# Climate Literacy

## for Sustainable Food and Water Security

MSSRF

Report of a National Workshop on Role of Gyan Choupals in Spreading Climate Literacy and Building Sustainable Food and Water Security Systems 2009

**Publication # MSSRF/PR/09/73**

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# Climate Literacy for Sustainable Food and Water Security

Report of a
National Workshop on Role of
*Gyan Choupals*
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Building Sustainable
Food and Water Security Systems

2009

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# *Executive Summary*

This report captures the essence of the presentations, discussions, recommendations and conclusions of a national workshop on the *Role of Gyan Choupals in Spreading Climate Literacy and Building Sustainable Food and Water Security Systems* held in New Delhi on September 2-3, 2009.

The national workshop was a follow up to the workshop on *Role of ICTs in the Management of Climate Change at the Grassroots Level* held in February 2008. Primarily for the media and *Gyan Choupal* workers, participants discussed ways to assess vulnerability, identify problem spots, prepare for disasters, develop coping and management strategies at the grassroots level and develop climate literacy. Focusing on community level interventions, importance was given to identification of local resources essential to secure livelihoods. This included investigating traditional and modern methods to ensure rainwater harvesting, its sustainable management, rain fed farming, climate context tables, appropriate cropping plans and strategies such as changing times of sowing, crop diversification and others - to reduce the adverse impact on agricultural production.

In view of the above, the 2009 workshop was to focus on the role of *Gyan Choupals*, telecentre managers and GGA partners in developing climate literacy at all levels by providing locale-specific and community-centred information. The workshop brought together representatives of the Government of India, research and academia, civil society, the private sector, *Gyan Choupals* and students. The two day workshop took a comprehensive view of the impact of climate change on agriculture, natural resources, biodiversity and livelihoods and the mechanisms to develop science and action-research based strategies and mechanisms for adaptation and mitigation.

The workshop was timely. Reports with alarming evidence of climate change, which can affect food security in India, have pushed the need for climate literacy to the forefront.

In 2009, several parts of India that were never water-stressed faced a drought situation. Indeed, farmers dependent on monsoons and irrigation for livelihoods have been experiencing evidence of climate change for some time now. The wildly swinging weather in 2009 is a wakeup call for policy makers and others responsible for devising adequate responses.

A national response to climate change requires reflection and action. Large scale adaptation programmes which depend on economic resources and institutions may not always be feasible. When infrastructure is weak and the environment exceedingly uncertain, modest local-adaptation models seem better. These models could be propagated and up-scaled to national levels.

Fortunately, results from many recent models for local-adaptation are encouraging. Several participants and speakers at the workshop highlighted decentralised community-centric models that ensured recharge and management of groundwater. Examples of water management, conservation and education were presented from various states in India. Local solutions, owned and managed by the community are especially effective. Many revived ecological traditions and resolved water conflicts. Some communities mobilised to use groundwater as a common resource, by pooling of bore wells and developing regulatory mechanisms.

In some of these experiments, irrigated areas have doubled and fodder production increased three times; three additional crops are being grown and there is a 240 per cent increase in grain produc-

tion. Communities have rejuvenated water streams; choosen not to sow water-guzzling crops, and excluded problematic industries through a river Parliament.

Successful practices emerged from use of traditional knowledge for building resilience in the area of weather prediction, wind direction, humidity and temperature – all which could be documented and disseminated. At the same time, strategies such as promotion of alternative cropping patterns, mixed cropping and intercropping, shelter belts, water harvesting ponds, livestock production – are all issues which need more attention and action.

Many of these autonomous adaptation models and practices, such as changing cropping patterns or pitting seeds deeper in the soils, can be shared through mobiles and broadband connectivity via telecentres and *Gyan Choupals* and used for climate literacy. However, this effort will have to be moderated and shared in a language and format that recipients can understand, internalise and ultimately use.

Gravely lacking are systems that enable rural communities to create and manage information. For example, a 'weather information for all' programme - by setting up mini agro met stations in each block with basic instruments to measure temperature, rainfall, wind speed and relative humidity – is needed. Mini agro-met stations can be built in each village with basic instruments to measure temperature, rainfall and wind speed, to help farmers take weather-based farm decisions.

The purpose of the workshop was to develop a road map for *Gyan Choupals* to deal with the effects of climate change in natural resources, food and water security and biodiversity. The success of this venture lies in its strong synergies, especially in the total of 400 strong partners in the *Grameen Gyan Abhiyan*. Convergence and synergy between public and private agencies is crucial. A major aim of the *Gyan Choupal* movement is to seek and promote convergence and synergy among initiatives launched by public, private and academic sectors.

An impressive body of work has been done and is underway by almost 400 partners of the GGA Alliance. The workshop was an opportunity to listen to these experiments, make connections and think about future work together. There was a proposal that the Jamsetji Tata Training School, in collaboration with Microsoft (SAKSHAM), Intel, agencies involved in capacity building, and the community colleges being established by the Indira Gandhi National Open University all together, train five lakh women and men Panchayati Raj members over the next five years. The training should emphasise traditional wisdom.

The workshop highlighted what *Gyan Choupals* could do to combat climate change. There was consensus that *Gyan Choupals* could take anticipatory action by creating and propagating drought, flood and good weather codes. They could train Climate Risk Managers at the local level, do nutrition literacy and promote the cultivation and consumption of local foods and underutilised crops.

The experiences of the last seven years of the Mission 2007, the GGA and its partners suggest that a National Network of *Gyan Choupals* be established for the empowerment of rural communities in areas of adaptation and mitigation of climate change. The Network would adopt a holistic approach covering all links in the knowledge generation and dissemination chain.

The workshop has ambitious expectations from *Gyan Choupals*. The call to produce one million knowledge workers at the grassroots level would require development of a package with appropriate incentives, including financial incentives, to assist *Gyan Choupal* operators and managers to sustain their role as interlocutors and knowledge workers. It would require high levels of continuous capacity building and reinforcement.

Given the trends in sustainable development and decentralisation of innovation, it was proposed that all 250,000 *Gyan Choupals* (CSC *Bharat Nirman* centres and other telecentres) ought to

possess all local data. This would require facilitation and be made mandatory, especially on issues dealt with by the Panchayats. Thus, each village should have all its data - livelihood assets (human, social, natural, physical and financial resources) - in their possession. These *Gyan Choupal*-enabled local data systems would be assets owned by the community and declared as such. For this a 'skills-development programme' for *Gyan Choupal* workers would be needed.

At a policy level, the National Climate Change plan needs to be dovetailed with the Water Plan, the Agriculture Plan, the NREGA as well as the Food Security Mission to ensure that subsidies and investments do not run counter to the sustainability of crops, animals, marine as well as human environments. Additionally, convergence among government agencies implementing the government's *Bharat Nirman*.

Tackling climate change is an expensive proposition. To counteract the effects of climate change on nutrition, the report *Climate Change: Impact on Agriculture and Costs of Adaptation*, released by the International Food Policy Research Institute (IFPRI) in September 2009, says that South Asia requires additional annual investments of $1.5 billion in rural development, over half of these going to irrigation expansion. The workshop recommended the creation of a comprehensive long-term plan to fund climate change mitigation and adaptation strategies, with emphasis on micro initiatives.

Climate Change will affect every single one of us, in the developed and developing world. The workshop was a timely reminder that Indians at all levels will need to come together to revive traditional wisdom, use modern science and technology, leverage networks and institutions and empower people in rural communities, through *Gyan Choupals*, to overturn and prevent the effects of climate change.

# *Foreword*

The present publication contains the highlights of a National Workshop on *Role of Gyan Choupals in Spreading Climate Literacy and in Building Sustainable Food and Water Security Systems*, held at New Delhi on 2-3 September, 2009. I would like to briefly indicate the importance of this workshop in the context of a warming planet.

Recent studies have shown that for each 1 degree Celsius rise in temperature, wheat yield losses in India will be of the order of 6 million tonnes. There will be similar effects on rice and other food crops. The leaders of G8 Nations who met recently at L'Aquila in Italy agreed to limit the rise in mean temperature to 2 degrees Celsius. This will have disastrous consequences for India's agricultural production and thereby to national food security. The consequences of global warming are multidimensional including:

Unpredictable deviations in monsoon behaviour; water scarcity and higher evapo-transpiration; receding glaciers; more frequent coastal storms; tsunami; more frequent drought and flood; more severe pest and disease epidemics; increase in the incidence of malaria and other vector borne diseases, etc.

Thus, the adverse impact of climate change will cover every aspect of human life. Obviously, the poor nations and poor in all nations, who have the least coping capacity, will suffer more. There is need for both anticipatory research and action to address issues relating to mitigation and adaptation. At the same time, there is need for participatory research with rural families in order to enhance their capacity to deal with calamities like drought, flood and higher temperature.

Action is particularly important in the following areas: contingency plans, alternative cropping strategies and compensatory production programmes.

India has about 127 agro-climatic regions. We will have to prepare computer simulation models on different weather probabilities. This will help to formulate codes of action for dealing with drought, flood and sea level rise. A good weather code should also be prepared to maximise production in favourable seasons. The impact will have to be studied not only on crops, but also on farm animals, fisheries and forests. Seed reserves of alternative crops will have to be built up at the local level. Grain reserves are essential for food security, seed reserves are needed for crop security. Local level gene – seed – grain – fodder - water banks will have to be promoted, so that the community itself will be able to adapt to new challenges.

The impact on women will be even more serious since they traditionally gather fodder, fuel wood, and water and take care of the health of animals and post harvest technology. Climate risk saviour crops will have to be identified and multiplied. Rice is one such crop since it can grow under a wide range of altitudes and latitudes.

In coastal areas, bio shields consisting of mangroves, *Salicornia, Atriplex* and other halophytes will have to be erected. Sea water farming will have to be promoted through the establishment of agri-aqua farms. This is important since 97 per cent of the total global water availability is from the sea. There is also need for below sea level farming as many coastal areas will have to practice agriculture under below sea level as a result of sea water inundation. The latest technologies - such as mobile phones providing information on wave heights and location of fish shoals - will have to be taken to fishermen.

Farm animals will have to be protected, since livestock and livelihoods are intimately related in most parts of India. Also the ownership of livestock is more egalitarian. Emergency food supply arrangements will have to be made by enriching agricultural biomass with urea and molasses. Ground water sanctuaries will have to be set up which can be utilized whenever there is water shortage.

In the area of mitigation also, local communities can contribute through better farm animal management and conservation farming. Fertiliser trees like *Faidherbia albida* will have to be planted on a large scale.

Finally, there is need for building a cadre of Climate Risk Managers at the local level. The Managers should be well versed in the science and art of managing climate aberrations. Every calamity also presents an opportunity and therefore steps should be taken to train vast numbers of community level Climate Risk Managers. While global thinking and action are essential, it will only be attention to local planning and anticipatory action that can reduce human hardship and save lives and livelihoods. For this reason MSSRF has initiated a programme for training at least two members - one woman and one man - of every *Panchayat* as Climate Risk Managers.

This publication indicates the power of modern ICTs in strengthening the coping capacity of local communities in the event of adverse changes in global climate.

I hope India can show the way to implementing the methodology of "think, plan and act locally and support nationally and globally" with respect to minimising human hardship in an era of climate change.

**M S Swaminathan**
Chairman, *Grameen Gyan Abhiyan*

# Acknowledgements

The Indian telecentre.org Academy – Jamsetji Tata National Virtual Academy (NVA) and Training School (JTTS) and Grameen Gyan Abhiyan (Rural Knowledge Movement – Mission 2007: Every Village a Knowledge Centre) Secretariat is very grateful to Ms Anita Anand and Dr Mahesh Uppal of Com First (India) Private Ltd. for partnering with M S Swaminathan Research Foundation (MSSRF) in the production of this publication.

The GGA Secretariat and JTTS extend sincere thanks to the Swiss Agency for Development and Cooperation (SDC), telecentre.org (International Development Research Centre – IDRC), Tata Education Trust, National Bank for Agriculture and Rural Development (NABARD) and Ministry of Earth Sciences for their valuable support (both financial resources and technical inputs) for conducting this timely workshop.

MSSRF is grateful to honourable Ministers, panelists, moderators and participants for their valuable contributions during the workshop.

The GGA Secretariat and JTTS are grateful to Indira Gandhi National Open University (IGNOU) for facilitation of the workshop and in particular by coverage of the event through Gyan Darshan and distributing selected study materials related to Sustainable Development to the workshop participants.

Special thanks to officials of Agriculture Today for covering this event in their magazine. The GGA Secretariat and Jamsetji Tata National Virtual Academy (NVA) and Training School are also extending thanks to the Centre for Science, Development & Media Studies (CSDMS) for covering this event in telecentre magazine and sharing the CSDMS publications to the workshop participants.

The GGA Secretariat and JTTS extend sincere thanks to the Institute of Agribusiness Management for sending their post-graduate students to participate in the workshop.

Sincere thanks are due to the officials of All India Radio and Doordarshan Kendra for covering this event.

The GGA secretariat and JTTS extend sincere thanks to Dr Jayalakshmi Chittoor, Consultant, Programme Management, Development Communications, ICT4D and Knowledge Management for her help in many ways.

The GGA secretariat and JTTS extend their sincere thanks to the officials of "Gram Vikas Jyoti" and distribute their publications to the workshop participants.

The GGA secretariat and JTTS convey their special thanks to the officials of NAAS for providing all the necessary facilities to conduct this workshop.

The GGA secretariat and JTTS are thankful to and appreciative of the role of the following staff members of MSSRF: Dr A A Nambi and Dr J D Sophia for rapporteuring of the workshop; Ms S Velvizhi, Mr R Rajkumar and Mr K Rameswaran for support in registration,

accommodation, transport, floor arrangements, media and taking care of the dignitaries; Mr J Srinath for compiling the PowerPoint presentations; Ms Nancy Anabel for acting as stage coordinator for the entire workshop; and Ms Ganga Vidya and Mr P Sivakumar, for their tireless and valuable inputs for this workshop.

Last but not the least, our sincere thanks to Dr Ajay K Parida, Executive Director and Prof M S Swaminathan, Chairman for their support at all the levels.

**S Senthilkumaran**
Director – IEC
*M S Swaminathan Research Foundation*

# *Acronyms and Abbreviations*

| | |
|---|---|
| AFPINET | Agricultural and Food Processing Industries Informatics Network |
| AFPRO | Action for Food Production |
| AGMARKNET | Agricultural Marketing Information Network |
| AGRIS | International Information System for the Agricultural Sciences and Technology |
| AIEP | Alternative and Innovative Education Programme |
| AISECT | All India Society for Electronics and Computer Technology |
| APHNET | The Association of South East Asian Nations (ASEAN) Postharvest Horticulture Network |
| APMC | Agricultural Produce Marketing Committee |
| ATIC | Agriculture Technical Information Centre |
| ARISNET | Agricultural Research Information System Network |
| C-DAC | Centre for Development of Advanced Computing |
| CEE | Centre for Environment Education |
| CIKS | Centre for Indian Knowledge Systems |
| CSE | Centre for Science and Environment |
| CSCs | Community Service Centres |
| CSOs | Civil Society Organisations |
| CTLC | Community Technology Literacy Centres |
| DACNET | Department of Agriculture & Cooperation Network |
| DISNIC | District Information System of National Informatics Centre |
| DRR | Directorate of Rice Research |
| FAO | Food and Agricultural Organization |
| GGA | *Grameen Gyan Abhiyan* |
| GIS | Geographic Information System |

| | |
|---|---|
| ICAR | Indian Council of Agricultural Research |
| IDRC | International Development Research Centre |
| ICARDA | International Centre for Agricultural Research in the Dry Areas |
| ICRISAT | The International Crops Research Institute for the Semi-Arid Tropics |
| ICTs | Information and Communications Technologies |
| ICT4D | Information and Communications Technologies for Development |
| IFFCO | Indian Farmers Fertilizer Cooperative Limited |
| IFPRI | International Food Policy Research Institute |
| IGNOU | Indira Gandhi National Open University |
| INCOIS | Indian National Centre for Ocean Information Services |
| IPCC | International Panel on Climate Change |
| ISRO | Indian Space Research Organization |
| MSSRF | M S Swaminathan Research Foundation |
| NAAS | National Academy of Agricultural Sciences |
| NABARD | National Bank for Agriculture and Rural Development |
| NAPCC | National Action Plan on Climate Change |
| NARS | National Agricultural Research System |
| NDMNET | National Disaster Management Knowledge Network |
| NEERI | National Environmental Engineering Research Institute |
| NeGP-A | National e-Governance Plan in Agriculture |
| NICT | Network For Information & Computer Technology |
| NGRI | National Geophysical Research Institute |
| NREGS | National Rural Employment Guarantee Scheme (NREGS) |
| NVA | Jamsetji Tata National Virtual Academy for Food Security and Rural Prosperity |
| PRIs | Panchayati Raj Institutions |
| SDC | Swiss Agency for Development and Cooperation |
| VKCs | Village Knowledge Centres |
| VRCs | Village Resource Centres |

# 1 *Gyan Choupals*: Opportunity and Challenge

In 2009, several parts of the country that were never water-stressed faced a drought situation. This brought home to many Indians the stark reality of climate change and the need to tackle the problem before it turns into a full-fledged crisis. People in rural India, especially farmers who are completely dependent on monsoons and irrigation for livelihoods, have been familiar with the evidence of climate change for some time now. But for sleeping policymakers and urban India, the wildly swinging weather in 2009 is a wakeup call.

"It's a 'Do or Dry Situation' to meet the challenge of ensuring food and water security for 1.2 billion Indians as well as the millions of farm animals", says Dr M S Swaminathan, Chairman, M S Swaminathan Research Foundation and Member of Parliament (Rajya Sabha).

The disappearing rains have revealed a policy hiatus that highlights the vital need for a country wide knowledge network, and the necessity of institutions such as *Gyan Choupals* at the core of such a network. *Gyan Choupals* are resource centres targeted specially to meeting information and knowledge needs in rural areas. ICTs (information and communication technologies) tools have made networking and knowledge transfer particularly easy and effective. *Gyan Choupals*, with their mix of ICT and other tools are therefore ideally suited for this role. Jawaharlal Nehru, the first Prime Minister of India, had said, "The future belongs to science and those who make friends with science." *Gyan Choupals* work as change agents to disperse the fruits of science and innovation—both traditional and modern—to all concerned.

Since 1992, the M S Swaminathan Research Foundation (MSSRF) has been implementing the Village Resource Centres (VRCs) and the Village Knowledge Centres (VKCs) programme, commonly known as *Gyan Choupals*, or literally, meeting places for knowledge. In 2003, this was supplemented by the creation of the Jamsetji Tata National Virtual Academy (NVA) to develop a cadre of grassroots workers to manage these centres and an ISRO partnership to set up VRCs. In 2009, there are over one thousand NVA fellows. The NVA programme is intended to bring together experts and grassroots level communities in a three-tier knowledge network and two-way communication. The objective is to make knowledge accessible to every home and hut in India's 600,000 villages. These goals are central to the *Grameen Gyan Abhiyan*, the GGA (Every Village a Knowledge Centre movement), a movement spearheaded by the MSSRF. Its goals are to develop a user-controlled, owned and managed network - in partnership with civil society and the public and private sectors - to help disseminate information, knowledge and skills.

In 2005, the Government of India allotted Rs 100 crore to NABARD to set up VKCs all over the country. Support for *Gyan Choupals* has also to come from the Rural Infrastructure Development Fund, the Financial Inclusion Fund of Rs 500 crore and the Financial Inclusion Technology Fund of Rs 500 crore. Apart from this, the Rural Innovation Fund, a joint initiative by telecentre.org, Microsoft Corporation, International Development Research Centre (IDRC) and the GGA, have provided seed capital for developing nine grassroots applications. The Department of Information Technology, government of India, has developed a scheme to set up 1.13 lakh Common Services Centres (CSCs), commonly called telecentres, in every block to

link rural India to a basket of information, goods and services through end-to-end demonstrable models. This scheme has now been integrated with the six-pronged rural infrastructure programme called *Bharat Nirman*, which was announced by the President of India in June 2009.

Besides this, the 2.65 lakh Panchayats in India are to be networked. In August 2009, the Ministry of Panchayati Raj announced a plan to set up high-tech software networking centres in all panchayats at a cost of Rs 28,000 crore over three years. To be called *Rajiv Gandhi Seva Kendras*, the construction and maintenance of these will be funded by the Centre. They will function as a single-window grievance redress system for all Centrally-funded rural development schemes and be integrated with the National Rural Employment Guarantee Scheme (NREGA), now renamed the Mahatma Gandhi Rural Employment Guarantee Programme, which is already catering to 65 lakh households. At these *kendras* (centres), each catering to 5000 people and providing high speed internet service, the villagers would be able to check their NREGA bank accounts, pay premiums for health insurance schemes for below poverty line families and get other such services. Since this proposal awaits the approval of the Planning Commission, it is not confirmed if the CSC scheme will be integrated with it later.

At the level of the government of India - as well as that of state governments - synergies are being established between the GGA and several nation-wide programmes. These include:

- National Knowledge Commission,
- National Rural Health Mission,
- *Sarva Shiksha Abhiyan* (Education for All),
- *Bharat Nirman* (Building India) for rural infrastructure,
- Mahatma Gandhi Rural Employment Guarantee Programme,
- National Rural Livelihood Mission,
- *Rashtriya Krishi Vikas Yojana* (National Agriculture Development Plan),
- National Horticulture Mission,
- National Food Security Mission,
- National Fisheries Development Board,
- Disaster Management,
- Rainwater Harvesting and Watershed Management (National Rainfed Area Authority), and
- National Action Plan for Climate Change – the largest programme of all all with eight separate missions)

These programmes have a major role to play in spreading climate literacy and building sustainable food and water security systems - the theme of the August 2009 workshop organised by the GGA and the NVA of MSSRF.

On June 30, 2008, Prime Minister Manmohan Singh released India's first National Action Plan on Climate Change (NAPCC) outlining existing and future policies and programmes addressing climate mitigation and adaptation. Ministries with lead responsibility for each of the missions are to develop objectives, implementation strategies, timelines, and monitoring and evaluation criteria and submit them to the Prime Minister's Council on Climate Change, which will monitor and periodically review and report on each mission's progress. The plan identifies eight core 'national missions' running through 2017, comprising of:

- **National Solar Mission,** with specific goals for increasing use of solar thermal technologies in urban areas, industry, and commercial establishments and generation of at least 1000 MW of solar thermal power
- **National Mission for Enhanced Energy Efficiency** to yield savings of 10,000 MW by 2012
- **National Mission on Sustainable Habitat** which calls for, among others, an Energy Conservation Building Code, emphasis on urban waste management and recycling, power production from waste, and incentives for the use of public transportation
- **National Water Mission** which aims at a 20 per cent improvement in water use efficiency through pricing and other measures
- **National Mission for Sustaining the Himalayan Ecosystem** for conserving biodiversity, forest cover, and other ecological values in the Himalayan region, to check receding glaciers
- **National Mission for a 'Green India'** looks at afforestation of 6 million hectares of degraded forest lands and expanding forest cover from 23 per cent to 33 per cent of India's territory
- **National Mission for Sustainable Agriculture,** to support climate adaptation by developing climate-resilient crops, expanding weather insurance mechanisms and new agricultural practices
- **National Mission on Strategic Knowledge for Climate Change,** that includes a new Climate Science Research Fund, improved climate modeling, and increased international collaboration as well as local private initiatives.

## 2 *Gyan Choupals:* Key to an Effective Response to Climate Change

India's climate change strategy is timely. Various academic reports have found alarming evidence of climate change that can affect food security in India, the largest area in South Asia. It is established that Asia, the most disaster-afflicted region in the world accounts for about 89 per cent of people affected, will bear the brunt of global climate change. This is particularly true of South Asia due to several reasons.

According to a 2009 report by the Asian Development Bank, *Addressing Climate Change in the Asia and Pacific Region*, more than 60 per cent of the economically active population and their dependents - 2.2 billion people - rely on agriculture for their livelihoods in developing Asia, mainly South Asia. Additionally:

- More people in this region live in physically exposed locations and are primarily dependent on rain-fed agriculture, with monsoons supplying 70 per cent of annual precipitation in just about four months.
- Rising sea levels endanger its long and densely populated coastlines and many low-lying islands. Saltwater intrusions are set to affect agricultural plains.
- The melting of Himalayan glaciers has already affected the region's water resources, leading to flash floods.
- Major expansion in energy, transport, urban systems and agricultural production are on line. Increasing access to energy and other services using high-carbon technologies will produce more greenhouse gases, hence more climate change.
- The financial and institutional capacity of most people and governments in developing countries to adapt to emergency climate change situations is limited.

## Food insecurity

1. The 2009 drought and late season floods in many parts of the country are evidence of climate change.
2. It was the worst monsoon since 1972 with 24 per cent less rainfall than average, according to official data released on October 1, 2009.
3. Fifty nine cent of over 600 districts received less than average rain.
4. The northwest region suffered the most with a 36 per cent deficit in rainfall this year. This includes western Uttar Pradesh, Delhi, Punjab, Haryana and Rajasthan.

The northwest region is also the country's food bowl. With cropland dropping by 6.1 million hectares, kharif or summer rice production is feared to be 10 to 17 million tonnes lower than 2008's record of over 99 million tonnes. Total farm output may drop by 2-4 per cent, according to a industry chamber forecast as late as October 5, affecting overall economic growth in 2009-2010.

If 2009 is an indicator of things to come, the future is even bleaker. According to the *World Development Report 2010 on Climate Change*, a global warming of 2 degrees Celsius above pre-industrial temperatures, the minimum the world is likely to experience, could result in permanent reductions in GDP of 4-5 per cent for South Asia. Extrapolating from past year-to-year variations in climate and agricultural outcomes, the WDR projects a decline in the yields of major crops in India by 4.5-9 per cent within the next three decades.

The same concern is reflected in *Climate Change: Impact on Agriculture and Costs of Adaptation*, a report released by the International Food Policy Research Institute (IFPRI) in September 2009. India is among the seven Asian countries most vulnerable to climate change and among only four particularly vulnerable to declining crop yields due to glacial melting, floods, droughts, and erratic rainfall, among other factors.

According to the IFPRI study, the Asia-Pacific region will experience the worst effect on rice and wheat yields worldwide, and decreased yields could threaten the food security of 1.6 billion people in South Asia.

IFPRI's calculations indicate that in South Asia, average yields in 2050 will decline from 2000 levels by about 50 per cent for wheat, 17 per cent for rice and about 6 per cent for maize because of climate change. As a result, average calorie availability in Asia might go down by 15 per cent and cereal consumption by as much as 24 per cent. The number of malnourished children in South Asia would fall from 76 million in 2000 to 52 million in 2050, were climate change not to erase some of this progress, causing another 7 million children to fall prey to malnutrition.

This aftermath of food insecurity was highlighted by Dr Swaminathan in his address at the Climate Change workshop. He drew attention to the fact that while poverty rates have declined significantly, malnutrition has remained stubbornly high. Malnutrition, as measured by underweight children below 3 years, was 45.9 per cent as per the 2005-2006 National Family Health Survey (NFHS) III, practically unchanged from the level of 47 per cent in 1998-99 NFHS II. This is partly because, even as per capita consumption of cereals has declined, the share of non-cereals in food consumption has not grown adequately to compensate for this decline. Clearly, existing policies and programmes are not making a significant dent on malnutrition and need modification.

## Water insecurity

Magsaysay award-winning water activist Rajendra Singh's comment that the employment guarantee programme NREGA should have been utilised only to build small irrigation systems for farmers reflects the growing water insecurity in the region.

The L'Aquila G8 Summit in July 2009 discussed how climate risks rose rapidly with temperature. Once temperature increases by about 2 degrees C, up to 4 billion people could be experiencing

growing water shortages. Agriculture could cease to be viable in parts of the world, particularly in the tropics, and millions more will be at risk of hunger. Rise in temperature could increase the risk of heat or drought stress to crops and livestock, change the growing span, hasten physiological development and maturation, and raise night time respiration, both of which help reduce potential yield.

The occurrence of droughts, floods and all kinds of natural disasters has gone up manifold because we are only taking from nature and not giving back anything.

**Rajendra Singh**
*Tarun Bharat Sangh, Alwar, Rajasthan*

Studies by Dr Swaminathan and S K Sinha have shown that even a one degree C rise in night temperature in Punjab and Haryana would reduce the duration of the wheat crop by about a week, in turn reducing yield by 4-5 quintals per hectare. Reduction in wheat yields however is predicted to be more pronounced for rain fed crops than irrigated crops. Additionally, an increase in summer temperature by 2 deg C could depress rice yields by 0.75 tons per hectare. In fact, Climate Change could reduce major crop yields by 4.5-9 per cent over 2019-33. The Eastern regions of India are predicted to be most impacted by increased temperatures and decreased radiation, resulting in relatively fewer grains and shorter grain filling durations. By contrast, potential reduction in yield due to increased temperatures in Northern India is predicted to be offset by higher radiation, lessening the impacts of climate change. Although additional CO2 can benefit crops, this effect is likely to be nullified by an increase of temperature. Climate change is also predicted to lead to boundary changes in areas suitable for growing certain crops.

Water is a right. We need to have a Water Plan of India. Groundwater is like a bank; we need to use the interest and not the capital. Our ability to share, manage and use water resources is going to make or break India.

***Sunita Narain***
*Director*
*Centre for Science and Environment*

Sunita Narain, Director, Centre for Science and Environment , pointed out that climate change means there is less information about what to plant, how to plant and when to plant and harvest. This is not because of failure of scientists and meteorologists. There is a lack of capacity to hold, conserve and manage the available water. Cloudbursts don't recharge groundwater. It rains only 100 hours in 8760 hours in a year in India. So it is extremely important to conserve every drop of rainwater. The bulk of the water used is groundwater and policymakers call it a minor irrigation issue. According to the water resources department, there are just 19-21 million groundwater wells which will decide our water future. The solution is to have decentralised community-centric models that ensure recharge and management of the groundwater. Water literacy and management practices are essential. Government schemes such as NREGA can be put to use to build assets and capacities at the village level for building a sustainable water future.

## Marine ecosystem

India's marine eco-systems, vital for the fisheries industry, are facing serious threats from climate change. S Masood Ahmad, NGRI, Hyderabad shared that a study conducted by the National Geophysical Research Institute (NGRI) and National Environmental Engineering Institute (NEERI) found that corals growing in the Lakshadweep and Andaman islands are getting bleached and facing extinction threat from increasing sea surface temperature and human-induced pollution.

Model studies have shown that the frequency of tropical cyclones in the Bay of Bengal is likely to increase. The rise in sea level could wreak havoc on the 7,300 sq km of coastline where 20 per cent of Indians live and make a living. Satheesh C. Shenoi, Indian National Centre for Ocean

Information Services (INCOIS), Ministry of Earth Sciences, said that nationally, coastal erosion will probably increase though the exact manner and rates at which these changes are likely to occur will depend on the character of coastal landforms (e.g., barrier islands, cliffs) and physical processes. However, in sandy shore environments, it is virtually certain that coastal headlands, spits, and barrier islands will erode at a faster pace in response to future sea-level rise. For acceleration in the rate of sea-level rise by 2 mm a year, some barrier islands may face rapid migration or segmentation.

India is home to 8 per cent of the world's biodiversity. The Sunderbans, the largest mangrove ecosystem in the world, is faced with a projected loss of 3-32 per cent area for 12 of the most vulnerable sea-facing islands by 2020. This is disastrous for the local population which makes a living from the forests and the waters as well as its invaluable biodiversity.

But the most important impact will be felt on fisheries trade and industry, which is a money-spinner and contributes significantly to exports. Fish is a rich source of food of the poor and the cheapest animal protein available. Acting as a livelihood safety net it has a strong gender division of labour, with women playing the key role in processing and retailing.

According to V V Sugunan, Additional Director General, Fisheries, Indian Council of Agricultural Research, fisheries will be impacted in three ways: direct changes, extreme weather changes and socio-economic changes. For example, altering food webs, replacement of low-value small fish with larger fish, and other negative impacts of the El Nino phenomena; sardine fish, whose habitation area is now extended along the northern coastline because of the rise in the sea surface temperature, instead of only Kerala in the sixties; and warm water fish of middle and lower Ganga, are now available in upper Ganga at Hardwar and above.

## National policies for Climate Change

The impact of climate change on inland fisheries which are more vulnerable is equally worrisome. Good management practices will have a major role. The major knowledge gaps are lack of information on critical thresholds and the synergistic interaction between climate change and other stressors.

Stephen J McGurk, Regional Director for South Asia and China, International Development Research Centre (IDRC), Canada, highlighted a set of issues important and relevant for India looking at broader national plans for climate change. They are:

We want a no-regret adaptation policy. When infrastructure is weak and the environment exceedingly uncertain small modest local adaptation models are better. Let's not strive for 100 per cent solutions. Ten per cent solutions in many places on an on-going basis are good enough.

**Stephen J McGurk**
*Regional Director for South Asia and China, International Development Research Centre (IDRC), Canada*

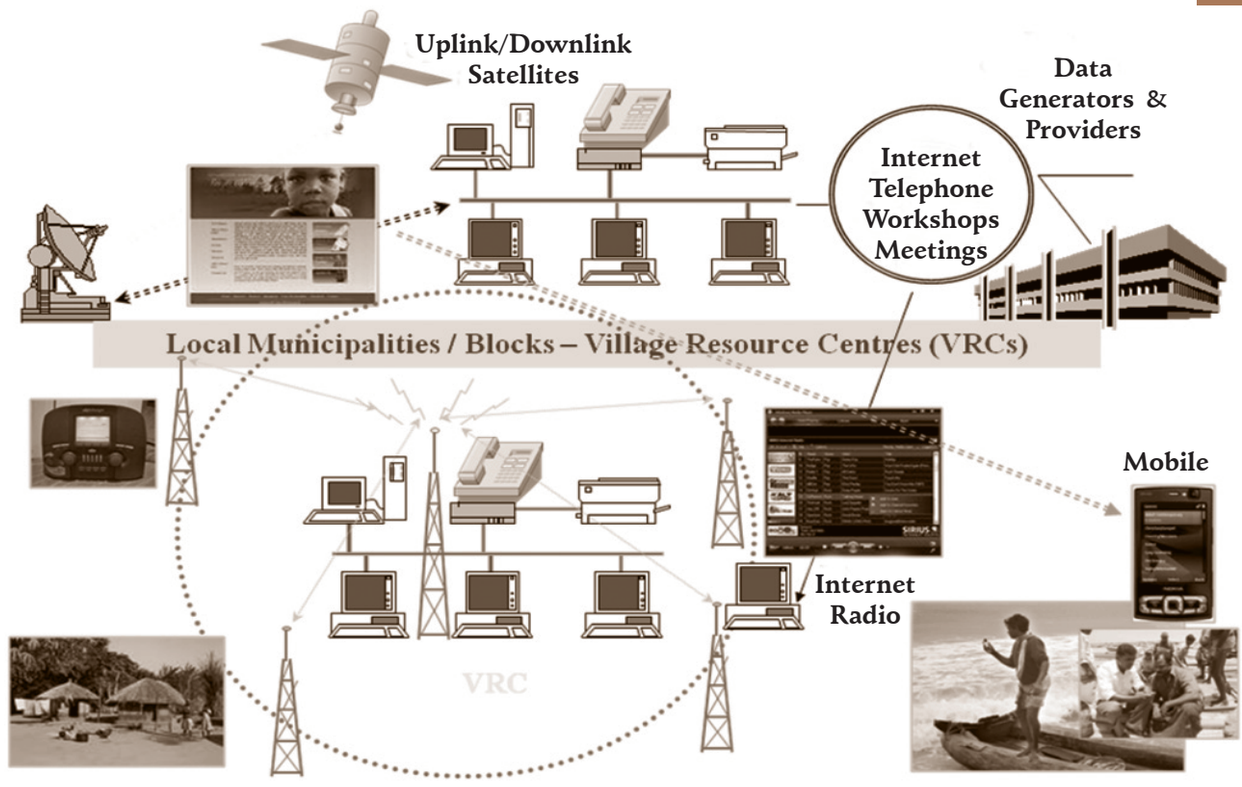
- Climate change will continue and temperature will rise, so the changing heat pulse needs to be monitored.
- There will be a high degree of uncertainty due to the nature, level and variability of weather. This cannot be captured by the existing downscaling models which are far too crude and unfit, even for Nepal, let alone the subcontinent.
- The higher western Indo-Gangetic plains appear to be getting drier. It is likely to lead to drier, warmer climate, wetter monsoons and unnatural climatic events. In the hydrological climate of India, all this implies higher transpiration, which has serious implications for adaptation.

Closing the gaps in information as well as stimulating institutions to get this information to the people that need them moves the discussion to *Gyan Choupal*s. These come in various models:

- Village Resource Centres,
- Village Knowledge Centres,
- *Bharat Nirman* Common Service Centres (renamed as *Bharat Nirman Rajiv Gandhi Sewa Centre*),
- Community Information Centres,
- Information Kiosks,
- Community Colleges,
- Community Technology Learning Centres, etc.

## Chart 1: *Gyan Choupals:* At the Core of the Three-tier Knowledge Network

Most of these initiatives are linked to the GGA and their reach is far and wide and the numbers are impressive. More specifically:




- *Bharat Nirman* CSCs - 113,000 - to be fully operation by 2010
- Village Resource Centres run by ISRO - 7,047 - at all block offices by 2011
- ITC *e-Choupals* - 45,000 - to be fully operation by 2011
- Community Technology Learning Centres - 25,000 - functional by 2009 through the Microsoft *Saksham* Project
- Community Information Centres of National Informatics Centre - 1,000 - functional by 2007
- 22 State Wide Area Networks, reaching to the Panchayat level, to be functional by 2010. It

would be free for all CSCs, but the last hut connectivity may be purchased from the State government concerned

- All states have some initiatives, such as *Bhoomi*, *Bhulekh, Akshaya*, *e-Seva, Gyandhoot*, *Akashganga*, etc.
- Mobile networks: IFFCO-IKSL-Airtel, QUALCOMM-Tata Teleservices-Astute Systems-MSSRF, Oracle initiative in watershed, etc.

## 3 Using Knowledge to Combat Climate Change: *Gyan Choupals* Services and Techniques

MSSRF's work in the area of ICT for Rural Development through *Gyan Choupals* received a major fillip when the government made knowledge connectivity a part of the ambitious rural infrastructure development programme. Another boost came from ITC Ltd, the Indian agro-products major, which has been setting up *e-Choupals* to aid farmers all over the country. Yet, the *Gyan Choupals* major challenge is content, and this will need to be addressed to tackle climate change effectively.

Dr Swaminathan said that little money was earmarked by government programmes for content creation for this knowledge connectivity. The five Cs of sustainable *Gyan Choupals* are:

- Connectivity
- Content
- Capacity Building
- Care and Management
- Convergence and Synergy

Content, according to Dr Swaminathan, should be demand-driven, dynamic, locale-specific and in the local language. Priority areas to raise awareness about climate change and to empower people are:

- Food quality and safety: Understanding *codex alimentarius* standards
- National Security Entitlements Passbook
- Soil Health Card
- Fertiliser Trees
- Water Literacy
- Genetic Literacy
- Nutrition and Health Literacy
- Quality Literacy
- Trade Literacy
- Social Safety Nets, including special databases on schemes in agrarian distress hotspots (e.g. *Vidarbha*)
- Animal Healthcare and Nutrition

Value addition to information and two way communications are important for dealing with water and food security. A Content Consortium at the district level would be a good idea.

Communicating uncertainties to public in a meaningful manner is not easy. Awareness is the precursor to literacy and hence Climate Change awareness should precede climate literacy. Also, agriculture is a state subject and Climate Literacy in many areas needs proactive involvement and management by the state and local governments.

Climate Change studies and work at the *Gyan Choupals* should involve both natural and social sciences and communication strategies designed to convey the message to the general, often poorly educated, public.

K S Murali, Programme Officer (Climate Change), World Food Programme, said even the chavadis of Karnataka - where radio played a very important role - could be seen as *Gyan Choupal*s. However, the content must be useful and accurate.

It is good that India has several huge schemes such as the NREGA and agencies such as NABARD which are significant mechanisms to spread climate change adaptation methods quickly across several states.
There is a consensus that a holistic approach to climate change is necessary. We should get smart and develop win-win solutions for the poor leading to economic benefits and empowerment.

**Gerolf Weigel**
*Deputy Country Director, SDC*

Anita Anand, Director, Com First pointed out that before *Gyan Choupals* are asked to take on the task of acting as centres of knowledge generation and distribution, it would be important to look at their capacity to deliver. For example, do *Gyan Choupal*s have the necessary infrastructure and support systems to take on the challenge? What and where are the knowledge resources and how can they be customised for *Gyan Choupals*? Will the *Gyan Choupal* approach need fine tuning? What alliances will be needed? How will formal knowledge systems be transferred to the community? Who will process the knowledge and practice in a form (language, level, and format) so that a community of stakeholders can use it and contribute to it?

## 4 Key Concerns and the Role of *Gyan Choupals*

The workshop highlighted several key concerns in various areas related to Climate Change, and suggested the role of *Gyan Choupals* in addressing these.

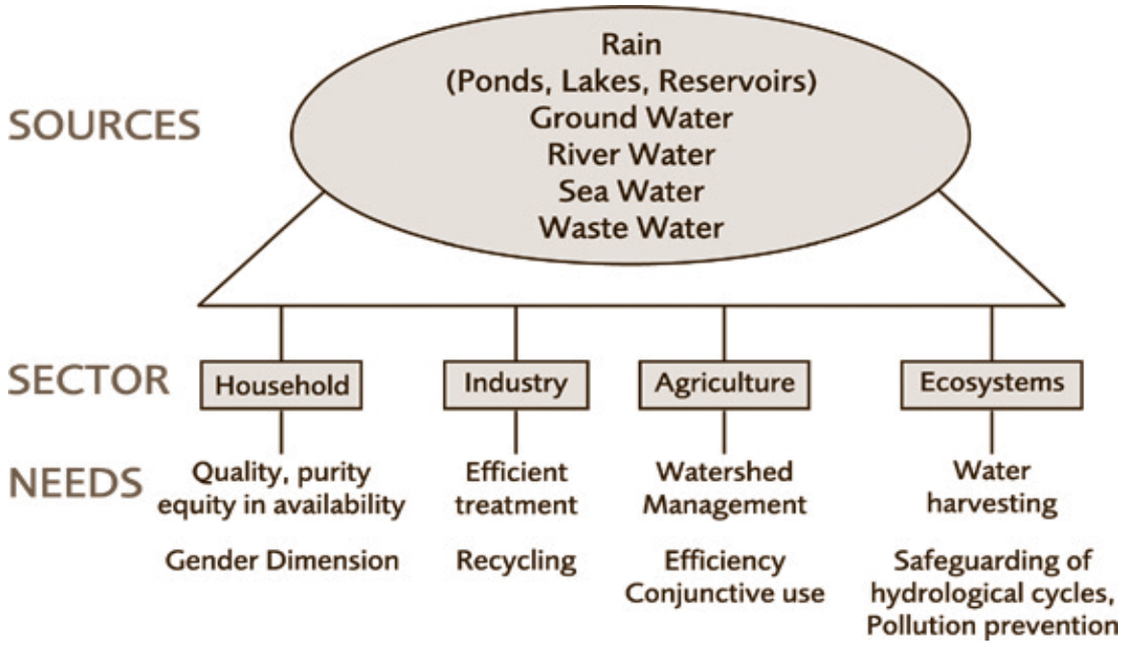
### A. Traditional and community coping mechanisms to combat food and water stress

***Community Food and Water Security Systems:*** Community food and water security systems could be promoted by establishing local gene, seed, and grain and water banks by rural and tribal families. These could be operated by local self-help groups, overseen by the village committees.

According to A Nambi, Project Director, Climate Change (V&A) Project, MSSRF, the Gene-Seed-Grain-Water Bank Continuum, a model developed by MSSRF uses an integrated approach concurrently addressing the 4Cs of Conservation, Cultivation, Consumption and Commerce, is another tool.

India does not have adequate warehouses and modern grain storage facilities even in the Green Revolution heartland that feeds the public distribution system (PDS). Dr Swaminathan has called for at least 50 ultra modern grain storage structures at different locations, each capable of storing a million tonnes of food grain. A national grid of grain storage structures will help prevent both panic purchase and distress sales. The World Food Programme (WFP), which supports grain banks, is looking at Supply Chain Management for food security in distress situation.

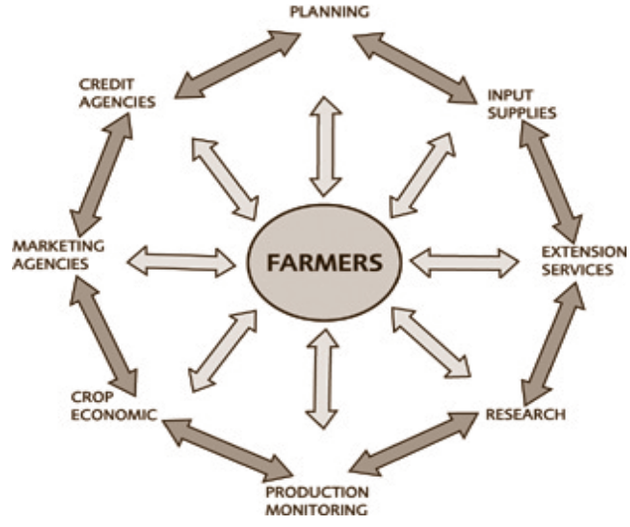
## Chart 2: Building a National Water Security System




B Venkateswaralu, Director, Central Research Institute for Dry land Agriculture (CRIDA) presented the findings of a National Networked Project on Climate Change in Nagaland. Here, coping mechanisms had built on the experiential wisdom of farmers who were cultivating a variety of vegetables in the hills, normally found in the Assam plains. Another indicator of change was the shifting of chickpea varieties suited to southern India, to central India. The *Dhoravar/Kottai* technology from Tamil Nadu could be suitably modified to manage sea water intrusion in coastal areas.

***Crop insurance:*** The National Agricultural Research System (NARS) can be used to educate SHGs and other agencies about coping mechanisms available to address climatic risks, such as crop insurance and weather-based crop insurance, as well as their limitations and farmers' experiences of using them.

***Experience and best practices in traditional water systems and climate management:*** Sustainable agriculture practices could be the most important tool against climate change and farmers hold the key to these. The experience of fishing villages in Nagapattinam district, Tamil Nadu (see Annexe 2: How Fishermen in a TN village are coping with Climate Change) is a good example of this.



***Vulnerability Ranking:*** Rakesh Kumar, Deputy Director, National Environmental Engineering Research Institute (NEERI), Mumbai, suggests a score-based ranking of districts for determination of vulnerability based on climate change. The factors that contribute to it are distribution and burden of climate sensitive impacts and proportion of vulnerable population. This vulnerability could be measured from both physical and physiological aspects. The incidence of some diseases such as asthma, plague, leptospirosis, mental health, cardio vascular diseases, heat stress, hypothermia has increased, due to climate change.

***Soil zoning:*** With irregular monsoon behaviour, it is essential to designate - in every agro-climatic region - areas that are 'most seriously affected' (MSA), and areas with adequate soil moisture to raise a crop, that is, 'most favourable areas' (MFA). In MSA areas, immediate relief will have to be provided and steps taken to revive agricultural operations as soon as there is adequate rainfall. Contingency plans and alternative cropping supported by seed banks will be necessary. Like grain reserves for food security, seed reserves are essential for crop security. In MFA areas, steps should be taken to promote additional production through free supply of fertilisers.

***Weather codes:*** In the same way, drought, flood, and good weather codes for each agro-climatic region are also needed. The drought code can indicate how adverse impact can be minimised through crop-life saving techniques, water conservation and efficient use. The flood code should indicate steps to revive farm and other livelihood activities when flood recedes. A good weather code would indicate methods of maximising the benefits of a good monsoon, to build up substantial grain reserves. Such codes should detail the anticipatory measures to be undertaken to minimise the adverse impact of abnormal weather and maximise the benefits of good monsoons. Such Action Codes should become integral parts of our climate literacy and adaptation plan and programmes.

***Agro-met stations:*** India's Meteorological Department under the Ministry of Earth Sciences has launched a project "Integrated Agromet Advisory Service in the Country" from April 2007, said R P Samui. This is a five-tier multi-organizational and multi-institutional project. The prime objective is to issue district level weather forecast and Agromet advisories for the farmers on real time basis. Adaptation or mitigation strategy as well as contingency plans are prepared in consultation with State departments and agricultural universities, ICAR, etc and communicated to the different users.

A 'weather information for all' programme is needed - by setting up mini agro met stations in each block with basic instruments to measure temperature, rainfall, wind speed and relative humidity. Mini agro-met stations can be built in each village with basic instruments to measure temperature, rainfall, wind speed and RH to help farmers take weather-based farm decisions.

***Climate risk managers:*** A team - one woman and one man – in every Panchayat can be trained as climate risk managers. Well-versed in data collection and interpretation, they can assist farmers to take timely location-specific decisions. The MSSRF is developing training modules to build a national cadre of climate risk managers based on the integration of traditional wisdom with frontier technologies. The aim would to train half a million climate risk managers by 2012. *Gyan Choupals* too can act as weather stations and generate weather and climate data to be posted for central repositories for analysis and agro advisory.

## B. Sustainable agriculture practices and possible change in cropping pattern and crop management

***More Crop and Income per drop of Water Movement:*** Involving farmer participatory action research in over 2500 villages, the movement aims to change mindsets – moving from volume to efficiency.

- In 2007-08, sixty three institutions in 23 states covering 2001 villages organised 5000 farmer participatory action research programmes.
- Each programme covered a minimum of one hectare. Water saving at farm level in various crops ranged from 23 - 89 per cent.
- The additional yield recorded ranged from 30-50 per cent in different crops.
- The additional income obtained by farmers was Rs 2,000- Rs 20,000 per hectare depending on the crop.

The technologies and interventions used were: System of Rice Intensification, Micro Irrigation with Fertigation, Soil Health, Promotion of Integrated Crop-livestock Farming System, Crop diversification and multiple uses of water, Weather-based crop insurance programmes, and convergence of credit, insurance and market. The recommendation is that at least 5 per cent of India's irrigation budget be devoted to this movement to achieve the objectives.

***WAR for Water:*** The components of the Winning, Augmentation and Renovation programme carried out by the Department of Science and Technology, Government of India, are: Rain Water Harvesting, Recycling of wastewater, Conjunctive use of water, Technologies for desalination, and providing safe drinking water for rural and remote areas.

*Gyan Choupals* could be linked to this by disseminating knowledge of scientific practices such as System of Rice Intensification (SRI) to bring down the use of large quantities of water, Sea Water Farming using mangroves, the Aqua-Agri farm model, and the 4Cs Approach (Conservation, Cultivation, Consumption and Commerce).

The Ministry of Rural Development is concentrating on water sustainability in a big way because while fossil fuels have alternatives. Water has no alternative.

**Agatha Sangma**
*Minister of State for Rural Development, Government of India*

Agatha Sangma, Minister of State for Rural Development, Government of India, said her ministry was keen to promote decentralised Community-centric Water Management Systems. Many such examples are creating mini revolutions in specific villages and districts. The challenge is to expand these locally and across regions.

In water-rich Uttarakhand, where Anil P Joshi, Director, Himalayan Environmental Studies and Conservation Organisation, runs his spring recharging projects, over 60 per cent of villages are now drinking water-scarce. Climate change along with deforestation has resulted in mountain springs - the main source of water - drying up. The project was designed to bring water to communities through traditional systems -with help of nuclear science - by identifying catchment zones for the spring through Isotopes application, and treating identified catchment areas for increased discharge. After treatment, the discharge rate of 16 springs went up 4-8 times, and so did production of rice and wheat. Owned and managed by the community, such water resources revive ecological traditions and solve water conflicts. A virtual land-lab model is being replicated in 143 springs in Uttarakhand, Himachal Pradesh and Jammu and Kashmir.

The average Indian now uses rivers for every activity except for what should be their most important use— drinking water. 'Our village, Our water, Our management' should be the new slogan. This will give decentralised water resource availability, allow ecological revival of traditions and diffuse conflicts over water.

**Anil P Joshi**
*Director, Himalayan Environmental Studies and Conservation Organisation*

In another interesting example, M Vanaja of Watershed Support Services and Activities Network (WASSAN) presented the Andhra Pradesh Drought

Adaptation Initiative (APDAI). A pilot project in rainfed areas in Andhra Pradesh (AP), communities have been mobilised to use groundwater as a common resource, by pooling bore wells and developing regulatory mechanisms. In water-scarce AP, 58 per cent of groundwater is drawn through bore wells - against the UN norms of 40 per cent- much higher than needed for irrigation, affecting rural poor and marginal farmers. Government policies such as free power supply, horticulture support for drips and sprinklers and other surface irrigation subsidies encourage this overuse. The APDAI project involves five villages in two districts and 166 farmers over 752 acres. Already, irrigated area has doubled and fodder production increased three times. Three additional crops are being grown, over and above a 240 per cent increase in grain production. About 25 per cent of pumping hours has been saved.

P K Ghosh, principal scientist, Division of Water Management, ICAR Complex for NEH Region, Meghalaya talked about the micro rainwater harvesting project taking off from Umiam, a region that suffered 25 per cent drought months in the last 15 years. This cheap zero energy-based *Jalkund* (water tank) technology has been replicated by NABARD in four states and up scaled by an NGO. In the north-eastern hill region, 111 such *Jalkunds* have been constructed. The capacity of each tank is 30,000 litres, costs Rs 6055 and harvests almost 45,000 litres annually. The water is used to irrigate high value crops such as off-season vegetables through drip irrigation and raise incomes to Rs 4.3 lakh at the regional level.

The Tarun Bharat Sangh, Rajasthan showed by example that valuing geocultural diversity will help reduce climate change impact. Rajendra Singh stressed on the critical issues of water rights for communities and encroachment and exploitation of Aquifers. In Alwar, the *Sangh* has rejuvenated water streams over a 6500 sq km area; chosen not to sow water-guzzling crops, and excluded industries through a river Parliament.

Issues of water delivery are equally important. Sunita Narain of CSE suggested that efforts should begin at the *Gyan Choupal* level. She pointed out that NREGA will help only if the scheme is run less like a famine relief programme and more for creating local level capacities. Since water management is about rights of management, *Gyan Choupals* should take up the slogan of *One Village Water Security Map for Every Village*.

## C. Sustainable livelihood, safeguarding biodiversity and forest resource management

Sybille Suter, Country Director, Swiss Agency for Development and Cooperation (SDC) said provision of climatic services and functions to rural communities is inadequate and therefore, the adaptive capacity of the rural poor must be improved. This can be done if the government mainstreams national welfare programmes such as the NREGA into its Climate Change plan, so that adequate employment opportunities for the poor could be provided along with environmental services.

The SDC has reoriented its interests in climate change in India and will now focus on adaptation and improvement in energy efficiency.

**Sybille Suter**
*Country Director, Swiss Agency for Development and Cooperation (SDC)*

In this light, Prof Swaminathan called for a three-pronged approach: Education, Social Mobilisation and Regulation through conserving water, regulating use of groundwater and mandating water harvesting as a mode to deal with climate change. The solution is to have decentralised community-centric models that ensure recharge and management of our groundwater, or the 19-21 million wells as per the water resources department. Water literacy and management practices are desperately needed. NREGA can be used to build assets and capacities at the village level for building a sustainable water future.

Various studies have pointed out how indiscriminate groundwater mining is leading to water starvation across the country, especially the food grain belt in the North. In this connection, Prof Swaminathan suggests we could look at 'fertilizer trees' to quench the thirst and hunger of soils. One is *Faidherbia albida* found in the Sahel region of Africa. Sixty years of research shows that mature trees supply the equivalent of 300 kg of complete fertiliser and 250 kg of lime on each hectare. This can sustain a per hectare maize yield of 4 tons. The second is photo-insensitive mutant *Sesbania rostrata*, which fixes nitrogen both in the stem and the roots.

The National Action Plan for Climate Change is not just a government plan. It must involve everybody and definitely the *Gyan Choupals*.

**Jairam Ramesh**

*Minister for Environment and Forests, Government of India*

Jairam Ramesh, Minister for Environment and Forests, Government of India, in his keynote address said, that ten per cent of the greenhouse emissions are being neutralised by our forest cover, which is only 21 per cent of the total area. Much of it has been degraded, and a study was needed to quantify the ecological value of the cover. At the same time, a quarter of all Indians depend upon forests for their livelihood. The ministry has three thrust areas:

- Forest management: Central to climate change adaptation and mitigation efforts since forests have high carbon sequestration value. Improving the quality of forests will be priority.
- Water Management and Water Security: Stop depletion and ensure efficient use and management by using price incentives, if necessary.
- Land productivity: The problem of degraded lands has reached serious proportions and is connected to food security. Many areas, such as central Uttar Pradesh, Madhya Pradesh (Bundelkhand), etc suffer from degraded lands and low productivity.

These challenges are being takes seriously, said Ramesh. In 2009-10, a fiscally insecure time, expenditure on forestry is going to be Rs 8,700 crore, more than double of that in 2008-09. More important, the new job will be to involve local communities, so far seen as encroachers, in forest management with the help of the two crucial forest laws, the older Forest (Conservation) Act, 1980, amended 1988 against the State/Union Territory Minor Forest Produce (Ownership of Forest Dependent Community) Act, 2005 and The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

*Gyan Choupals* could play a role in the interface of forest management and people using ICTs. Madhya Pradesh has taken the lead in using ICTs for forest management. This could be incorporated in *Van Vigyan Kendras* (Forest Knowledge Centres), or VVKs to give people a stake in forests.

## D. Science and Technology

Ramesh Kumar Jalan, Climate Change Community, United Nations Development Programme (UNDP) stated that the International Panel on Climate Change (IPCC) has 140 models of Climate Change, of which only 89 models have a scientific basis, the rest being opinions of scientists. Also, as Stephen McGurk of IDRC stressed, downscale models for capturing climate change take two to three years to develop, so things will remain a bit uncertain until a new generation of global circulation models is developed, which will take time.

It remains important to intensify research on assembling genetic material for a warming India. Novel genetic combinations for tolerance to higher temperature and moisture stress can be developed through the tools of recombinant DNA technology. J C Rana, National Bureau of Plant Genetic Resources, Regional Station, Shimla called for using underutilised crops as a buffer for climate change and strengthening farmer-seed systems to promote open, dynamic and integrated genetic system.

Similarly, flood and salinity tolerant strains of major crops can be developed. Farming has to become knowledge-and technology-intensive if we are to overcome the emerging challenges. Prakash Rao, Associate Professor, Symbiosis Institute of International Business, Symbiosis International University, Pune says development of resource conserving technologies would be crucial.

Scientific research for climate change must also include health research–general physical, psychological and mental health conditions. The National Health Policy must consider.

- Environmental and occupational health scenario and policy- for instance, leptospirosis is now linked to climate change though it wasn't so 15 years ago.
- Ecological research (pollen/spore calendar, fungal growth, particulate matters, VOCs) and linking with meteorological parameters.

***Disaster management:*** Since geological disasters have been precipitated by growing hydro-meterological disturbances, P. G. Dhar Chakrabarti, Director, SAARC Disaster Management Centre called for convergence of Climate Change and Disaster Management via Community-Based Disaster Management Plans and the need for horizontal and vertical integration of plans and action. The Centre is planning to launch an India Disaster Knowledge Network, whose chief objective will be to free up local knowledge and mitigate and adapt to climate change using that knowledge, at the forthcoming India Disaster Management Congress.

## 5 Needs and Requirements: Integrating and Strengthening *Gyan Choupals* in Climate Change Strategies

A scientist had shown the late Norman Borlaug, father of the Green Revolution, a nitrogen tracer developed for measuring soil fertility. Borlaug said: "Take the tracer to the farmer".

Yet, agriculture knowledge creation and dissemination has been neglected. In Gujarat, said B Venkateswarulu, director, CRIDA, Hyderabad, there has been no appointment of agricultural extension officers in the pas t 30 years. So the questions here are: how do we engage local communities to spread knowledge about these initiatives? How do we ensure this to spread across frontiers of knowledge? How do we engage local authorities, businesses and people in climate adaptation to feed into national-level policy making?

### Space Technologies

Remote sensing helps in mapping, monitoring changes and deriving bio-geophysical parameters of earth resources and environment. Jai Singh Parihar, Deputy Director, RESA, Space Applications Centre (SAC), said ISRO is using space technology for

- **Mapping Indicators** of climate change
- **Assessment of agents** of climate change, such as green house gases and aerosol, their sources and distribution pattern
- **Modeling the impact of climate change** in various fields and natural resources that will be helpful for planning towards adaptation measures and preparedness
- **Communication** automated gathering of information from remote places and communicating with remote area

**P S Roy**
*Deputy Director, National Remote Sensing Center, ISRO*

According to P S Roy, Deputy Director, National Remote Sensing Center, ISRO, the advent of availability of multi resolution satellite sensors and communication systems has made the development of spatial explicit information relevant to farmers as advisories and its communication more efficient. NRSC provides Land Use and Land Cover Maps containing Net Sown Area, Seasonal Water Spread Area and Seasonal Snow Cover which is a useful tool for local planning, even for dealing with mid-season drought. A n operational system has been established to provide spatial and temporal information on crop production, net sown area, agriculture drought, water use patterns and irrigation management, watershed amelioration, ground water prospects, soil moisture variations to facilitate in season and long-term planning and management. It also generates information on condition and progress of drought, ground based rainfall and associated agro meteorological information, water spread and crop progress patterns in command areas. Data is disseminated through the web-enabled information system *BHOOSAMPADA*.

Efforts are ongoing to develop systems that can form real time advisories to farmers through the new ISRO geo-portal *BHUVAN*, which showcases Indian imaging capabilities in multi-sensor, multi-platform and multi-temporal domain. It is a gateway to exploring and discovering virtual earth in 3D space with emphasis on Indian region.

Recent advances in synergistic use of geospatial technologies like GPS, satellite communication systems, automated weather monitoring systems and satellite based biophysical and geophysical information can provide real time forecasts of cropping patterns and production.

According to Virendra Mani Tiwari, Scientist, Gravity and Magnetic Studies Group, National Geophysical Research Institute, Hyderabad, planning sustainable availability of water resources in a climate changes scenario requires information of spatio-temporal variability of the total water storage, ground water storage, melting glaciers, etc. Ground monitoring of these is a herculean task and difficult but recent developments of space technology allows providing this information from the sky using satellite Gravimetry -- surface water variation through satellite altimetry and soil moisture, rainfall etc through satellite data. This data can tell us how stored water getting depleted from the northern region, as sparse bore well measurements were not giving the magnitude of loss. Water mass loss from northern Indian region is about 50 cubic km every year, and 30 cubic km from the whole of India. Such research can be brought to communities in, for instance, specific regions where studies have been made such as Karnataka, Andhra, Maharashtra and Punjab.

## Universities

Ganesha Raj Kasargod, Deputy Director (Applications), Indian Space Research Organisation (ISRO) shared how ISRO's 500 VRCs across the country were promoting knowledge connectivity between universities, research institutes, hospitals and a large number of institutions for medicine, water, food security, and climate.

Universities such as IGNOU and Research Institutes such as IARI and ICRISAT can and need to play and major role in promoting Climate Literacy. Universities are diversifying their portfolios and are offering new courses including Climate Change. As a policy, Climate Change research and extension and crop insurance can be incorporated into the agricultural science education.

H S Gupta and H C Joshi of the Indian Agricultural Research Institute (IARI) suggest creation of a compelling model for integrating climate research with the people and community. Currently, the Climate Change literacy programme through the National Agricultural Research System (NARS) operates through the following:

1. The Department of Agricultural Research and Education (DARE)
2. The Indian Council of Agricultural Research (ICAR)
3. Various Research Institutes and National Research Centres under ICAR
4. The All India Coordinated Research Projects of ICAR on agro meteorology and dry land agriculture jointly educated 100-150 farmers at all their centres during October, 2008 about adverse effects of climate change
5. Central Agricultural Universities
6. State Agricultural Universities, and
7. *Krishi Vigyan Kendra*s.

NARS is used in giving real time information on climate through Agromet Advisory Groups in some universities, though their scope has to be enlarged and they need to be extended to all state universities.

The Informatics Development Programme at grassroots level was serving many farmers, according to M Moni, Deputy Director General (Agricultural Informatics), NIC, works through the following:

- Informatics Blueprint of a Village (DISNIC-PLAN Programme)
- Agricultural Resources Information System (AgRIS)
- National e-Governance Programme in Agriculture (NeGP-A) (22 services)

Agricultural Technology Information Centres (ATIC) are already providing technological information to farmers. They should reorient their knowledge base in line with CC. ATICs have free phone call facilities to respond to farmers, so they can be used to provide latest information on climate risk avoidance with the help from expert base available at Institutes/SAUs.

## Traditional wisdom and modern knowledge

Loss of traditional knowledge systems which supported livelihoods and societies over centuries have also resulted in loss of traditional coping mechanism against eventualities, hence creating less resilient communities. This knowledge must be brought back to the *Gyan Choupals* for compilation and dissemination so that conflicts are minimised.

For instance, in the past farmers used to go into the forests during the pre-monsoon seasons to collect mulch for manuring fields. Nowadays the foresters do not permit this. K Venkataraman, Senior Consultant, National Biodiversity Authority, Chennai, highlighted how fisher folk in coastal areas were making use of traditional fish aggregating devices for catching fish, which provided scope for further research. Environment Minister Jairam Ramesh said how large tracts of land have been reclaimed in central Uttar Pradesh through use of gypsum, a traditional technology, and poor people have benefited.

**Climate-proof crops and traditional foods:** Suresh Mathevan from the Centre for Indian Knowledge Systems (CIKS), Chennai, highlighted the importance of traditional varieties of crops, some of which were short-duration, resistant to floods and droughts, and could potentially be used as a tool to deal with climate change.

**Coarse cereals:** The neglect of coarse cereals because of low marketability has also contributed to the nutrition deficiency in the rural areas. C.S. Rama Lakshmi, Environment cell, Department of Forest, Environment, Science & Technology, Government of Andhra Pradesh, said the department's AP Environment Connect project, launched in 2009, enabled the stakeholders to deliberate and evolve environment friendly actions with synergy. Community Sensitisation programmes on waste management, electricity and water conservation, petrol and LPG usage, tree planting and

protection are underway. There is also a move to introduce coarse cereals in the Public Distribution System (PDS) and promote use of local foods such as *ragi, jowar* and *bajra*. Villagers have forgotten to eat millet; hence promotion activities included awareness programmes and cooking classes. Mathevan of the Centre for Indian Knowledge Systems (CIKS), Chennai, said his organisation conducted Food Festivals to promote coarse millet but it was extremely difficult to get farmers interested because of poor prices.

**Traditional foods:** Besides coarse cereals, traditional foods can be promoted through *Gyan Choupals* and taken from land to lab. Rape leaves, cauliflower, *amaranth*, drumstick leaves, spinach, parsley, turnip greens, carrot, tapioca chips, sweet potato, yam and radish eliminate many nutritional and vitamin/mineral deficiencies. The government can also mainstream the nutritional dimension in the National Horticulture Mission and promote such foods. Similarly, to prevent malnutrition, *Gyan Choupals* can be used to counsel mothers and promote government ICDS programmes.

**Weather forecasting:** Traditional methods of weather forecasting are used in several parts of India. In Saurashtra, rainfall predictions were made by almanacs, and the results were comparable with the IMD. A V Balasubramanian of Centre for Indian Knowledge Systems, Chennai said the CIKS had validated the *Panchangam* (Southern almanac) from the perspective of rainfall, correlated with modern knowledge, and produced an agro-almanac, *Velan Makkal Panchangam*, in Tamil for farmers for the Yuva year 14 April 1995 to 13 April 1996. Methods for long range forecasting of rain include one where the weather is observed during a period of 14 days in the Tamil month of *Margazhi* (mid-December to mid-January).

**Early warning systems:** Early warning systems reduce negative impacts. For instance, the Tamil Nadu Agricultural University is carrying out a project called ClimaRice which provided SMS alerts to rice farmers to tackle climate change.

Vijay Prathap Singh Aditya, Chief Executive Officer, Ekgaon Technologies, said early warning systems that are 'alive' during an eventuality serve multiple functions and are increasingly recognised as a critical factor influencing the economic and human impacts of climatic variability and natural hazards. Ekgaon is piloting such systems in many parts of India. Traditional knowledge in communities even today contains examples/methods/techniques of early warning, mostly for slow onset disasters but many for sudden onset disasters also. Over centuries, religions and faiths over have established preparedness/response mechanism introduced as part of day-to-day life through rituals and prohibitions. Modern science has not been able to identify/validate such mechanisms although many of these have proven themselves over time and still have large followers. The search is not to contest claims but to identify the "living" mechanisms that support delivery of early warning, build resilience and prepare communities. Singh Aditya shared an example of the *Aadi* festival in South Tamil Nadu during which the colour of the dress of the local deity decides what crop is to be sown in the region. The colour itself is decided by the priests through natural observation of rainfall. This forecast has stood the test of time and found to be more reliable then the metrological forecasts!

**Medicinal plants:** There is a widespread revival of interest in medicinal and aromatic plants. The *Gyan Choupals* can help in the documentation and validation of this information. An ecosystem based approach to climate change is required, which is not fully understood by professionals. This knowledge can be generated, documented and disseminated.

**Climate monitoring:** In the tribal-dominated KBK (Koraput-Bolangir-Kalahandi) districts in Orissa, 50 years of data on rainfall was available. It indicated a decrease in the number of rain days, an increase in prolonged dry spells and in non- seasonal rainfall. Citing this example, Virinder Sharma, Environment and Livelihoods Adviser, Climate Change and Energy Unit, DFID India, stressed the need to differentiate between climate variability and climate change and said adopting a vulnerability approach might be more appropriate.

# 6 Climate Literacy and Adaptation: Role of *Gyan Choupals*

Knowing what we know about the challenges to dealing with Climate Change, how can such knowledge be adapted for *Gyan Choupals*? How do we transfer formal knowledge systems to the community? How do we generate process and disseminate this knowledge among stakeholders? Various experiments and pilots were shared at the workshop and pointed towards possible solutions.

**Drought preparedness:** In an experiment in Adakkal Mandal in Mahabubnagar, Andhra Pradesh, ICRISAT scientists used VKCs to foster drought preparedness at the community level. Colour-coded maps derived from satellite imagery and ground level information were used to inform farmers and village leaders of potential vulnerability and possible remedial measures. In late May 2009, they issued a Drought Vulnerability Forecast anticipating seasonal rainfall at 400 mm, compared to the normal average of 550 mm. Actual rainfall received till August was 135 mm. They named six villages likely to be most affected: Vemula, Thimmapur, Nijaralapur, Ponnakal, Thimaipalli and Thunkanipur. Problems related to drinking water scarcity, inadequate irrigation, fodder shortage was also predicted.

A typical agro-advisory issued in June-July 2009 suggested that farmers who had not started paddy nurseries were advised to grow crops like Castor seeds, Maize, Sorghum, Green gram, Black gram, Chickpea and Pigeon pea. Detailed package of practices were issued on a weekly basis. Special sessions on alternative farming due to delayed monsoons were held and farmers were advised to take up mixed and inter-cropping.

**Demystify and inform:** Demystification of technical information and its transference it to the community in a simple form is the key to the success of any programme. Sybille Suter, SDC cited the V&A Project and the Biodiversity Project with MSSRF as successful examples to be used for climate literacy using ICTs. The V&A Project, which includes land-based, weather-based, knowledge management and water-based interventions in Andhra Pradesh and Rajasthan, showed uncertainty was an important factor.

S C Jain, Programme Coordinator, Action for Food Production (AFPRO), cited the experience of working with communities in Rajasthan and Andhra Pradesh under the V&A project for promoting the concept of Water Bank and Water Budgeting exercise in creating awareness on vulnerability issues and promotion of adaptation technology for water resource management.

**Monitoring water resources:** A project on Participatory People's Monitoring of Water Resource from Yavatmal, Maharashtra included community sensitisation on ground water dynamics - by explaining the aquifer boundaries; systematic recoding of water level from observation wells and rainfall; conducting water budgeting exercises with farmers, water utilization for different purpose in the village etc. These exercises have resulted in crop planning and adoption of efficient methods for irrigation. The sensitisation tools are simple and in the vernacular language.

**Climate adaptation techniques:** In Mousuni Island, Sunderbans - about 15 per cent of which is eroded due to inundation - WWF India is piloting a project to teach local people to deal with climate change. The Mousuni Climate Adaptation Centre is connected by ICTs that provide information on Early Warning Systems and Internet. A Disaster Response Team (DRT) was created consisting of local people who would deal with disasters, Shirish Sinha, Head, Climate & Energy, WWF India said. Efforts to build the capacities of the local people for disaster management include a seed bank - which has reintroduced long lost traditional varieties of crops - including a salt-tolerant paddy variety called *tal mugur*; a book bank that provides books; diversification of cropping patterns, fisheries, whereby sea bass spawns from hatcheries have been introduced in protected brackish water ponds as an alternate crop in case of saltwater incursion; and preventing coastline erosion by strengthening embankments through regeneration of mangrove

vegetation on the southwest coastline. Such climate adaptation centres are just another form of *Gyan Choupals*.

However, as McGurk of IDRC said, we need to exercise caution in adopting adaptation programmes. Very large hydrological structures generate a lot of interest but also require huge investment. A no-regret adaptation policy is needed. Where infrastructure is weak and the environment exceedingly uncertain, modest local-adaptation models are better. So, these models should be propagated and linked to national levels, if possible.

We have to spend much more on agriculture and irrigation. The NREGA should be used only to build water security systems. It is now time to shift attention from northern states and promote rice cultivation in the eastern states.

In India's poorest states, the scientists should come out of their air-conditioned rooms and labs and find out how the farmers live and work. We need to help the last man, and this calls for a change of mindset.

**Mabel Rebello**
Member of Parliament (Rajya Sabha),
Government of India

He also felt autonomous and distributed adaptation models and practices, such as changing cropping patterns or pitting seeds deeper in the soils, are easy to disseminate through mobiles and broadband connectivity via CSCs and can be used for climate literacy. These tools can be used to educate all about, for instance, electricity subsidies that are given in a wide swathe of states, which are groundwater depleting and unsustainable and therefore mal-adaptive policies. Hedging climate risks and any other kind of risks would be good adaptive policies. Micro-insurance, mobile banking and telecentre services, being transformative policies, would go beyond climate literacy.

Adaptive capacities also depended on economic resources and institutions. Successful practices emerge from use of traditional knowledge for building resilience in the area of weather prediction, wind direction, humidity and temperature. These have to be documented and disseminated. At the same time strategies such as promotion of alternative cropping patterns, mixed cropping and intercropping, shelter belts, water harvesting ponds, livestock production – are all issues which need more attention and action.

While devising strategies and mechanisms to deal with climate change, heterogeneity of the country needs to be taken into consideration. Mabel Rebello, Member of Parliament (Rajya Sabha), Government of India, pointed out that while the state of Jharkhand suffered from drought and practiced rainfed agriculture, Chhattisgarh produced abundant rice because its development planners had paid sufficient attention to irrigation. Jharkhand farmers need kerosene to lift water from the wells but the state had no subsidy for kerosene. She called for the Green Revolution to move to states such as Orissa, Jharkhand and Assam.

## 7 The Synergy of Partnership

The purpose of the workshop was to develop a road map for *Gyan Choupals* to deal with the effects of Climate Change in natural resources, food and water security and biodiversity. There is a strong potential for success of this move lies in its strong synergies, especially in the total of almost 400 strong partners in the *Grameen Gyan Abhiyan*.

A major aim of the *Gyan Choupal* movement is to about convergence and synergy among the various initiatives launched by public, private and academic sectors.

For *Gyan Choupals* to take on the challenges posed by climate change, synergistic cooperation needs to be developed and nurtured between the corporate sector (Intel has one lakh teachers for its Each One Teach One programme), universities, research centres, government and its ministries/ programmes/schemes, NGOs and CBOs as well as SHGs.

As Prof Swaminathan said, "The Jamsetji Tata Training School should, in collaboration with Microsoft (SAKSHAM), Intel and other agencies involved in capacity building, aim to train five lakh women and men members of Panchayats during the next five years."

## The Grameen Gyan Abhiyan:
### Partners (22 Indian states and 32 countries)

| | |
|---|---|
| Academic Institutions | 15 |
| Corporate Social Responsibility of Private Sector | 50 |
| CSOs | 14 |
| NGOs | 205 |
| Funding Partners | 4 |
| Government of India | 16 |
| Hospitals | 4 |
| Media | 14 |
| Research Institutions | 30 |
| State Governments | 36 |
| Tata Group | 7 |
| UN Agencies | 5 |
| Virtual Networks | 16 |
| TOTAL | 416 |

There are many *Gyan Choupals* and numerous models and actors. The Climate Change Community, UNDP Solutions Exchange is a web-based example of *Gyan Choupal*. Modules for climate literacy are being developed by MSSRF with Interco-operation (IC) of Hyderabad, National Institute for Agricultural Extension Management (MANAGE) of Hyderabad and Winrock International India, New Delhi.

Partnership plays a key role in effective dissemination strategies. Ramesh Savalia, Programme Coordinator (Sustainable Livelihoods), Centre for Environment Education (CEE), spoke about his experience in climate literacy in the semi-arid region in Gujarat. CEE works through as many as 14 agencies such as:

- Rural Knowledge Centre (RKC)
- Farmers Field School (FFS)
- *Paryavaran Vikas Manda*l (Youth & Women)
- Self Help Groups (SHGs)
- Common Interest Groups (CIGs)
- Federations
- Community Based Organisations (CBOs)
- Village Development Committees (VDCs)
- Village Water Committees (VWCs)

- Village Milk Cooperatives (VMCs)
- Migrating Pastoralist Groups
- BPL Groups
- Landless Groups
- Saltpan Workers Groups

Knowledge and information empowerment are the guiding principles of *Gyan Choupals*. Provision of demand driven and dynamic information to local communities through PRIs is the key. With 50,000 *Gyan Choupals* as the goal—a goal that can be reached by the help of ICTs. Yet, only 8 per cent of Indians are exposed to Internet. It is important to increase this figure and considered other mechanisms to service the network.

## 8 Recommendations and Conclusion

We need to institute a National Rural Knowledge Commission to compliment the National Knowledge Commission, develop a roadmap for a robust knowledge based society, and bridge the rural and urban knowledge divide in India.

**Basheerhamad Shadrach**
*Senior Programme Officer - Telecenter.org, International Development Research Centre (IDRC)*

Basheerhamad Shadrach, Senior Programme Officer, telecenter.org, International Development Research Centre (IDRC), said the June 2009 President's call for Bharat Nirman CSCs in every Panchayat in the nation had given the *Gyan Choupals* programme the much-needed boost.

**Vikas Goswami**
*Head, CSR, Microsoft Corporation India*

Shadrach suggested that for *Gyan Choupals* to play an apt role in tackling climate change, it was necessary to demystify issues around Climate Change and put it in perspective. The context is different in different countries. Developing countries did not have the conspicuous consumption of the west, said Ms Vikas Goswami, head, CSR, Microsoft Corporation India. Flexibility in farming practices was crucial to climate change. Internet could be used to reach a large number of Indians, since only 8 per cent of the people in India are connected.The following recommendations – in principle and action - were made:

1. Make "knowledge connectivity" a realistic and implementable activity of *Bharat Nirman*.

**Recommendation:** Set up a small group of people to develop a roadmap for overlaying the much demanded "knowledge-layer" to *Bharat Nirman*.

2. Encourage convergence among government agencies implementing *Bharat Nirman*.

The need for providing climate literacy, sustainable food security and sustainable water security requires convergence of resources, projects implemented by nodal agencies at program design, implementation and monitoring levels. This would include the Ministry of Rural Development, Ministry of Water Resources, Ministry of Communication and Information Technology, and the Ministry of Human Resources Development. Specific agencies involved in *Bharat Nirman* programme often work with little or no coordination between them.

**Recommendation:** Constitute a small group to develop a convergence plan for addressing these specific challenges through *Bharat Nirman*.

3. Produce one million knowledge workers at the grassroots level.

*Gyan Choupal* operators and/or managers are grassroots champions, knowledge workers and gatekeepers. They are the people with their 'ear to the ground' and are in the best position to collect and process data and facilitate other link-workers.

**Recommendation:** Develop a package with appropriate incentives, including financial incentives, to assist *Gyan Choupal* operators and managers to sustain their role as interlocutors and knowledge workers.

4. Develop *Gyan Choupals* as knowledge repositories of villages of India.

Each of 250,000 *Gyan Choupals* (CSC *Bharat Nirman* centres and other telecentres) ought to possess all local data. This must be facilitated, and made mandatory, especially on subject issues dealt with by the Panchayat.

**Recommendation:** Each village should have all its data - livelihood assets (human, social, natural, physical and financial resources) - in their possession. These *Gyan Choupal*-enabled local data systems are assets owned by the community and should be declared as such.

5. Create 6,000 *Gyan Choupal* community colleges in support of skills development in rural areas.

IGNOU has initiated a community college movement in India and the Department of Information Technology, IGNOU and telecentre.org are managing and implementing the work of the telecentre.org Academy in India and globally. There is a National Skills Development Mission for convergence of work in this area, for instance in certifying people on skills, and for imparting skills among unskilled workers.

**Recommendation:** Prepare a 'skills-development programme' for knowledge workers in support of collecting, documenting, disseminating and interpreting local information and for owning information systems in villages. As an income generation activity, this information can be shared with other institutions and communities.

6. Create a Rural Knowledge Network to eliminate the *Bharat* and India divide

A rural knowledge infrastructure is crucial to tackle climate change holistically. The National Knowledge Commission has recommended creation of a National Knowledge Network connecting a number of premier institutions. This could be the hub for a rural knowledge network to create inter-connections between lab and land, land and lab, and land and land. It is also important to build capacity within academic bodies and student communities for strengthening technology innovation and local practices.

Together, they must develop a roadmap for a robust knowledge-based society and to bridge the rural and urban divide, in both knowledge and related infrastructure. This would facilitate setting up a national network of *Gyan Choupals* and regional networks on the basis of Agro-Climatic Zones.

**Recommendation:** Convert large CSCs/VRCs as knowledge and skill development hubs in 6000 blocks, each catering to the learning needs of at least a hundred thousand people – and developing linkages with *Gyan Choupals*.

7. Comprehensive long-term plan to fund climate change mitigation and adaptation strategies, with emphasis on micro initiatives.

Tackling climate change is likely to be an expensive proposition. To counteract the effects of climate change on nutrition, the IFPRI report on climate change says, South Asia requires additional annual investments of $1.5 billion in rural development, over half of these going to irrigation expansion.

**Recommendation:** The National Climate Change plan must be dovetailed with the Water Plan, the Agriculture Plan, the NREGA as well as the Food Security Mission to ensure that subsidies and investments do not run counter to the sustainability of crops, animals, marine as well as human environments.

8. Actively encourage harmony between nature and people through effective decentralisation.

Development is about helping and not hurting people. A paradigm shift is needed in the minds of policymakers and administrators. Tribal communities - which are rich in traditional knowledge and culture practices and live in harmony with nature - are dying out due to lack of livelihoods as modern development has not only bypassed them, but disenfranchised them by displacing them from their habitat. It is still not too late. The key element in dealing with climate change is developing resilience and using a community based approach to assess existing resources and utilisation practices.

**Recommendation:** At the PRI level, people's experiences and scientific knowledge must be collected, collated, disseminated and mainstreamed, with an effective communication methodology.

## 9 Conclusion

Prof M S Swaminathan, chairman, MSSRF concluded the workshop with the following remarks:

1. A Content Consortium should be established in each agro-climatic zone. Its members would include all relevant government, NGOs, academic and financial institutions.

2. The Jamsetji Tata Training School, in collaboration with Microsoft (SAKSHAM), Intel, the community colleges being established by the Indira Gandhi National Open University and others involved in capacity building – can train five lakh women and men Panchayati Raj members during the next five years, focusing on traditional wisdom. There are 240,000 Panchayats in India.

3. The *Gyan Choupals* must be based on the principle of providing content which is demand driven, dynamic, gender sensitive, location specific and in local language. A major aim of the content is to demystify technology.

4. The *Gyan Choupals* should place emphasis on taking anticipatory action in meeting the challenges of climate change, reflected in the form of temperature fluctuation, drought, flood and sea level rise. For this purpose, the *Gyan Choupals* should create and propagate drought, flood and good weather codes.

5. The *Gyan Choupals* should be to help bring about convergence and synergy among various initiatives, started by public, private and academic sectors.

6. The *Gyan Choupals* should work with soil health testing vans and mini-meteorological stations. The aim should be to train Climate Risk Managers at the local level. 'Weather for All' should be the joint endeavour of the *Gyan Choupals* and the mini-meteorological station.

7. The *Gyan Choupals* should do nutrition literacy and promote the cultivation and consumption of local foods and underutilised crops. This would help create an economic state in conservation by helping to find markets for the underutilised crops.

8. A National Network of *Gyan Choupals* should be established for the empowerment of rural communities in areas of adaptation and mitigation of climate change. The Network should adopt a holistic approach covering all links in the knowledge generation and diffusion chain.

Prof Swaminathan announced a Follow-up Committee with Ajay Parida as Chairperson and Senthilkumaran as Convenor. The following persons could be requested to serve on the Committee:

- R Chandrashekhar Secretary, Department of IT, Government of India
- Latha Pillai, Pro Vice Chancellor, Indira Gandhi National Open University
- Basheerhamad Shadrach, Senior Programme Officer, Telecenter.org, International Development Research Centre (IDRC)
- Gerolf Weigel, Deputy Country Director, Swiss Agency for Development and Cooperation (SDC)
- P G Dhar Chakrabarti, Director, SAARC Disaster. Management Centre
- Ganesha Raj Kasargod, Deputy Director (Applications), Indian Space Research Organisation (ISRO-HQ)
- Ramesh Kumar Jalan, Resource Person and Moderator, Climate Change Community, Solution Exchange, United Nations Development Programme
- Vikas Goswami, CSR Head, Microsoft Corporation India Private Limited
- M J Khan, Chief Editor, Agriculture Today
- Virinder Sharma, Environment and Livelihoods Adviser, Climate Change and Energy Unit, DFID India



















Two day National Workshop on
Role of Gyan Choupals / Telecentres in
Spreading Climate Literacy &
in Building Sustainable Food and
Water Security Systems "









ANNEXE 1

# Important Laws and Policies Related to Biodiversity

- The Indian Forest Act 1927.
- Destructive Insects and Pests Act, 1927.
- Agricultural Produce (Grading and Marketing) Act, 1937.
- Indian Coffee Act, 1942.
- Rubber (Production and Marketing) Act, 1947.
- Tea Act, 1953.
- The Prevention of Cruelty to Animals Act, 1960.
- Customs Act, 1962.
- Seeds Act, 1966.
- The Marine Products Export Development Authority Act, 1972.
- The Water (Prevention and Control of Pollution) Act, 1974, amended 1988.
- Tobacco Board Act, 1975.
- Territorial water, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act, 1976.
- Coconut Development Board Act, 1979.
- Maritime Zones of India (Regulation and Fishing by Foreign Vessels) Act, 1980.
- The Forest (Conservation) Act, 1980, amended 1988.
- Air (Prevention and Control of Pollution) Act, 1981, amended 1987.
- National Oilseeds and Vegetable Oils Development Board, 1983.
- Agricultural and Processed Food Products Export Development Authority Act, 1985/1986.
- Environment (Protection) Act, 1986, amended 1991.
- Spices Board Act, 1986.
- National Dairy Development Board, 1987.
- Fisheries Act, 1987.
- New Seed Development Policy, 1988.
- The Public Liability Insurance Act, 1991, amended 1992.
- Wildlife (Protection) Act, 1972 and Wildlife (Protection) Amendment Act, 1991.
- Foreign Trade (Development and Regulation) Act. 1992.
- The National Environment Tribunal Act, 1995.
- The National Environment Appellate Authority Act, 1997.
- The Disaster Management Act, 2005.
- Biological Diversity Act, 2002.
- The Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003.
- State/Union Territory Minor Forest Produce (Ownership of Forest Dependent Community) Act, 2005.
- The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

ANNEXE 2

# Coping with Climate Change: Fisher Folk in Chinnangudi, Tamil Nadu

Chinnangudi village is in the low-lying coastal district of Nagapattinam, Tamil Nadu, where fishing has been a primary livelihood for over five generations. Villagers are vulnerable to multiple hazards such as cyclones, floods and drought. However, their knowledge of fishing and the sea, passed on by their ancestors, along with 'Fish Banks', skills and abilities to decide on seasonal fishing patterns have stood them in good stead all these years. But, no longer. The fisher folk, earning Rs 4,000 - Rs 10,000 a month, have shifted from catamarans to motorised fibre-boats, to go 30 fathoms deeper and in groups to fish, to manage effects of climate change that has affected fishing and income.

Their traditional knowledge includes that of aquatic habitat, climate and weather change, and principles of navigation, which helped them survive the Tsunami. For instance, their knowledge classified wind patterns into five types, deeply linked to availability of fish.

- *Kondal Katru*, or winds from north-west to east during September-November, yielding *Engraulids* or *Thaadi Poruva*, *Ellapporuvaa* and *Madhya Poruva*.
- *Vadai Katru*, or winter winds blowing from the North East during November-February, when small sardines such as *nethili, maththi, chaala*, seer *(vanjaram)*, flying fish *(kola)*, tuna *(soorai)* and *Carangids* are available.
- *Kodai Katru* or summer winds blowing from South West during February–August, when carangids *(kanagankelluthi, arai)*, lethrinids, squid *(oosi kanawai)*, cuttle fish *(kanawai)* and sharks (suraa) are caught.
- *Katchan Katru or Thendral Katru* when wind blows from South to North West, during August–September, yielding shrimps *(iraal)*.
- *Nedun Katru* or *Mel Katru*, winds from South to North, yielding lesser sardines *(nethili, maththi* and *chaala)*.

Seawater patterns also dictate fishing. For instance, during *Karaikedutha Neervadu* or *Vaneevadu Karaikedutha Vellam*, or December to February, the current flows towards the shore and the clouds move from north to south or west, the sea is very calm and fishermen do *shankh* (large spiral-shelled species) fishing. Similarly, during *Soneervadu* or *Sone Vellam*, the currents flow from south east to north east, indicating rough and muddy seas and therefore a good catch.

According to fisher folk, movement of fish and other sea creatures indicate imminent weather patterns. For instance, when the small crabs living on the shore disappear, it indicates on-coming storms, rough winds, very high waves and very high wind speed. The appearance of *vattasori* or jellyfish indicates rough seas. If a floating live or carcass of whale is spotted while fished folk are at sea and the waves rise up to half meter within 30minutesm an imminent storm is guaranteed.

A cyclone or a tsunami sets them back years, because their knowledge is informal. A disaster like the tsunami was a milestone in their lives, forcing them to notice the drastic changes between before and after. More specifically:

## Pre and Post Tsunami Changes in Chinnangudi village, Tamil Nadu

| Pre | Post |
|---|---|
| **Extinction and Decline of Species** Certain species have disappeared, while some have declined in numbers. | Fish like *Kavakuthuva* and *Suthumbu*, abundantly available before, are now extinct. *Vala* fish (*Trichurus*/Ribbon Fish) have delcined rapidly and *Mullu Vala* fish is now available only during rainy season. The availability of *Kola* (Flying) fish, also plentiful before, has become very erratic. |
| **New Species available** Fishermen rarely came across Matthi fish *(Sardinella longiceps)* two decades ago. | After 1977, *Matthi* fish are plentiful; so fishermen have made it their predominant catch. |
| **Changes due to Drying River** *Ullam* or Chinese Herring fish, which thrives in the river water flowing into the sea, used to be plentiful. | This fish is now not available. The river has dried up completely. |
| **Lack of preparedness** Traditional knowledge allowed fishermen to equip themselves with requisite tools, such as specific nets for a species. | With changing wind direction and water currents, fishermen are unable to equip themselves properly or forced to carry all possible nets, which leads to less catch and less income. |
| **Seasonal Shift of Species** *Eyela Meen* and mackerel were available from January to July, when the water current moved towards South to North (Sone Vellam) allowing the fishermen to net 10,000-15000 *Eyela* and 4000 Mackerel fish per catch. | Post-Tsunami, the *Eyela fish* catch is reduced significantly. Mackerel has reduced to 500 –1000 only in the normal season. High catch is available mid-September, surprising the fisher folk. |
| **Erratic weather** Fishermen, over 50 years old, say their elders would predict the weather by just observing the sea, wind and clouds. Regular rains helped spawning. | Deviations in sea and weather behaviour are more frequent. Earlier, rain could be predicted by the presence of *vandal* (dirt) floating on the surface of the sea. Now, even the floating dirt does not lead to rain. Erratic rain cycles have led to disturbance in fish spawning cycles. |
| Sea Water Ingress has become a common phenomenon in the coastal stretch of Nagapattinam in the last ten years. | Ten years ago the area between the high tide line and their settlement areas was around 400-500 metres, used for drying fishing nets and landing boats. Now, due to seawater ingress, that distance has reduced to 100-200 metres and could get completely inundated in a few years. The government is putting rocks in the seashore in the village of Poompuhar. |

## Coping Mechanisms

Post-Tsunami, most fisher folk are afraid to go into the sea due to its unpredictable nature. They avoid tall waves, crossing into international waters, and spending on diesel. They do not have the financial resources to explore potential and new fishing zones using traditional knowledge. Their motorised fibre boats make long trips dangerous, as they could develop snags at mid-sea, unlike the catamarans. They now:

1. Carry multiple fishing nets as they are now clueless which species would be available.
2. Want all their traditional knowledge validated with the scientific data inputs. The Village Knowledge Centre (VKC) at Chinnangudi in South Tamil Nadu, with the help of Indian National Centre for Ocean Information Service (INCOIS), puts up Early Warning Electronic Display Board and other internet website information in jargon-free local language. The VKC in Nagapattinam district provides the information on wave heights, wind speed, wind direction, potential fishing zones, and tsunami alert through a siren, etc.
3. To conserve diesel, the fisher folk tend to go straight to the coordinates where the fish is available and return safely. The small and marginal fisher folk too are using the Global Positioning System (GPS) with the help of the local VKCs.
4. Want inputs while they are at sea. The Fisher Friend Mobile Application (FFMA) is a joint venture between four partners – MSSRF, Qualcomm, Tata Teleservices and Astute Systems Technology – who share their core competence to serve as a livelihood information platform for fisher folk. This application gives wave heights, weather and wind forecast for 4 days, potential fishing zones, news flash, latest Government incentive schemes, market information, and Yellow pages. Features to be added to this service are: audio advisory clip for the day, selection of such clips of the various inputs related to fishing, sea and the families, and the Intelligent Navigation System using global positioning system (GPS).

# *Agenda*

## National Workshop on Role of *Gyan Choupals* in Spreading Climate Literacy & Building Sustainable Food and Water Security Systems

## September 2-3, 2009

## National Academy of Agricultural Sciences, New Delhi

| **Wednesday, September 2, 2009** | |
|---|---|
| 10.00 – 11.15 | **Inauguration** |
| | **Welcome Address - Dr Ajay K Parida, Executive Director, MSSRF** |
| | **Special Remarks** |
| | **Stephen J McGurk, Regional Director for South Asia and China, International Development Research Centre (IDRC), Canada** |
| | **Sybille Suter, Country Director, Swiss Agency for Development and Cooperation (SDC)** |
| | **M S Swaminathan, Chairman, M S Swaminathan Research Foundation and Member of Parliament (Rajya Sabha)** |
| | **Anita Anand, Director, Com First (India) Private Ltd** |
| 11.15 – 11.45 | **Tea** |
| 11.45 – 12.00 | **Inaugural Address - Jairam Ramesh, Hon'ble Minister for Environment and Forests, Government of India** |
| 12.00 – 13.15 | **Role of Space Technology in Mitigation and Adaptation to Climate Change** |
| | **Chair - Ajay K Parida, Executive Director, MSSRF** |
| | **Panelists** |
| | **P S Roy, Deputy Director RS & GIS-AA, National Remote Sensing Agency, Indian Space Research Organisation Department of Space** |
| | **J S Parihar, Deputy Director, Remote Sensing Applications Area, SAC** |
| | **Virendra M Tiwari, Gravity and Magnetic Studies Group, National Geophysical Research Institute (NGRI)** |
| 13.15 – 14.15 | **Lunch** |
| 14.15 – 16.15 | **Role of Universities and Research Institutions in promoting Climate Literacy (Resilience, Mitigation and Adaptation)** |
| | **Chair - V N Rajasekharan Pillai, Vice Chancellor, IGNOU** |
| | **Panelists** |
| | **Satheesh C Shenoi, Director, Indian National Centre for Ocean Information Services (INCOIS)** |
| | **R P Samui, Deputy Director General of Meteorology (Agricultural Meteorology)** |
| | **Rakesh Kumar, Deputy Director, Head, National Environmental Engineering Research Institute (NEERI), Mumbai** |
| | **H C Joshi, Head, Division of Environmental Science, IARI** |

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| | **V Balaji, Global Leader for Knowledge management and Sharing, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)**<br>**A K Bhatnagar, Additional Director General of Meteorology, IMD**<br>**Prakash Rao, Associate Professor, Symbiosis International University, Pune** |
| 16.15 – 16.30 | **Tea** |
| 16.30 – 18.15 | **Sustainable Community Centric Practices for Water Management**<br>**Chair - Agatha Sangma, Hon'ble Minister of State for Rural Development, Ministry of Rural Development, Government of India**<br>**Moderator - Sunita Narain, Director, Centre for Science and Environment (CSE), New Delhi** |
| | **Panelists**<br>**P K Ghosh, Principal Investigator, Farmers Participatory Action Research Programme – Jal Kund, ICAR, Shillong**<br>**Rajendra Singh, Tarun Bharat Sangh, Alwar, Rajasthan**<br>**M Vanaja, Andhra Pradesh Drought Adaptation Initiative, Watershed Support Services and Activities Network (Wassan), Hyderabad**<br>**Anil P Joshi, Director, Himalayan Environmental Studies and Conservation Organisation, Uttarakhand**<br>**S C Jain, Programme Coordinator, AFPRO (Action for Food Production)** |
| **Thursday, September 3, 2009** | |
| 10.00 – 11.45 | **Coping mechanisms for Protecting Food Security in an Era of climate change**<br>**Chair - Mabel Rebello, Member of Parliament (Rajya Sabha), Government of India**<br>**Moderator - Ajay K Parida, Executive Director, MSSRF** |
| | **Panelists**<br>**B Venkateswarlu, Director, Central Research Institute for Dryland Agriculture (CRIDA)**<br>**A K Gogoi, ADG (Agro), ICAR**<br>**A Nambi, Project Director, Climate Change (V&A) Project, M S Swaminathan Research Foundation, Chennai**<br>**C S Rama Lakshmi, Addl. PCCF (Environment cell), Department of Forest, Environment, Science & Technology, Government of Andhra Pradesh**<br>**Kirtiman Awasthi, Research Associate, Solutions Exchange, United Nations Development Program** |
| 11.45 – 12.00 | **Tea** |
| 12.00 – 13.15 | **Traditional Knowledge and Best Community Practices for Climate Management**<br>**Chair - K Venkataraman, Senior Consultant, National Biodiversity Authority** |
| | **Panelists**<br>**V V Sugunan, ADG, ICAR Fisheries**<br>**Mr Suresh Mathevan, Centre for Indian Knowledge Systems (CIKS), Chennai**<br>**Vijay Pratap Singh Aditya, Chief Executive Officer, Ekgaon technologies**<br>**J C Rana, NBPGR** |
| 13.15 – 14.15 | **Lunch** |
| 14.15 – 16.00 | **Climate Literacy to Promote Sustainable Livelihoods and Safeguarding Biodiversity**<br>**Chair - Ajay K Parida, Executive Director, MSSRF** |

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|---|---|
| | **Panelists**<br>**K Venkataraman, Senior Consultant, National Biodiversity Authority**<br>**K R Viswanathan, Senior Advisor (Climate Change), Swiss Agency for Development and Cooperation (SDC)**<br>**Prof Dr T N Balasubramanian, M S Swaminathan Research Foundation**<br>**M Moni, Deputy Director General (Agricultural Informatics), NIC**<br>**Shirish Sinha, Head, Climate Change and Energy Programme, WWF India**<br>**Ramesh Savalia, Programme Coordinator (Sustainable Livelihoods), Centre for Environment Education (CEE)** |
| 16.00 – 16.15 | **Tea** |
| 16.15 – 18.30 | **Valedictory Session, Recommendation and Way Forward**<br>**Chair: M S Swaminathan, Chairman, M S Swaminathan Research Foundation and Member of Parliament (Rajya Sabha)** |
| | **Brief Remarks on lessons learnt and way forward**<br>**Basheerhamad Shadrach, Senior Programme Officer - Telecenter.org, International Development Research Centre (IDRC)**<br>**Gerolf Weigel, Deputy Country Director, Swiss Agency for Development and Cooperation (SDC)**<br>**K S Murali, Programme Officer (Climate Change), WFP**<br>**P G Dhar Chakrabarti, Director, SAARC Disaster. Management Centre**<br>**Ganesha Raj Kasargod, Deputy Director (Applications), Indian Space Research Organisation (ISRO-HQ)**<br>**Ramesh Kumar Jalan, Resource Person and Moderator, Climate Change Community, Solution Exchange, United Nations Development Programme**<br>**Vikas Goswami, CSR Head, Microsoft Corporation India Private Limited**<br>**Virinder Sharma, Environment and Livelihoods Adviser, Climate Change and Energy Unit, DFID India** |
| | Vote of Thanks:<br>S Senthilkumaran, MSSRF |

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