results and impact was prepared. To celebrate the Year of Scientific Awareness 2004, the students and teachers of M K Ananthasivan Knowledge Centre organized a two-day Science Meet on 26 and 27 December, which focused on Conservation of Environment and Biodiversity and provided a forum to discuss skills, knowledge and policies used for conservation in hilly area ecosystems like Wayanad.

The highlights of the meet were a contest for the Young Child Scientist Award and an exhibition on the importance and value of the biodiversity of the Western Ghats. It was decided to select five schools from the district for follow-up action in the area of environment protection and biodiversity conservation.

The major indication was that CAbC should emerge as a Knowledge Centre for different stakeholders, with a conservation garden as the focal point.

Training, Meetings and Workshops

The biodiversity team participated in planning and organizing the Science Society Interface on Tribals and Biodiversity Related Legislation in collaboration with the Kerala Institute for Research, Training and Development Studies (KIRTADS), Calicut, in April 2005 (See SPA 607).

301.3 Jeypore

The projects on community-based agro biodiversity conservation, natural resource management and food security were strengthened through various initiatives.

In–situ on farm conservation and Participatory Plant Breeding

The focus was on *in-situ* on farm conservation through PPB-led-PCS programmes, large-scale production of Kalajeera, cultivation of selected PPB varieties, multiplication of F4 varieties and data collection, including collection of agronomic characters of PPB and PCS varieties.

New strides in the benefits of Participatory Breeding and improvement

The model of conservation, cultivation and commercialization of excess produce, put in place during the past few years, started showing results. The model has gained favour not only in the villages where the PPB programme is implemented, but also in several other villages. The benefits of the PPB program were communicated through farmer - to - farmer extension. Farmers took the PPB

initiative forward by growing LRs on a large scale, though they continued to grow HYVs because of available markets and buy back arrangements (Table 3.3).

As a result of the participatory improvement paradigm, the number of LRs has exceeded the number of HYVs, reversing the situation of some years ago.

Farmers in Jeypore tract made concerted efforts to produce more *Kalajeera*, the LR selected by them from the PPB programme. Along with 8 PPB villages, 12 other villages took an active role in the production of the variety that was found to yield 3.5 to 4 tonnes/ ha on an average.

Farmers of Tolla village produced seeds of *Kalajeera* in contiguous plots of 2.51 ha given by 7 farmers as a participatory group endeavour. Due to unfavourable rainfall distribution, optimal yields could not be realized. Including grain and straw, the cost : benefit ratio worked out to be 1: 2.5 (Table 3.4). It is obvious that cooperative seed production of LRs like *Kalajeera* would be highly profitable when commercialization is intensified and farmers' rights for the variety is obtained.

Participatory Breeding Initiatives

- A small experiment was laid to test the logic of growing specific LRS in certain types of land. The popular medium *LR Sapuri* was tested by farmers in lowland. It was found that *Sapuri* grown in lowland flowered about 10 days earlier and the yield improved by 20 %. Taking the cue, farmers tested the traditionally grown medium land LR, *Gathia*

Table 3. 3: ***Villages growing diverse landraces of rice in Jeypore tract (2003-4)***

Village	No. of communities	Varieties				Area (acres)	Population			
		LRs	SLR	HYV	SHV		M	LM	F	LF
Patraput	3	6	1	8	1	46.10	320	100	300	50
Pujariput	8	7	3	8	1	164.65	200	40	210	10
Tolla	6	13	6	11	1	56.68	204	81	199	21
Baliguda	6	12	6	11	2	178.90	275	125	225	25
Nuaguda	2	12	4	2	1	42.75	60	30	66	12
Total	25	50	20	40	6	489.08	1059	376	1000	118
Common		30		34						

SLR: Specific landraces; SHV: Specific high yielding varieties; M: Male; LM: Literate Male; F: Female; LF: Literate Female

Commonly cultivated LRs: Barapanka, Bodikaburi, Dangardhan, Kalajeera, Matidhan, Muktabali, Paradhan, Sapuri, Umuriachudi Commonly cultivated HYVs: 1001, Culture-1, Lalata, Parijat, SP-10, Swarnamashuri

in upland and recorded early maturity and yield improvement. Such farmer-driven initiatives need to be nurtured and upscaled for enhanced realization of the yield and quality potential of LRs

- In 1999-2000, a few men and women from farming families were trained in emasculation and pollination techniques in rice. The crosses sown in plots, suffered from heavy rains. To save the F_1s, the seeds were planted in pots. The growth was subdued and only 200g of F_2 seed could be retrieved. They were grown in 5 lines along with 5 parents of UL and ML (eliminating LL parents whose crosses failed) during Kharif 2002. The F3 populations from each of the F_2 lines were raised in 8 lines each during Kharif 2003. Some failed leaving in all 35 F_3 populations. They were grown interspersed with parents in a completely randomized design. Data on 7 quantitative traits were recorded on two 3-plant composite samples. Grain Filling % and Harvest Index were computed to give 9 traits.

This year a selection was made from among the 35 populations produced by pollination techniques, based on their statistical superiority over all the 5 parents. A multivariate mean test across all 9 traits selected F3s that exceeded 4 parents (Sel 1:1 popln- F_3 -7), 3 parents (Sel 2**:** 2 poplns - F_3 - 23, F_3 - 31), and 1 parent (Sel 3**:** 2 poplns, F_3 -6, F_3 -29). Those F_3s, as good as any parent, were grouped as Sel 4 (22 poplns). 8 F3 populations that did not exceed any parent significantly were discarded. The 4 selections were grown as F4 populations along with all the parents during Kharif 2004 in a design alternating parents and F4s. Quantitative data has been recorded. Based on a multivariate analysis, superior populations will be selected and advanced further.

Forward momentum: Participatory conservation, enhancement, consumption and commercialization of rice landraces, particularly *Kalajeera*, have opened up new avenues for collaborating with the Government of Orissa, particularly in seed storage, recognizing farmers' rights, contribution to poverty reduction, and marketing, including buy back of seeds and grains.

Quality seed production: It was seen that pure seed production would help farm families to get a higher yield as they are able to withstand drought and flash flood conditions for a longer period. The process of pure seed production

Table 3.4: ***Cost: Benefit of Kalajeera seed***

Area ha	Seed kg	Grain kg	Straw kg	Estimated Income (Rs)	Cost of Production(Rs)	Benefit (Rs)	Cost: Benefit
2.51	2,610	1,400	6,500	61,307	17,390	43,917	1:2.5

Seed Rs 16.88/kg; Grain Rs 10/kg; Straw Rs 0.5/kg

has been initiated in 8 demonstration villages and operational villages of 7 NGOs. As of now, 37 traditional varieties are under the process of purification and 10 traditional varieties are under large-scale production by farm families.

Marketing of traditional varieties

Market survey and a study report by an intern, clearly revealed that the local people are unaware of the importance of rice from traditional varieties. It was found that the number of traditional rice varieties in the market is fewer than improved varieties. To overcome such challenges, certain approaches were adopted.

The nutritious qualities of unpolished rice were popularized through a door-to-door campaign. Grain was collected from farm families, milled and sold in the local market. Individual passbooks were issued to each farm family participating in the programme. Within a period of 34 days, more than 500 households were made aware of the advantages of unpolished rice and 25 ql of processed rice was sold under the programme at the rate of Rs 18.00 or Rs 20.00/kg. It is planned to form a network which will take care of the marketing of unpolished, aromatic and other special kinds of rice.

Natural Resource Management

Plantation: The villagers of Tolla utilized their wasteland by planting 1,000 cashew seedlings in 4.8 ha of land. Before planting they had a Central Village Comittee (CVC) meeting along with MSSRF staff at which the resolution was passed, the plan of action prepared and responsibilities distributed. The seedlings were given to the farm families at a subsidized rate by the Horticulture Dept. One member of each farm family contributed labour to prepare the land and fence the plantation area.

Fish farming: In Tolla, fingerlings of *Rohi, China Rohi, Bhakura, Mir kali,* and silver carp were introduced in the percolation pond in late August, after the pond was purified with lime. In San Taliaguda 2,000 fish fry and 2.5 kgs fingerlings of *Rohi, China Rohi, Bhakura, Mirkali and* silver carp were introduced in one acre of the reservoir.

Vermicompost: There are 57 vermicompost pits in the demo villages and the idea is spreading widely in the peripheral areas. Rs 24,000 was mobilized from the Spices Board, Koraput, for the construction of 24 *pucca* vermicompost pits at Jhalaguda and Taliaguda. Besides vermicomposting, Nuaguda village has started production of vermiwash, which acts as a bio-pesticide and bio - hormone for plants.

Community Water Bank: As per the action plan every farm family participated in the construction of the *mahabandha* (reservoir). It will contribute towards the water needed for the livestock and agriculture in 24 ha of land. In summer, it will cater to horticultural activities in 16 ha of land, benefiting at least 35 families in the village. It will also support the growth of the forest adjacent to it.

Use of biofertilizer and biopesticides: The use of biofertilizers is increasing in the demo villages. They are applied one month before transplanting. Neem, karanja and turmeric are

used by all the families to save their grain and seed from insects and pests. One hundred grams of the pesticide was sold at Rs 3.00.

Use of diesel pumps: Diesel pump sets provided by MSSRF are being used for various purposes. At Nuaguda and Pujariput, the villagers use them to run the rice huller unit and for lifting water for floriculture and vegetable cultivation. This has reduced the drudgery of women in the villages to a significant extent and helped the farmers to get a better price for rice. The income from the pump sets goes to the village fund.

Community Gene-Seed-Grain Bank Continuum (CGSGrB)

The main activities of the year were seed and grain loan distribution, loan repayment, formation of management committees, monitoring of seed sowing area, individual passbook distribution, impact study and storehouse repairs.

Management committees now operate the CGSGrB. The CVC has been monitoring the activities which include accounting, verification of seed in the field, and distribution. For each of the above responsibilities, three-management committees, each with three members, were formed in consultation with the CVC. In each of the committees, one member is from the CVC, one from MSSRF and one from Panchabati Grama Unnayan Samiti (PGUS) – a registered farmers body. For better monitoring and accounting, individual passbooks were issued to farm families. Approximately 142 acres of land is now under cultivation of LRs, the seeds of which were taken from different community seed banks (CSBs) and the land races grown and selected under PCS.

The CSBs in 6 villages have 4,438.5 kg seeds of different landraces. They were used by 113 farm families in 61.7 ha of land. Similarly the grain banks of these villages supported 187 families at times of distress with 11,964.5 kg of grain. It ensured food availability for 37 days and protected families from exploitation.

Community Food Banks (CFBs)

The CFBs in the eight villages were strengthened. There were regular meetings to resolve problems. The passbook system was introduced for easy record maintenance by the management committees and for transparency in transactions.

A noticeable impact of the CFB operation has been a fall in the acute food scarcity during lean periods, consumption of seed, dependence on moneylenders, distress sale by the farmers and food scarcity during natural calamities. Food support was also extended by the banks to the handicapped, orphans and the aged. Food Stock in all the CFBs has increased by over 100 %. Focus was on networking and capacity building with a view to enhance livelihood security through SHGs and micro enterprises.

Evaluation of the project and documentation of findings is now being planned. It is also proposed to develop training material on the operation and management of CFBs and conduct workshops for replication.

Promoting Nutritious Millets

Under the broad objective of enhancing the contribution of nutritious but neglected crops (millets) to food security and to the incomes of the rural poor, various steps were taken, such as farmer participatory varietal trials on finger millet, little millet and Italian millet; participatory yield enhancement trials on nutritious millets; value addition, processing and marketing and creation of local capability for the production and supply of good quality seed. A survey was conducted on the use, constraints and opportunities of millets. Documentation of local knowledge has been undertaken.

Farmer Participatory Varietal Trial: The trial was conducted in two replications through RBD design. An *ex-situ* collection of 100 finger millets, 25 little millets and 35 Italian millets was studied. There was also a local collection of 9 finger millets, 4 little millets and 3 Italian millets. The farmers were able to see the changes in plant growth in the different varieties. In the final varietal selection 43 farmers (20 men + 23 women) and 5 scientists participated. They considered the duration, grain and fodder yield, taste, colour, time of maturity and land type to identify the variety. Out of the *ex-situ* collection 7 finger millets, 9 little millets and 7 Italian millets were selected. From the local collection, the participants selected 2 finger millets, 1 little millet and 1 Italian millet.

Under this experiment two field demonstrations were also conducted. Farmers were trained on improved agronomic practices, optimizing seed rate, sowing in time and in rows and quality seed production. The farm families were introduced to finger millet-based scientific intercropping of little millet, pigeon pea and niger.

Value Addition and Networking: Four exhibitions were conducted in tribal fares in the region and 40 kg of finger millet powder, 30 kg of de-husked little millet and 15 kg of de-husked Italian Millet were sold by 2 women SHGs of Balia village. A biodiversity fare was conducted for the farmers of the 16 demonstration villages to assess the diversity of agricultural crops of the region. Four SHGs were established through the Community Food Bank Programme and the members were trained to take up value added millet production and marketing activities. Four NGOs of three districts have shown an interest in replicating these activities.

Bhumipuja of Biju Patnaik Medicinal Plants Garden and Research Centre

The Bhumipuja of Biju Patnaik Medicinal Plants Garden and Research Centre was held on 16 November, 2004. Twelve acres of land, adjacent to Jeypore town, was allotted by the Govt of Orissa to MSSRF to conduct *ex-situ* conservation and research on medicinal plants used by tribal people. The Honourable Chief Minister, Mr Naveen Patnaik performed the Bhumipuja in the presence of Prof M S Swaminathan, Mr Ravi Narayan Nanda, Minister of state for Science and Technology and Water Resources, Mr Surya Narayan Patra, Minister for Energy, Mr Balabhadra Majhi, Minister, SC-ST Welfare and Ms Subha Sharma, Collector, Koraput. At a special

workshop on Herbal Focus held at Koraput, eminent scientists and resource persons from universities, Govt. Departments, research organizations and Panachayat Boards discussed the promotion of medicinal plants in Jeypore tract under the aegis of MSSRF.

301.4 Community Gene Bank

To commemorate the tenth anniversary of both the G T Scarascia Mugnozza Community Genetic Resources Centre (SMCGRC) and the Gene Bank (GB), a meeting was held in Rome in December 2004. Subsequently, on 13 February, 2005, another meeting was held at the NAAS which was attended by a delegation from the Italian Academy of Sciences, Rome, PGR scientists from ICAR, NBPGR, IPGRI and ICRISAT. Some of the dignitaries who attended the meeting were Prof Scarascia Mugnozza, Prof Luigi Monti and Prof Balio from Italy, Prof M S Swaminathan, Dr M Velayutham, Prof V Arunachalam and Dr S Bala Ravi from MSSRF. Several ideas on the way forward for the Gene Bank were discussed, including expanding the concept of Gene-Seed-Grain bank to other continents like Africa and work in the area of disaster management, specifically in tsunami affected areas. On 14 February, 2005 a meeting was held in honour of the President of Italy, Mr H E Carlo Azeglio Ciampi, at which a video film on the Community Gene Bank of MSSRF was screened. Prof Scaracia and Prof M S Swaminathan spoke at the meeting. An exhibition on the work of MSSRF in the biodiversity hotspots of Wayanad, Jeypore and Kolli Hills was held in the premises. The proceedings of the meeting will be printed shortly. The meeting helped to showcase to an international audience, the manner in which local communities could be involved in the conservation, characterization and sustainable management of PGRs.

Germplasm exploration: The gene bank has identified the following landraces as tolerant to salt as they withstood seawater at the time of the tsunami: *kunthali*, *kallurundai*, *vellakudavalai*, *katchakombalai*, *kuzhivedichan* and *soorakuruvai*, and they have been deposited in the gene bank. These accessions will be distributed to farmers in the coastal areas and multiplied on a large scale, after being subjected to characterization and lab test to assess tolerance of salt levels. The activity will be coordinated by the TNAU and the IARI. (See SPA 601)

Germplasm characterization: Under the IFAR - IPGRI fellowship for the year 2004, characterization of genetic diversity of finger millet accessions from ICRISAT and MSSRF gene bank was undertaken to identify germplasm accessions having higher yield and better taste as well as being suitable for the diverse cropping systems in India. For the study 150 accessions from ICRISAT and 35 accessions from the MSSRF gene bank were used. The trials were conducted in ICRISAT and MSSRF. Alpha design was used in two replicative trials conducted in the kharif season. Estimated genotypic variance, phenotype diversity, Wald Statistic analysis-environment x genotype, range, mean and variance for different traits and Shannon–Weaver diversity index were studied. On the

basis of inflorescence, finger millet germplasm was classified into four races (compacta, elongata, plana and vulgaris) and ten subraces. A group of farmers was asked to select accessions. The farmers' selection coincided with the scientists' findings. Farmers demonstrated their skills in preparing 14 different ragi items. The study identified promising germplasm accessions from ICRISAT and the MSSRF gene bank.

Community Herbarium: The community herbarium at the MSSRF houses a total of 733 classified voucher specimens and 500 pictorial diagrammatic representations, which have been added with the help of an artist.

Programme Area 400

Ecotechnology

The Centre has supported the establishment of 144 income-generating activities and the turnover was around Rs 63 lakhs. New initiatives were taken on decentralized production and marketing of Arbuscular mycorrhiza *and* Azosprillum. *The annual transaction of 453 SHGs was around Rs 3.4 crores. 16,000 trainee days were covered through training programmes at Chennai and the field centres, targeting participants at local, regional, national and international levels. The Biovillage council has been registered as a society. In the final year now, the first phase of the MSSRF-OSU project on Sustainable Management of Natural Resources demonstrated the best practices for the management of problems connected with land, water and agro-climatology in relation to the cropping system.*

Sub Programme Area 401

JRD Tata Ecotechnology Centre

The Centre continues its efforts to operationalize sustainable development through the Biovillage paradigm, which aims to optimize the use of natural resources and enhance the opportunities of the rural poor. Multi stakeholder analysis, participatory research and development, need-based training and capacity building and promotion of grassroot institutions are the major strategies adopted to develop biovillage models in different agroclimatic regions. Networking and partnerships were established with agencies like government departments, NGOs, banks, research institutions, international development agencies, community-based organizations and Panchayat Raj institutions in implementing the project activities. The centre focused on strengthening the grassroot institutions to facilitate the process of role change and continued to diversify the livelihoods of the rural poor to ensure job led economic growth.

The Centre has been continuing its activities in the same geographical locations, as mentioned in earlier Reports. (Table 4.1)

The following are the highlights of the activities of the Centre.

- The grassroot institutions have registered as societies under the Society Registration Act and become legal entities. The training and confidence building provided, helped them to become more autonomous. Need-based partnership development with other institutions helped MSSRF to move forward in the proposed role change.
- The annual transaction of 453 SHGs, comprising 6,523 individuals, operating from the four field centres is around Rs 3.4 crores, including their cumulative savings, credit and financial support from banks and

Table 4.1: ***Regions and focal themes of JRD Tata Ecotechnology Centre***

Region	Area	Focus
Coastal	Chidambaram, TN Pondicherry and Kendrapara, Orissa	Water-use efficiency; soil conservation; crop diversification and value addition; multiple livelihoods 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 the time and labour of rural poor; increasing agricultural productivity; modern ICT-based training,extension and development
For all the above	Chennai	Land-lab linkages and laboratory studies

government organizations and business turnover.

- The Centre has supported the establishment of 144 income generating activities, assisting 1,725 rural men and women belonging to resource poor households. The total turnover was around Rs 63 lakhs.
- The number of farmers adopting the IIFS model has reached around 100 and the process of documenting the self-replication has started. The results of the IIFS model in Chidambaram area in Cuddalore district, TN, is being replicated and field-tested in a similar agro-ecosystem in Kendrapara, a coastal district in the state of Orissa.
- The Manikollai Lift Irrigation Farmers' Association has become a local resource and training centre for sustainable agriculture in the region. The District Collector has declared Manikollai the best village in the block.
- The success of credit linking in Kodathur Biovillage, based on a tripartite agreement between the SHGs, the bank and a corporate company, inspired the State Bank of India to replicate the same model in a village in Pondicherry and Dharmathupaty in Dindigul district of TN.
- Based on past experiences, the Centre continued its efforts to promote System of Rice Intensification (SRI) in Pondicherry and Kannivadi, TN. For the first time, the method was introduced in Kendrapara, Orissa and the results indicate good potential for expansion of the method.
- The Reddiarchatram Seed Growers Association (RSGA), a grassroot institution extending need-based service to the local farmers, completed around 2,600 trainee days. As a part of their decentralized ICT-based extension, they have prepared knowledge-based training material in print, CD and audio forms.
- The group farming approach was adopted through backward and forward linkages for maize and cotton crops with RSGA as the local facilitating agency between the farmers and other partner agencies such as banks, marketing agencies and agencies providing technology. The business turnover was around Rs 17 lakhs, with 90 % repayment.
- In addition to the four existing VKC, three more were established. Two centres are located in hamlets belonging to Scheduled Castes to cater to the information needs and learning skills related to their livelihoods. The third centre is located in the Gandhi vegetable market at Oddanchatram which supplies the information from markets across the country and serves as the centre for e- commerce.
- The successful management of ecoenterprises like *Trichogramma viride* and *Pseudomonas fluorescens* has encouraged the Centre to continue the process of technology demystification and customization. New initiatives were taken on decentralized production and marketing of *Arbuscular Mycorrhiza* (AM) and biofertilizers like *Azosprillum* and

phosphobacteria in collaboration with women SHGs.

- The Centre initiated the process for organic certification with IMO, Bangalore for coffee, lemon and pepper produced at Thonimalai, Dindigul district, by small and marginal growers.
- A study was carried out on the role of SHGs in facilitating the formation of social capital and the final report was submitted to the Redesigning Integrated Community Development Programme of the Asian Productivity Organization (APO) at Tokyo.
- A national consultation on *Job Led Economic Growth: Towards an Era of Sustainable Self Help Revolution* was organized. The proceedings were summarized and published as the *Chennai Declaration*.
- The Staff of the Centre participated in international meetings and addressed issues related to non formal education for strengthening livelihoods; open and distance learning methods for agricultural development; climate forecasting for farm level decision making and eco agriculture.
- The Centre has covered around 16,000 trainee days through several training programmes at Chennai and the field centres, targeting participants at local, regional, national and international levels.

401.1 Coastal Region

401.1.1 Chidambaram

The Centre has been continuing its activities with the involvement of the grassroot institutions to enhance water use efficiency, soil management and crop diversification and creating opportunities for multiple livelihoods through enterprise development.

Grassroot institutions: Thenkoodu SHG federation: It has been functioning since 2002 and has 32 women SHGs and 4 men SHGs. Efforts are being made to overcome constraints and strengthen the capacity of the leaders. The executive committee was restructured to ensure operational efficiency; in the reconstituted structure, nearly 85 % are women representatives. For effective management and close interaction with the federation leaders and members of the SHGs, the federation was divided into five clusters. Each cluster has six to eight SHGs, representing two or three villages. Each cluster has an administrative committee; the president of the cluster takes the responsibility of conducting the monthly meeting and organizing the bank linkages. The clusters work closely with Panchayat Raj Institutions (PRIs) and the office bearers and members of the clusters are actively involved in the Grama Sabha meetings and execute the decisions taken at the meetings. In one of the clusters, the village panchayat has allotted six cents of land to construct an office building for the SHG cluster. The financial transactions and monthly turnover in the federation are pooled from different clusters and discussed at the monthly meetings of the federation. During the reporting period, the federation mobilized an amount of Rs 23.55 lakhs from banks. Out of this, *Manavelli* cluster received Rs 9.75 lakhs from Indian Bank for seven women SHGs (140 members), *Poothavarayapettai* cluster received

Rs 1.50 lakhs for three women SHGs (60 members) and *Senthirakillai* cluster received Rs12.30 lakhs (109 members) for different activities. In all 309 women were benefited, with loans to start various activities like floriculture, dairying, goat rearing, pottery, petty shop, integrated fishpond, tailoring, land lease, tiffin stall and book binding. From these enterprises individual members earn an average monthly income of Rs 1,300 to Rs1,500. Two women SHGs at *Senthirakillai* village and one SHG at *Kuriyamangalam* were involved in the production and marketing of *Panchayakavya*. An exposure visit was organized to Kannivadi, which provided an opportunity to interact with the SHG members and learn about grassroot institutional management, credit operation and enterprise development.

Manikollai Small Farmers Lift Irrigation Federation: Manikollai is located at the tailend of the Cauvery delta. The results of the lift irrigation project are positive and encouraging. With the support of lift irrigation, farmers in the federation intensified their cropping system and during the last year, the cropping intensity increased two to three fold with paddy in the rainy season and low water requiring crops like finger millet, sorghum, sesame and sunflower in the subsequent two seasons.

The federation has conducted meetings regularly and has taken the responsibility for repayment of bank loans and community bank loans (borrowed from the micro credit banks of Friends of MSSRF). The association has constructed six sheds for housing the pumping station and electricity supply is due. Four farmers are practising the IIFS model. Manikkollai village has been named the best village in the Porotnova Block, based on criteria such as the problem of water scarcity having been resolved through the innovative approach of group farming, cleanliness and availability of a local forum in the form of Manikollai Lift Irrigation Federation.

Several government and non-governmental agencies have been able to reach the village and implement development programmes. The federation is working closely with them to organize Farmers' Field School, conduct training on soil testing and biofertilizers, provide technical inputs from Annamalai University and NABARD, and arrange financial linkages, health camps and water management.

Aquaculture for enhancing livelihood: In Vadurayanpattu village of Melbhuvanagiri union, two Scheduled Caste women SHGs are involved in composite carp farming activities. Since capacity building is essential to take up aquaculture activities, around 140 trainee days were organized on basic knowledge about the candidate species, the management of the pond, feed preparation and feeding mechanism. Some Indian and Chinese carp species, Catla *(Catla catla),* Rogu *(Labeo rohita),* Mirigal *(Cirrihinus mirigala),* common carp *(Cyprinus carpio)* and grass carp *(Ctenopharyngodon idella)* are being cultivated in the community pond. The pond was taken on lease for Rs17,500 per annum. This is the first time that women members of a socially and economically disadvantaged group have ventured into a group-based aquaculture

activity, using a community pond in a multicaste village in this region. Four harvestings were achieved and the fishes sold locally at the rate of Rs 40/kg. So far, the group has earned around Rs 15,500; the season will continue for another four months and the rough estimation of the total income is around Rs 32,000 for the year.

Backyard ornamental fish breeding: One Women SHG in Keelamanakkudi village has taken it up as a group enterprise. 200 trainee days on the culturing technique, need for water change and feed preparation, feeding methods and enterprise management were concluded. In the ornamental fish-breeding unit, livebearers like guppies and mollies are being cultured in the tank. The tanks were stocked at the rate of 15-20 mother fishes. The young ones were raised in separate tanks. The fishes were fed with locally manufactured pellet feed. As an addition to the monthly income, each member gets about Rs 150-200 from ornamental fish breeding.

Integrated Intensive Farming System (IIFS): The IIFS model has been replicated in three blocks *viz*. Portonova, Melbhuvanagiri and Keerapalayam, by nearly 100 farmers. The number of components varies from farm to farm, according to the suitability. Out of these, 10 farms were randomly selected for a modest survey. The results showed that in all the farms, pond bunds were fully utilized. There are three layers of crops; the first layer had perennial trees like coconut and mango, the second layer had annual moringa, banana, sesbania and papaya and the third layer had mixed vegetable crops and buffalo grass. Banana, annual moringa and buffalo grass provide more income with less expenditure. The income from the perennial tree crops will increase many fold after a few years. The cost benefit ratio in the integrated pond system is higher (2.99) if the fishery component is excluded than if included (2.14). This is mainly due to the high cost of fish feed from the external market. Therefore, experiments and demonstrations on utilizing farm wastes for fish feed are necessary. The experiences gained in the paddy based IIFS helped to initiate a similar model in the horticulture belt of Portonova block. Several meetings with the farmers of Chinnady Kuzhi resulted in the formation of *Vallankundra Vellan Vivasayigal Sangam*. During these meetings the farmers from Manikollai Small Farmers Lift Irrigation Group shared their experiences of following the IIFS model.

Biological management of aquatic weed - Hydrilla verticillata: The study documented the efficiency of the biological management of the submerged weed *Hydrilla verticillata.* The grass carp *(Ctenopharyngodon idella)* was used as a biological agent in controlling the weed. The sampling of weed biomass was carried out. Two infested ponds were selected: one for treatment and another as control. Each pond covered an area of around 2.75 ha. The grass carp with an average weight of 243.41kg was stocked in the experimental pond at the rate of 400 per ha in January 2003. It was found that the weed biomass in the experimental pond has reduced to nil since June 2003.

401.1.2 Pondicherry

The Biocentre – the hub of the Biovillage Programme: The Biocentre located in Pillaiyarkuppam village has been functioning as a service and information centre, particularly to the small and marginal farmers in the region. It provides need-based services and skills for the different sections of the community like SHGs, farmers and farm labourers. The Biovillage Council (Federation of the SHGs) has legally registered as a society, in the name of *Innyur Grama Sangam*. It has also revived its Community Banking component, as the SHGs are paying the monthly contribution and it has been decided to start internal lending among the SHGs. The Biocentre is also focusing on training more local resource persons in the villages for enterprise development and management and to take up technological interventions pertaining to agriculture and animal husbandry. 41 new SHGs were formed during the year and the total strength of the Biovillage Council is now 244. Among the existing groups, 97 SHGs have renewed their credit linkage with the local commercial banks.

During the year, training was imparted on various entrepreneurial activities such as mushroom production, production and marketing of *Trichogramma*, *Pseudomonas flourescens*, integrated scientific dairy farming with backward and forward linkages, aquaculture, horticulture, vermicompost and apiculture. Nearly 1,747 trainee days were achieved at the Biocentre. The training programmes helped the members of SHGs from 380 households to take up different income generating activities. Apart from this, 1,680 trainee days were organized specially on group management, monitoring, business proposal writing, evaluation and accounting software. Focusing on the exclusive needs of the Biocouncil members, 435 trainee days were organized on society formation and registration, leadership qualities and institutional management.

Members of the Biovillage Council are now emerging as local resource persons to conduct training programmes. They are managing the mushroom (with a spawn production centre) and *Trichogramma* production cum training centres located at the Biocentre. They have trained around 120 members (360 trainee days) on mushroom production, including members of SHGs belonging to the Biocouncil, tsunami victims, SHGs promoted by DRDA and other Pondicherry based NGOs like Feral and Palmyra. Women members from three SHGs were trained on the production and marketing of *Trichogramma.* Integrated scientific dairy farming was initiated at the Biocentre with forward and backward linkages like fodder cultivation, gobar gas and vermicompost. The Biocentre has supplied fodder seedlings to establish 4 ha of fodder at other field sites of MSSRF like Kendrapara, Chidambaram and Kannivadi.

The Biocentre has taken efforts to address various social issues like property ownership, legalizing marriages, human rights and dowry. The leaders take the help of the Women's Commission, Pondicherry, to solve these

problems. The SHG members motivate other women in the village to approach the Commission to solve their problems. The social commitment of the Biovillage council members was expressed through the support they extended for tsunami victims to meet their immediate requirements like stoves, rice, mats and so on.

System of Rice Intensification (SRI): Field trials were conducted on the SRI method of paddy cultivation during *Sornavari* season with ADT 37, a medium-duration variety. Based on the results of the previous two demonstrations, it was decided to gauge the efficacy of the number of seedlings per hill in the SRI system. Single and double seedlings per hill were compared with the conventional practice of bunch planting (4-5 aged seedlings/hill).

Among the three methods of planting, there was not much difference between the SRI double seedlings and conventional planting methods. Fourteen day old double seedlings (SRI method) per hill performed well and the grain yield was around 4.4 t/ha with a harvest index of 35 %. (Table 4.2). The grain yield was nearly 20 % higher than the one seedling per hill. In the single seedling, mortality rate of the seedlings was higher due to the high temperature prevailing during the planting period. Similar observations were recorded during the previous two demonstrations. Though there are no significant differences in yield between the SRI double seedlings and the conventional planting method, the unit cost of production is lower in SRI due to the decreased cost of nursery management and seed cost. Also the SRI system consumes less water than the conventional system. Focus Group Discussions with the participating farmers indicated the need for intensive training on nursery management as well as transplantation of young seedlings. They also indicated that the plants in the SRI method of cultivation are sturdy and able to resist lodging at the time of maturity, compared to the conventional method of planting. The farmers felt that the SRI planting method is highly suitable for mechanized paddy harvesting, which has become a common practice. Due to the high temperature during the *Sornavari* planting season, the SRI method with double seedlings per hill instead of single seedlings, could be a viable alternative for higher productivity, income and water use efficiency. In this effort around 250 farmers (1,750 trainee

Table 4.2: ***Outcome of the SRI field trial carried during* Sornavari *2004***

Details	No. of productive tillers per sq.m	Grain yield (kg/ha)	Harvest Index (%)
SRI – Single seedling per hill	414.4	3,503	31.84
SRI – Double seedlings per hill	508.8	4,392	35.12
Conventional planting	533.33	4,326	33.65

days) in ten villages were trained on SRI in the Biovillage trial plot.

Kodathur Biovillage: The activities of Kodathur biovillage, based on a tripartite agreement among the Biocouncil, and the SHGs, State Bank of India (SBI) and a corporate company, are progressing well. Eighty families are participating in the integrated scientific dairy farming programme. As a result, the cattle population doubled during the year, 70 milch animals were added and the total turnover is around Rs 17 lakhs. In all, 27,800 labour days were generated. The net profit earned per family was around Rs10, 420. To support the dairying activities, 2.2 ha of fodder was cultivated (worth Rs 2 lakhs) by the SHG members. They have received Rs 27, 000 as a subsidy from the Government of Pondicherry for the promotion of fodder activity. The biogas units installed as a component of the project are working well. To promote the practice, around Rs 24,000 was dispersed to the owners as a subsidy from DRDA. Two vermicompost units started during the second half of the year, using slurry collected from the biogas pit, produced around 1,000 kg of manure. One SHG is involved in *Pseudomonas* production. Around 1,000 kg of *Pseudomonas* was produced in a period of three months. The value of the product is around Rs 50,000 and on an average each individual is getting Rs1,000/ month in addition to regular employment. At the initial phase, an exposure visit was organized to a similar unit successfully managed by a women SHG at Kannivadi in Dindigul district.

Based on the positive experiences gained at Kodathur biovillage, SBI was keen on replicating the activities in Sandaipudukuppam village in Mannadipatty commune. A series of meetings were conducted at Sandaipudukuppam village with the support of local leaders, elders and the leaders of women SHGs. A multidisciplinary team from MSSRF conducted the Participatory Rural Appraisal (PRA) in February. Representatives from SBI also participated in the PRA exercises. Several subgroups were formed to work on social mapping, natural resource mapping and timeline charting. The following observations emerged from the appraisal:

- A considerable number of families in the village are landless agricultural labourers.
- A majority of the landholders have bore wells.
- Marginal farmers depend on multiple occupations for their livelihoods.
- There are a number of unemployed youth in the village.
- The existing SHGs are interested in group-based enterprises to generate income.
- Both men and women farmers and landless labourers are interested to come together and form SHGs/ farmers' clubs.
- About 40 different kinds of income generation activities are being practised in the village.
- Women own no assets and have reasonably more work to do than men.

The process of social mobilization, situation analysis and partnership building in Sandaipudukuppam village resulted in the formation of 12 new SHGs (six men and six women) and linking 220 families under the folder of the SHG movement, which was formally linked with SBI. The Biovillage Council has been actively involved in enabling the community to participate in the credit linked Biovillage programme in Sandaipudukuppam, supported by the bank.

It was realized that developing need-based linkages and networking with government departments, research institutions, banks, universities and NGOs are important to instill confidence in the Biocouncil members to become more and more independent in the future. Biocouncil members and SHGs were actively involved in special entrepreneurial skill development programmes organized with the support of NABARD to strengthen enterprise activities. Similarly the Centre supported the mangrove plantation jointly carried out by the Biotechnology division of MSSRF and the Forest Department, Pondicherry. The activity covered around 5 ha at *Nallavadu* and *Uppalam* villages with the active participation of SHGs. Discussions are going on to increase the planting area.

MSSRF, in collaboration with Madras Institute of Development Studies (MIDS) and Institute for Financial Management and Research (IFMR) is preparing the State Development Report of Pondicherry for the Planning Commission, Government of India. MSSRF has taken the responsibility of preparing chapters on Agriculture and Rural Development and Health and Social Security. Visits to the respective government departments in Pondicherry were carried out to collect specific data related to the assigned chapters. Analysis of data, compilation and drafting of the chapters was undertaken side by side. The first draft has been submitted to the Planning Commission.

The in-house capacity building training programme enabled SHG members to develop business proposals with the help of an auditor. Apart from SHGs and farmers' clubs, youth clubs were also formed to initiate employment and income generating activities. The programme helped the staff to train members on the identification of appropriate enterprises and the importance of working out the economic viability of the enterprises.

401.1.3 Kendrapara, Orissa

The project activities continued in Manitri, Niyamitpur, Padagayaspur, Narendrapur, Balia and Nembera villages. The activities were also extended to Anduli, Basaghar and Ghantiapalli. The focus of the activities continues to be developing suitable agriculture and aquaculture models through sustainable natural resource management, mobilizing the resource poor, forming SHGs, and providing training and capacity building in collaboration with different agencies.

Integrated Intensive Farming System (IIFS): The Farming System approach was demonstrated to introduce diversification in this paddy-based cropping system with the

integration of aquaculture and horticulture. The IIFS model was taken up at Manitri village in May 2004, for purposes of demonstration and training. The IIFS model farm is being managed and maintained by the members of three women SHGs. A pond about 3/4 of an ha in area has been dug to harvest rainwater and carry out aquaculture activities. About 60,000 fingerlings were stocked in the pond. The harvest started recently and till now the fish catch has been sold for Rs 3,100. Another major activity is cultivating vegetables in rice fallows around the pond. Live fencing with jatropha was established. During the reporting period, the group has sold vegetables worth Rs 4,400.

SHGs and income generating activities: Currently there are 31 SHGs functioning in nine villages. This year 123 women and 15 men have formed nine new groups. These groups were able to mobilize Rs 4,42,400 through their regular savings and loans borrowed from the banks. As a part of capacity building and introducing new techniques, 1,643 trainee days on organic pesticide preparation, paddy parboiling, soil testing, mushroom production and vermicomposting were organized. A team of 21 members went to Pondicherry and TN on exposure visits to gain a perspective on the functioning of grassroot institutions, taking up group activities, functioning of the Biocouncil Federation, organic farming and running of VKCs.

Enterprises like backyard poultry, mushroom culture and pisciculture were undertaken on group basis and the income generated included Rs 20,000 from poultry, Rs 3,000 from mushroom and Rs 27,000 from pisciculture. Recently two SHGs in Nembera village and one SHG in Niyamitpur have initiated grocery business with a bank loan. One of them is having a good turnover in turmeric powder. Two SHG members in Padagayaspur have started trading in rice with funds received through the internal lending process. The concept of kitchen garden has been introduced to members of women SHGs. The activities are targeted among the Scheduled Caste community for developing a livelihood opportunity through vegetable cultivation as a group activity. The members of the SHG are cultivating vegetables for the first time, using biofertilizers and biopesticides and are also involved in the production and marketing of vegetable seedlings.

Farmers' experimentation with SRI: Based on the MSSRF experience in Kannivadi (TN) and Pillayarkuppam (Pondicherry) over the last two years, the SRI experiment was carried out in four villages namely, Niyamitpur, Balia, Padagyaspur and Manitri in Kendrapara district of Orissa. This experiment was conducted with the collaboration of farmers to test and demonstrate the SRI technique in this region. Irrigation management was not included in the SRI practices as this area is rain fed. Seedlings of 12 to 14 days were transplanted at a spacing of 25 cm x 25 cm with one seedling per hill and two seedlings per hill in the SRI treated plots. Farmers evaluated the SRI paddy in comparison with the conventional method.

The average yield with SRI in most fields was 26 % to 68 % higher than the average yield

Table 4.3: ***Grain yield (Kg/ha) in SRI farmers' field in comparison with the conventional method***

Details/ Farmers	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6	Farmer 7	Farmer 8	Farmer 9
Farmers' Practice	3,775	4,250	3,938	3,000	4,166	6,388	3,583	4,454	4,761
Single seedling/hill with 25cm x 25 cm	6,350	5,625	5,000	4,500	4,833	6,944	3,833	5,625	5,238
Double seedling/hill with 25cm x 25 cm	6,250	6,666	6,250	4,000	4,500	7,500	3,666	5,208	5,000
% of yield increase over farmers' practice from Single seedling	68.21	32.35	26.98	50.00	16.01	8.70	6.97	26.29	10.01
% of yield increase over farmers' practice from Double seedling	65.56	56.84	58.71	33.33	8.01	17.40	2.31	16.92	5.01

compared in the conventional method. The yield of paddy obtained in different fields is given in Table 4.3. On an average (in five farmers' fields) 3,833 to 6,944 kg per ha of grain yield was recorded under single seedling and 4,000 to 6,666 kg per ha in double seedling in SRI plots, using local and improved varieties. However, not much yield increase was observed in two fields. The differences might be due to the seeds and practices adopted by the farmers. The farmers of the surrounding area have gained a good impression of SRI techniques after visiting the demonstration plots and observing the tillering and harvesting. They are planning to introduce the SRI method in their fields during the forthcoming season.

All the farmers of Niyamitpur village were mobilized to form a VVV Farmers' Club under the NABARD-supported scheme. The farmers' club has taken up seed production of paddy, green gram, sunflower and vegetables in 12 ha of land and has a buy back arrangement with the State Seed Corporation, Orissa. Maha Babu COL committee has facilitated farmer-to-farmer learning through horizontal transfer of knowledge. Training programmes were organized with the support of local farmers and KVK. Around 300 farmers, both men and women, have been trained and a total of 1,500 trainee days (1,000 for men and 500 for women) have been accomplished. As a part of the training programmes, one booklet, 2 leaflets and audio and video CDs have been prepared, which are shared with other local NGOs.

Aquaculture: Based on the Chidambaram biovillage experience, income-generating aquaculture activities were initiated in unused

community ponds. Two ponds, one in Manitri and another in Ghantiapalli, were dug by the local communities. In addition to aquaculture activities, the bunds were utilized to raise vegetable crops and the water used for critical irrigation of vegetables. The fries and fingerlings were stocked according to the size of the ponds and stock density (one per two meter square). After seven months the weight of the fingerlings increased to 750 gm - 1 kg and harvest is proposed.

It was decided that a resource map should be created for the Mahakalpara Block on a GIS platform. The GIS database contains information on village boundaries, soil, geomorphology and drainage for the Block as such, and for Manitri village, the field boundaries have been included. Activities related to GIS and Remote Sensing (RS) would be integrated as part of the decision support system of the Information Village component, being developed at the project site. (See SPA 104)

401.2 Hill Region

401.2.1 Thonimalai

Thonimalai is geographically an isolated village, located in the western slopes of Kodaikanal hills, an offshoot of the Lower Palani hills, surrounded by forestlands. The multi-tiered plantation of coffee-lemon-pepper with other crops in combination like banana/sweet orange/pomegranate is the primary livelihood of the local people. The primary school constructed in 2003 by MSSRF with active local participation, is functioning well with an average strength of 35 students and 2 teachers. The VKC continues to cater to the needs of the local people. Information on improved agronomic and organic management practices is available in the VKC. It provides market information for plantation crops on a daily basis.

Organic farming: Organic cultivation has been identified as a source of value addition to enhance the household income of the small and marginal farm holders. Efforts have been made to initiate the process of organic certification for coffee, lemon and pepper with the support of IMO, Bangalore. It is also planned to include *Utz Kapeh* certification, a worldwide initiative for certified coffee, which guarantees that the certified coffee meets environmentally appropriate growing practices by socially and economically disadvantaged groups. Potential buyers have been identified for a preliminary discussion. Steps are being taken to strengthen the Internal Control System and other necessary documentation for the certification. To overcome the drawbacks in quality certification, training and capacity building programmes were conducted by experienced resource persons from the Coffee Board and State Horticultural Department.

Strengthening traditional skill through Apiculture: The *Pulayan* hill dwellers of Thonimalai village were mobilized to form a men SHG. The TN Adidravidar Development Corporation (THADCO) offered support. The group of 15 *Pulayan* tribal men was trained in different techniques of apiculture, resource inventory and planning, extraction methods and quality control by the Keystone Foundation,

Kothagiri, The Nilgiris. As part of the training programme, the trainees were taken to traditional Irula and Kurmba settlements (traditional honey collecting tribals of the Nilgiris district) to undergo intensive hands-on training. Subsequent to the training, 45 beehives were ordered by the Keystone Foundation and installed in different places. Based on their traditional knowledge of the movement of bees, the *Pulayans* identify the colonies and collect honey with the skill acquired by training. During the year, only 38 % of the hives were cultured and the rest of the hives faced mass mortality or bees absconding. The problem was sorted out by providing artificial feed to retain the colonies during off-season. Due to hot weather conditions and dry environment, only 10 % of the hives were able to reach the honey extraction stage.

Application of Geographic Information System (GIS) in farm and village level planning: GIS was used to develop a farm-level plan in Thonimalai, to optimize natural resource management and to improve the quality and productivity of coffee, lemon and pepper with frontier technologies (See SPA 104).

401.3 Semi-Arid Region

401.3.1 Kannivadi

The activities of the year focused on strengthening institutional building, horizontal transfer of knowledge, diversification of livelihoods through promoting ecoenterprises and application of modern ICT for promoting literacy and rural development.

Grassroot Institutions

Kulumai, a federation of around 134 SHGs, and RSGA, a farmers' association, are the two-grassroot level institutions functioning at Kannivadi. The development process in the area focused on strengthening the capacity of these grassroot agencies to carry forward decentralized sustainable development at the village level. Efforts have been made to become a passive observer from being an active facilitator and facilitating grassroot organizations to play a key role in developmental activities.

Farmers' Association: The farmers' association was involved in facilitating horizontal transfer of knowledge and carried out 2,600 trainee days. Training and capacity building programmes were organized among men and women farmers and agricultural labourers by experienced local farmers. Resource persons from the Coffee Board, Spices Board and agricultural and horticultural extension departments of the TNAU focused on issues such as coffee-based plantations and organic farming in Thonimalai; sustainable agricultural practices for growing vegetables in Oddanchatram; and group farming, quality literacy and market linkages in Kannivadi.

Group farming to achieve the power of scale: The group farming approach was adopted to address the problem of production risks and availability of timely and adequate credit and market linkages. It was tried out in cotton and maize with the active participation of 53 and 86 farmers respectively, covering 50 ha under

cotton and 128 ha under maize. An agreement was reached among the farmers, bank and marketing agency, regarding the quality of the produce, price fixation and transportation. The approach offered a link among 'farm, market and banks'; the production risks and market factors were taken care of with the support of the farmers' association. As a result, farmers benefited through timely credit, adequate quality inputs and services and assured buyers. The buyers benefited through supply-chain efficiency and banks and companies benefited through assured clientele for their products and services. The approach also generated awareness among the farmers about insurance services, especially for high value, risky crops like cotton and the need to improve the quality of the produce to get a higher price.

Based on the initiatives taken up and experiences gained by the farmers' association, the Department of Agriculture, Dindigul district, invited the farmers and discussed the practical constraints faced by them. They recognized the farmers' association as a potential partner for creating a supply chain system and requested them to consider group farming for maize in four blocks of the district in the forthcoming season. The farmers' association, working closely in partnership with the Department of Agriculture, organized the Farmers' Field School on Cotton – Integrated Pest Management and National Watershed Development Programme on Rainfed Farming in Kannivadi. An intensive five-day hands-on training programme on editing software helped them to prepare their own Open and Distance Learning (ODL) training materials, both in print form as well as CDs, with the technical support of MSSRF.

The association continues to manage the website Oddanchatrammarket.com in collaboration with traders. The website was redesigned to include the product name in different south Indian languages to reach more people. Many agro processing industries and institutions are approaching the farmers' association for daily data. The association played a key role in mobilizing the traders in the Oddanchatram market and organizing them as an export group. The main objective is to initiate and strengthen farmer-trader forward linkages in this region. The commission agents underwent two training programmes on export marketing, especially on storage and packaging, to meet international standards. They came forward to form a group and efforts are underway for registration under the Societies Act, APEDA registration and Export and Import Code. Simultaneously the process of identification of reliable buyers and market network analysis are going on.

With reference to the medium range weather and seasonal climate forecasting, the farmers association has been managing the B type weather station. The forecasting systems were institutionalized through the hub of the VKCs managed by the farmers' association. The TNAU is continuing its support for weather station management and seasonal climate forecast. Attempts are being made to communicate only the forecast to the people, instead of giving follow-up advice based on the forecast. The farmers take decisions based on

multiple strategies, instead of the single strategy recommended earlier. In the process, the farmers become active collaborators in using the information.

To meet the local information need, the farmers' association is publishing a fortnightly, '*Seithisolai'.* A detailed content analysis was carried out, which indicates that more importance was given to local need-based agricultural practices, focusing on the crops suitable for that period/ region as well as information on agricultural inputs. The magazine also provides information on pest management, biopesticides, weather forecast, traditional proverbs, local medicinal practices, local festivals, functions and ceremonies.

Kulumai-SHG Federation: The Federation is legally registered under the Societies Act and is functioning with an annual turnover of Rs 178.75 lakhs. It enabled nearly 3,000 men and women in the region to get credit and saved them Rs 14 lakhs from moneylenders. *Kulumai* has been insisting on the differential rate of interest for different needs. The repayment rate is more than 90 %. Through commercial banks and government development departments, the federation mobilized nearly Rs 57 lakhs, which benefited nearly 1,500 SHG members.

The loan taken from the federation, SHGs and banks have been used for the following purposes: education (6.5 %); medical costs (7.8 %); petty business (15.5 %); agriculture (9.0 %); dairy (9.0 %); land purchase for cultivation and house construction (21.0 %); house repair/construction (4.3 %); goat rearing (14.6 %); and marriage and related occasions (9.3 %). With the support of loans from banks, 329 men and 269 women in the groups started small business activities.

Capacity building to meet the needs of the SHG members is a constant activity of the federation. Nearly 2,508 trainee days, 1,931 for women and 577 for men, were carried out. The accounts management system of the federation has been computerized, with the support of special software developed for it by a consultant. It helps them to keep accounts effectively and retrieve it according to need. To ensure effective management, the region was divided into seven clusters and cluster level group meetings were organized.

Community Informatics: VKCs play a major role in providing locale-specific information to the local men and women, thereby promoting horizontal transfer of knowledge.(See SPA 601). The hub of the VKC located at Kannivadi, continues to be an active point for information access and computer-based training on sustainable agriculture. The dynamic information database, which covers various aspects, is updated periodically in all the six VKCs. The centres provide information on commodity-based market trends, government schemes, educational opportunities, simple remedies based on locally available medicinal plants, agriculture, pest management and weather forecast. On an average, nearly 390 members visited the centre every month for various purposes. Nearly 77 % of the total visitors (4,671) approached the centres to seek information. The knowledge centres also

covered training programmes to farmers on quality literacy, especially on *Codex Alimentarius,* Sanitary and Phyto Sanitary (SPS) measures of WTO, and food and nutritional security. Computer-based training materials have been prepared and are used in the training programmes. Household level nutrition budgeting has been carried out in two VKCs, using locally designed software, to develop a plan to ensure gender sensitive household level nutritional and food security. Apart from this, numerous students in the villages come to learn the basics of computer related programmes.

An Internet connected knowledge centre has been functioning at Oddanchatram market itself and the merchants were trained on the use of other websites to explore market trends and prices.

The computer-based functional literacy model developed by the VKC has proved that the programme has been cost effective when compared to the conventional government sponsored non-formal education programmes. Two more VKCs were established in two villages with the support of UNESCO. These centres focus on non-formal education related to the livelihood security of the forest-based tribal groups, agricultural labourers and small and marginal farmers of semiarid regions. The process has been initiated for developing a software for the local web page *Vyapar,* for sharing information among the local farmers through the VKCs and for efficient and cost effective management of the VKCs.

Food and Nutritional Security: A household food and nutritional security check was conducted and the information collected from the villagers was consolidated, subjected to analysis and shared with the villagers to create an awareness among them on their nutritional status. The study indicates that the intake pattern of the people in both the villages does not meet the Recommended Dietary Allowance (RDA). In a majority of the households, there is widespread deficit in the intake of all nutrients. The analysis indicates that in Thonimalai, except for the months of February and March, only one-fourth of the population fell in the “Deficient in all nutrients” range, whereas in Samiarpatty, a majority of the population fell under the “deficient in all nutrients” category.

Based on the results of the analysis, specific training material was prepared and circulated among the villagers, and training programmes conducted. Also, a home-specific kitchen garden was planned and implemented in Samiarpatty village. Three or four varieties of greens, drumstick, papaya, guava, snake, bitter and ridge gourd and ladies finger were selected and distributed to the people. The vegetables are now available and the nutrition status of the villagers is expected to improve.

Ecoenterprises for livelihood Security

Banana paper unit: Efforts were continued to strengthen the market linkages of the Jansirani women’s SHG members. A catalogue and product profiles were prepared, both in the local language and in English, to expand the market. As a result of the advertisement in the Trade

India Infocom web page, new market linkages, both at the national and international levels, were created. The unit generated around 900 labour days. Need-based training programmes, which covered nearly 170 trainee days, were organized to enhance their skill in producing paper of different thickness (measured in terms of GSM) and reduce wastages. The group members have participated in district, state and national level exhibitions and shared their experiences with bank officials, NGOs, farmers' associations and developmental workers.

Trichoderma viride: The production unit at S Pudur, managed by a women SHG has stabilized its production process. During the initial periods the production rate was very low (100 kg/month), but slowly the group developed skills in the various processes of production. The group was able to reduce the cost of production by nearly 40 % over a period of nine months. The unit generated nearly 950 labour days, produced 5 tonnes and distributed nearly 12 % of the production to local farmers. Now the group has entered into an agreement with two more marketing agencies and created a local demand through farmers' network in different villages of the region. Discussions are going on with coffee and pepper plantation owners in the nearby hills, which could create a huge demand in the future. The group members are actively participating in the farmers' association meetings at the local and district level, farmers' mela, and exhibitions to generate awareness as well as to promote the product. Soil and crop specific local strains are isolated and multiplied to meet the local demand, increasing the farmers' confidence. It is learnt that linkages with multiple market sources help to sell the product and sustain production. The group is planning to diversify the product using other strains of *T. harzianum* that could be used for other crops like grapes, to combat many fungal diseases. The unit is acting as a training centre and is visited by bank officials, senior managers of govt. departments and representatives of NGOs from other developing countries. The members of the SHG are considered as role models and are being invited to motivate and train SHGs in other regions to take up village based, eco-friendly enterprises.

Pseudomonas fluorescens: A women SHG whose members belong to socially and economically weaker sections of society is managing the unit which has a capacity to produce 10 tonnes of the product per annum. The production process was refined and stabilized over the initial three months and the production cost was reduced by 25 % of the estimated cost. Documents are being prepared to register the product under the Central Insecticides Act, 1971. The unit produced 4.5 tonnes of the product and sold nearly 4.0 tonnes, which helped to generate 850 days of employment over a period of 10 months. The group has entered into an agreement with a market dealer and is slowly expanding its network. It trained 24 members of SHGs from Pondicherry and Kannivadi.

Trichogramma Biopesticide Production: Three SHGs in Kannivadi region are involved in the production of *Trichogramma* biopesticide. These groups are collectively involved in

marketing and market linkages have been established with sugarcane industries and private agencies. In order to strengthen partnership with the private sector a sugarcane officers' meet was organized. The unit's production capacity has increased two fold. It has generated nearly 970 labour days and produced 7,800 cc, which can cover about 520 ha. The members of these three SHGs are training other groups in the production and marketing of *Trichogramma* parasitoid. They have developed a simple, user-friendly training manual in Tamil. SHGs promoted by three NGOs in TN have received hands-on training from them. Problems like the incidence of *Tribolium* (an insect pest, which causes damage at the time of web formation of *Corcyra*) and a fungal disease are the constraints in production and efforts are being taken to overcome the problems. There is a need to streamline and enhance the scale of production in each unit to meet the market demand.

Production of low cost biofertilizers: Awareness, training and capacity building programmes on the use of biofertilizers, crop specificity and methods of application, were organized for men and women farmers and agricultural labourers by the RSGA in Kannivadi region. Simple training manuals were developed in the local language, focusing on the biofertilizer types and methods of application. *Kulumai*, a SHG federation, has selected Kaliyammal women SHG, *Kappliyapatti*, to initiate the enterprise. The members are landless agricultural labourers belonging to socially and economically disadvantaged groups. Four members who were selected for training underwent five days hands-on intensive training on the production of *Azosprillum* and phosphobacteria at MSSRF, Chennai. An exposure visit was organized to a low cost *Pseudomonas* production unit successfully managed by a women SHG in a nearby village. It gave them confidence to take up the enterprise. Subsequently an orientation workshop was organized and the members prepared a business plan. Efforts were taken to identify a suitable site and market linkages, to establish a unit and initiate production (See SPA 203.1).

Replication of Variable Rate Technology: As a continuation of the dissemination of Variable Rate Application Technology in Sriramapuram area, Dindigul district, there has been significant correlation between the pattern of soil nutrients and the spectral index. To verify the same, the real time soil and ground truth data was collected with remote sensing, and is being analyzed. Collection and entry of the farmers' field level information has been completed to develop the Farmers' Information System, which will be used to prepare crop suitability maps at the village level.

New Initiatives

Low cost decentralized production of Arbuscular Mycorrhiza (AM): The successful production and marketing of *Trichoderma viride* inspired TNAU to collaborate in field demonstration, production and marketing of AM. The colonies offer nearly 50 % saving in

chemical (phosphorus) fertilizer, higher resistance to soil-and-root borne pathogens, and help in wasteland reclamation by providing extended arm to plant root system. *Puduvai* women SHG of Pudupatti, a group of women from the socially and economically disadvantaged section, were involved in the production. A five day hands-on intensive training was organized at the village, with the technical support of the Department of Microbiology, TNAU, Coimbatore and MSSRF. It covered around 100 trainee days. The training covered the basic soil microflora and fauna, the importance of AM species in crop production, the production processes, quality control measures and methods of application. A sample drawn from the pit was analyzed for its spore count and showed a 15 Colony Forming Unit per rootlet. A marketing agency has been identified and discussions are being held to develop a long-term agreement for marketing. It is proposed to expand the unit to a capacity of 5 tonnes per annum.

Credit linked Biovillage – Integrated Scientific Dairy: The Kodathur biovillage model developed by MSSRF and SBI at Pondicherry was replicated in Dharmathupatti region of Dindigul district. A baseline survey was organized to understand the socio-economic conditions, as well as a natural resource assessment of land and water. The analysis revealed that the present pattern of agriculture has limited scope in creating productive employment and economic growth and is increasing the degradation of natural resources. Around 60 men and women members from 8 SHGs identified dairy as a viable enterprise, with relevant backward and forward linkages. They are in the process of developing a tripartite agreement among the SHG federation, banks and the marketing agency. Necessary documentation to avail of a loan was completed and applications were submitted to the bank. GIS is being used to develop a village information system for targeting households and initiating appropriate interventions. A village level spatial database was established to develop thematic maps pertaining to natural resources and socio economic conditions.

*SHGs and Social Capital***:** A modest study on "Social Capital and Rural Development: Role of Self Help Groups in Development" was carried out among SHGs which have been functioning for more than three years. The main objectives of the study were to observe the impact of social capital at the intra-household level on income, gender issues and health status. The study revealed that SHGs have brought about a considerable improvement in the social status of women, both at the household and community levels. The new forum of SHGs is helping members to discuss health-related issues regularly, and problems are solved through collective action. Recognition, reciprocity and mutual commitment built trust among the members.

The in-house training programme on 'Enterprise Development and Management' led to the submission of a business plan to initiate scientific dairy farming and aromatic oil extraction from lemon grass.

401.4 National Network on Biovillages and Community banking

The activities under the National Network on Biovillages and Community Banking continued as shown in Table 4.4. Several training programmes were organized. The interventions focused on strengthening the livelihoods of the landless by creating employment opportunities through microenterprises (Table 4.5).

Micro credit banks supported by Friends of MSSRF: During the year 26 new micro-enterprises have been facilitated in different project areas of MSSRF by extending interest-free loans from the mircro credit banks. 18 new micro credit banks have been set up, of which 6 are exclusively meant to support enterprises to be started by the SHGs and fishermen affected by the tsunami. 'Friends of MSSRF', successfully initiated in Australia in September 2004, have set up 6 new micro credit banks. Donors from USA are in the process of setting up " Friends of MSSRF" this year.

The programme has developed a network with like-minded organizations, NGOs and other institutions in various parts of the country, by sharing the experience of the biovillage model with reference to natural resource management and value addition to the time and labour of rural women and men and providing multiple livelihood options to the rural community through linkage of micro credit and income generating activities. The organizations associated with the programme are:

Table 4.4: ***Financial transactions of SHGs***

Project Area	Cumulative No. of SHGs	Total members	Total financial transactions (Rs)
Pondicherry	240	2,300	89,55,000
Kannivadi	134	1,678	2,19,70,000
Chidambaram	36	775	27,90,000
Kendrapara	32	470	4,42,000
Total	**442**	**5,223**	**3,41,57,000**

Table 4.5: ***Number of Microenterprises initiated by SHGs***

Project Area	No. of Enterprises	Members involved	Amount invested (Rs)
Pondicherry	36	279	11,97,250
Kannivadi	16	267	10,30,845
Chidambaram	17	118	9,29,225
Kendrapara	9	132	1,04,000
Other project Areas	66	929	30,47,340
Total	**144**	**1,725**	**63,08,660**

Madhya Pradesh: IIFM, Ekalavya (NGO), SBI

Chattisgarh: DRDA, Farmers' Associations and NGOs

Uttar Pradesh: Govt. departments, (UPBVN) and farmers

Andhra Pradesh: NGOs, SBIRD and institutions like GIFT

Karnataka: SIRD, NGOs like MYRADA, BAIF, ICRISAT, IDS, Sadhana etc.

Gujarat: VIKSAT, CII

Tamil Nadu: Indian Bank Management Academy and many NGOs

Several government agencies and NGOs have arranged meetings to popularize the concepts of biovillage, community banking and the development of market based micro enterprises.

401.5 Chennai

The laboratory at Chennai concentrates on research in indigenous plants and conducts frequent training programmes for the SHGs based at the field sites.

Bioremediation of endosulfan and quinalphos using tolerant bacteria: Studies were conducted to degrade pesticide residues by incorporating leaves of green manure plants such as *Cipadessa baccifera*, *Clausena dentata, Dodonaea angustifolia* and *Melia dubia* with *Trichoderma viride*. The tested plants also increased the soil bacteria, particularly *Bacillus* sp. apart from degrading pesticides (endosulfan and quinalphos). Hence, a study was conducted to test the tolerance limit of bacteria to different concentrations of endosulfan and quinalphos. The growth of the bacterium in pesticide amended media at different concentrations such as 3, 5, 7, 9 and 10 µl/ml was checked. Two days after incubation, the bacterial colonies were noticed in all the concentrations except 10 µl/ml. However, the bacterium was able to form a single colony after 15 days of incubation at 10 µl/ml. It indicates that application of green manure leaves generates a conducive environment for beneficial bacteria that are tolerant to organo phosphorus pesticide residues in the soil.

Bioassay and purification of active crude extract: Argemone mexicana, a notorious weed in rainfed conditions, is known to be effective against mosquitoes. An experiment was carried out to explore its pesticidal properties against cotton bollworms like *Helicoverpa armigera* and *Spodoptera litura.* The leaf powder was used to test the efficacy individually and in combination with other plants like *C. baccifera, C. dentata, D. angustifolia and M. dubia.* The results indicate that *S. litura* larvae exposed to 10 g of *A. mexicana* resulted in the least pupation (13 %), while *A. mexicana* + *M. dubia* in combination recorded 16 % pupation. The pupal weight and length were severely affected and 100 % malformed moth/dead pupae were observed in the same combination. *A. mexicana* in combination with *D. angustifolia* resulted in least adult life span (0.3 days). In many of the treatments the fecundity and egg hatchability were nil. In the case of *H. armigera,* the larvae treated with 10 g of *A. mexicana* alone, 5 g each of *A. mexicana* + *D. angustifolia* and *A. mexicana* + *M. dubia* recorded the least

pupation. Pupal development (weight and length) and healthy moth emergence were severely affected in 5 g of *A. mexicana* + *C.dentata* followed by 5 g of *A. mexicana* alone. The adult life span was least in 5 and 10 g of *A. mexicana + C. baccifera*; fecundity was nil in all the three doses of *A. mexicana* (individual) and in 10 g of *A. mexicana + Clausena, Cipadessa* and *Melia*. Except for *A. mexicana + D. angustifolia* the rest of the treatments showed nil hatchability.

In continuation of this study, the crude extract (hexane, petroleum ether, chloroform, acetone and water) of *A. mexicana* alone was tested against third instar larvae of *H. armigera* and *S. litura.* In the case of *S. litura* chloroform extract arrested the pupation completely. The adults (1st generation) survived for a short period in hexane and petroleum ether extracts. The surviving adults were completely devoid of oviposition in petroleum ether and water extract treatments. But in the case of *H. armigera* pupation was the least (3 %) in acetone extract as against 100 % in untreated, which also resulted in 100 % malformed moth/ dead pupae. The adult life span was minimum in petroleum ether extract (6 days). Fecundity was meager (7 eggs) in petroleum ether extract treated larvae. Except for hexane and petroleum ether solvents, egg hatchability was zero in the treatments, as against 91% egg hatchability in untreated.

Chloroform extract, which showed promising pesticidal property against *S. litura,* was purified for further analysis. 8th fraction showed single ice-blue spot, and is being subjected to further spectral analysis. Similarly, acetone extract, which was effective against *H. armigera* was fractionated using column chromatography. 6th fraction was distinct with a single ice-blue spot indicating purity and is being subjected to further spectral analysis.

Purification and identification of active constituent in C. dentata: In-depth studies on *C. dentata* were carried out last year against *H. armigera* and promising pesticidal properties were found. Among the different crude extracts tested, crude petroleum ether extract was found to be the most effective. Hence, this year, crude petroleum ether extract was fractionated through column chromato-graphy. Thin layer chromatogram of the 3rd fraction showed the presence of ice blue spots. It was subjected to NMR [^{1}H and ^{13}C] spectroscopy along with IR, MS and UV analyses. The active principle behind the pesticidal effect was identified as (23E)-23,24,27 - trimethyl - octacos - 23 - enoic acid - dihydroxy- [(2E)-4-methyl-pent-2-enoil-oxy-methyl ester] with a molecular formula of $C_{38}H_{70}O_{6}$.

Technical support: Need-based technical support was provided to already established *Trichogramma* units in the field sites. A training programme was organized for newly formed groups on IPM and production and marketing of *Trichogramma* as an ecoenterprise in the coastal villages of Pondicherry. Training on the production of oyster mushroom was conducted and recipes distributed.

Soil, water and plant analysis: Soil samples (577), and compost (14) from Kannivadi, Villupuram and Chidambaram field sites were analyzed for major nutrients namely N, P, K and organic carbon. Leaf samples (102) were

analyzed for moisture content, and water samples (2) analyzed for pH, Ec, anions and cations.

Training, Partnership building and Networking

The Centre facilitated an exposure visit and training programme for government officials and a team of development workers from the Development and Rehabilitation Programme for Batticaloa District (DERBA), Sri Lanka. The objective was to share the grassroot level experiences on poverty alleviation, natural resource management and information empowerment. An exposure visit was arranged for seven senior officers from Uttar Pradesh Bhumi Sudhar Nigam on institution building, promoting multiple livelihoods and gender and food security. A meeting was organized to develop a partnership between sugarcane industries and women SHGs producing *Trichogramma* parasitoid.

The Centre conducted a mobile workshop in collaboration with other programme areas on "Enterprise Development and Management" for twenty selected MSSRF staff who are involved in field level enterprise development activities. It was organized to provide professional skill and guidance in promoting multiple livelihood opportunities; to understand the underlying principles of microenterprise development and management; to facilitate the identification of suitable and appropriate enterprises; and to provide an exposure to some of the institutions that have technological options for demystification and customization at the field level.

The staff of the Centre collaborated actively with the UDRC in organizing an orientation workshop on "Science-led Approaches to Rural Development" and contributed to the joint in-house participatory research study on "Gendered impact of grassroot institutions".

National Consultation on Job Led Economic Growth - Towards an Era of Sustainable Self Help Revolution: The proceedings were summarized and brought out as a publication. A booklet on selected market-driven eco enterprises undertaken by SHGs was published with minimum illustrations to promote mutual learning among the institutions involved in promoting SHGs.

The Centre continued to establish and strengthen the network and partnership with grassroot organizations. It interacted closely with TNAU on seasonal climate and weather forecasting, biopesticide and biofertilizer production technologies; resource materials for open distance learning and need based technical support. The Centre is working with the Department of Geography, University of Madras, for the preparation of village and farm level GIS-based tools for microlevel planning. In order to strengthen information sharing among VKCs, linkages were established with the Centre for Development of Advanced Computing, Bangalore, to develop special software and local web pages. The Centre is one of the partners in the International Network on Small and Medium Enterprises for Local Economic Development (INSLED) hosted by the Institute for Small Enterprise and Development, Cochin to promote small enterprises for economic development.

Sub Programme Area 402

Sustainable Management of Natural Resources (SMNR) for Food Security

Under the MSSRF - Ohio State University (OSU) collaborative project on SMNR for food security, field experiments/demonstrations were conducted in red soil (alfisols), alluvial soil (entisols) and black soil (vertisols) respectively in TN, Punjab and Madhya Pradesh (MP). This project was funded by Sir Dorabji Tata Trust. The project was executed through demonstration and training mode for disseminating improved agricultural technologies in soil, water and crop management practices, to enhance food security and environmental quality. This is the fourth year of operation of the project.

402.1 Pudukottai, Tamil Nadu

This project is implemented directly by MSSRF at Ariyamuthupatti village in Pudukottai district and at Kannivadi in Dindigul district. Fruit saplings were planted under the Wasteland Development Scheme and were pot watered. Agri-horticulture practice has prevented erosion of soil due to wind and rain. Intercropping of redgram, groundnut, cowpea, greengram and blackgram was adopted by the farmers for enriching the soil (Table 4.6). Of all the combinations, medium duration redgram along with groundnut gave the highest economic return. Among the various agronomic treatments tied ridges were found to conserve more moisture than the ridges and furrow system.

Application of enriched compost under rainfed agriculture not only supplies nutrients to the crop but also conserves moisture. This practice was found to be attractive by the farmers. The *Mangayee Amman* women's SHG came forward to prepare enriched compost on a commercial basis.

Ariyamuthupatti Tank

In collaboration with the revenue department and the Project Officer, DRDA, the tank at Ariyamuthupatti was desilted and deepened. During the year, only 10 % of the tank was deepened due to paucity of funds. Fortunately, there was substantial rainfall of more than 1,300 mm. The excess water, after irrigating the existing rainfed crops, was stored in the tank. It helped not only to extend the area under irrigation, but also to enhance the groundwater level.

During the dry season, the farmers adopted moisture conservation measures such as crop residue mulching, pitcher irrigation, burying coconut husk and application of enriched compost along with crop residues, to save the fruit plants planted under the Wasteland Development Scheme.

Under Zero Energy Gravitational Drip System, PKM.1 variety of tomato was raised at Ariyamuthupatti saving water up to 63 %, while at Kannivadi the water saving was found to be 73.8 % when Namdhari variety of chillies was

Table 4.6: ***Effect of enriched compost on soil parameters and DMP***

Parameter	With EC(kg/ha)	Without EC(kg/ha)
Dry matter yield of red gram	3,500	2,500
Post-harvest N available	156	141
Post-harvest P available	33	27
Post-harvest K available	175	158
Post-harvest organic carbon (%)	0.47	0.36

Initial soil analysis: Av.N - 117; P - 20; K - 168 kg/ha; O.C. - 0.38 % DMP - dry matter production.

raised as a test crop. This water saving system was keenly observed by the farmers for adoption during the forthcoming season.

Livelihood opportunities

Four more women SHGs came forward to produce *Trichogramma* parasite. Each SHG was sanctioned a subsidy of Rs 85,000 by the DRDA, Pudukottai and an equal sum was sanctioned as a loan by IOB. This enterprise will enhance job opportunities, reduce under-employment and promote biological control of pests.

Two women SHGs, *Mangayee Amman* and *Akhilandeswari* from Ariyamuthupatti and Maringipatti, are producing *Trichogramma* parasite. During the year 9,604 Tricho-cards worth Rs1.83 lakhs were produced and marketed. Regular marketing of the Tricho-cards and payment arrangements were made through EID Parry India Ltd. The Tricho-cards are used to control the inter node borer in sugarcane. This type of biopesticide application reduces the cost of inputs, prevents atmospheric and soil pollution and enhances environmental quality.

Capacity building

Under capacity building, intensive training on tricho production was provided by experts from TNAU, EID Parry, MSSRF and Vivekananda Training Institute, Pattukkottai. SHG members were taken to the biovillages in Pondicherry and Kannivadi.

Training on tricho production and maintenance of accounts was given to newly formed SHGs by members of *Mangayee Amman* and *Akhilandeswari* SHGs.

Training

For the benefit of SHG members, 21 training programmes were conducted over a period of 708 days for 616 trainees. The topics covered were microenterprises, Government assistance, Tricho card production, turkey rearing and pest control.

In collaboration with TNAU, ICAR and the Joint Director of Agriculture, a special report on the soil health of the tsunami-affected areas was prepared in the form of a Research Project to be implemented in Kharif, 2005. This is aimed

at the removal of sodicity and other toxic elements from the soil and to enrich the soil for sustainable agricultural production by the seashore farmers of Nagapattinam District.

402.2 Punjab Agricultural University, Ludhiana

The major problems of the alluvial soil tracts are excessive pumping of ground water and lowering of ground water level, resulting in the sinking of many submersible pumps, and the excess use of electricity.

Due to the incorporation of rice and wheat straw and green manure in Nawanshahar, the bulk density of the soil decreased from 1.53 to 1.42. As a result of a progressive shift towards maize-wheat rotation, the area under rice declined by 9.7 % whereas for maize, there was an increase of 13.2 %. While accepting the alternate cropping system of maize-wheat rotation, the farmers felt that the economic return is less than that of the paddy-wheat cropping system, and feel that the loss should be compensated.

In Faridkot district, the existing cropping system of rice-wheat is changing to the cotton-wheat system. The area under cotton has increased from 1,650 ha during 2002-03 to 30,000 ha in 2004-05. The practice of NO-TILL for wheat crop has increased from 550 ha during 2003-04 to 1,070 ha during 2004-05.

Wherever possible, the feasibility of inland aquaculture with Catla, Rohu, Mrigal and common carp was demonstrated in farmers' fish pond, which yielded 25 Q/ha of fish.

Gobi sarson, which is a short duration crop, was promoted as intercrop with sugarcane to give additional production. Similarly, wheat was grown as intercrop for two years with poplar tree cultivation. The farmers were able to get additional income from wheat, without affecting the growth of poplar. Similarly, ginger and turmeric are raised as inter crop in the poplar field to provide additional income to farmers.

A SHG consisting of 14 members was started and has taken up honey production.

Training

A total of 350 trainee days was organized during the year, covering various aspects of land and water management practices and bee keeping.

402.3 Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

The soil of Hoshangabad and Narasinghpur districts of MP is heavy clay in nature, leading to water stagnation during kharif because of poor infiltration, percolation and lateral movement of water. It is also low in organic carbon content and other plant nutrients.

The field trials conducted at both the sites on broad bed and sunken bed methods of cultivation proved to be superior to the flat bed system in increasing the yield of both kharif crops (soybean and rice) and rabi crops (wheat and gram) by 66 %. The change in productivity of these crops, compared to the base year of 2000-2001, is given in Table 4.7.

Table 4.7: ***Increase in productivity in the project area***

S.No.	Village	Productivity (Q/ha)	
		2000-2001	2002-2003
1	**Narsinghpur**	**Average of 3 villages (Dangidhana, Murlipodi, Bagpodi)**	
	Soybean	9.80	21.44
	Wheat	19.13	25.68
	Gram	12.77	17.69
2	**Hoshangabad**	**Average of 3 villages (Mongwari, Baihrakhedi, Dolaria)**	
	Soybean	10.08	14.98
	Wheat	14.47	30.63
	Gram	11.53	17.36

The demonstration of fish culture in the waterlogged Haveli fields in the kharif season was taken up in farmers' fields.

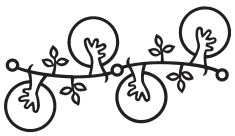
Training

A total number of 980 trainees received training in various aspects of sustainable agriculture, such as intercropping, INM and IPM.

Four scientists from MSSRF underwent a fortnight's training programme at OSU in October, 2004. This provided them more insight in the areas of soil quality assessment, sustainable agriculture, watershed management, biofuel, no tillage and natural resources policy.

The first phase of this project (2001-2005) has demonstrated the best practices for the management of problems connected with land, water and agro-climatology in relation to the cropping system. The project has also introduced the adoption of biological software as income generating technologies at the rural community level through SHGs. Training programmes have been undertaken to infuse skill and capacity building. The experience gained through this project will be scaled up in the form of Community Managed Integrated Farming Systems Programme on a watershed basis with the bio-village paradigm for Natural Resource Management and Job-Led Economic Growth.

Programme Area 500



Food Security

Food Security will be a separate Programme Area from this year. Mission 2007: Hunger free India, *is one of the important Missions launched by the Foundation in early 2004 to address the first UN Millennium Development Goal of Eradication of Poverty and Hunger, and mobilize action for achieving substantial results by 15 August, 2007, the sixtieth anniversary of India's independence. Towards this end, Regional Consultations were held across the country during the year. A Technical Resource Centre for Food Security was set up to carry forward the Hunger free India initiative. A study on Hunger hotspots in the Asia Pacific Region was prepared for the UN Hunger Task Force and preparation of a Food Security Atlas of Cambodia is in progress.*

Sub Programme Area 501

BV Rao Centre for Sustainable Food Security

The Centre organized a series of consultations across the country on *Mission 2007: Hunger Free India*, aimed at bringing together on the same platform all the stakeholders, to draw a roadmap for moving towards the goal. The Resource Centre for Food and Feed Banks continued to coordinate and monitor the activities at the field sites in Orissa and TN, besides coordinating training programmes in Ladakh. A Technical Resource for Food Security was established early this year with UN World Food Programme (WFP) support to carry forward the *Hunger Free India* initiative.

501.1 Regional Consultations on Mission 2007: Initiative for Hunger Free India

As part of the initiative to disseminate information and get a feedback from the different States on the issues and problems facing them on the food security front, the MSSRF, WFP and the National Commission on Farmers (NCF) organized a series of four regional consultations between September and November, 2004. While the consultations were part of an advocacy and dissemination project, conducted as a follow-up of the three Food Security Atlases, brought out jointly by MSSRF and WFP, they enabled the NCF to get the various stakeholders on the same platform, to understand the issues and problems at the grassroot level. The aim was to enlist public awareness and government support for making India hunger free by 2007, the sixtieth anniversary of India's independence. The WFP provided funding as well as logistic support to organize the various consultations. The platform of the NCF greatly facilitated the participation of diverse stakeholders. In all the consultations, the problem of rural distress, environmental degradation and water resources attracted attention.

State-level Reports

The Ford Foundation Chair and research staff prepared brief but highly focused reports on the overall food security situation in each State. Special attention was given to the production and profitability problems of small farmers in each of the 31 States in India. The reports can be accessed on the MSSRF website. They are based on secondary data and include the aspects of crop production and related problems, natural resources base and degradation, adequacy of food grain production and its availability to people as reflected in the calorie consumption of the low income groups, the level of poverty and so on. The reports contain the occupational profile of rural women in each State and their classification as main and marginal workers. They also give an assessment of two important programmes that have a bearing on food and nutrition security - the Public Distribution System (PDS) and the Integrated Child Development Services (ICDS) programme.

Regional consultations were held in four locations *(viz.* Hyderabad, Ahmedabad,

Shillong and Delhi), one each for southern, western, eastern and northern India. The details of the consultations are given in Table 5.1. Representatives from all the States in each of these regions participated in the consultations. Prof M S Swaminathan chaired the consultations and stressed the need to make India hunger free, alleviate farmers' distress and bring about gender equity. At each meeting, MSSRF presented a regional picture of the food security situation and rural problems and issues, to initiate the discussion. This was followed by presentations on the problems and prospects in individual States in the region by State government officials. Based on the deliberations and incorporating the views of all the participants, an action plan for each region was prepared.

The Action Plan that emerged from each of these consultations has been submitted to the NCF and the issues raised, included in the first report of the Commission titled "Saving Farmers and Serving Farming", submitted to the Government of India in December, 2004. They will also be included in the proposed publication containing the State level reports. Broadly, all the Action Plans highlighted the current agrarian crisis facing the country, the issue of farmers' suicides and problems facing women in agriculture. The need for urgent action through a human-centric approach, bringing about convergence and synergy between the various safety net programmes and providing for a pro active package of technology, services and public policy in tune with local needs and exigencies, were emphasized.

Table 5.1: ***Details of Regional Consultations***

Venue and Date	Highlights
Regional Consultation of Southern States, Hyderabad, 20 Sept, 2004	Inaugurated by Dr Rajasekhara Reddy, CM of AP
Regional Consultation of Western States, Ahemedabad, 28-29 Oct, 2004	Organized in collaboration with Disaster Mitigation Institute, Ahmedabad; Inaugurated by Shri Bhupendra Singh Chudasama, Minister for Agriculture, Govt of Gujarat.
Regional Consultation of Eastern and North-eastern States, Barapani, Meghalaya, 3-4 Nov, 2004	Organized in collaboration with the ICAR Research Complex for the NE Hill Region, Barapani. Inaugurated by Dr D D Lapang, CM of Meghalaya; Ministerial level participation from Assam (Mr W A Chowdhary,Minister for Agriculture), West Bengal (Dr Surya Kanti Mishra, Minister for Panchayats),Tripura (Mr Tapan Chakraborty, Minister for Agriculture).
Regional Consultation of Northern States, New Delhi, 18-19 Nov, 2004	Included a session with representatives of All India Federation of Women in Agriculture (AIFWA) on the issues facing women farmers across the country.

501.2 Resource Centre for Community Food and Feed Banks

Community Food Bank (CFB) is a mechanism for decentralised storage and management of grains at the village level, to address transient food insecurity and provide immediate relief during emergencies.

The Centre has set up models of food banks in villages in Orissa and TN. It coordinated food and feed bank activities in these two States and fodder banks in Ladakh. It also organized training in fruit processing and post harvest technology in Ladakh. The work in both Orissa and Namakkal in TN, is implemented through the Site offices. In Kalrayan Hills in TN, it was in collaboration with World Vision, while in Ladakh, the NGO CENSFOOD helped to set up Community Fodder Banks for livestock in two villages.

The CFB in the eight villages in Orissa have been in operation for two years now. In all these villages, the Gene-Seed-Grain Bank continuum is in place. Water banks have been built in some villages through small micro watersheds to harness rainwater. The CFB is now becoming the focus of other community development activities in the village. Microenterprises for income generation have been initiated through SHGs. The entitlement cards listing the various Government schemes for food and nutrition have been successful in mobilizing the community to demand their dues. An evaluation of the CFBs is now planned. The work done has been reported in detail under SPA 301.3. The Community Feed Bank at Namakkal continued to focus on increasing the area under cultivation of maize, and strengthening the farmers' clubs and facilitating them in the sale of maize. A major initiative during the year was training of landless SHG members in the production of hybrid maize seed and facilitating them to take up seed production for enhancing their income (See SPA 301.1).

CFB in Kalrayan Hills

This Project is being implemented in collaboration with World Vision India. Two model CFBs have been developed at Melvazhapady and Tazhvellar villages. A storehouse is being built, the cost of which is being borne by World Vision.

Frontline demonstrations of minor millets by TNAU were facilitated and the area under millet cultivation was increased by 10 ha. Two participatory experiments on zero energy cool chamber were conducted and the chambers tested with different construction material. Based on the results, a concrete cool chamber retail vegetable outlet, managed by a SHG, was set up in Melvazhapady village. The wonder rat trap developed by TNAU and insect trap being marketed by the Rural Innovations Network were demonstrated.

A fall in migrant labour has been observed in the villages. Networking with World Vision has yielded positive results. The organization has decided to implement the CFB and zero energy cool chambers in other project areas. Following a meeting with the State Planning Commission in September 2004, steps have been initiated

by the administration to ensure access to Government entitlements, such as electricity connection and mid day meal at schools in the two villages.

Initiatives in Ladakh

The members of CENSFOOD, Ladakh, have set up community fodder banks in two villages following their training in Chennai and Jeypore. The initiative was of help during the unexpected heavy snowfall this year.

Training was arranged in fruit processing and post-harvest technology for representatives from Ladakh, after consultations with the Ladakh Autonomous Hill Development Council (LAHDC). A team of eight received training at CFTRI, Mysore. Following this, on-site training was arranged for groups of farmers at Leh and Kargil respectively. Follow-up training will be provided.

Project Status

The project support for CFBs under the Resource Centre came to an end formally in December. A Technical Resource Centre (TRC) for Food Security has now been launched.

The main mandate of the TRC is to initiate activities centred on *Mission 2007: Hunger Free India*. CFBs also come under the ambit of the TRC. A proposal for the second phase of the Feed Bank Project was submitted to the Venkateshwara Hatcheries Group and consent obtained for moving on to the second phase of the project.

Sub Programme Area 502

Ford Foundation Chair for Women and Food Security

Besides the State level reports prepared for the *Hunger Free India* consultations, two major research studies, one on Hunger Hotspots in the Asia Pacific region and the other a Food Security Atlas of Cambodia, were undertaken by the Ford Foundation Chair. The chair also worked closely with the UDRC in organizing the National Seminar on Gender Concerns and Food Security Issues in Rice Farming Systems (See SPA 602.1). The chair also helped devise a programme for long-term educational and nutritional support for children orphaned during the recent tsunami (See SPA 703.5).

502.1 Hunger Hotspots in the Asia Pacific Region: April-August 2004

Outline and Major Findings

The mandate of the United Nations Hunger Task Force (HTF) is to produce a plan to reduce the proportion of hungry and malnourished people by half, by the year 2015. Towards this end, MSSRF was commissioned to prepare two research papers on hunger hotspots in the Asia Pacific region. The HTF had two co chairs — Prof M S Swaminathan of MSSRF and Prof Pedro Sanchez of Earth Institute, Columbia University, USA. The research papers were used to prepare the final report of the HTF submitted to the United Nations in August, 2004.

The first paper was on recognizing the hot spots in the Asia Pacific region and analysing the reasons for the concentration of hunger in rural areas, despite food surpluses in many countries of the region. The first section was on macro indicators of hunger and related factors. The second part was based on the household level data from demographic health surveys conducted in many nations. The second paper was based on the experience of China in reducing hunger and the lessons to be learnt by other developing countries.

The main objectives of the analysis of the first paper were:

- to identify and select hunger hotspots in the Asia Pacific region
- to identify the factors that correlate to hunger in these areas
- to identify effective interventions that can be implemented in these and other areas affected by hunger and
- to identify and select strategies for implementing these interventions.

The identification of hotspots will help governments and donors to define priorities and focus their resources in those places where hunger is most prevalent.

Hunger hotspots were identified on the following lines: if more than 20 % of the under-five children were found to be underweight or if more than 1,00,000 under-five children were underweight, in a given national or sub-national unit. Children are defined as underweight if their weight-for-age z-scores are below minus two standard deviations (-2SD) from the median of the NCHS/CDC/WHO International Reference Population. Linear regression analyses (OLS) were undertaken at the county-level and macro-level, using the percentage of underweight under-five population as the dependent variable, in order to establish causal relationships between underweight and socio-economic factors that are expected to result in underweight. A similar analysis was undertaken at the micro-level with z-scores of weight-for-age children as the outcome variable. The farming systems and the policies pursued by the different countries were reviewed and their impact on hunger and poverty was assessed. The national and sub-national level underweight data was compiled from several sources and provided by CIESIN. The household data came from nine Demographic and Health Surveys (DHS). The data was provided by the HTF.

It was found that in the Asia Pacific region, the highest rates and numbers of underweight under-five children are concentrated in units located in India, Pakistan, Nepal, Bangladesh, Uzbekistan, Myanmar, Vietnam, Philippines, Indonesia and Afghanistan. From the county-level, macro-level and micro-level analyses of the determinants of underweight children in the Asia Pacific region, the following factors emerged as significant on the underweight status of children in developing countries: poverty, food production, mother's education, sanitation, health facilities and water. The results of the analyses clearly pointed out that the underlying determinants (conditions at the

householdlevel) are extremely important and significantly correlate to hunger. The results also clearly show that individuals who are malnourished have been ignored by different sectors such as agriculture, health, education, social welfare, finance and labour. To address malnutrition effectively, a deeper understanding of the several causes of malnutrition at the communal and household levels is required, as well as policies designed to target those populations that are more vulnerable and the creation of alliances between sectors.

This study has attempted to explore the determinants of underweight among children at the micro-level in a few countries in the Asia Pacific region. The factors expected to influence underweight in children under five are elaborated in a diagrammatic form in the conceptual framework diagram. At the household level, three major sets of factors are expected to cause underweight in under-five children. The first set consists of food security factors such as poverty, transfer of income and access to food through production in the households. The second set of factors are the ones that influence the care given by the mother, which depends on the mother's educational status. The third set of factors that could influence underweight in children under the age of five are the factors related to health facilities, sanitation and safe drinking water.

Ideally it is advisable to have quantitative data on all these aspects. However most of the national health survey data is qualitative in nature and as such the results broadly indicate the significant association with the factor. The best-fitting models in this micro-level assessment account for 25 % of the observed variance of the outcome variable. This is a good percentage of the variance explained, considering a dataset comprising nearly 25,000 observations.

It is therefore reasonable to say that factors such as demographic characteristics of the households like the number of children of five and under, total children born to the mother; maternal attributes such as the mother's current age, educational attainment (primary and secondary), occupation as a skilled or manual labourer; health attributes such as the duration of breastfeeding, morbidity and vaccination; indicators of sources of drinking water (well water is considered as safe); indicators of sanitation such as the type of toilet facility prevalent in the household and indicators of poverty like the ownership of assets such as television, power supply and the spouse's occupation, all have a significant impact on the underweight status of the child.

This leads to some policy implications such as the need to take care of the women and their knowledge base, education and spread of the best practices along with safe drinking water and sanitation. This study clearly brings out the interventions aimed at the household level as agents of development, as strongly as that of poverty related indicators of the households. Integrated services for women and children and health facilities, including hundred percent immunisation and safe drinking water, go a long way in reducing the problem of underweight in children.

502.2 Food Security Atlas of Cambodia

The Cambodia office of the UN World Food Programme commissioned MSSRF to prepare a Food Security Atlas of Cambodia (FSAC) on the lines of the Food Insecurity Atlases of Rural and Urban India and Atlas of Sustainability of Food Security in India.

Food Security Concept

The term "food security" may mean different things to different people. It is widely used in different contexts. The Food and Agricultural Organization (FAO) of the United Nations, on the occasion of the World Food Summit in 1996 in a report titled "Food for All", defined the term food security: *Food security is physical and economic access to sufficient safe and nutritious food, to meet the dietary needs and food preferences for an active, healthy and productive life.* Thus food security has three dimensions — food availability, food access and food absorption.

The objectives of the Food Security Atlas of Cambodia

The main objective is to report the present food security situation of Cambodia in all the three dimensions, with the help of some key indicators. The study will also assess the capacity of Cambodia and its provinces to achieve food security for all the citizens, now and in future, given the natural resource endowment and the levels of exploitation.

The second objective is to study the situation at the sub-national levels of provinces and municipalities, and in some instances, the commune level, and bring out a food security index that would rank the provinces, municipalities and communes as per the situation.

The third objective is to identify the major issues of concern and suggest some solutions in terms of policies and programs, that would make the nation more food secure.

The report will provide a situation analysis for the purpose of suggesting the broad areas of interventions and does not carry out any policy evaluation of the existing or future policies or programmes. Areas of policy focus and programme focus would be identified and highlighted, based on the status analysis.

The report would first make all the information related to food security available at one place. Secondly the issues and problems that require immediate policy interventions will be highlighted. Since food security is the central issue, the report will concentrate on agriculture and rural areas.

The organization of the study

The study is organized into six major sections, including the introductory section and the concluding chapter. The second section of the report is on food availability. It starts with a description of the present food production and consumption situation, to assess the adequacy of food availability, given the consumer preferences. This section also looks at the problems of production and sustainability of production. A detailed analysis of the health of the natural resource base of the country is also included, as long-term sustainability of food

security depends upon it. The third section is on food access and livelihood access, at the national level and the levels of provinces and municipalities. The fourth section is on food absorption and nutritional security of the population, which depend on health infrastructure, sanitation and safe drinking water. The fifth section sums up the food security situation in all its aspects and brings out an index of food security that ranks the provinces and municipalities. This section highlights the issues of concern and the policy and programme prescription for the same.

Expected outcomes

- Making available all the information on the food security of Cambodia, both quantitative and qualitative at one place, for ready reference
- Analysis of province level food security, to identify the most food insecure provinces and most food insecure categories of population, such as those who are unemployed and poor, those exposed to disasters, the landless and so on. Their magnitude, location and problems will be highlighted.
- Analysing the causes and implications of food insecurity at the province level so that areas of intervention can be recognized.
- Analysis of the commune level information would be attempted, provided the data on poverty, unemployment, stunting, underweight, education, and disaster proneness is made available.
- A final set of policy and programme suggestions for the macro as well as the micro level will be given, with clear indication as to priority.
- The FSAC would transfer the positive knowledge and practical experience from India to Cambodia.
- The FSAC would be an effective and efficient message to attract thinking on the issues of food insecurity.
- The final draft of the FSAC would be presented at the Food Security Forum at the Council of Ministers.

502.3 Workshop on Gender Sensitivity of the Employment Guarantee Bill

A one-day workshop on gender sensitivity of the Rural Employment Guarantee Bill was organized on 28 January, 2005, to examine and make recommendations on engendering the Employment Guarantee Bill tabled in Parliament in December, 2004. The basic purpose of the proposed Employment Guarantee Act (EGA) is to provide at least 100 days of guaranteed additional employment per person to rural manual labourers who do not get work throughout the year. Criticism was leveled against the Bill in Parliament, to the effect that it does not fulfil the above objective. In its current form, the Act cannot help the poverty-stricken labour class. The stake of women, who constitute a large percentage of rural manual labour, has been totally neglected. After deliberation at the workshop by several grassroot level organizations, and collective thinking, MSSRF developed a set of

recommendations. These were submitted to the NCF. The NCF has taken these into consideration in submitting a note to the Joint Parliamentary Committee set up by the Government to examine the Bill.

Sub Programme Area 503

The Sustainability of Farming Systems: A Case Study of the Rice-based Farming System in North-east TN

The study on Sustainability of Farming Systems was initiated in February, 2004, to study the ecological stability and economic viability of rice farming systems and to understand the causes for un-sustainability in farming systems. This is a three-year research project.

A detailed reconnaissance survey was carried out in the semi-arid tracts of central and north-eastern TN in the last quarter of 2004. Of particular interest were the rice belts in the north-eastern part of TN. Subsequent visits to this rice belt revealed the diversity in cultivation practices and associated cropping systems. The belt is typically agro-pastoral and livestock is an important and integral part of livelihood. Tanks provide irrigation to these farms. They are mostly non-system tanks, fed purely by rainfall. In the last two decades, this belt has slowly shifted to growing mono-crops of high yielding varieties with high dependence on external inputs. Managing the natural resource base was discussed with the farmers and observations made on extreme overdraft of groundwater, excessive use of fertilizers and pesticides and possible reduction in diversity of crops due to extensive mono-cropping of rice. The inputs received from Rice Research Station in Tirurkuppam, Thiruvallur, have been instrumental in identifying the study area and the villages.

Two major hypotheses have been finalized for the study

- There exists a positive correlation between biodiversity in agriculture and the livelihoods of the local community in semi-arid rice livelihood systems.
- Nitrogen and water-use efficiency remain unchanged across the farms, despite diversity in farming.

The methodology involves estimating the diversity (bio-physical, management and organisational) in the rice farming system at the village level and conducting a socio-economic study based on the Rural Livelihoods System framework of the SDC. The recommended management practices and actual practices in the farmers' fields will be compared and contrasted. Soil quality and nutrient uptake by the plants from the soil will be studied from selected plots having diverse cropping patterns. Water-use efficiency will be evaluated using actual measurements of water used in the fields. The ecological, social and economic constraints faced by the farmers will be evaluated. Appropriate indicators that are

easily identifiable and measurable will be selected. Strategies for sustainable management will be recommended. Data collection will be both qualitative and quantitative, based on secondary information obtained from existing records from government and non-governmental sources. Gender disaggregated primary information will be collected from the farmers through questionnaires, focus discussions and field observations.

Two villages have been identified for a detailed study of livelihoods. The villages typically represent the rice belt as outlined above. One village has only one crop a year, rice, and the other village has two and even three crops a year. A diverse set of crops and animal base constitute the farming system in the second village. Basic resource mapping has been done with the help of the villagers. Detailed socio-economic evaluations are being carried out. Water use in the fields and soil quality analysis are being carried out simultaneously.

Programme Area 600

Information, Education and Communication

This Programme Area encompasses various divisions of the Foundation like Informatics, UDRC, THMRC and the Library, which primarily perform the IEC role. While rendering service to other Programme Areas of the Foundation and outside through this role, it also has major projects of its own like the National Virtual Academy (NVA). The Jamsetji National Virtual Academy for Rural Prosperity is spearheading the movement for Mission 2007: Every Village a Knowledge Centre *through a National Alliance. UDRC published "Gender Issues in Agriculture and Rural Livelihoods", a course module for undergraduates in agriculture universities. Vacation training programmes were conducted for school children in Chennai and Orissa under the ECAS initiative. The international consultation on Agricultural Biodiversity and Elimination of Hunger and Poverty brought together participants from 24 countries.*

Sub Programme Area 601

Jamsetji Tata National Virtual Academy for Rural Prosperity

The Jamsetji Tata National Virtual Academy for Rural Prosperity (NVA) has become the umbrella for MSSRF's initiatives in ICT-led development.

From small beginnings as an experimental Information Village Project started in Pondicherry in 1998, MSSRF's initiative in the use of ICT for information and poverty alleviation in rural areas has evolved and expanded over the years. By December 2004, twelve VKCs were in operation in Pondicherry. VKC initiatives are also being attempted at other field sites and different models are emerging in response to local needs. (See SPA 102 and SPA 401). As a need was felt for a network linking experts and grassroot level communities, the NVA was launched in August, 2003 with the generous support of Sir Dorabji Tata Social Welfare Trust. The state level hub, located at MSSRF is the knowledge resource that creates and maintains web sites and databases for the local hubs, in close collaboration with national and international agencies. It is linked to Village Resource Centres (VRCs) which in turn are linked to VKCs for a cluster of villages. A diagrammatic representation of the linkages is given in Figure 6.1. It is an information system that establishes lab-to-lab, lab-to-land, land-to-lab and land-to-land linkages.

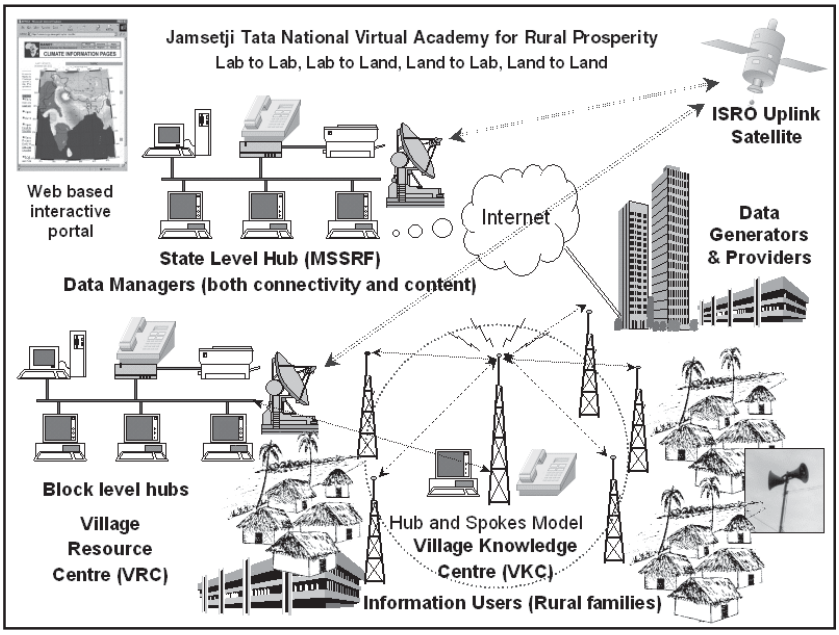


Figure 6.1: ***ICT-enabled knowledge flow***

The NVA aims to provide information and knowledge related to drought, climate management, augmentation of water, maximizing crop yield (more cropper drop) and markets, and build skills and capacities of the rural poor, with a view to enhancing livelihood opportunities, and empowering vulnerable people to make better choices and have better control of their own development.

A State level hub in Chennai and four block level hubs in TN at Thiruvaiyaru (Thanjavur District), Sempatti (Dindigul District), Annavasal (Pudukkottai District) and Thangatchimadam (Ramanathapuram District) have been set up. In October 2004, ISRO provided satellite connectivity for three block level information centres (Thiruvaiyaru, Sempatti and Thangatchimadam) under the Village Resource Centre (VRC) programme. The Hon'ble Prime Minister of India inaugurated this programme through video conferencing in October 2004. In his inaugural speech, he said, *"Community-based vulnerability and risk-related information, provision of timely, early warning and dissemination of weather related information can lead to reliable disaster management support at the village level."*

This network provides the services of tele-education, tele-medicine, online decision support, interactive farmers' advisory services, tele-fishery, weather services and water management. This programme covers both farm and fishing families based on the motto "food, water, health, literacy and work for all and for ever".

Under the VRC programme, a spatial database for Thiruvaiyaru has been prepared by ISRO. It reveals the land use pattern of crops grown such as paddy, sugarcane and oil seeds. It also includes fallow lands, sandy areas, built-up land, water bodies and a detailed soil survey. The database helps farmers to plan their activities. TNAU has developed a software called DSSIFER which gives a district-wise cropping pattern. The TN Rice Research Institute has suggested that it could include the land and water resource plan.

Under the *Microsoft Unlimited Potential Programme (MUPP)*, 100 Community Technology Learning Centres (CTLC) are to be set up.

Training and Capacity Building Programmes

A series of need based training programmes was facilitated through networking with various research, NGO and Government agencies.

Pre-rabi season training programmes: The Departments of Agriculture, Horticulture and Animal Husbandry of Dindigul district, Gandhigram Rural Institute and NVA/VRC jointly organized a few pre-rabi season training programmes covering the blocks of Athoor, Nilakottai and Batlagundu. The cultivation practices of jatropha, sweet sorghum, sugar beet and pulses were discussed, as well as details of a regulated market, rain water harvest and farm ponds. Booklets were also prepared for the training programmes.

Health camps and awareness programmes: Health camps were organized in tribal areas

with the support of the Panchayat, Christian Fellowship Hospital and Goodwill Tribal Outreach Programme (NGO). Health awareness programmes were conducted to help them guard against diseases like malaria, diarrhoea and jaundice. Hepatitis-B awareness and vaccination programmes were also conducted with the help of SHGs.

Computer Aided Learning Programme: With the help of the Azim Premji Foundation, the Computer Aided Learning Programme (CALP) was initiated in all the VRCs. So far 50 CDs have been developed on various topics such as the importance of conserving energy, learning English and learning to invest in small business.

Government schools are being involved in the programme with the permission of the Education Department. The process of research in children's learning curve has been set in motion and training is being given to the school teachers.

In Thangatchimadam and Pudukkottai, nutrition gardening has also been initiated in the schools with the help of the Department of Horticulture. In Pudukkottai, the National Pulses Research Centre provided technical guidance. In Thiruvaiyaru, the CALP was linked with Eco-Clubs in schools. Health awareness classes are also being conducted with the help of Primary Health Centre doctors.

Accounting Software Training Programme: Accounting software has been developed for SHGs with the help of the DRDA. SHGs were trained in maintaining accounts and they submit monthly reports to banks and the DRDA.

Kitchen Garden Training Programmes: Orientation programmes were conducted on the importance of vegetables in the diet and raising vegetable crops in the space around the houses. Kitchen garden programmes were initiated with technical support from the Department of Horticulture and National Pulses Research Centre

Table 6.1: ***Training in organic farming***

Venue/Theme	Date	Technical Support	No. of persons trained
Sempatti: Organic farming and kitchen garden	6 January, 2005	TN Organic Farmers' Association	50 farmers (including women)
Sempatti: Vermicompost	3-4 February, 2005	S S Vermicompost, Vadipatti	40 (members from 6 SHGs and farmers)
Merpanaikadu Panchayat, Aranthangi Block: Vermicompost	February, 2005	National Pulses Research Centre	48
Athoor: Herbal healing for humans and animals	22 February, 2005	SEVA, Madurai, Rotary Club of Dindigul	--

In Thangatchimadam, 30 SHG members and 5 people from Thaneerotru, who participated in the kitchen garden training programme now produce a variety of vegetables. In Thiruvaiyaru, Anbuthamil SHG is maintaining a kitchen garden and selling vegetables in the neighbourhood.

Training programmes in Organic Farming and Herbal Healing: Training in organic farming was arranged for women SHGs and farmers with the help of TN Organic Farmers' Association (Table 6.1). The importance of preparation of *panchakavya, amirtha karaisal,* herbal pesticide and insecticide and organic methods of farming and vermicomposting was emphasized.

Training Programmes on different crops: Training was imparted on methods of cultivation, with the help of various agencies as shown in Table 6.2

Telephonic advisories were also provided on various aspects of cultivation such as seed treatment, intercropping and pest control.

Training in GPS and other fish finding equipment:

With the help of Marine Product Export Development Authority (MPEDA), training programmes were organized for fishermen in Rameswaram on GPS and other fish finding equipment as well as the processing of fish (Table 6.3).

Livestock maintenance: In October 2004, a touch screen multimedia module for livestock was set up in Thiruvaiyaru and Sempatti with the support of Livestock Development Group, University of Reading, UK. The module provides information on the various aspects of rearing livestock and poultry. A person who got information on Mastitis and its cure through the touch screen module, consulted a veterinary doctor and cured the animal herself.

Users have suggested that there should be more information on livestock varieties, marketing, prevention and control of different diseases, details of hospitals and so on.

Animal husbandry camps and awareness programmes were arranged at Pudukkottai,

Table 6.2: **Training programmes on crops**

Crop	Venue & Date	In collaboration with
Oilseeds	Thumalapatti, 19-20 Jan, 2005	Dept of Agriculture, Nilakottai
Gingelly	Thanjavur district, 8 Jan and 26 March, 2005	TNAU, Dept of Agriculture, Former Director of Seed Certification & Panchayat
Groundnut Advisories	on a continuing basis	ICRISAT and CRIDA

Table 6.3: ***Details of MPEDA training programmes***

Programme	Date	No. of Participants
Training on GPS and other fish finding equipment	12 March, 2005	81 fishermen from 7 villages
Hygienic handling of fish preservation and processing	13 March, 2005	72 fishermen

Dindigul, Thiruvaiyaru and Pondicherry with the help of the Veterinary Department, Rotary Club of Pudukkottai, KVK, Veterinary University Training and Research Centre, Fruits and Vegetable Growers' Association, Rajiv Gandhi College of Veterinary and Animal Sciences and panchayats. The problems addressed included deworming, foot and mouth disease, fertilisation tests, artificial insemination and surgery.

Use of Video and Audio Media

The hub at MSSRF has a good satellite bandwidth under the ISRO VRC programme. All the Centres regularly hold video conferences between the rural communities and experts, between farmers, between SHGs and between farmers and manufactures. They promote lateral learning among rural families. Interactive programmes were held during the year for diverse groups:

- Joint Director, Agriculture, Thiruvaiyaru and farmers of Ramanathapuram
- Project associates of Thiruvaiyaru and farmers of Sempatti
- Farmers of Thangatchimadam and HEHCO International Trust, Thiruvaiyaru
- Coconut Farmers' Association, Sempatti and Coconut farmers, Thangatchimadam
- Farmers of Sempatti and Thiruvaiyaru and Mr Sharma, Asst. General Manager, NABARD
- Fishermen and women, Thangatchimadam and villagers from Nattam, Sempatti
- SHGs, Thangatchimadam and SHGs, Sempatti

Forty audio programmes on different topics were created by knowledge workers and relayed every Saturday through All India Radio, Pondicherry. This programme produced under the Open Knowledge Network (OKN) collects and disseminates information in the local language on various matters.

Multipurpose Functions & Services

The VKCs perform multipurpose functions in response to local needs and demands. For instance, the Centres have been approached for information on contract farming, sale of *Azospirillum* and dealership for various products.

Despite seawater inundation following the tsunami, a few local rice varieties were not

affected by salinity. The characterization, cost of cultivation and farmers' views on these varieties were documented and transferred to the Community Gene Bank at Chennai. Now the Gene Bank and the NVA are in the process of multiplying these seeds for dissemination (See SPA 301.4).

INCOIS conducted interaction meetings for fishermen at Thangatchimadam Centre, explaining the features of INCOIS Digital Electronic Board set up by the Centre and its use. The Gulf of Mannar Trust and NVA/VRC organized an interaction meeting at which Mr Ramasubramaniyan, IFS, explained the activities of the Trust and the formation of Village Marine Councils (VMC). After the meeting two villages, Karaiyoor and Francis Nagar approached the Gulf of Mannar Trust for forming a VMC in their village.

Several awareness programmes were conducted at the Thangatchimadam, Thiruvaiyaru and Sempatti centres. A Gender Awareness Programme was also conducted at Thangatchimadam for SHG members covering issues of rights in custody, health, the importance of education and micro-enterprise training for self-employment. A woman farmer from Thiruvaiyaru, nominated by MSSRF, received the ASPEE award for the best woman rice farmer in the International Year of Rice, 2004.

National Alliance for Mission 2007: Every Village a Knowledge Centre

The small beginnings of the Information Village Project evolved into a National Alliance for *Mission 2007: Every Village a Knowledge Centre*. MSSRF conducted a Policy Makers' Workshop on 8 and 9 October, 2003. The need for developing a master plan as well as a business plan for extending the benefits of ICT to all the 6,00,000 villages in India by 2007, which marks the 60 anniversary of our Independence, emerged strongly at the workshop.

Following this, in July 2004, MSSRF, OneWorld South Asia and NASSCOM Foundation initiated a National Alliance for Mission 2007 with an initial alliance of 80 partners. It was recommended that the alliance spread the rural knowledge centre movement and function like the Consultative Group on International Agricultural Research (CGIAR), without a legal structure. The Alliance has a Chairperson, Secretary General, Secretaries, and four task forces for connectivity, content, management of knowledge centres and resources. It also has a steering committee for Mission 2007. So far, six executive board meetings have been held. There are over 150 Alliance members now.

In the budget speech for 2005-2006, the Honourable Finance Minister supported the goal of Mission 2007 and provided Rs 100 crore to be disbursed by NABARD for VKCs.

"*The National Commission on Farmers has recommended the establishment of Rural Knowledge Centres all over the country using modern information and communication technology (ICT). Mission 2007 is a national initiative launched by an alliance comprising nearly 80 organizations including civil society*

organizations. Their goal is to set up a Knowledge Centre in every village by the 60th anniversary of Independence Day. Government supports the goal, and I am glad to announce that Government has decided to join the alliance and route its support through NABARD. I propose to allow NABARD to provide Rs 100 crore out of RIDF".

– Budget speech by Shri P Chidambaram, Minister of Finance, GoI, 28 February, 2005

Following this, NABARD organized a one-day workshop on support to VKCs under RIDF at Mumbai on 4 April, 2005. Participants from MSSRF, NASSCOM Foundation, Microsoft, NCF, Maharashtra Knowledge Corporation Ltd., ITC, representatives from TN, Pondicherry, Karnataka, AP, Maharashtra, Gujarat, Rajasthan, Uttaranchal, Orissa, West Bengal, and Kerala governments, and NABARD officials participated. The existing e-governance plans, ICT grassroot initiatives, connectivity, content, setting up and management of VKCs, sustainability of VKCs, appropriate staffing arrangements and formation of state chapters of Mission 2007 were discussed. It was agreed that Connectivity, Content, Capacity Building and Care and Management of the VKCs are the 4 Cs crucial to the success of Mission 2007.

NVA Fellows

It is proposed to have a cadre of rural knowledge workers from across the country to create a stake in local ownership and management. Starting with a set of Master Trainers, the network will widen to cover a larger group in an expanding scale, in keeping with the aim of the NVA of reaching frontier technology to the 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. This cadre of grassroot workers, both men and women, are to be elected as Fellows of the Jamsetji Tata National Virtual Academy for Rural Prosperity and trained to be master trainers for spearheading the knowledge revolution in rural India. In 2004, 6 Fellows were selected through a rigorous selection process as the first Fellows of the NVA. 137 grassroot workers were inducted as Fellows of the NVA at the second National Convention of Mission 2007 and the Convocation of the NVA inaugurated by the President of India in July, 2005.

The aim is to select one million Fellows by August 2010.

Sub Programme Area 602

Uttara Devi Resource Centre for Gender and Development

The Centre continues to divide its attention and resources between its external and internal mandates.

602.1 External Mandate

The two chief areas of focus continued to be agriculture/rural livelihoods and biodiversity.

Agricultural curriculum: The development of a course module for undergraduates, "Gender

Issues In Agriculture and Rural Livelihoods", taken up in 2003, in collaboration with Kerala Agricultural University (KAU), has been completed after some unforeseen delays. The Visiting Fellow, Dr. Sara Ahmed, submitted the 16 units during the year, while UDRC offered some support in putting together the readings and classroom exercises. Preparation for publication was initiated in August 2004 and the final module in CD format was ready by the end of December. 500 copies have been printed for purposes of promotion.

The module is a joint publication of KAU and MSSRF and a Memorandum of Association governing the terms and conditions of ownership and distribution, has been drawn up, which will protect the author's copyright while allowing for dissemination and promotion to the potential user community. For now, a single copy in CD and three in print format, are available at a minimal cost, on request. It is hoped that a publisher would take it up later as a large-scale venture.

The process of dissemination has begun. A brochure has been placed on the web sites of KAU and MSSRF. It is also being distributed and there have been requests for the module.

In the next phase, distribution depends on promotion, where the lead is expected to be taken by KAU, since they are a part of the Agri-University system of ICAR. This may take time, and feedback is expected only in the course of the year. UDRC continued to give support to KAU faculty, extension workers and others through participation in training and sensitization programmes, workshops and meetings related to gender.

Linkages: A new linkage was established with the proposed Gender Resource Centre being set up by the Ministry of Agriculture and Cooperation. UDRC was invited at the initial stages to help in developing a concept note on objectives and programmes of the proposed GRC through discussions and papers, and later on to participate in a meeting organized by the Ministry. This is another channel through which gender sensitization of agricultural extension personnel at different levels and field organizations can be carried out for dissemination of the material developed as part of the curriculum.

International Year of Rice: This was one of the major activities taken up this year by MSSRF, with the involvement of several programme areas, units, and field sites. For UDRC, it involved the three areas of agriculture, biodiversity and mainstreaming, since the theme chosen was *Gender, Rice and Food Security.* UDRC played a significant role in relation to the conceptualisation, planning, structuring and documentation of the events.

Five workshops were held over the year (See SPA 702). While the first national seminar was of a purely scientific nature, focusing on the role of biotechnology and molecular biology for the future of rice, the remaining four were organized around the theme. Three of these were regional in nature, focussing on Orissa, Kerala and the North-East respectively. Orissa and Kerala were chosen because MSSRF already has a presence there and is working

on rice biodiversity, and the North-East because of the importance of that area for this purpose. The themes were also region specific – in Orissa and the North-East, it related to issues of conservation, and sustainable and equitable utilization of genetic biodiversity, and in Kerala, to the potential of medicinal and aromatic rice. The regional workshops were held in collaboration with local partners, and involved a range of stakeholders including the agricultural and biodiversity research community, representatives of the farming community, women's organizations, community leaders, NGOs, social scientists, traders, government officials and several others. This science–society interface stimulated wide interest and led to conclusions and recommendations of an inter-sectoral nature, and was a good opportunity to bring gender issues to the attention of the scientific community.

The second national seminar held in Chennai in September, 2004 was an interdisciplinary one, dealing with the gender dimensions of food security at various levels, addressing the issues resulting from women's involvement at various stages from conservation, production, post-production, and the market to the impact of globalisation. The outcomes, addressed to policy makers, have been widely circulated, and have been taken up for further action by the Planning Commission and the NCF. In addition to the reports of each workshop, a summary report on the entire series and the IYR programme was released in January 2005 and widely circulated.

The Visiting Fellow Programme of UDRC was also linked with this series of events. Ms Sumi Krishna, a distinguished researcher, writer and gender specialist who has had a long association with MSSRF was invited to be the Visiting Fellow for 2004 and in that capacity to study the gender and food security dimensions of rice farming livelihood systems in the seven North-Eastern states. The paper, *The Gendered Price of Rice* was presented as the keynote paper at the workshop in November 2004, and formed the basis for the group discussions that followed.

This paper, along with five others presented at the national seminar held in September 2004, were published in an issue of the *Economic and Political Weekly* in June 2005 as a special set of articles on the theme of *Gender and Food Security.*

602.2 Internal Mandate

The work on the internal mandate of gender mainstreaming continued, with UDRC in the lead and drawing financial and human resources from both within and outside MSSRF.

Gender mainstreaming continued through orientation programmes and the development of specific local plans and institutional mechanisms at some sites. A three-day workshop on gender was held for the staff at the Namakkal field site. On the last day, the entire team took up detailed planning for the site and for steps needed to build and strengthen local grassroots organizations such as federations of SHGs.

Orientation for women staff: As in the previous year, a separate meeting was held for women field staff, since several more women had joined MSSRF since then and required orientation. The experiences gained after last year's meeting were shared, and those found most useful were the exchange of visits at the field level, inter-project exposure, and the placement of less experienced workers with more experienced ones. This mechanism for regular interaction and exposure will be continued.

Workshop for Approaches to Development: Following widespread demand for training in development skills and approaches at the field level, a short term-training/orientation course on *Science-led Approaches to Rural Development* was conducted. A three-member resource team of social scientists, two of whom were from UDRC, developed the course over a few weeks, setting out the basic content and framing the methodology. It was decided to involve our own experienced staff as in-house resource persons, and to give them guidelines in tackling the assigned topic appropriately, in terms of both content and process. About 40 staff members participated in the course, and were divided into three groups – new entrants, older staff members and resource persons. Pre-course assignments were given to all three groups – village studies and case studies of success/failure for the first two and leadership of one or more sessions to the resource persons. Thus capacity building could take place at the three levels of orientation, refresher and trainers' training, while basic concepts were articulated, clarified, illustrated and recorded. The course was conducted over three days in June, 2004, and has been documented in detail. The village studies and case studies have been collected and are being prepared as study material for the future.

In-house participatory research study: The study was conducted by the field staff on the differential impact on men and women in the community of the grassroot groups namely SHGs (mainly female) and farmers' associations (mainly male) and examine, if any changes in gender relations at the community and household level could be observed. The same three-member team planned the study over a period of time, and prepared the tools and methodology. The second objective of the study was to sensitize the field staff and give them basic training in skills for social research in the field. Twelve staff members were selected and given an initial two-day orientation on field research methods. Pairs of workers assigned to the five selected field sites in TN and Kerala, carried out the work from July to September. The teams have submitted their reports. The entire data has been tabulated and a comparative analysis is in progress.

Sub Programme Area 603

Voicing Silence

Voicing Silence continued with its revised strategy of working with different groups of women using theatre as a tool for empowerment.

Traditional women artists' group: This year saw the culmination of five years of effort to

empower this group of 12 women to set up an autonomous theatre company. In February the group performed the full-length (all-night) play *Kannagi - Manimekalai* combining the traditional play *Kovalan Kathai* with *Manimekalai*, earlier developed by *Voicing Silence*. The show, which signalled their availability as a group, was attended by a number of company managers looking for talent for the next season. During the period February – September 2004, there was no activity with the women artists, as this period is the height of their own regular performing season, and they are not available for additional activities. At the end of every performing season, the "companies" for the next season are usually formed/re-formed and announced with a performance. In September, 2004, the women's company was launched as a wing of a theatre company, by its manager, who will oversee the financing and management of the women's company also. The opening performance on 29 September in a village near Kanchipuram formalized the arrangement, and was reported in the Tamil media. The group of twelve women is autonomous in terms of choice of plays, assignment of roles, and all matters connected with artistic direction, while programme schedules, arrangements, and finances are the responsibility of the company manager. Regular performances by this group have begun from early 2005. The long-term success and viability of the group cannot be commented upon at this stage.

Aravanis' (trans-sexuals) theatre group: Though first contacted in August, 2003, the group re-established contact only 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 marginalized segment of society. At the end of an intensive five-day workshop held in the last week of April, 2004 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. It was performed on the last day to a small audience of friendly critics.

Since May, 2004, this play has been in regular performance for advocacy and the theatre group now has a name and identity of its own. More than 20 performances have already been held in different parts of TN, in villages, small towns and cities and in Chennai, in support of the human rights of *aravanis*. The performances have been in different settings and for different audiences, including students and young people, and are invariably followed by a discussion. There has already been a powerful effect, well documented by the media, on awareness of the human rights issues raised by *aravanis*, and reflected in the remarkable degree of response from various organizations. For example, Government housing has been offered to the group, and is in the process of being built, while others have had access to jobs, formerly denied to them, and vocational training. They have also received support for their campaign to get voting rights and identity documents. The performances have been sponsored by different agencies; *Voicing Silence* sponsored only the first one. Sometimes, funds are even collected on the spot after a show to support the campaign. The

movement is slowly taking off with the help of theatre, though there are still many difficulties to be surmounted.

Of the three groups that *Voicing Silence* has worked with so far, two have moved ahead towards the objective of being able to work autonomously, while the third, the group of village women from the Biovillages project in Pondicherry which emerged last year, has not. After the initial enthusiasm, and the visible impact on their self-confidence, which has even been documented on video, the group has not followed through with the series of planned local performances, due to various preoccupations, lack of financial support and local conflicts.

Documentation

When *Voicing Silence* completed ten years of work, a need was felt for an objective and critical study by a sympathetic professional. A young theatre scholar, with a special interest in women's issues and women's theatre, was invited to take up the assignment. Based on her study of all the available documentation in both print and audio-visual form, observation of some performances, participation in some workshops and festivals, as well as interviews with many of those who had taken part in the activities of *Voicing Silence* over the years and in-depth conversations with the two project leaders, the manuscript was completed towards the end of 2003 and has been accepted for publication by a leading specialist publisher. However, work on editing and processing the book has just started, and it is expected to be out only by early 2006.

Sub Programme Area 604

The Hindu Media Resource Centre

The Hindu Media Resource Centre (THMRC) was established in 1998 to act as an interface between experts of diverse fields and media professionals, with the prime objective of reaching the general public through the media. It regularly organizes Media Workshops, Millennium Lectures, Public Fora and Media Tours, in addition to producing documentary films and maintaining a website (www.mssrf.org).

Media Workshops provide scope for brainstorming important ethical, social, cultural and scientific issues in a holistic manner. THMRC organized six media workshops (Table 6.4.1) covering issues like mangrove restoration and organic farming (See SPA 101). 15 articles were published on these issues in both national and regional newspapers. The importance of community participation in any developmental activity, especially in mangrove restoration, was well documented by the media.

Millennium lectures are the views of experts who have an excellent understanding of issues at the global and national level. THMRC organized four such lectures on Gender Dimensions and Hunger free India (Table 6.4.2) and three Special lectures/programmes (Table 6.4.3).

Public fora are planned in easily accessible locations to enable the general public, students

Table 6.4.1: ***Media Workshops***

Date	Theme
5 June, 2004	*Coastal Wetlands: Mangrove Conservation and Management*
14 June, 2004	Policy Advocacy media workshop on *Joint Mangrove Management*
2 July, 2004	*Organic Farming and Marketing*
27 July, 2004	*Mangrove Wetlands: Conservation and Management*
4 September, 2004	Media and Expert Consultation on *Farmers' Distress and Suicides – Causes and Cures*
13 March, 2005	*Public-Private Partnership in Biotechnology*

Table 6.4.2: ***Millennium Lectures***

Date	Theme
3 September, 2004	*Gender Dimensions in Rice Farming - Implementation to Policy* - Prof Abhijit Sen, Member, Planning Commission, GoI and Professor, Jawaharlal Nehru University
31 October, 2004	*Learning: Our Common Wealth* - Sir John Daniel, President, Commonwealth of Learning
26 November, 2004	*Women, Food for Work and Human Development* - Mr Pedro Medrano, Country Director, The United Nations World Food Programme, India
11 January, 2005	*Mission 2007: Hunger free India* - Dr. Daniel Gustafson, FAO Representative for India and Bhutan

Table 6.4.3: ***Special Lectures/Programmes***

Date	Theme
10 December, 2004	*Making Science Sing* - Mr Jeremy Webb, Editor, *The New Scientist*, London
12 January, 2005	*The Immortal Singer…* In remembrance of Sangeethakalanidhi Smt M S Subbulakshmi
2 April, 2005	*Beyond Tsunami: Significance of the Dandi March* - special programme to commemorate the 75th Anniversary of Mahatma Gandhi's Dandi March and Salt Satyagraha

and media persons to interact with leading scientists. To create a habit of active participation, arts and engineering college students were encouraged to take part. On the occasion of the birth centenary celebration of late Shri JRD Tata, a public forum titled "Job-led Economic Growth: Towards a Sustainable Self-help Revolution" discussed the role of SHGs in generating microcredit and taking up social issues effectively. It was observed that banks should provide long-term viability to make the self-help groups more sustainable (Table 6.4.4).

Media professionals from Chennai were taken on a tour of MSSRF site offices. Interacting with the community gave them insights and in-depth understanding of the issues, and their successes and failures. This motivated others when it was published as a feature story in newspapers. Kakinada in AP and Pichavaram, Kalpakkam and Kolli Hills in TN were covered (Table 6.4.5).

Documentary films, targeting the media, donor agencies, national and international guests, experts in different fields, students and the public, were scripted, directed and produced to document the activities on mangrove restoration and conservation in AP and Orissa. A motivational film illustrates the concept of community banking. "We shall overcome…" - a docu-drama enacts the tragedy of the tsunami, and the use of the VKCs for warning and saving lives. The impact of mangrove forests in saving lives during such disasters is also documented. The film revolves around the post-tsunami activities in building new lives

Table 6.4.4: ***Public fora***

Date	Theme
12 March, 2004	*Biotechnology and Shaping the Future of Rice*
18 July, 2004	*Job-led Economic Growth: Towards a Sustainable Self Help Revolution*
29 October, 2004	*Integrated Water Resources Management Approaches: Global and National Scenario*
11 March, 2005	*Biotechnology and Global Public Good*

Table 6.4.5: ***Media Tour***

Date	Theme
27 July, 2004	Ten national and regional language journalists who were taken on a tour of MSSRF sites, attended the media workshop on *Joint Mangrove Management Activities* and interacted with the people at Pichavaram, TN.
31 March, 2005	Journalists and representatives from All India Radio were taken for the launch of *Shaping the future of the fishermen after Tsunami* at Sadras Kuppam, Kalpakkam.

and livelihoods. These films were screened during various occasions (Table 6.4.6).

The *Mannin Manam* programme, which began to be broadcast last year, was continued. To understand and document the feedback of the audience, an interactive session was organized for people who have been regularly listening and sending their feedback, under one umbrella called the Radio Club.

The members represent the entire state. Indian bank, All India Radio (AIR), MSSRF and 90 farmers of the club attended the interactive session. The farmers wanted the programme to continue for another 52 weeks as they liked its participatory approach. Their suggestions were documented as input for forthcoming programmes.

The *website* is the window for the world to find out more about MSSRF. The post-tsunami action plan for building lives and livelihoods, minutes of meetings, details of individual and institutional donors who extend financial support, *New Andaman* action plan and paper presentations are some of the highlights.

Public relation being another dimension of the mandate, media liaison for all the events organized by MSSRF is taken care of (Table 6.5). So far 254 stories and in-depth articles have featured in print, in addition to the electronic medium. Seventy-five developmental stories, reporting post-tsunami activities, were coordinated for AIR, private and government television channels, newspapers and community radio channels.

Table 6.4.6: ***Documentaries produced during the year***

1.	A Way to Prosperity – A Kudankulam experience
2.	Power of Partnership – Film on Friends of MSSRF, Tokyo
3.	*Pani t-thee* – Subtitled in English
4.	*Thullal* – documentation of the play
5.	*Arangerum ezhuchi* – An advocacy film on women's empowerment
6.	Message from Mangroves – Film on Orissa mangroves
7.	Biodiversity, Natural Resources and Rural Livelihoods- Project impact film
8.	Vision, Progress and Prospects – Invocation film
9.	Message from Mangrove Wetlands – Activities covering TN, AP & Orissa
10.	Gene Bank – Activities covering the decade
11.	Biological Management of Water Hyacinth – Project proposal – a visual tool
12.	In Remembrance – Dedicated to those who lost their lives in the Kumbakonam tragedy
13.	Gender Module – MSSRF and Kerala Agricultural University
14.	Towards Sustainable Management of Natural Resources – A film on effective soil and water management
15.	We Shall Overcome ... – A film highlighting the activities of post-tsunami rehabilitation
16.	Eternal Relevance of the Sea as a Social Resource – A Film marking the 75th Anniversary of the Dandi March

Table 6.5 : ***Media liaison***

Date	Theme
18 June, 2004	*Measures of Impact of Science and Technology in India: Agriculture and Rural Development* Interaction with Dr R Chidambaram, Chairman, Atomic Energy Commission
18-19 July, 2004	*Declaration on National Consultation on Sustainable Self Help Groups (SSHGs)* Press conference with Prof M S Swaminathan Chairman, MSSRF
26 December, 2004	*Post-tsunami Reports on Info Village* - Press conference CNN - Mr Ramesan, Chennai Ms Radha Bhan, Singapore, and Financial Express,Dinamalar
10 January, 2005	*Beyond Tsunami – Rebuilding Lives and Livelihoods* - consultation under the aegis of NCF, followed by press conference by Prof M S Swaminathan, Chairman, NCF and MSSRF
11 January, 2005	Launch of MSSRF – WFP Technical Resource Centre for Food Security and Media interaction with ASPEE women farmer awardee
7 March, 2005	*Biotechnology and Organic Farming* – An interdisciplinary dialogue
11 March, 2005	*Nano-biotechnology - Implications on Food Health and Nutritional Security* - An Interdisciplinary dialogue
18 April, 2005	*Role of Biodiversity in achieving the UN Millennium Goals* – International Consultation NDTV – Mumbai, Together – Bangalore, Malayala Manorama – Kottayam
10 May, 2005	*Salt Tolerant Gene*, Summer camp - Dr Ajay Parida, Programme Director, Biotechnology, MSSRF
12 May, 2005	*Tsunami Rehabilitation: Achievement of Millennium Development Goals,*- Mr Lennart Båge, President, IFAD
15 May, 2005	Sesame Village Project – Farmers' Meet-Media Coverage at Erode
28 May, 2005	*New Andaman - Action Plan* - Media conference by Prof M S Swaminathan, Chairman, MSSRF & Prof P C Kesavan, DAE Homi Bhabha Chair, MSSRF

Sub Programme Area 605

Every Child a Scientist Programme

This programme was started in Chennai in August 2002 and targeted children belonging to the economically under-privileged sections of society, in the age group of 13-15 years. The Centre has a number of computers and multimedia learning material to make learning an enjoyable experience. With encouragement from the Deputy Commissioner of Education, Chennai, it has established good rapport with Corporation school headmasters, teachers, orphanage schools and government-aided schools in the Zone X area. The Programme is also in operation at Wayanad (See SPA 301.2).

At Chennai, monthly, theme-based training modules of 10-day duration were conducted, to reach more schools and students in a year and ensure optimum utilization of the resources at the Centre. They were on topics like Ecotechnology, Biodiversity, Information and Communication Technology, Health and Hygiene, Environmental issues and Biotechnology. About 300 students benefited from this programme during the year. In March, a series of lectures, followed by practical training in batches spread over the month was also carried out on an experimental basis, to cover more schools and students. In addition to the fourteen schools that have already undergone training, two new schools have been identified and have sent their students during the year.

At the end of each theme-based programme, the students submit projects on different topics and depict their ideas through charts. These charts act as a source of information to subsequent batches of students.

A Science Exhibition was held in November 2004, and students from various schools prepared models on environmental issues including pollution, forestation, deforestation, rain water harvesting, acid rain, the five types of land, and uses of medicinal plants. There were also a few working models. Nearly 200 students visited the exhibition. The children explained their messages enthusiastically through dance and song to the visitors. On Children's day, a lecture on "Children in love with Nature" by Dr Kundavai Devi, Madras Crocodile Bank Trust, was organized. Teachers and students from many schools attended this lecture. Dr Kundavai Devi brought many reptiles like snakes, tortoises, and chameleons and explained their habitat, morphology and feeding habits.

The Centre has developed resource material on various topics in the local language as multimedia CDs. This programme has stimulated curiosity among the students, while giving them an opportunity to learn the concepts of Biology and environmental issues.

Touch and Smell Garden

This garden was developed to allow the visually challenged to experience the biodiversity in plants and learn through the senses of touch and smell. This year a seed album was developed for children to learn about the

different types and shapes of plant seeds and their characteristic features. The idea was to expose the children to the plant kingdom, via seeds. The seed album at present has a number of species like *Allium cepa, Piper cubeba, Piper niger, Abrus precatorius, Pongamia glabra, Sapindus emarginatus and Plantago ispagula*.

In February 2005, a workshop was held for Heads/Principals of schools for the blind in the state. A total of 40 Principals and Government officials participated in the workshop and valuable suggestions emerged. A number of them showed interest in replicating this garden in their premises. The names of plants, the rationale for selecting the species and the layout of the garden were explained at this meeting. A group 30 NSS volunteers and students also participated in the workshop, which achieved the twin objectives of creating an awareness about the need for such gardens and orienting the participants towards developing such gardens within their campuses.

Genetic Literacy and Genome Clubs

This programme is in its third year, with the focus on two major target groups, namely, school children and Panchayat members at the grassroot level. A number of camps/workshops were held throughout the year as shown in Table 6.6. At the workshops for school/college students, participants were introduced to topics such as Biodiversity and Biotechnology, Implications of Biotechnology for Rural Development, Biodiversity Act and Role of Institutions dealing with Biodiversity Material, Biodiversity and Conservation through Genome Clubs, Implication of Biological Diversity on Research and Commercialization related to the Indian System of Medicine, Ethno medicine of tribal communities of South India and the fundamental need for conservation of Biodiversity.

For the Panchayat leaders, the workshop included themes like the basic biology of genes and genetic diversity of rice in the Jeypore tract, genetic literacy, genome clubs and biotechnology, and the importance of genetic awareness for rural development. A workshop for school teachers was also conducted, at which the role of teachers in rural development and biodiversity conservation through the Genetic Awareness Programme was emphasised.

A Genome Club member won prizes at the Science Exhibition held at the district level. Members of the Genome Club and other students carried out village sanitation programmes, especially on 15 August and 2 October. The club members contribute articles and poems for "*Genome Shikhha*"(Genomic Flame), the bimonthly magazine in Oriya that is being printed and distributed in Jeypore. Some of the students have started a genetic awareness campaign on their own in their villages and schools. The participants have been able to develop village level Bioresource Registers. Genome Club members have also organized various competitions in their school (See SPA 102 also).

Table 6.6: ***Genetic awareness workshops***

No. of programmes conducted	Topic	No. of participants	No. of participants		
		M	F	SC/ST	General
1	Summer Camp for School Students	15	6	8	13
6	Workshop for School Level Genome Club	235	370	458	147
3	Seminar for College Students on Genetic Literacy	169	80	24	225
7	Panchayat Level Genetic Literacy Programme	110	62	60	112
1	Training Programme for School Teachers on Genetic Literacy	50	25	55	20

Vacation Training Programme for school children on Bioresources and Biotechnology

This year MSSRF conducted two programmes, one in Orissa (11 May – 31 May 2005) and one in Chennai (25 April – 11 May 2005). The objective of these programmes was to create awareness on Biodiversity Conservation and its implications. The programmes offered a unique opportunity to interact with experts in the field and be inspired by them. As part of the course, the students visited Biodiversity-rich areas like Kolli Hills and Chidambaram in TN and Bhitarkanika Mangrove Forest, Nandankaanan Zoological Park, Chilika Lake and other areas of pristine biodiversity, including the Jeypore rice tract, in Orissa. The students also conducted experiments in the laboratory and got a first hand experience of working in frontier areas of Biology. They had the opportunity of visiting the Raasi Seed Company, Athur, where they learnt about crops, the strategies employed for selecting, and screening for desirable traits. Some of the students also participated in the hybridization experiments in their farm. In addition, the participants visited leading national laboratories and gained exposure to various technical and scientific advances in the areas of Bioresources and Biotechnology. Twenty-two students in Chennai and twenty-seven students in Jeypore who had appeared for standard X examination in March 2005, took part in these programmes.

Sub Programme Area 606

Library and Information Services

606.1 Design and Development of Databases and Maintenance Services

The Informatics Division has been working to enhance capacity building and information networking by collecting, collating and disseminating actionable information. Informatics is also looking after the intranet, web services, remote administration and email administration.

606.2 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. The Centre also supports a CD-ROM library, which offers CAB Abstract searches free of cost. From June 2004 to May 2005, 1,262 researchers from 23 universities, 16 research institutions and 46 colleges used the CD-ROM library. The concept of Open Access is also being promoted.

606.3 Library

The Library provides relevant information and plays an important role in meeting the needs of the research programmes of the institution. The main services rendered are Online Public Access Catalogue (OPAC), Current Awareness Service (CAS), Selective Dissemination of Information (SDI), Online Information Retrieval System (E-Alerts), Photoduplicating Service and Publication & Distribution Service. It also provides documentation support through the print and electronic media.

The Library holds books, journals, back volumes of journals, reports, newspaper clippings and CDs. These relate to various subjects like Agriculture, Biodiversity, Biotechnology, Climate, Education, Food & Nutrition, Forestry, Gender, Health, Information Technology and Rural Development.

During the year, 855 new books were added to the existing collection. The journals available in the library are 110 in number. There is a collection of 98 newspaper clippings relating to MSSRF and its activities during the year 2004-2005. CDs dealing with different subjects have also been added and back volumes have gone up by 228 in number.

The Library is open to all and provides open access to its resources. The facilities are used not only by the staff of MSSRF, but also by students and researchers from Chennai and outside. There were 1,057 external users during the year.

Sub Programme Area 607

Conferences and Workshops

Many conferences and workshops were organized during the year, both at Chennai and the various site offices. Some of them have been reported under the respective programme areas, such as the various regional consultations on *Mission 2007: Hunger free*

India. The series of events organized to commemorate the International Year of Rice has been reported as a special project, to highlight the importance of the activity. A few of the other important meetings organized during the year are highlighted in this section.

Agenda for National Happiness, 4-5 August, 2004, Chennai

A small group of 35, comprising academicians, bureaucrats, nutritionists, doctors, civil activists, economists, journalists, and representatives of UN agencies and NGOs, debated for a day and a half, on happiness and how to achieve a state of national happiness, at an interdisciplinary dialogue on "Agenda for National Happiness", on 4 and 5 August, 2004. The meeting was one of the events organized to commemorate the birth centenary of the eminent industrialist and philanthropist, Bharat Ratna late Shri J R D Tata.

The dialogue was formally inaugurated by Mr. Russi Lala, former Director of the Sir Dorabji Tata Trust, who set the tone by emphasizing the human aspect and highlighting several instances of positive humanism from Shri J R D Tata's life. Shri M V Rajasekharan, Honorable Minister of State for Planning, Government of India, presided over the inaugural session, Professor M S Swaminathan explained the theme and purpose of the dialogue and Mr Pedro Medrano, Country Director, UNWFP, delivered the Keynote Address.

Summing up the discussion, Professor Swaminathan held up 4 Fs as prerequisites in fostering a mindset for happiness: Freedom from Want, Freedom from Fear, Freedom of Worship and Freedom of Expression. The role of education as a tool, the importance of social and gender equity, the role of media, the need to rise above dogmatism and fundamentalism, health security for all, greater power to the people through local self-governance and people-centred development, were among the many aspects that were stressed. There was considerable debate on measuring and monitoring tools, on the relativity of the concept of happiness and how it differs from person to person and group to group.

Interactive Workshop on Crop Biofortification for Alleviating Micronutrient Malnutrition, 22-23 August, 2004, Chennai

An Interactive Workshop on *Crop Biofortification for Alleviating Micronutrient Malnutrition* was held on 22 and 23 August, 2004, to discuss the strategy that could be adopted to complement the fortification measures already being implemented in the country, and the prospects of employing biotechnological options for enhancing the nutritional status of the staple foods, to combat the problems of malnutrition. In order to gain an in-depth understanding of the global efforts on Biofortification, the Harvest Plus team of the CGIAR was invited to participate in the meeting. About 40 participants discussed the possible role of the biotechnological tools that could be used to address the issue of malnutrition on a network model. The

Secretary, DBT, Dr M K Bhan and the Programme Director of Harvest Plus, IFPRI, Dr Howarth Bouis, set the tone of the proceedings.

A major recommendation of the workshop was to develop networks on rice, wheat and maize biofortification, with experts drawn from different institutions. The National Institute of Nutrition would provide testing facilities for the nutrition components and bioavailability of iron and zinc *in vitro* and *in vivo* of the biofortified products to be developed under various networks and provide overall guidance on matters related to the nutrition status of the target populations. Linkages will be developed with the Harvest Plus programme so as to avoid duplication and get the benefit of their experience as well. The DBT would consider proposals for setting up the facilities necessary for testing nutrients and the bioavailability of micronutrients. At the same time, a partnership between the public and private sectors would be fostered on the basis of an ethical code designed to ensure the supremacy of the principles of public good and social inclusion in relation to the dissemination of the varieties emanating from this coordinated project.

Farmers' Distress: Causes and Cures, 4 September, 2004, Chennai

A one-day consultation was organized in collaboration with the NCF to deliberate on the root causes for farmers' distress across the country and identify the short-term and long-term measures needed to face the crisis. The well-known journalist Mr P Sainath, who has been covering the issue extensively, set the tone for the meeting with his keynote address. Farmers' Associations from TN, AP and Kerala were represented and the problems facing them were discussed. The problems in Karnataka and Orissa were also highlighted. The Agriculture Minister of AP, Shri Raghuveera Reddy, participated in the discussion on AP. Government officials, academicians, journalists, NGOs, bankers and officials from leading insurance companies were among the other participants. The deliberations revealed the multi-dimensional nature of the agrarian crisis. The output from the meeting contributed to the first report of the NCF, submitted to the Government of India in December 2004.

Access and Benefit Sharing Policies and Laws for Asia Pacific Region, September 22-24, 2004

Experts from South Asian countries and Europe participated in the three-day workshop. It provided an overview of the current trends in South Asian countries and information on the Indian scene.

Workshop on ICT-enabled development: South-South Exchange through Travelling Workshop, 15-22 October, 2004, Chennai

The South-South Exchange travelling workshop took place for the third year in succession in October, 2004. It brought together 21 development practitioners from 15 countries (including four from India) to learn about the MSSRF approach on using ICT, share their knowledge with others and interact directly with the villagers. Participants discussed the hub and spokes model, technical

specifications, institutional structure, local content creation and rural livelihoods.

Workshop on Up-Scaling pro-poor ICT-policies and practices, 17-19 November, 2004, Chennai

MSSRF and SDC together organized a workshop on the use of ICT for poverty reduction. Practitioners and policy makers from Asia and Africa met from 17-19 November, 2004 in Chennai, India, to review experiences in Asia and Africa in the use of ICT for poverty reduction. The event was organized in coordination with and supported by the Global Knowledge Partnership (GKP), One World South Asia and the UNDP.

The *Chennai Statement* was issued at the end of the workshop. It reflects the shared concerns of the participants. Among the participants were representatives from multilateral organisations, bilateral agencies, non-governmental organisations and the private sector. The *Chennai Statement* will serve as an input for the on-going global debate on the role of ICTs for development, and in particular, the poverty reduction agenda for the implementation of the World Summit on the Information Society (WSIS) principles and action plan, in the context of the Millennium Development Goals (MDGs)

Symposium on Uncommon opportunities – A Roadmap to Peace, Employment and Food Security, 20-22 November, 2004, New Delhi

This symposium was held on the occasion of the tenth anniversary of the International Commission on Peace and Food (ICPF), chaired by Prof M S Swaminathan in 1994. The symposium was jointly organized by MSSRF, WFP, NCF, International Commission on Peace and Development, and Mother's Service Society, Pondicherry. The symposium had four sessions. The inaugural session was on 20 November. It was followed by three sessions on peace, employment and food security on 21 and 22 of November, 2004.

The symposium was designed to address inter-related issues of peace, employment and food security and highlight the importance of the components of food security, livelihood security and internal and external security.

Prof M S Swaminathan introduced the topic of uncommon opportunities for employment, food security and global security. The External Affairs Minister Mr. Natwar Singh, delivered the keynote address. This was followed by the inaugural address by His Excellency the President of India, Dr A P J Abdul Kalam. Mr Pedro Medrano, Country Director, WFP, gave a special address on the occasion. Several eminent persons including members of the International Commission on Peace, the President of the World Academy of Arts and Sciences, Dr Walt Anderson, its Past President, Dr Harlan Cleveland, the author of the Book, *World Peace Army*, Mr Robert Von Harten and the Secretary General of the Pugwash Conference, Prof Paolo Cotla Ramusimo, participated. A number of retired defence personnel and analysts and members of the diplomatic corps from India and abroad, were also present. There was active

participation in the first session on peace and global security. Topics ranging from nuclear disarmament to internal and external threats to peace were discussed. The forenoon session on 21 November, on Employment, was chaired by Dr S P Gupta and the afternoon session was chaired by Dr Montek Singh Ahluwalia, Deputy Chairman of the Planning Commission. This session had many presentations on employment opportunities. The session on food security on 22 November and the concluding session that followed were chaired by Prof M S Swaminathan. Several presentations dealt with the problems of food production of small farmers. The role of ICT in reducing knowledge gaps was discussed.

The B V Rao Centre for Sustainable Food Security and the Ford Foundation Chair for Women and Food Security were actively involved in organizing the event, making summary presentations and bringing out a booklet of the important speeches.

Workshop on Learning from ICT for Rural Development Projects in Asia, 1-3 December, 2004, Chennai

MSSRF and IDRC organized this workshop from 1-3 December, 2004. Participants from Afghanistan, Bangladesh, Bhutan, Canada, Laos, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, and USA met and exchanged experiences and validated the key learnings from the various projects. They also discussed common issues facing ICT for rural development projects, such as appropriate connectivity, content, and sustainability.

Beyond Tsunami: Saving Lives and Livelihoods, 10 January, 2005, Chennai

The meeting was convened jointly by MSSRF and the NCF, a fortnight after the tsunami struck, to discuss the rehabilitation measures to be initiated at different levels and time frames. Water, shelter, sanitation, health and revival of livelihoods, psychological rehabilitation, repair of catamarans and achieving convergence and synergy among all on-going programmes with similar objectives, were identified as the immediate tasks. Ecological rehabilitation, agronomic rehabilitation, economic rehabilitation and disaster preparedness, mitigation and management were identified as the medium-term tasks over the two-year period of 2005-07. Strengthening environmental defense systems, enlarging opportunities for sustainable livelihoods based on a pro-nature, pro-poor, pro-women orientation to technology development and dissemination, improving the productivity, profitability and sustainability of agriculture and fisheries were listed as the long-term measures needed over a 5-year timeframe. About 50 people actively associated in post-tsunami relief and rehabilitation in South India participated.

Inter-disciplinary Dialogue on Biotechnology and Organic Farming, 7-10 March, 2005, Chennai

The evergreen revolution methodology is based on an integrated natural resources management strategy, and is not just commodity-centered like other green revolution technologies. Soil health care, water

conservation and management and integrated pest management receive attention on a systems basis. Biotechnology could play an important role in this as it involves a basket of technological approaches to promoting the productivity, profitability, sustainability and stability of major farming systems. The biological software essential for sustainable agriculture like biopesticides, biofertilizers, vermiculture and similar techniques receive intensive attention. The aspect of Biotechnology which is of concern to organic farmers, is recombinant DNA technology. Such transgenics have been the subject of considerable debate and discussion. Biosafety protocols are still being evolved in different countries, although the Cartagena Protocol based on the Global Biodiversity Convention is now being implemented. While it is recognized that the Green Revolution was a product of public research, the Gene Revolution is largely viewed as being in the hands of the private sector. The need for the desegregation of the various concerns relating to the gene revolution, and whether there could be a possible co-existence of biotechnology and organic farming, were the areas of discussion in this dialogue. Over 50 participants who represented the stakeholders attended the dialogue.

The main issues of contention identified by the participants in the GM debate included the priorities for research and who sets them, the need to assess the alternatives before choosing a path, whether the research is being driven by markets, and ethical considerations. It was agreed that risk assessment measures should be put in place and good monitoring plans should be prepared before products of such technologies are taken to the field or marketed. Finally, the participants agreed that well-defined National Policies in Biotechnology were absolutely necessary.

Nanobiotechnology: Implications for food, health and nutrition security, 11-13 March, 2005, Chennai

This year, the annual dialogue was Interdisciplinary and focussed on *Nanobiotechnology: Implications on Food, Health and Nutrition Security*. This was jointly organized by IFPRI and MSSRF from 11 to 13 March, 2005. The Governor of TN, Shri Surjit Singh Barnala, inaugurated the dialogue. There were about 50 participants from both India and abroad, including the IFPRI trustees, deliberating on the applications of nanobiotechnology.

The main recommendations of the meeting included the need for conceptual clarity on the role of nanobiotechnology in food, health, ecological and livelihood security, the design and launch of a National Challenge Programme on Nanobiotechnology and Food and Health Security, and the need for regulatory mechanisms. The proposed National Biotechnology Regulatory Authority could have a Standing Committee on Nanobiotechnology, and a few centres of training, retraining and retooling in the techniques and rules of Nanobiotechnology, should be identified. There is an urgent need for greater interaction between scientists and media personnel on the risks and benefits associated with biotechnology and nanobiotechnology. The

proposed National Board for Strategic Agricultural Research should launch a National Mission for Nanobiotechnology for Sustainable Nutrition Security.

Beyond Tsunami: Significance of the Dandi March, 2 April, 2005, Chennai

The meeting convened to commemorate the Platinum Jubilee of the Dandi March and Gandhiji's Salt Satyagraha, focused on the importance of seawater as a social resource. Sea Water Farming, Enhancing Livelihoods in Coastal Areas, Biotechnological Tools for Salinity Resistance, Multiple Micronutrient Fortification of Salt, Salt Pans and Coastal Livelihoods, Shelterbelts and Protection of Coastal Communities and Livelihood Opportunities for Fisher Communities, were among the issues discussed. The subject assumed greater relevance in the context of ongoing post-tsunami rehabilitation activities. Shri Mani Shankar Aiyar, Union Minister for Petroleum & Natural Gas and Panchayati Raj, was the Chief Guest on the occasion. Government officials, including officials from the Salt Commissioner's office, representatives from marine and fisheries institutes, scientists and NGOs participated.

UN Millennium Development Goals - Five years later: Agricultural Biodiversity and Elimination of Hunger and Poverty, 18-19 April, 2005

MSSRF, the International Plant Genetic Resources Institute (IPGRI) and the Global Facilitation Unit for Underutilized Species (GFU), in association with other partners, organized an International Consultation on 18 and 19 April, 2005, to highlight the role of plant biodiversity in achieving the UN MDG on Hunger and Poverty. About a hundred experts and policy makers with varied backgrounds from 24 countries took part in the event. The task was to consider how agricultural biodiversity can help the world to achieve the MDGs, and in particular the goal of freedom from hunger and poverty.

The output from the Consultation was the development of a "Platform for Action" for enhancing the use of agricultural biodiversity in addressing UN MDG on extreme poverty, hunger and health. This document may be presented to the UN General Assembly in September 2005, ("UN Millennium Assembly and Summit plus 5") which will facilitate the international community to revise the action plan related to the MDGs. The highlights of the Chennai Platform for Action for a Hunger and Poverty Free World are the need to recognize that incorporation of agricultural biodiversity conservation and sustainable use in national development plans, such as Poverty Reduction Strategies, along with the creation of cross-sectoral linkages and coherence among concerned Ministries at the national level, is important for the delivery of the MDG. Emphasis on the need for a decentralized and community-managed sustainable nutrition security system based on expanded agricultural biodiversity; recognition and reward for the invaluable contributions of rural and indigenous people, particularly women, in the conservation and enhancement of agricultural biodiversity and conferring of social prestige and economic benefit to its primary conservers; promotion of local markets and access to

international markets for the products of agricultural biodiversity, especially traditional and functional foods; ensuring equity and fairness among all participants; the launch of national nutrition literacy programmes and the promotion of coarse cereals as nutritious cereals were the other issues taken up for discussion.

Science-Society Interface on Tribals and Biodiversity Related Legislation, 26 –27 April, 2005, Calicut

A national level, two-day consultation was organized by CAbC Waynad in collaboration with the Kerala Institute for Research, Training and Development Studies (KIRTADS). Shri A P Anil Kumar, Hon. Minister for Scheduled Castes and Scheduled Tribes and Cultural Affairs, Government of Kerala inaugurated the two-day interface. Several local dignitaries participated in the meeting. The issues discussed included the Biodiversity Act 2002, the Protection of Plant Varieties and Farmers' Rights Act 2001, and Traditional Knowledge. Representatives of various tribal groups from different parts of Kerala, scholars and officials participated in the meeting. The meeting was conducted in bilingual mode on the first day to enable maximum benefit to the participants. On the second day the programme was conducted in the local language, Malayalam. The tribal people felt that they should have a better say in influencing the decisions of the State Biodiversity Board. It was recommended that more young adivasis should be given training in biodiversity laws, to be able to play an active role in safeguarding biodiversity and scientific validation of their traditional practices, especially the use of medicinal plants. It was also suggested that 'bare foot lawyers' should be formed among the young tribals and given training to impart their knowledge to other tribal people.

Consultation on Post-Disaster Manage-ment and Prevention Strategies, 13-14 May, 2005, Chennai

MSSRF and IDRC organized a two-day consultation on Post-Disaster Management and Prevention Strategies at MSSRF, Chennai, on 13-14 May, 2005. Participants discussed the issues related to local governance, livelihood, reducing vulnerability, adaptation, and information empowerment at the meeting. The consultation was triggered by the devastation caused by the tsunami in South and Southeast Asia, including the east coast of India and the need for long-term prevention and management strategies.

National Consultation on The Role of Panchayati Raj Institutions in Spear-heading a Rural Knowledge Revolution, 9 June, 2005, Chennai

MSSRF, NCF, Gandhigram Rural Institute and Microsoft Unlimited Potential Programme together organized this consultation. Panchayat leaders from TN, NGOs, representatives from the Government, NABARD and Microsoft discussed the issues of the location of VKCs, content development, capacity building, ICT-SHGs, evaluation and monitoring, and sustainability. Panchayat leaders expressed their desire to be actively associated with the movement.

Programme Area 700

Special Projects

The International Year of Rice was celebrated through a series of regional and national workshops. A summary report of these has been brought out as a publication. The devastation caused by the tsunami that struck in late December triggered immediate relief and long term rehabilitation initiatives. Bioshields and restoration of livelihoods through a network of coastal Biovillages and Village Knowledge Centres are the key elements in MSSRF's post-tsunami rehabilitation effort. A special report was prepared on strategy for development of post-tsunami New Andamans at the request of the administration there. MSSRF was identified as the lead agency to implement a project on vulnerability assessment and enhancing the adaptive capacity to climate change in semi-arid regions of the country.

Sub Programme Area 701

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

The aim of the study is to capture the technological achievements of the Indian rural economy in the post-Independence period in the field of agriculture, comprising crop husbandry, animal husbandry, forestry and inland and marine fisheries. In addition, sectors of development vital for human health and wellbeing such as health care, water and energy have also been taken into consideration. The study does not attempt to analyse the impact of all the technological interventions in a sector; it concentrates on a few significant interventions that have helped in bringing about rapid transformation. In other words, the intention is to identify and analyse the impact of a particular technology that has been primarily responsible for triggering progress in a sector. Such significant technologies are referred to as *catalytic technologies* in this study.

Once the catalytic technology (or technologies) in each sector is identified, an indicator (or a set of indicators) is chosen to reflect its impact. Technology has at least three dimensions: development, diffusion and impact. Appropriate indicators will be identified to capture the progress in these dimensions.

The study will adopt an indicator-approach to measure technological progress across sectors. Attempts will be made to compute indices of technology development, diffusion and outcome. Given this methodology, there will be no attempts to either isolate the 'pure' effect of technological interventions or make an assessment of technical efficiency. This study relies on published secondary data and covers a time span of five decades, from 1951 to 2001, though the exact time period may vary across sectors.

The Office of the Principal Scientific Adviser to the Government of India has commissioned this study for a period of 2 years and work began in March, 2004. A Project Review and Monitoring Committee (PRMC) has been set up to oversee the project. In March 2004 the proposed methodology for the study was presented and it was reviewed at a Methodology Workshop organized at MSSRF in June to get feedback from experts.

The Methodology Workshop was presided over by Dr R Chidambaram, Principal Scientific Adviser to GoI and attended by more than 35 academicians and bureaucrats. Papers were prepared in the sectors of Crop Husbandry, Fisheries and Water Resources, which have been revised on the basis of the comments received. The First Reality Check Workshop was held at Shillong in November.

Draft reports on the various sectors are being prepared and circulated among experts.

Sub Programme Area 702

International Year of Rice

MSSRF organized a series of regional and national workshops during the year to commemorate the International Year of Rice.

The details of the workshops are given below:

- *Conservation of Rice Biodiversity*, organized in partnership with the district administration Jeypore, Orissa – 1-2 March, 2004.
- *Molecular Breeding and Shaping the Future of Rice*, National Colloquium, Chennai – 12-13 March, 2004.
- *Medicinal and Aromatic Rice of Kerala*, organized in partnership with the Regional Agricultural Research Station of Kerala Agricultural University, Pattambi, Kerala – 20-21 August, 2004.
- *Gender Concerns and Food Security Issues in Rice Livelihood Systems in India: Challenges and Opportunities*, National Seminar, Chennai – 2-4 September, 2004.
- *Rice Heritage of the North-East: Challenges, Opportunities and Strategies for the Future*, organized in partnership with the ICAR Complex for Northeast Hill Region at Barapani Meghalaya – 5-6 November, 2004. (See SPA 602.1)

Funding support for these events was received from FAO; DBT GoI; Planning Commission, GoI; XV Genetic Congress Trust; MAHYCO Research Foundation; WFP; Institute of Bioresources and Sustainable Development and National Medicinal Plants Board.

A summary report of the workshops is included in *Gender, Rice and Food Security – A report on the IYR Programmes,* which was released by Dr Daniel Gustafson, FAO Representative for India and Bhutan at MSSRF in January, 2005. Copies have been sent to the participants of the various workshops, institutions and sponsors.

A project on Rice Bio Park, to recommend the utilization of all the parts of the rice biomass, was finalized during the year and business plans prepared with support from TIFAC, to implement the project in TN, Karnataka and AP. This was presented to diverse groups at meetings in Chennai, Hyderabad and Shillong and was well received.

Sub Programme Area 703

Tsunami: Relief and Rehabilitation Initiatives

Tsunami waves hit the Indian coast on 26 December, 2004. The waves affected the coastal districts of four states, TN, Pondicherry, AP and Kerala, of which TN was the worst affected. The impact was huge in terms of the loss of human lives, natural resources and basic livelihood assets. Immediately after the devastation, Government departments, NGOs, civic organizations, corporate companies and local communities became involved in relief measures.

MSSRF is also planning various initiatives for medium and long term rehabilitation programmes, based on the framework suggested by Prof M S Swaminathan, Chairman, NCF, in his article published in *The Hindu,* 17 January, 2005: "Beyond Tsunami: An agenda for action", focusing on strengthening the ecological foundations of sustainable human security, rehabilitating livelihoods and fostering sustainable livelihood security and setting up knowledge centres.

703.1 Immediate relief measures

MSSRF helped to promote relief measures in Cuddalore and Nagapattinam districts. The MSSRF team conducted a rapid assessment of the situation in the affected villages in the Pichavaram, Parangipettai and Pazayar areas the day after the tsunami. On the basis of the assessment, as a first step towards relief, MSSRF helped in organizing community cooking in Killai village, where a relief camp for fishing families was established and in two *Irular* settlements, dependent on fishing in the mangrove waters for their subsistence. Transport facilities were provided to take the affected families to relief camps. In addition, MSSRF organized an informal coordination unit to perform day-to-day assessment of relief activities and facilitate the distribution of relief materials provided by various organizations. More importantly, MSSRF collected and distributed medicines that were needed by the Primary Health Centres and relief camps and extended support to the Association for Medical Doctors of Asia (AMDA), Japan, to organize medical camps in 25 villages, benefiting more than 6,000 injured people. AMDA brought physicians from various renowned medical institutions in India and Nepal, experienced in medical relief activities during natural calamities. Medical camps were organized to attend to the injured and help in immunization.

Help was offered to the UNWFP to tie up with various NGOs and the district administration in the tsunami affected districts of TN for distribution of fortified biscuits. Three hundred and fifty tonnes of biscuits in 75 gram packets were made available for distribution.

Swiss Humanitarian Aid (SHA), working under the auspices of the SDC, sought the help of MSSRF in working out the logistics and liaisoning with the relief and rehabilitation nodal officers of the Government of TN. MSSRF provided support to the team in damage assessment, trauma counseling, water and sanitation, medical supply and housing and hosted a satellite secretarial office for the SHA team and its associates for three months.

703.2 Mangroves, shelterbelts and tsunami in the Pichavaram region

A rapid assessment of the role of the mangroves in mitigating the impact of the tsunami in the areas around the Pichavaram mangroves began on 27 December (See SPA 104). This assessment showed that the fishing hamlets of MGR Thittu, Chinnavaikal, Pillumedu and Kannagi Nagar, situated on a sandy beach between the mangrove wetland and the sea, were totally exposed to the waves. Loss of life and damage to property were high

in these villages. On the other hand, fishing and farming hamlets such as Kalaingar Nagar, MGR Nagar, Killai Meenavar Colony, Vadakku Pichavaram and T S Pettai, which are located within the physical cover of the mangroves, were only slightly affected or totally protected. Loss of life and fishing crafts in the hamlets that were totally exposed to the tsunami waves and in the hamlets under the physical cover of the Pichavaram mangroves are shown in Tables 7.1 and 7.2.

Field visits to the mangroves the day after the tsunami indicated that a few trees located close to the sea had been uprooted. This indicates that the mangrove trees along the first few rows bore the brunt of the tsunami waves and the friction created by these and subsequent rows of trees reduced the speed of the waves. Discussion with the villagers who were fishing in the mangroves when the tsunami struck revealed that the sea water flushed into the mangroves by the tsunami was distributed into the natural tidal creeks as well as into the canals that are dug for restoration and hence the amount of water reaching a point was greatly reduced. This clearly indicates that the mangrove forest and associated wetlands together played a crucial role in mitigating the impact of the tsunami.

Scientific assessment

It was decided to conduct a scientific assessment of the little or no loss of life and property in the hamlets under the physical cover of the mangrove forests.

Selection of hamlets: Two hamlets, one exposed to the tsunami (designated as non-protected) and the other protected by mangroves, were selected, using the following criteria:

- The distance between the sea and hamlets should be more or less the same.
- The protected and non-protected hamlets should be located almost on the same elevation.

Table 7.1 ***Loss of life and fishing crafts in the hamlets that were exposed to tsunami in the Pichavaram region***

Hamlet	Total families	Total population	Casualty		Houses damaged	Fishing crafts lost
			Adult	Children		
MGR Thittu	173	856	24	26	163	43
Chinnavaikal	50	211	5	6	57	31
Pillumedu	45	120	5	7	82	20
Kannagi Nagar	10	30	2	0	04	05
Muzhukkuthurai	155	512	2	3	136	47
Total	**433**	**1,729**	**38**	**42**	**442**	**146**

Table 7. 2 ***Loss of life and fishing crafts in the hamlets that are under the physical cover of the Pichavaram mangroves***

Hamlet	Total families	Total population	Casualty*		Houses damaged	Fishing crafts lost
			Adult	Children		
MGR Nagar*	180	650	3#	0	0	15
Kalaingar Nagar*	76	306	0	0	0	0
Vadakku Pichavaram*	181	963	0	0	0	0
Killai Fisher colony	241	1,439	0	0	0	26
T S Pettai*	292	1,261	8#	0	0	24
Total	**970**	**4,619**	**11**	**0**	**0**	**65**

** Hamlets which participated in JMM and restored more than 300 ha of mangroves with the support of MSSRF and TN Forest Department # Died while fishing in the backwaters*

- The selected villages should be more or less similar in economic status.

T S Pettai, which is located about 1.8 km from the sea, was selected as the protected village because of the presence of a thick mangrove forest between this village and the sea. Muzhukkuthurai, which is located about 1.4 km from the sea, was selected as the non-protected hamlet, due to the absence of mangroves between the village and the sea. T S Pettai is located on the southern side of the Pichavaram mangroves whereas Muzhukkuthurai is located to the north of the mangroves and the distance between these two villages is about 6 km.

Indicators to assess whether mangroves mitigated the impact of the tsunami: The impact of tsunami on the villages was assessed, based on the following indicators:

Indicator 1: Loss of lives within the village due to the forceful entry of the waves

Indicator 2: Number and type of houses fully or partially damaged

Indicator 3: Extent of damage to the farm lands in the village

Results of the assessment: Analysis of the results indicates that a part of the Pichavaram mangrove forests, about 1,100 m in breadth and located on the eastern side of T S Pettai and a small lagoon, about 700 m in breadth, between the mangroves and the sea, protected the village. The mangrove forest patch that protected the village has three distinct vegetation zones. The first zone, which is about 10 m wide, is located along the edge of the lagoon and is characterized by the presence of *Rhizophora apiculata* and *R. mucronata* trees. These two species possess characteristic roots called stilt roots, which diverge from the branches and tree stems as much as 2 to 3 m above the ground and penetrate the soil some distance away from

the main stem. The primary function of these roots is breathing but they also provide strong physical support to the trees. They help the *Rhizophora* trees to withstand winds of as high a speed as 140 km per hour. During the tsunami, these roots absorbed most of the energy of the waves and reduced their speed. The root systems also deflected the water into the nearby canals and tidal creeks. Though some of the trees were uprooted in this process, they saved the village from destruction.

Another species called *Avicennia marina* is found next to this *Rhizophora* zone. It extends for about 1,000 m from the edge of the lagoon to the village. This species also has a special root system called aerial roots, which bind the soil tightly. After the *Avicennia* zone, a sandy area about 10 to 12 m in breadth is found. This sandy area is characterized by the presence of another mangrove species called *Excoecaria agallocha*; in the elevated portions of this sandy area, palm trees are found. T S Pettai is located next to the *Excoecaria* zone.

The tsunami, after crossing the lagoon, first traversed the *Rhizophora* zone and then the *Avicennia* and *Excoecaria* zones and finally reached the village. As a result, the speed of the tsunami was reduced considerably and it caused little damage to life and property. Apart from this, most of the water brought by the tsunami was distributed into the lagoon, canals and tidal creeks associated with the mangroves and the volume of water reaching the village was reduced to a large extent. Loss of life within the village of T S Pettai was nil and there was no damage to the houses. But there was a gap in the *Excoecaria* zone near the village through which water entered and damaged the groundnut crop cultivated in about 30 ha.

On the other hand, the non-protected village of Muzhukkuthurai, which is located about 1.4 km from the sea, was totally destroyed. No mangroves are present between the village and the sea, though a backwater system about 700 m wide separates the village and the sea. Even though it was able to absorb a considerable amount of water, the speed with which the water entered the village was high due to the absence of a barrier around the village. The mouth of the Pichavaram mangrove is located close to the Muzhukkuthurai village, through which also a large amount of water entered the village. As a result of all these factors, the loss of life and property, particularly the number of houses damaged, was high in this village. According to local reports, 5 people died within the village and 136 houses, mostly huts with brick walls, were damaged either completely or partially. This study proves that where mangrove forests have been restored, the impact of natural calamities is much less.

Another study was conducted on the role of coastal vegetation such as casuarina shelterbelts and sand dunes in mitigating the impact of the tsunami, the results of which are summarized below:

- Casuarina shelterbelts played a significant role in reducing the impact of the tsunami by reducing its speed. The sand dunes present along the coastal areas and

associated vegetation located near the villages also mitigated the impact of the tsunami by deflecting the waves.

- Multi-species shelter plantation will provide both ecological and livelihood security to the coastal community.
- Starting of casuarina plantations right from the high tide line is one of the serious concerns relating to shelterbelt plantation along the coastal areas. This may have serious implications on the ecology of the coastal areas, sometimes even on the wildlife:

  Many of the sandy beaches are utilized by sea turtles as nesting grounds and it has been reported in many places that raising of casuarina very close to the sea prevents nesting by sea turtles.

  Different species of crabs live in different vertical zones near the high tide line and planting of casuarina close to the high tide line would affect the niches of these crabs.

  Most importantly, a sandy beach supplies sand to the littoral current, which runs parallel to the shoreline. This current system, in combination with wind-induced waves, takes away sand from one place and deposits it in another area. Since this process takes place simultaneously all along the coast, a balance is achieved between removal and supply of sand in a given place and this balance prevents sea erosion. If shelterbelt plantations are raised from the high tide line, the supply of sand to the littoral current would be reduced or stopped (due to sand binding property of the plantation) and to compensate this, current and waves would remove large amounts of sand from other areas, leading to erosion in those areas.

In order to avoid such environmental problems it is recommended, on the basis of the above study, that shelterbelt plantations should start at least 50 to 75 m away from the high tide line. Studies on the role of Pichavaram mangroves and other vegetation such as shelterbelts in mitigating the impact of the tsunami were supported by the Japan Bank for International Cooperation and TN Forest Department.

703.3 Restarting the livelihood process through catalytic interventions in selected villages

The extensive fieldwork carried out in the tsunami affected villages in Cuddalore and Nagapattinam districts helped to understand the community's perception on post-tsunami relief measures and rehabilitation plans. Meetings were held with the affected families, village leaders, Panchayat leaders, local government officials involved in the relief measures and NGOs working in these villages. After a few months, the communities prepared to restart their livelihoods. Rebuilding requires the efforts and initiatives of several agencies with different capacities. In this context MSSRF made a modest effort to support livelihoods in selected villages.

Three hamlets (Table 7.3) which were very badly affected were chosen for the rebuilding

Table. 7.3 ***Impact of tsunami in selected villages of TN***

Village	Total population	Affected population	Casualty	Catamaran, boats & nets damaged (%)	Houses damaged (%)
Samiyarpetai	1,729	1,315	24	90	85
Muzukuthurai	512	155	5	70	65
Madavamedu (Nagai)	1,455	1,300	15	85	80

initiatives of MSSRF and synergizing the three pronged approach to rebuild life beyond the tsunami, in terms of developing coastal biovillage, bioshield and establishing computer-based VKCs in course of time.

Needs assessment and prioritization: Need assessment was carried out through informal interviews, group discussions with traditional panchayat and elected panchayat leaders and field observation of the ongoing relief activities. Discussions were also held with the local government officials and NGOs working in these villages. These meetings and discussions, especially with the villagers, revealed their intention to restart fishing activities, for which they needed immediate help. More than ten needs, *viz*. purchase of boat and net, repairing of boats, positioning big boats, house construction, identification of places for house construction, revolving fund, enterprises for fisherwomen, infrastructure like roads, landing centre and storage facilities, were listed by the different sections of the fishing community, of which three were prioritized for immediate action:

- Support to buy boats and nets
- Repairing of damaged boats (catamarans and small boats)
- Starting of traditional micro enterprises (fish vending by women)

The women vendors asked for financial support to restart their business and the men supported it, as it is vital to market the fish catch. The community decided to pool the resources contributed by different agencies and develop a system to share the available assets among themselves so as to provide an opportunity for each household. Subsequently community-based groups were formed in each village with representation from the Panchayat, meenavar Panchayat, women SHG leaders, government officials, representatives of other NGOs working in the village and MSSRF. A Memorandum of Understanding (MOU) was signed between MSSRF and the local group, indicating clear roles and responsibilities for each of the partners, in monitoring and sharing the resources and benefits. Based on the prioritization, MSSRF extended support to repairing engines and netmaking (*Kavalavalai*, and *Vaalavalai*) and provided a revolving fund for women SHGs to initiate traditional enterprises. The fishermen were able to revive their livelihood activities and the women to start their small-scale fish vending business.

Exposure visits to Village Knowledge Centres: Following discussions held with the villagers and the interest shown by them, an exposure visit to Pondicherry was organized for 34 men and women of the village level committees. They visited the hub and a few VKCs located in the coastal villages and interacted with the men and women in the villages and the local animators who are managing the VKCs. After their return they held meetings in their respective villages and expressed interest in establishing VKCs in their villages. MSSRF has already initiated the work and the centres will be established soon.

MSSRF has taken up a few long-term projects for implementation to address the problems of ecological rehabilitation, rebuilding of livelihoods of fishing and farming communities and to develop a grid of VKCs in the tsunami affected districts of TN, supported by different supporting agencies. These projects will be implemented in a process mode with the active participation and collaboration of other stakeholders like the village communities, district level government departments, NGOs, and banks.

With support from the DBT, the Govt. of India has selected four tsunami affected villages for ecological and economic rehabilitation activities. These villages have been selected on the basis of the damage, occupation of the villagers and opportunity for ecological and economic rehabilitation. The details are as follows.

Perzhyar: This village falls under Nagapattinam district, the worst affected district in the country. The village comprises 300 families with a population of 2,000, of which 150 families have been severely affected. There are opportunities for restoration of the degraded mangrove areas as well as undertaking some income generation activities.

Pattinamcherry: This village, with 300 families, has encountered about 200 deaths. Seventy percent of the houses are completely damaged. The village falls under Karaikal administration of Pondicherry.

Keelaranjore: This is a non-fishermen village of 155 families that has been severely affected by the tsunami. About 60 percent of the households have been affected. Twenty houses have been completely washed away. In addition, about 20 ha of land has been severely affected through the intrusion of sea water.

Sadras East: This is a village near Kalpakkam that has been severely affected, with reports of more than 50 deaths. Many people are agricultural labourers and are in urgent need of alternate livelihood options. The village has more than 250 families of which about 100 have been severely affected.

The broad areas in which MSSRF proposes to undertake activities with DBT support include establishment of VKC and Weather Forecasting Centres; ecological restoration; economic rehabilitation of the local communities for sustainable livelihoods through training and capacity building, and ensuring market linkages. A few of the identified areas include: mushroom cultivation, fish products, vermicompost, cultivation of medicinal plants,

poultry, goat rearing, trichoderma production, crab fattening, floriculture and horticulture.

Activities have been initiated in all the villages after discussions with the community. A VKC has been established in Sadras Kuppam. The project has also established a partnership with Venkateshwara Hatcheries Ltd. for a small poultry estate managed by SHGs trained for the purpose. The project is also working in close collaboration with the TN Veterinary and Animal Sciences University in the areas of livestock management.

Microsoft Corporation has sanctioned a project which includes developing a bioshield, soil reclamation of agricultural fields affected by sea water inundation, training the villagers on green and organic manuring methods, rebuilding the shattered livelihoods of the affected communities and establishing VKCs. In addition, the project will support the construction of a training center at Chidambaram to execute constant capacity programmes for the tsunami victims of fishing and farming communities in the region.

MSSRF, in collaboration with the DAE, is undertaking ecological and economic rehabilitation activities in a few selected villages. The ecological rehabilitation would have two components: mangrove plantations and multi layered coastal bioshields along the coastline of the IGCAR region. Economic rehabilitation would address sustainable livelihoods of the local communities through training and capacity building for enterprise development with definite market linkages. The project also would establish VKCs for a cluster of 8-10 villages.

There is also a long term plan to organize orientation programmes for different implementing agencies involved in tsunami rehabilitation programmes at the state and district levels on Bioshield, coastal Biovillages and VKCs.

703.4 ICT for Strengthening the Ecological and Livelihood Security of Coastal Communities

The VKCs located in the coastal areas of Pondicherry played a major role immediately after the first tsunami attack and in post-tsunami relief activities. The public address network in these VKCs is helping to distribute tsunami relief materials to the affected community.

Based on the earlier experience at Pondicherry and other field centres, the process of setting up VKCs in the tsunami affected coastal districts of Cuddalore, Nagapattinam and Kanyakumari has been initiated with the help of Tata Relief Committee, Microsoft, Canadian International Development Agency and OKN. Four VKCs have been set up in Kovalam (Kancheepuram District), Akkaraipettai (Nagapattinam District), Kadiapattinam and Keelamanakkudi (Kanyakumari District).

Need assessment was carried out through group discussions with leaders, youth groups, SHG members, children and school teachers, research institutions and NGOs. Some of the immediate concerns of the local communities

include early warning information on wave height, sea current, sea rock, cyclone, tsunami and so on; mapping of the sea within a 10 km radius from the shore, supported with GIS maps; training in the use of GPS, eco-sounder and hygienic handling of fish processing. They also need information on prevention, detection and cure of several diseases like chickenpox, malaria and jaundice. The tsunami has orphaned many children. The villagers need information on childcare. In addition to the fishing community, farmers and saltpan workers were also affected severely by the tsunami. They are in need of both sea and land based livelihood opportunities. They also need computer aided learning programmes for children and software training for the youth. Some of the villages are situated near the estuaries. The children want to know more about the flora and fauna of the area.

With the help of Tata Consultancy Services and Azim Premji Foundation, a Computer Aided Learning Programme and Adult Literacy Programme have been initiated at the Kovalam and Akkaraipettai centres. The volunteers at the two centers are undergoing training on MS-Word and database management under the Microsoft *Unlimited Potential* Programme

Tool kits and capacity building

Tool kits on Bioshield, Coastal Biovillage and VKC, meant for field level workers engaged in development work in the coastal areas, have been prepared. The tool kit on Bioshield focuses on mangrove forests and plantations of other appropriate species, which could help to mitigate the ravages of storms, cyclones and tsunamis. The Coastal Biovillage kit deals with the process of village level institution building and skill development for the sustainable use of natural resources and need based skill enhancement to improve the livelihoods of fishers, small and marginal farmers and labourers. The tool kit on VKCs depicts the step by step process of establishing the centre and the importance and supply of need driven local specific information to different sections of the community.

703.5 Long-term Educational and Nutritional Support to Children Orphaned by the Tsunami

It has been decided to provide long-term support to the children orphaned by the tsunami in TN and Andaman and Nicobar Islands. Some funds have already been earmarked for this scheme. Funding support is expected from Bharat Soka Gakkai, New Delhi. The aims of the scheme are:

- To provide long-term support to the children by making all the payments necessary for education, from the date of commencement of such support to the completion of the last year of schooling, in the system of 10 +2 years of schooling
- To provide long-term regular nutritional support to the orphan child and the family through weekly /monthly assistance in cash or kind from the date of commencement of the support to the last year of schooling.

To facilitate support over several years, it is planned to create an educational support fund, the interest from which will be utilized for regular support, and evolve monitoring and evaluation methods.

Information is being collected to draw up an appropriate scheme. The six most adversely affected villages, which reported enormous loss of life, have been selected for visits. The affected villages have been surveyed to collect initial information about orphaned children staying in the government orphanages, those staying with parents, those who are with close relatives, tsunami orphaned children in the schools, the socio economic background of the children and so on. After a detailed village survey, it has been decided to support the orphaned children living with the community, to encourage the community to take care of the child, rather than dislocating the child to an orphanage. Information about the local NGOs working in the area is also being collected. A detailed survey schedule has been prepared and a survey of the affected villages is planned, to select the most deserving children for long term support under the MSSRF scheme.

703.6 Preparation of an Action Plan for the development of post-tsunami "New Andamans"

Noting the immediate relevance of Professor M S Swaminathan's analysis in the *Hindu*, 17 January, 2005 refered to earlier, for the development of post-tsunami *"New Andamans"* as endorsed by the Honourable Prime Minister of India, Dr Manmohan Singh, MSSRF was approached by H E Prof Ram Kapse, the Lt Governor of Andaman & Nicobar Islands, to prepare an action plan.

In pursuance of this, a spearhead team was set up with Professor P C Kesavan, Homi Bhabha Chair as the leader and Dr K Balasubramanian, Dr John Joseph, Dr Ravishankar, Ms R V Bhavani and Prof Subbiah Arunachalam as the members.

The team visited the islands and discussed the opportunities and options with all the stakeholders, to evolve the locale-specific action plan presented below:

The need for a locale-specific, problem-oriented, interdisciplinary solution arose from the fact that the earthquake of severe intensity (9.0 in the Richter scale) followed by the tsunami has caused considerable geological and geo-morphological changes in the Andaman & Nicobar Islands. The inhabited, farm-based Diglipur in the northernmost Andaman has risen by 0.5 to 0.8 m with the result that the groundwater has receded and the ponds, lakes, lagoons, littoral swamps and mangrove forests have dried up. There is an urgent need to set up a community-centred rainwater harvesting and water bank management system. An integrated system of watershed management for agri, silvi- and aquaculture with women SHGs trained for this purpose will be essential.

In contrast, South Andaman is inundated with seawater, making paddy cultivation

difficult. Application of gypsum is not an ecologically sound or economically viable solution. The recommendations therefore, are to develop a mangrove-based bioshield with focus on aquaculture, particularly tiger prawns and mud crabs. Since the current monsoon could worsen the inundation and cause disruption of transport and communication, MSSRF has suggested setting up Community Grain Banks immediately to avert transient *hunger hotspots* and starvation deaths.

The Nicobar group of islands were the worst hit. The jetties and roads within the islands have been totally destroyed. Reconstruction of these, and setting up community grain banks are urgent needs. The major destruction of coconut forests and agricultural fields in Campbell Bay (Great Nicobar) and submergence of mangrove forests in the Nancowrie group of islands require attention. MSSRF has suggested community-based coconut nurseries with buy-back arrangement and the erection of a mangrove or casuarina-based bioshield with coconut, pandanus, arecanut and spices as intercrop, for ecological rehabilitation with economic viability. Introduction of yellow-flesh sweet potato to supplement food and nutrition security, as well as supply of multi-fortified (iodine, iron and vitamins) salt to overcome micronutrient deficiency, has also been recommended.

In principle, sustainable livelihood enterprises in these islands should be largely forest-and fisheries-based, and agriculture along the lines in the mainland should not be encouraged. These islands have great potential to become *organic agriculture islands of the world*. The coastal biovillage paradigm, with biological software for organic coconut, spices and aquaculture and knowledge centers, should be established immediately. VKCs concentrating on time- and locale-specific and demand-driven information need to be established. This will also form part of Mission - 2007 which aims at converting all the 600,000 plus villages of India into VKCs (See SPA 601).

A cadre of *Master Trainers or* catalysts of the New Andamans movement, initially of 500 women and 500 men with capacity building, should be developed immediately. With a 'bottom-up' approach ensuring the use of traditional knowledge, the goal of *New Andamans* is clearly achievable.

Sub Programme Area 704

Vulnerability Assessment and Enhancing the Adaptive Capacity to Climate Change in Semi-Arid India

MSSRF was chosen as the lead agency to implement a new four-year project on "Vulnerability Assessment and Enhancing the Adaptive Capacity to Climate Change in Semi-Arid India" ("V&A Programme") by the SDC in January, 2005. The overall goal of the V&A Programme is to secure the livelihoods of the rural poor and vulnerable communities by promoting adaptation measures that build and

enhance their capacity to better cope with the adverse impacts of climate change and by improving their disaster preparedness.

The focus of the programme is on optimising and integrating climate change related knowledge in existing service delivery systems in the water, agriculture and rural energy sectors in the two Indian States of AP and Rajasthan. Another important aim of the V&A Programme is to catalyze and enhance communication and policy dialogue on climate change issues at different decision levels.

The goal and focus of the programme have been articulated through three specific objectives:

- Build community level capacities with regard to best practices and technologies in the agriculture, water and energy sectors
- Optimise the service delivery system and services at selected sites of AP and Rajasthan
- Promote policy dialogue and advocacy at different levels and link up with the second National Communication process set up by UNFCCC.

To achieve these objectives, the V&A Programme combines four different components that help to define the way of implementing activities: research and analysis; natural resource management; capacity building and action learning; and local empowerment.

The four-year V&A programme adopts a three-stage set-up with an initial stocktaking and documentation period, an implementation period and a period of consolidation, focusing on outreach, networking and dissemination.

The programme's institutional structure is based on a strong cooperation between a National Consortium of partners and an International Consortium of back-stoppers/ advisors and others at the community, district, state and national government levels. The National Consortium of partners includes the lead agency MSSRF in Chennai, together with the National Institute of Agriculture Extension Management (MANAGE) and Action for Food Production (AFPRO), both based in Hyderabad. The International Consortium consists of two Swiss-based agencies, namely, Inter-cooperation, Bern, and INFRAS, Zurich. The programme steering committee will be responsible for overall guidance.

It is expected that within an evolving, international, climate-change context, this V&A programme in India will make an important contribution to Adaptation Science. The programme will demonstrate and implement adaptation measures and coping mechanisms at the community level and at the same time translate them to an international policy level, making this SDC programme very unique.

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Thamizoli, P. 2005. Humanitarian, Economic and Environmental Aspects of Disaster Management. *State Level Workshop on Disaster Management*. TN Science Forum, Chennai. February 12-13.

Thamizoli, P. 2005. Self Help Groups and Social Capital: Impact of Social Capital on Gender Issues. *National Seminar on The Concept of Social Capital and its Relevance for Theory, Research and Policy*. Pondicherry University, Pondicherry. March 10-11.

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Participation in Training Programmes/ Workshops

Baskar, R. 2004. *Barefoot Taxonomist Training Programme on Documentation of Traditional Knowledge and Natural Resources*. FRLHT, Amirthi. August 18-20.

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Awards/Honours

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Parida, A. 2005. *Editorial Board Member*. Asian Biotechnology and Development Review, RIS, New Delhi.

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Ms. K. Chitra
Scientist

Mr. A. Vedhamoorthy
Scientist

Mr. R. Baskar
Accounts Assistant

Mr. P. Boopathy
Technical Assistant (Field)

Mr. D. Sengottuvel
Technical Assistant (Field)

Mr. P. Thangavel
Field Assistant

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Administrative Assistant

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Field Assistant

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Mr. Prasanth Kumar Parida
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Ms. Nancy J. Anabel
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Technical Assistant

Dr. V. Palaniappan
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Measures of Impact of Science & Technology In India: Agriculture & Rural Development

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Principal Scientist & Project Coordinator

Dr. M Nirmala Devi*
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International

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Programme Area 200 : Biotechnology

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Indian Council for Agricultural Research
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Ministry of Science & Technology, New Delhi

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National Medicinal Plants Board, New Delhi

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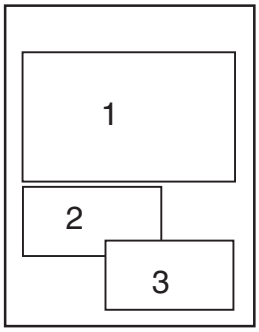
List of Acronyms

AFLP	Amplified Fragment Length Polymorphism
AFPRO	Action for Food Production
AIR	All India Radio
AM	Arbuscular Mycorrhiza
AMDA	Association for Medical Doctors of Asia
AP	Andhra Pradesh
APEDA	Agriculture and Processed Food Products Export Development Authority
ASPEE	American Spring and Pressing Works Pvt Ltd
BARC	Bhabha Atomic Research Centre
CAbC	Community Agrobiodiversity Centre
CALP	Computer Aided Learning Programme
CCDP	Coastal Community Development Program
CENSFOOD	Centre for Sustainable Development and Food Security in Ladakh
CFB	Community Food Bank
CFTRI	Central Food Technology Research Institute
CGB	Community Gene Bank
CGIAR	Consulate Group on International Agricultural Research
CGSGrB	Community Gene-Seed-Grain Bank
CIESIN	Centre for International Earth Science Infomation Network
COL	Commonwealth of Learning
CRIDA	Centre for Research in Dryland Agriculture
CSB	Community Seed Bank
CSR	Coastal Systems Research
CVC	Central Village Committee
CWDRM	Centre for Water Resource Development & Management
DAE	Department of Atomic Energy
DBT	Department of Biotechnology
DRDA	District Rural Development Agency
ECAS	Every Child a Scientist
FD	Forest Department
FMB	Farm Management Book
FRLHT	Foundation for Revitalization of Local Health Traditions

FSAC	Food Security Atlas of Cambodia
GoI	Government of India
GIS	Geographical Information System
GoM	Gulf of Mannar
GPS	Geographical Positioning System
HTF	Hunger Task Force
HYV	High Yielding Variety
IARI	Indian Agricultural Research Institute
ICAR	Indian Council for Agricultural Research
ICRISAT	International Crop Research Institute for Semi Arid Tropics
ICT	Information Communication Technology
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IGCAR	Indira Gandhi Centre for Atomic Research
IIFS	Integrated Intensive Farming System
IMO	Institute for Market Ecology
INCOIS	Indian National Centre for Ocean Information Services
INM	Integrated Nutrient Management
IPGRI	International Plant Genetic Resources Institute
IPM	Integrated Pest Management
ISRO	Indian Space Research Organisation
JMM	Joint Mangrove Management
JNKVV	Jawaharlal Nehru Krishi Vishwa Vidyalaya
KAU	Kerala Agricultural University
KVK	Krishi Vigyan Kendra
LEISA	Low External Input Sustainable Agriclture
LR	Land Race
MANAGE	National Institute of Agriculture Extension Management
MDG	Millennium Development Goal
MP	Madhya Pradesh
MPEDA	Marine Products Export Development Authority
NAAS	National Academy of Agricultural Sceinces

NABARD	National Bank for Agriculture and Rural Development
NASSCOM	National Association of Software and Service Companies
NCF	National Commission on Farmers
NGO	Non Government Organization
NSS	National Service Scheme
NVA	National Virtual Academy
OSU	Ohio State University
OKN	Open Knowledge Network
PAU	Punjab Agricultural University
PCR	Polymerax Chain Reaction
PGPR	Plant Growth Promoter
PGR	Plant Genetic Resources
PGUS	Panchabati Gram Unnayan Samiti
PPB	Participatory Plant Breeding
PPVFR	Protection of Plant Varieties and Farmers' Rights
PRI	Panchayat Raj Institution
RAPD	Random Amplified Fragment Polymorphic
RIDF	Rural Infrastructure Development Fund
RS	Remote Sensing
RSGA	Reddiyarchatram Seed Growers' Association
RSVY	Rashtreeya Sam Vikas Yojna
RuTAG	Rural Technology Action Group
SBI	State Bank of India
SBIRD	State Bank Institute of Rural Development
SDC	Swiss Agency for Development and Cooperation
SHA	Swiss Humanitarian Aid
SHG	Self Help Group
SMNR	Sustainable Management of Natural Resources
SRI	System of Rice Intensification
SSR	Simple Sequence Repeats
THADCO	The Tamil Nadu Adi-Dravidar Development Corporation
THMRC	The Hindu Media Resource Centre
TN	Tamil Nadu

TNAU	Tamil Nadu Agricultural University
UDRC	Uttara Devi Resource Centre for Gender and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNWFP	United Nations World Food Programme
USO	Universal Service Obligation
VKC	Village Knowledge Centre
VMC	Village Mangrove Council
VRC	Village Resource Centre
VVV	Vikas Volunteer Vahini
WARDA	Wayanad Agriculture and Rural Development Association
WSHG	Women Self Help Group
WTO	World Trade Organisation

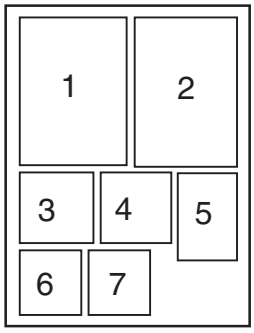


Front Cover

1. Dr A P J Abdul Kalam, President of India, with NVA Fellows at the first Convocation of the Jamsetji Tata National Virtual Academy for Rural Prosperity, held at New Delhi, 11 July, 2005

2. Shri Naveen Patnaik, Chief Minister of Orissa and Shri Rabi Narayan Nanda, Minister of State for S&T, at the Bhoomi Puja for the Biju Patnaik Medicinal Plant Garden and Conservation Centre at Jeypore, Koraput District, Orissa, 16 Nov, 2004

3. The President of Italy, H E Carlo Azeglio Ciampi and Prof G T Scarascia Mugnozza, President, Italian National Science Academy, at the tenth anniversary celebration of the MSSRF G T Scarascia Mugnozza Community Genetic Resource Centre and Gene Bank, New Delhi, 14 February, 2005



Back Cover

1. High-resolution remote sensing imagery dated 29 December, 2004 of the Pichavaram region, showing the impact of the tsunami on mangrove-protected (T S Pettai) and non-protected (Muzhukkuthurai) villages

2. Network of Village Knowledge Centres – highlighting the ones in the coastal, tsunami-affected region

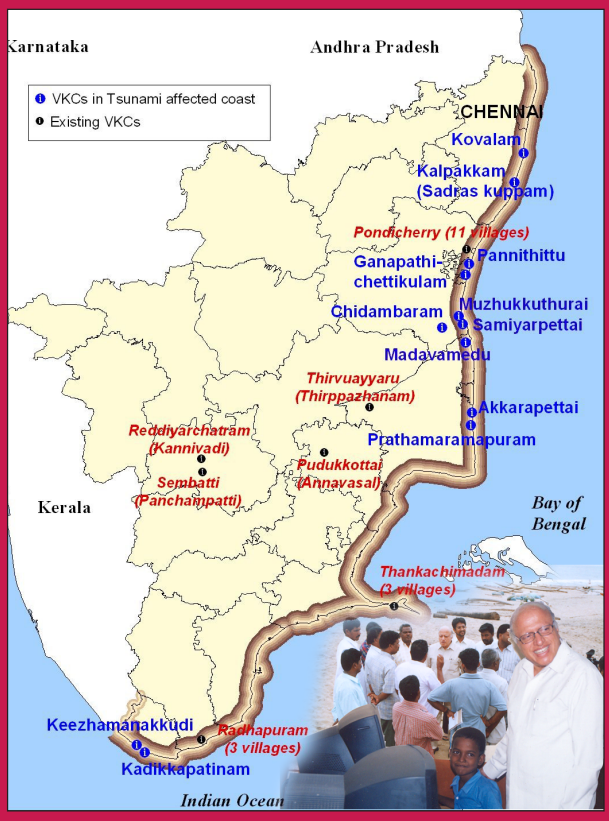
3. Paddy varieties in the farmers' field, which withstood the tsunami - Kuzhivaduchan at Vedaranyam, Tamil Nadu

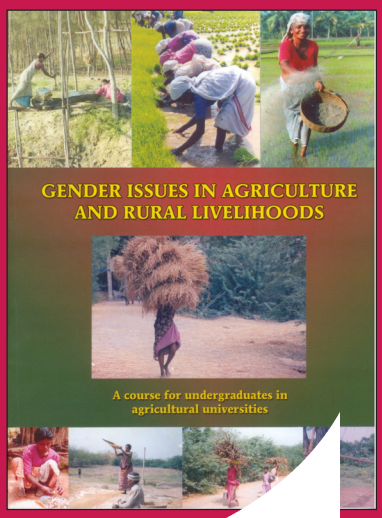
4. Restoring Livelihoods post-tsunami - harnessing the aqua resources

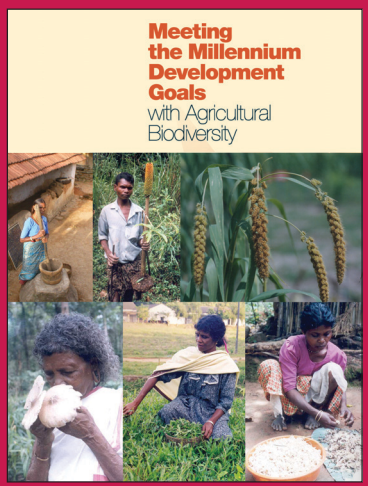
5. A course module on Gender Issues in Agriculture and Rural Livelihoods

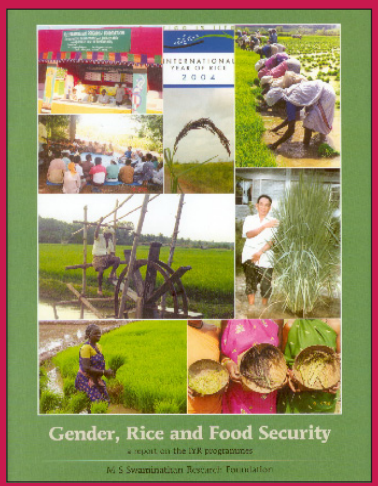
6. Meeting the Millennium Development Goals with Agricultural Biodiversity – diversifying the food basket

7. Gender, Rice and Food Security - a Summary Report of the IYR programmes









Address:
M. S. Swaminathan
Research Foundation
III Cross Road
Institutional Area
Taramani
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