Productivity Enhancement through Sustainable Management of Natural Resources

Proceedings of Tata-ICRISAT-ICAR and Model Watershed Projects' Review and Planning Meeting

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International Crops Research Institute for the Semi-Arid Tropics

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Productivity Enhancement through Sustainable Management of Natural Resources

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Tata-ICRISAT-ICAR and Model Watershed Projects' Review and Planning Meeting

Editors
Suhas P Wani, KH Ananta and KL Sahrawat

4-6 May 2010

Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, Rajasthan, India

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New Delhi, India

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4-6 May 2010

Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, Rajasthan, India

Executive Summary

Nearly two-third of India's agriculture is rain-fed and contributes to nine per cent of Gross Domestic Product (GDP). These rain-fed areas have unexploited potential and hope to meet increased future food needs but these areas are fraught with soil erosion, land degradation and loss of productivity. Watershed management is an approach for appropriate planning and implementation of natural resource management (NRM) to protect socio-economic needs of the community in these areas.

International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) is implementing watershed development projects to cope with uncertainties in these rain-fed areas with overall objectives of enhancing productivity through rainwater harvesting, enhancing rainwater use efficiency, improving rural livelihoods and minimizing land degradation. The dryland areas of Madhya Pradesh and eastern Rajasthan are the target ecoregion under SDTT-ICRISAT-ICAR-Project, while the target districts for pilot scale interventions under SRTT-ICRISAT-ICAR-Project are Saraikela Kharsaw and Gumla in Jharkhand and Jhabua and Mandla in Madhya Pradesh. In MoA (GoI)-ICRISAT project, nine states viz. Rajasthan, Gujarat, Madhya Pradesh, Karnataka, Uttar Pradesh, Tamil Nadu, Maharashtra, Andhra Pradesh and Orissa are the target regions to establish nine Model sites of learning representing technologies for different rainfall zones (<700 mm, 700 to 1100 mm, and >1100 mm per annum). Similarly, in MoRD (GoI)-ICRISAT project, the objective is to establish four Model community watershed sites of learning in three target rainfall zones in four states of Rajasthan, Maharashtra, Madhya Pradesh and Tamil Nadu.

The annual review and work plan development meeting of the Tata-ICRISAT-ICAR and Model watershed projects was held at Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, Rajasthan from 4-6th May, 2010 with the following objectives:

- to review the progress and synthesize the findings from the work done at different locations under SRTT, SDTT and Model watershed projects in India;
- to identify emerging issues, discuss up-scaling strategies, and prepare workplans for sustainable use of natural resources and increasing productivity in India;
- to plan strategic participatory research and development trials for enhancing productivity.

Sixty five participants included learned experts from state agriculture universities, ICAR, partner NGOs, Sir Dorabji Tata Trust (SDTT), Sir Ratan Tata Trust (SRTT), ICRISAT and other agencies.

In the inaugural session, Dr Suhas P Wani welcomed the Chief Guest Dr SS Chahal, Vice Chancellor, MPUAT and other delegates. Chair of this session was Dr SS Chahal and he was assisted by rapporteur Dr KH Anantha. The workshop objectives were presented along with the agenda of the workshop. During the inaugural session, Mr Bhaskar Mitra from SDTT and Mr Kiran Petare representing CInI and SRTT presented the thrust areas and the approaches adopted by them for sustainable management of natural resources and poverty reduction in India. Mr Bhaskar Mitra explained the work portfolios of SDTT under six major themes: natural resource management, livelihood, media and culture, urban poverty, health, education and human rights. SDTT projects earlier were started in South India but now focus has also been given to North India from year 2006 onwards. SDTT presently runs 147 projects across the country and out of those 68 % projects focus on food security.

Mr Kiran Petare presented that Collectives for Integrated Livelihood Initiatives (CInI), a separate unit in year 2002, was established for agriculture and natural resources management. Thematic areas of CInI include *Kharif* paddy stabilization, *Kharif* maize stabilization, diversion based irrigation system (Revival of traditional irrigation systems), non-timber forest produce, micro-finance and livelihoods, community based organizations. CInI has evolved a strategy for *Kharif* paddy stabilization. Mr Petare focused on integrated management of agriculture and forestry for generating consistent source of income and to support livelihood in rain-fed areas. CInI is working on non timber forest produce and those initiatives are taken with Indian Institute of Forest Management (IIFM) Bhopal. In addition, Mr Petare suggested poverty mitigation through strengthening community based institutions promoted around the diverse sectoral themes of tribal livelihoods.

Dr Suhas P Wani, Principal Scientist and Project Coordinator, presented the overview of the research done in the four projects along with the partners and identified the major challenges/constraints of arid and semi-arid agriculture. Dr Wani emphasized the importance of watershed management and consortium approach as an entry point for addressing these challenges. The major issues focused in the projects were: land and water management, rainy season fallows, rice fallow management, improving water use efficiency, soil test-based integrated nutrient and pest management, natural resource management and livelihoods in rain-fed areas. He also highlighted the unique feature of converging several projects from GoI (Ministry of Agriculture, Ministry of Rural Development and Ministry of Water Resources) in the target areas of the SDTT-ICRISAT and SRTT-ICRISAT projects.

Dr SS Chahal, Vice Chancellor of MPUAT, in his opening remarks appreciated ICRISAT's efforts to arrange the workshop in the university. He lauded the success of the projects and assured to strengthen the ongoing collaboration between the university and these projects. He focused on practicing stress tolerant crop varieties for enhancing agricultural productivity in rain-fed areas and called for community participation for better natural resources management and poverty reduction. He emphasized the need for socioeconomic transformation, equity in benefit sharing and better employment opportunities for women and land less. There was a discussion in the workshop that public-private partnership is need of the hour in natural resource management in dryland areas. The new holistic approach and technology intervention are essential to boost dryland productivity and better resource management.

In this meeting, the major issues of arid and semi-arid areas regarding water scarcity, nutrient deficiency, salinity, alkalinity, small and marginal land holdings, poor economic status, increasing food prices and high population growth were discussed. Scientists suggested management strategies to overcome these problems and to enhance agricultural productivity. Moreover, it was emphasized that vast untapped potential exists in rainy season fallow and rice fallow lands in India which could be harnessed by adopting improved technologies.

The partner NGOs BAIF, BYPASS, CARD and DEEP working under SDTT-ICRISAT and GVT, FES, PRADAN and TSRDS working under SRTT-ICRISAT projects and BIRDS, JalaSRI, READ, BAIF, DA, BYPASS, BAIF, Shristi, PEDO, WOTR, Seva Mandir working for Model watersheds presented the progress reports, findings and challenges during the year 2009-10. Keeping in view the progress made and challenges ahead, work plan of SRTT-ICRISAT-ICAR, SDTT-ICRISAT-ICAR, Model watershed projects for year 2010-11 were prepared and presented on the last day of the meeting. Under SDTT-ICRISAT-ICAR project, the out scaling of best practices was taken in a big way, but in SRTT-ICRISAT-ICAR it was agreed too early or premature for the project to undertake out-scaling activities in a big way. Dr Wani emphasized data recording and proper documentation in the projects which generally is poor in spite of many good works done. During the workshop, a clear message emerged to focus not only on the activities but also on the process to make this initiative self-sustaining.

1. Introduction

Rain-fed production systems dominate world food scenario and will continue to contribute the bulk of the world food production. Sixty per cent of India's agriculture is rain-fed and contributes to nine per cent of gross domestic product (GDP). These areas are fraught with soil erosion, land degradation and loss of productivity, which have serious equity implications as they affect very subsistence of poor marginalized people. In addition, burgeoning population, poverty, lack of awareness of the improved farm technology and lack of knowledge and skills to use them, low income levels and resource-poor farmers constitute major threat to the sustainable development in these areas. These rain-fed areas have scarce water resources and are also prone to severe land degradation (Wani et al., 2002, 2003, 2008, 2009). Sustainable management of land and water are more crucial in sustaining global food production. Watershed management is an approach for appropriate planning and implementation of natural resource management (NRM) to protect socio-economic needs of the community in these areas.

International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) has shown that integrated watershed management approach (IWMP) can cope with uncertainties in these rain-fed areas. This can be good entry point for improving rural livelihoods with overall objectives of enhancing productivity through rainwater harvesting, enhancing rainwater use efficiency and minimizing land degradation. The IWMP adopts farmer participatory approach based on Integrated Genetic and Natural Resource Management (IGNRM) for sustainable development of the SAT region (Wani et al., 2008b) and income could become an engine of growth for sustainable development of dryland areas. The work done under Comprehensive Assessment (CA) based on the meta analysis suggested the need for policy reforms in watershed implementation and management which now have been streamlined in new common guidelines by the GOI (GoI, 2008). Farmer-centric approach is adopted in the project implementation to ensure greater participation of the community for the success of a project.

Brief Description of the Projects

1.1 SDTT-ICRISAT-ICAR Project: *Improving Rural Livelihoods and Minimizing Land Degradation through the Community Watershed Approach for Sustainable Development of Dryland Areas*

The target eco-region for this project is the dryland areas of Madhya Pradesh and eastern Rajasthan with assured rainfall, with medium water-holding capacity soils (Figure 1). The rainfall in Madhya Pradesh

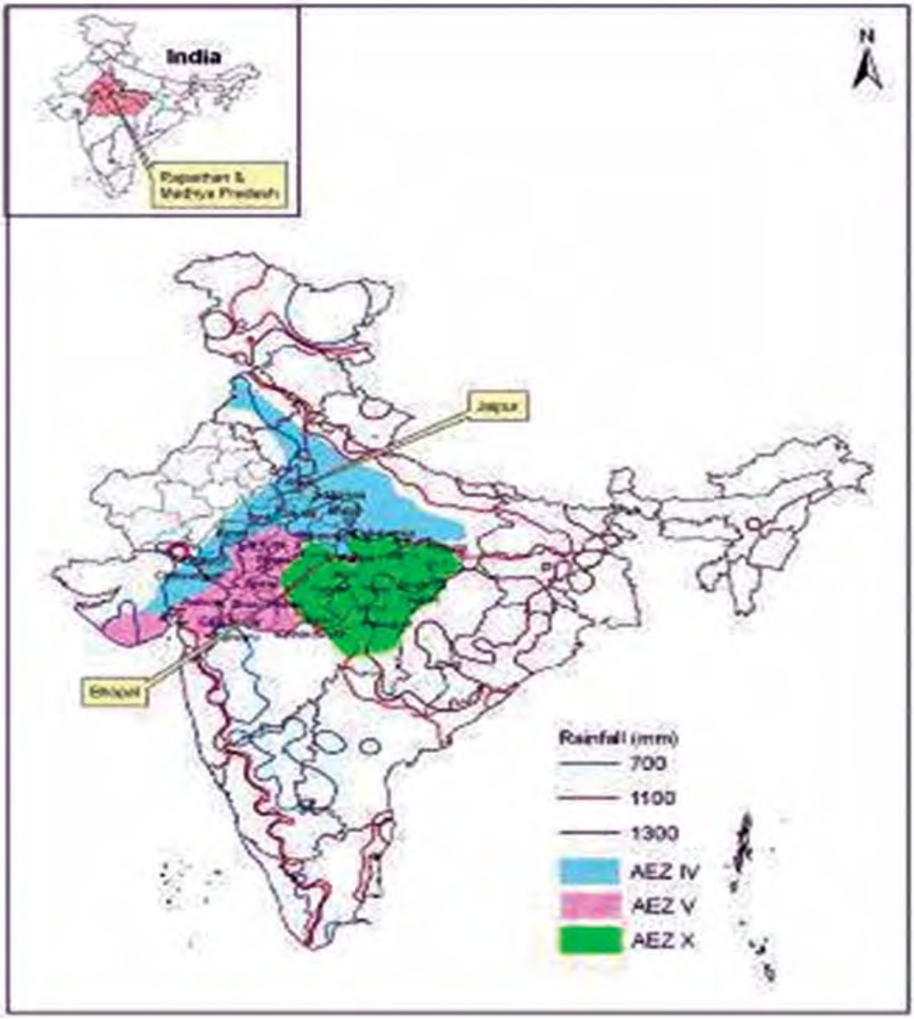

Figure 1. Target eco-region of Madhya Pradesh and eastern Rajasthan: agro-ecozones, soils and rainfall in the region.

varies from 770 to 1690 mm per year; soils are predominantly black soils (Vertisols and Vertic Inceptisols) and loamy Alfisols varying in soil depth. The length of growing period (LGP) varies from 90-180 days and in some cases extends up to 210 days. The LGP in the central highland of Madhya Pradesh varies between 150-180 days, extending up to 210 days in some cases; soils are predominantly red and black. Proposed contiguous districts for scaling-out activities for productivity enhancement are Rajgarh, Shajapur, Sehore, Raisen, Vidisha, Indore, Badwani and Guna. Major crops grown in the region are soybean, sorghum, maize, rice, pigeonpea, wheat, and chickpea. In eastern Rajasthan covering the districts of Alwar, Banswara, Bhilwara, Jhalawar, Sawai Madhopur and Tonk, the soils are red and black with the rainfall varying from 660 to 1025 mm per annum. The LGP in eastern Rajasthan varies from 90 to 150 days and the main crops grown are pearl millet, sorghum, maize, wheat, chickpea, mustard and sesame. The specific objectives of this project are:

- to consolidate the science-led farmer-centric community watershed approach at the nucleus benchmark watersheds to enhance productivity, and to reduce land degradation in three districts of Madhya Pradesh and eastern Rajasthan states and to use these sites as the centers of learning for scaling-out the benefits across the three target districts;
- to scale-out the benefits of productivity enhancement and community watershed management with technical backstopping in the target agro-eco-region of Madhya Pradesh (7+1 districts) and Rajasthan (7+1 districts); and
- capacity-building of lead farmers, development workers, and consortium partners in the target region, and provide technical support to the development agencies in the area of community watersheds.

1.2 SRTT-ICRISAT-ICAR project: *Increasing agricultural productivity of the farming systems in parts of Central India through participatory research-cum-demonstrations and knowledge sharing innovations*.

The target districts for pilot scale interventions are Saraikela Kharsaw and Gumla in Jharkhand, and Jhabua and Mandla in Madhya Pradesh. Annual rainfall in Jharkhand varies from 1000-1600 mm, while in Madhya

Pradesh it varies from 600 to 1600 mm. About 70-80 per cent of the annual rainfall is received during the southwest monsoon period (June-Sept.). Soils are predominantly black (Vertisols, Vertic Inceptisols), as well as Entisols and Alfisols varying in soil depth. Jhabua and Mandla districts in Madhya Pradesh receive annual rainfall of 885 and 1580 mm, respectively, while Gumla and Saraikela Kharsaw receive 1100 and 1400 mm rainfall, respectively. These districts in general are dominated by an agrarian economy. Jamshedpur is also known for its industrial development. Length of growing period (LGP) varies from 120-240 days in the target eco-region (Figure 2). Temperatures of above 45°C are common in the summer months while in winter they could be as low as 10°C.

The overall objective of this project is to increase the impact of the development projects in central India through technical backstopping and empowerment of stakeholders to improve livelihoods through

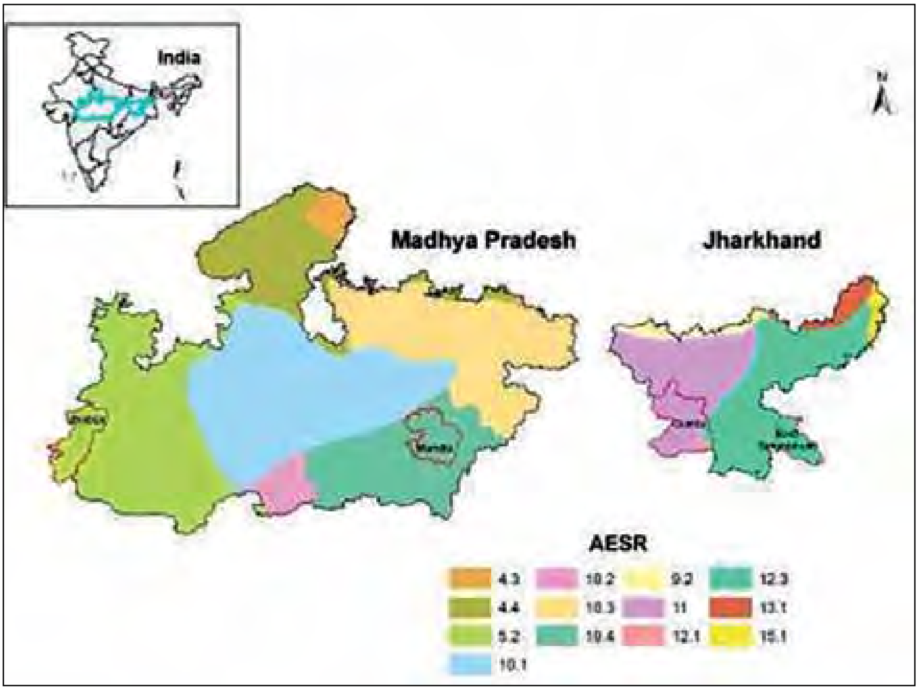

Figure 2. Target eco-region of Madhya Pradesh and Jharkhand: AESR and districts

increased agricultural productivity and livelihood opportunities via sustainable use of natural resources.

The specific objectives of this technical assistance program are:

- to establish a holistic participatory IGNRM Model for the convergence of activities in four nucleus clusters (five villages in each cluster) encompassing suitable technical, institutional, gender equity, and policy options for enhanced agricultural productivity and crop-livestock management systems to alleviate poverty; and
- to provide technical know-how to farmers, landless rural people in the target districts, and partner NGOs supported by the SRTT in the region through empowerment by bringing in together the learnings from national and international experience.

1.3 Ministry of Agriculture and Ministry of Rural Development, Government of India- ICRISAT Model watershed project:

Rain-fed areas increasingly seen as the potential lynchpin of rural agricultural prosperity, provides the foundation for subsequent development. In this context, watershed development should be seen as a strategy to enhance water productivity and yield enhancement through sustainable management of natural resources in dryland areas (GoI, 2008; Wani et al., 2008b). The Government of India has recognized the importance of rain-fed agriculture in the country and has established a National Development of Rainfed Areas Authority (NRAA) to accelerate the growth rate as well as improve the livelihoods of rural poor. The GoI has adopted a community watershed management approach to improve rain-fed agriculture. This approach could as well be the entry point to improve livelihood opportunities in rain-fed areas through increased rain-fed food and feed production and also through maintenance of the natural resource base, which is the lifeline for rural enterprises. The approach can be a principal component of integrated rural development efforts to alleviate poverty in rural India. However, the watershed programs have not yielded the desired results in terms of enhancing productivity in rain-fed areas, improving rural livelihoods, and protecting the environment, largely due to lack of application of appropriate technologies in different agro-ecoregions and not following holistic approach. Thus, there is an urgent need to establish sites of learning in three different rainfall zones (<700 mm, 700 to 1100 mm, and > 1100 mm rainfall per annum) spread through different states to cover the country. Facilities for training in specific eco-regions will go a long way in building the capacity of NGOs, lead farmers and concerned government line department staff.

MoA (GoI)-ICRISAT project: *Establishing sites of learning community watersheds in three different rainfall zones in India*. The major objectives of this project are:

- ➢ to establish nine Model sites of learning in three target rainfall zones (<700 mm, 700 to 1100 mm, and > 1100 mm rainfall per annum) for demonstrating the potential of rain-fed areas by adopting integrated water resource management approach; and
- ➢ to prepare training modules in the areas of integrated watershed management for developing capacity of different stakeholders.

MoRD (GoI)-ICRISAT project: *Establishing* Model *community watersheds in four selected states in India.* The major objectives of this project are:

- ➢ to establish four Model community watershed sites of learning in three target rainfall zones (<700 mm, 700 to 1100 mm, and > 1100 mm rainfall per annum) for demonstrating the potential of rain-fed areas by adopting integrated water resource management approach; and
- ➢ to disseminate the best watershed management practices in the areas of integrated watershed management for developing capacity of different stakeholders.

Strategy of Model Watershed Development

- ➢ Identify nine districts in three rainfall zones (<700 mm, 700 to 1100 mm, and > 1100 mm y^{-1}) (Figure 1 and Table 1) in different states covering geographical distribution and major soil types.
- ➢ Establish nine sites of learning of 1000 ha each (minimum) encompassing holistic community watershed management approach. Actual size of each micro-watershed site will be estimated based on delineation of the watershed boundaries.

- Establish raingauges and hydrological monitoring stations at sites of learning watersheds, which will provide strategic data on hydrological parameters for planning watershed interventions in specific agro-eco-regions with varying soil types.
- Develop NRM-based income-generating activities for improving livelihoods of vulnerable groups.
- Demonstrate improved management options for enhancing productivity on sustainable basis.
- Train lead NGOs and farmers to serve as trainers in the region
- To establish field laboratory for students to undertake strategic research in target agro-eco-regions in the area of community watershed management.
- Holistic and integrated approach for sustainable development of rain-fed areas through conservation, enhancement, and efficient use of natural resources by using watershed management as an entry point for improving rural livelihoods.
- Developing innovative and effective mechanisms to share the knowledge with different stakeholders and build community-based institutions for sustainable development.
- Harness public-private partnerships for backward and forward linkages, for improving the incomes of the farming community.

Target Regions

Table 1 and 2 gives description about target regions of Model watersheds in India.

Table 1: Details of the MoA (GoI) – ICRISAT Model watershed sites selected in different states of India

State	District	Block/*taluk*	Village/*gram panchayat*	Area (ha)	Collaborating institutions/ organizations
Rajasthan	Dungarpur	Biscuwada	Saram, Virpur and Gasu ka Baga	1110	DWMA (State Government); PEDO (NGO)
Gujarat	Jamnagar	Jam Jodhpur	Mahiki	1430	BAIF (NGO), DWMA (State Government)
Madhya Pradesh	Guna	Chachoda	Allkhedi, Barkheda Khurd, Kadiyakhpri, Kalan and Kadiyakhpri Khurd	1370	BAIF (NGO), DWMA (State Government)
Karnataka	Dharwad	Hubli	Parasapur and Devargudihal	1135	DWDO (State Govt); BIRD (NGO)
Uttar Pradesh	Jhansi	Babina	Punavali, Kanchanpur and Damagar	1385	National Research Center on Agroforestry; Development Alternatives
Tamil Nadu	Tirunelveli	Kalakad	Keelanpoorni, Melkavai and Sadaayaman kulam	1150	TVS-ASRI (PIA)
Maharashtra	Jalgaon	Jalgaon	Pathri, Samner and Lasgoa	1350	JalaSRI Program-MJ College, Jalgaon; NGO
Andhra Pradesh	Medak	Sadasivapet	Konapur and Nagulapally	1220	DWMA (State Govt); READS (NGO)

Orissa	Mayurbhanj	Baripada	Baripada	1250	KVK, Orissa Agril. Univ. and Soil Conservation Dept.

Table 2: Details of the MoRD (GoI) – ICRISAT Model watershed sites selected in different states of India

State	District	Block/*taluk*	Village/*gram panchayat*	Area (ha)	Collaborating institutions/ organizations
Rajasthan	Udaipur	Jhadol	Dob, Newaj	1114	Seva Mandir
Maharashtra	Ahmednagar	Sangemner	Dolasane, Dambalewadi	1563	WOTR
Madhya Pradesh	Rajgarh	Silwani	Chorpipariya, Siyalwada, Gaganwada, Rampura, Dungaria, Padariya Kalan	1736	BYPASS
Tamil Nadu	Dindigul	Nilakottai		2305.5	Centre for Improved Rural Health and Environmental Protection (CIRHEP)

2. About the Workshop

The annual review and work plan development meeting of the 'Tata-ICRISAT-ICAR and Model watershed projects supported by the Government of India (Ministry of Agriculture and Ministry of Rural Development)' was held at Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, Rajasthan from 4-6th May. Sixty five participants included learned experts from state agriculture universities, ICAR, ICRISAT, representatives of partner NGOs, Sir Dorabji Tata Trust (SDTT), and Sir Ratan Tata Trust (SRTT) and other agencies. The main objectives of the workshop were:

- to review the progress and synthesize the findings from the work done at differnet locations under SRTT, SDTT and Model watershed projects in India;
- to identify emerging issues, discuss up-scaling strategies, and prepare workplans for sustainable use of natural resources and increasing productivity in India;
- to plan strategic participatory research and development trials for enhancing productivity.

3. Inaugural Session

Dr Suhas P Wani welcomed the Chief Guest Dr SS Chahal, Vice Chancellor, MPUAT and other delegates. Chair of this session was Dr SS Chahal and he was assisted by rapporteur Dr KH Anantha. The workshop objectives were presented along with the agenda of the workshop. During the inaugural session, Mr Bhaskar Mitra from SDTT and Mr Kiran Petare representing CInI and SRTT presented the thrust areas and the approaches adopted by them for sustainable management of natural resources and poverty reduction in India. Mr Bhaskar Mitra explained the work portfolios of SDTT under six major themes: natural resource management, livelihood, media and culture, urban poverty, health, education and human rights. SDTT projects earlier were started in south India but now focus has also been given to north India from year 2006 onwards. SDTT is presently running 147 projects across the country and out of those 68 per cent projects focus on food security.

Experimental or research trials are being conducted along with partner organizations like ICRISAT, Tamil Nadu Agricultural University, Agricultural University J&K, MS Swaminathan Research Foundation (MSSRF). Mr Bhaskar Mitra shared SDTT's experience on the introduction of irrigation systems in northern and eastern India for enhancing agriculture productivity. SDTT, working with International Rice Research Institute, has taken initiatives for identifying appropriate paddy variety in Madhya Pradesh.

Mr Kiran Petare presented that Collectives for Integrated Livelihood Initiatives (CInI), a separate unit in year 2002, was established for agriculture and natural resources management. Thematic areas of CInI include *Kharif* paddy stabilization, *Kharif* maize stabilization, diversion-based irrigation system (revival of traditional irrigation systems), non-timber forest produce, micro-finance and livelihoods, community based organizations. CInI has evolved a strategy for *Kharif* paddy stabilization.

Mr Petare focused on integrated management of agriculture and forestry for generating consistent source of income and to support livelihood in rain-fed areas. CInI is working on non timber forest produce and that initiatives are taken with Indian Institute of Forest Management (IIFM) Bhopal. In addition, Mr Petare suggested poverty mitigation through strengthening community based institutions promoted around the diverse sectoral themes of tribal livelihoods.

Dr Suhas P Wani, Project Coordinator, ICRISAT, presented the overview of the research done in the four projects along with the partners and identified the major challenges/constraints of arid and semi-arid agriculture. Dr Wani emphasized the importance of watershed management and consortium approach as an entry point for addressing these challenges. The major issues focused in the projects were: land and water management, rainy season fallows, rice fallow management, improving water use efficiency, soil test-based integrated nutrient and pest management, natural resource management and livelihoods in rain-fed areas. He also highlighted the unique feature of converging several projects from the Government of India (Ministry of Agriculture, Ministry of Rural Development, and Ministry of Water Resources) in the fragile areas of the SDTT-ICRISAT and SRTT-ICRISAT projects.

Dr Wani in his presentation identified six major challenges for overall development in SAT regions viz., climate change, land degradation, loss of biodiversity, food crisis, energy crisis and population explosion. Land and water are most critical natural resources for mitigating these problems. It is noted that rainwater use efficiency can be substantially improved in drylands of the SAT to harness the potential of rain-fed agriculture for achieving food security and inclusive growth. This can be harnessed through integrated watershed development approach. Watershed development program in India is silently revolutionising the rain-fed areas and can become growth engine for inclusive and sustainable development in most of the dry tracts. Meta analysis which is based on 636 case studies has revealed that average benefit-cost ratio obtained 1:2.01 and Internal Rate of Return (IRR) is 27.43 per cent. However, large variability is found in their performance across the regions. Thus, the better implementation of watershed development programs can build resilience against those challenges of dryland agriculture. Productivity of rain-fed agriculture could be doubled on farmers' fields with seeds of improved cultivars, soil-test based nutrient management and improved water, soil and pest management options. Importance of holistic livelihood approach to increase agricultural production was also highlighted. Convergence, collective action, capacity building, and consortium for technical backstopping are thrust areas to promote watershed development as a growth engine. In addition to land-based activities, off farm activities such as microenterprises for livelihood promotion in watershed project areas are important subsidiary activities to promote rural livelihood system through linking agriculture. Thus, community participation is a prerequisite for achieving the goal of sustainable livelihoods. In this context, Dr Ajit Dhatt, Advisor, Agriculture, SRTT RGR (Reviving Green Revolution) Cell, Punjab Agriculture University suggested to strengthen the community-based organizations to reap the benefits of watershed development program holistically.

Dr SS Chahal, Vice Chancellor of MPUAT in his opening remarks appreciated ICRISAT's efforts to arrange the workshop in the university. He lauded the success of the projects and assured to strengthen the ongoing collaboration between the university and these projects. He focused on practicing stress-tolerant crop varieties for enhancing agricultural productivity in rain-fed areas and called for community participation for better natural resources management and poverty reduction. He emphasized the need for socioeconomic transformation, equity in benefit sharing and better employment opportunities for women and landless. There was a discussion in the workshop that public-private partnership is need of the hour in natural resource management in dryland areas. The new holistic approach and technology intervention are essential to boost dryland productivity and better resource management.

The inaugural session ended with a vote of thanks by Dr Girish Chander.

4. Technical Sessions

4.1 Technical Session I

Chair: Mrs Neelima Khetan
Rapporteur: Dr Kaushal K Garg

In this session, five papers were focused on various problems of arid and semi-arid areas regarding water scarcity, nutrient deficiency, salinity, alkalinity, small and marginal land holdings, poor economic status, increasing food prices and high population growth. Different management strategies were suggested to overcome such problems and to enhance agricultural productivity. Productivity of rain-fed agriculture could be doubled on farmers' fields with seeds of improved cultivars, soil-test based nutrient management and improved water, soil and pest management practices. Moreover, it was emphasized that vast untapped potential exists in rainy season fallow and rice fallow lands in India which could be harnessed by increasing water use efficiency through conservation practices and cultivating short variety improved cultivars.

Water or nutrient management indeed highly important for productivity enhancement but compartmental approach may not target agricultural production to its potential level; it requires an integrated approach which comprises land management, balanced nutrient management, conservation tillage, improved seed varieties, disease and pest management, crop intensification and diversification. It was discussed that a large portion of cultivable land in India is left fallow during *Kharif* and *Rabi* season which could be generated into productive land. For example, approximate 2 million ha land in Madhya Pradesh remains fallow during monsoon despite a good soil condition and sufficient rainfall. Lack of awareness about available technology to alleviate water logging and poor economic status are the main constraints of the development which could be overcome by consortium approach and capacity building program. Alternative options of watershed management practices should be presented in front of farmers so they may choose based on their understanding, capacity or economic status.

Dr PL Maliwal from MPUAT, Udaipur, described major problems in Rajasthan on water scarcity, soil salinity and alkalinity, shallow soil depth in rain-fed agriculture and water logging in irrigation command areas. He observed that Rajasthan stands first or second rank in producing pearl-millet, barley, kidney beans, rape and mustard, oil seeds, corriander, garlic, etc. However, productivity status is far below than potential. The major constraints identified are: natural constraints such as inadequate rainfall, poor fertile soils, low water holding capacity, high infiltration rate and shallow soil depth. Due to scarcity in rainfall, there is limited availability of groundwater. The crop suffers from high temperature and wind velocity. Socioeconomic constraints include high growth rate of population (2.83%); increased fragmentation of land holdings (44.87 in 1980-81 to 53 lakhs in 1990-91); and 30 per cent of population belonging to Scheduled caste and Scheduled Tribe (SC & ST) category, most of which live below poverty line and are unable to adopt new technology. Infrastructural constraints are inadequate spread of retail outlets for agriculture input; lack of post harvest marketing and processing infrastructure support like cold storage, grading, washing, cleaning, waxing, packing and container services; poor infrastructure support for horticulture and vegetable crops including marketing; slow farm mechanization; and inadequate supply of power. The suggested strategies such as soil and water conservation structures, micro irrigation, water conservation practices like zero tillage, availability of improved seed, nutrient, pest, weed management, improved farm implements, crop diversification, orchard and horticulture plantation are required for improving agriculture productivity and better livelihood.

Mr P Pathak from ICRISAT made presentation on rainy season fallow management in Vertisols. He observed that Vertisol becomes sticky in wet and creates water logging condition due to poor infiltration rate, whereas it gets extreme hard in dry situation. Thus, there is a risk of losing post rainy season crop. Broad band and furrow (BBF) system allows water to dispose safely from the field, conserve more moisture and protect crop from the water logging situations. Long term trials made by on farm station and farmers' fields show that BBF system is sustainable and productive. He highlighted on farm trails in Madhya Pradesh on BBF maker cum seed drill and identified high participation from farmers for using this technology. Soybean and chickpea production has gone up with improved system compared to farmers' practice. He also identified strategies for reducing monsoon fallow system in SAT vertisols. These include: land smoothing; construction of field drains and establishment of drainage networks; improved land and water management system viz. BBF landform for in-situ soil and water conservation and safe disposal of excess runoff; proper implement for BBF system; system that improves the workability of soils; land preparation before monsoon; runoff collection and supplemental irrigation (essential for some regions); appropriate crops and cropping systems with short duration cultivars and other improved practices; and capacity building of farmers.

Dr Piara Singh from ICRISAT while presenting about enhancing water use efficiency and productivity in rain-fed areas identified major constraints such as rainfall uncertainty, land degradation, small landholdings and low investment by farmers. It is important to note that further increase in food production has to come from higher productivity per unit of water and land to meet future food needs. Thus, enhancing water use efficiency is a prerequisite and water use efficiency can be improved by minimizing evaporation losses and diverting vapor flow towards transpiration. There is a large scope available for increasing water use efficiency in Madhya Pradesh. A number of strategies have been suggested to increase water use efficiency in watersheds such as *in-situ*, *ex-situ* practices, improved seed varieties, INM, IPM, crop intensification, diversification and supplemental irrigation. Dr Singh identified factors responsible for enhancing rainfall use efficiency. First, *in-situ* water conservation practices; second, improved crop agronomy- better crop establishment, plant population, integrated nutrient management or balanced nutrition of crops; and third, improved crop varieties and cropping system. He has identified factors for enhancing supplemental irrigation efficiency such as improved methods of irrigation application and better irrigation scheduling; improved crop agronomy- better crop establishment, plant population, integrated nutrient management or balanced nutrition of crops; and improved crop varieties and high value crops.

Integrated nutrient management is an essential component of sustainable agricultural productivity. This issue has been discussed by Dr Girish Chander from ICRISAT, highlighting the need of soil-test based fertilizer management for improving productivity and livelihoods. Soil testing comprises three steps: soil sampling, chemical analysis and interpretation of the results. Dr Chander described soil sampling protocol and importance of stratified sampling. Data showed that majority of farmers' fields across the SAT regions in India are deficient in micro and secondary nutrients: S, B and Zn. Crop yield in different states showed that the highest yield was achieved with improved cultivar and balanced nutrition. Further, chickpea has shown impressive benefit-cost ratio followed by wheat and mustard. He argued, therefore, that soil-test based fertilizer management is essential to achieve higher productivity and economic gains in rain-fed agriculture.

Dr MM Roy from CAZRI presented various challenges of arid regions of western Rajasthan for enhancing agriculture production and their management strategies. Extreme climate, poor soil, wind erosion, poor water resources, desertification are major challenges. His presentation focused mainly on construction of rainwater harvesting structures, crop diversification, stress tolerant crop, grass land management, agro-forestry, and protecting wind erosion by shelter belts, gum and aloe-vera production, and micro-enterprises. Dr Roy observed that fodder availability is not kept with the pace of growing livestock population in Rajasthan. There is a large gap in fodder requirement and availability, especially in arid Rajasthan. The livelihood issues are more prominent and he stressed that to reduce rural poverty natural resource management (NRM) and rural non-farm sector (RNFS) based livelihood systems need to be developed.

4.2 Technical Session II

Chair : Dr MM Roy
Rapporteur : Dr Girish Chander

Our NGOs partners BAIF, BYPASS, CARD and DEEP working under SDTT-ICRISAT projects presented the progress reports, findings, and challenges/constraints during year 2009-10. Mr Bhaskar Mitra, Mr Kiran Petare and Dr Wani emphasized that although it is important for partner NGOs to achieve their work targets but more important for them is to understand the process mechanism of the community transformation. They emphasized to share the lesson learnt, constraints, problem faced by partners NGOs while executing specific work activities.

Mr Somnath Roy, Chief Program Coordinator, BAIF, Bhopal, presented their work on productivity enhancement in Madhya Pradesh. BAIF is Pune-based NGO, established 42 years back and working presently in 14 states in India. This project was initiated from *Kharif* 2008 onwards in seven districts of Madhya Pradesh: Vidisha, Anandpur, Indore, Badwani, Sehore, Guna and Rajgarh. Balanced nutrition trials were conducted with the application of urea, DAP, zinc sulphate, boron and gypsum. Varietal performance trials were conducted with soybean (JS 335, JS 9305, Samrat, NRC 12), maize (Ganga, Kaveri), pigeonpea, black gram (T-9) in *Kharif* and wheat (Lok 1), chickpea (JG 11, JG 426) in *Rabi*. In addition, attention was given on crop diversification, *Glyricidia* plantation, construction of vermicomposting units and BBF land management practices. Such interventions showed promising outcomes in different watersheds in terms of yield enhancement. A success story on kitchen gardening in Rignodia village was presented. Lady finger, brinjal, *turai,* tomato and *lauki* were cultivated and showed promising outcome in meeting domestic vegetable requirements.

Similarly, representative from BYPASS, Mr Akhilesh Singh Yadav working in Madhya Pradesh reported their experiences of productivity enhancement by practicing INM, BBF, IPM and by using improved variety of crop in *Kharif* (soybeans) and *Rabi* seasons (chickpea). They supported for installing sprinkler system in a farmers' field. In addition, farmers' day and training programs are organized on improving soil health, IPM, organic farming, soil and water conservation, nursery plantation cattle vaccination. Seed bank is also successfully established. The project achievements during 2009-10 are highly encouraging. Crop diversification, fodder development, kitchen garden, vermicomposting and farmers' club are important activities in the project villages.

Mr Vivek Sharma from CARD presented their work in five villages in three blocks of Shajapur district in Madhya Pradesh. Their work included baseline survey of the watershed, PRA, introducing and distribution of HYV seeds, construction of vermicompost units, formation of seed bank in each village, *Glyricidia* plantation, kitchen gardening, human development activities (capacity building of farmers), dissemination of information and technology, and documentation and photography. They organized animal health camps and promoted for establishing seed bank in village. Total 19 training programs were organized and 612 farmers were trained.

Mr Bachchu Singh Choudhary from DEEP presented their work progress on productivity enhancement in Tonk and Sawai Madhopur districts in Rajasthan. The project activities included baseline survey, constraint identification, farmers' participatory evaluation and selection of varieties, micronutrient addition and balanced nutrient management trials, village-level seed banks, vermicomposting, capacity building, water saving technology, convergence of on going government activities, breed improvements in small ruminant. They introduced ICGV 9114, an improved variety of groundnut in the targeted area. Water saving technologies such as BBF through tropicultor, sprinkler irrigation, ridge and furrow system and farm pond were implemented. Capacity building training on INM, IPM, soil testing was given to farmers. Selected farmers were exposed to learn in ICRISAT, Patancheru and ICAR, New Delhi. Other than these activities, DEEP also got involved in other activities for welfare of the society.

Dr AK Chourasia from BAIF program reported their work on productivity enhancement in 25 villages located in five districts (Alwar, Bhilwara, Jhalawar, Banswara and Bundi) of Rajasthan. BAIF has a working experience of 30 years in Rajasthan. About 1200 families benefited last year through this project. Vermicomposting units were established; *Glyricidia* nursery was planted; crop varieties of maize (Mukta, Kaveri), black gram (T 9), soybean (JS 335), wheat (Lok 1) and mustard (Madhuri) were tested. Approximately 2-3 times higher crop yield was found after using improved variety of seeds and INM intervention as compared to control fields. Adoption rate of technology in the project area is about 40-50% on improved seed, 35-40% on micronutrients and 35-40% on intercropping practices. Crop diversification has also been adopted by farmers, who also found that soybean variety JS 9305 produces good yield in project area.

4.3 Technical Session III

Chair : Dr Suresh C Alagundagi

Rapporteur : Mr Raghavendra Rao Sudi

Total nine presentations from SRTT (four presentations) and Model watersheds (five presentations) were made. The presentations from SRTT included productivity enhancement initiatives in two districts of Madhya Pradesh: one by Deepak Sharma of GVT on Jhabua district and the other by PK Maharana of FES on Mandla district. Abhishek of PRADAN made a presentation on Gumla district while Manoj Kumar of TSRDS presented on Sarai Kela of Jharkhand. The five presentations on progress of Model watersheds were made by Agasimundin from Karnataka, Gouri Rane from Maharashtra, Naveen Kumar from Andhra Pradesh, Sudhir Yadav from Madhya Pradesh and SN Pandey from Uttar Pradesh, respectively.

Key points discussed during GVT presentation: Mr Kiran Petare urged PIAs to focus on the dissemination of information among farmers. Processing of data collection needs to be concentrated on major activities of the project. Dr SP Wani advised PIAs not to go by target mode to conduct trials, but put some extra effort to upscale the technology. Convergence of other programs has to be brought in for up-scaling the technology and there is a need to spend enough time with farmers in order to sensitize. One of the participants suggested conducting field walks for farmers from other areas to the trial fields during 2-3 crop growth stages to visualize the effectiveness of technology, supported by many participants.

The main point that emerged from the FES presentation was the concept of para-workers as service providers to scale up the technology. Dr Wani mentioned that it is a good concept and quoted the example of field facilitator concept of Bhoo Chetana program in Karnataka. Another point discussed during this presentation was about how the community/ collective demonstration can be conducted, even on lease basis, as a solution for successful demonstration of technologies, especially for small and marginal farmers.

The presentation of Gumla brought out several initiatives of success story like mono crop to double crop, micro nutrient application in paddy, followed by second crop with pulses, seed bank, *Glyricidia* and low-cost drip irrigation. It was also mentioned that the failure of chickpea crop was due to late rainfall and low level of farmers' participation. Dr Wani suggested that the documentation of success story of tribals is really worth emulating. He also quoted the examples of a tribal watershed of Adilabad in Andhra Pradesh. This presentation was adjudged as the best presentation.

The key point that emerged during TSRDS presentation was on chickpea seed supply. Dr Wani advised on ensuring the availability of seeds through seed production. This was initiated on leased land by TSRDS as the chickpea crop occupies more area year after year, and therefore, distribution should be done through SHGs for some incentive.

During the Model watershed presentations, Mr Kiran Petare suggested that for PRA of HHs all the income-generating activities should be considered to understand cash flow process at individual household level. He emphasized on SHG-bank linkage process that could bring down the dependence of households on money lenders. Other suggestion was that the convergence of various government programs going on in the watershed should be brought in to achieve maximum benefit effectively. One suggestion made was on exploring the data for geo-hydrological characterization of Model watersheds from Advanced Center for Water Resources Development and Management (ACWADAM), Pune, which is very cost-effective. Dr Piara Singh mentioned that the thorough baseline information should be collected, as it is at initial stage, which plays very important role in impact assessment and evaluation process. Mr Kiran Petare mentioned that as Gujarat faces severe salinity problem, enough thrust should be given to tackle this problem in the program. Lastly, it was suggested that instead of terming farmers as beneficiaries, they should be called stakeholders.

4.4 Technical Session IV

Chair : Dr Ajit Dhatt

Rapporteur : Dr Piara Singh

In this session six presentations were made on Model watersheds being implemented in Madhya Pradesh, Rajasthan, Gujarat and Maharashtra. The presenters reported the progress made so far, the constraints they faced and the future work plans.

Mr Akhilesh Singh Yadav working in Garbhan Wadi Model watershed in the Raisen district of Madhya Pradesh presented their work progress. Mr Yadav discussed the current status of agriculture and natural resources of the watershed area and the constraints and opportunities to enhance productivity and natural resource management. He spoke about the completion of PRA and the collection of baseline data. He said that while the watershed has lot of forest area, it is not clear who would work in the forest area. During the session, questions were raised as to what a Model watershed is and how it looks like. Dr Wani responded that the Model watersheds have to follow the common guidelines issued by the Ministry of Rural Development, Government of India, though this is not done so by many of the existing watersheds.

Mr Dasharath Thakar working on Model watershed (Kalwad) in the Jamnagar district of Gujarat presented the work progress. He discussed the natural resources of the area and the associated biophysical problems. He spoke about the completion of baseline survey of about 100 households and the formation of watershed association and watershed committee. He also presented the progress made so far. Mr Thakur pointed out that soil salinity is a major problem in Gujarat. Therefore, he emphasized on studying the soil and water quality of the area.

Mr Sisir K Sarangi of Shrishti (NGO) presented the progress report on Nuagaon Kunta Model watershed situated in the Mayurbhanj district of Orissa. In this area, paddy is the main source of livelihood of the rural community. He discussed the works done in the area on productivity enhancement, microenterprises, capacity building, collaboration and convergence of other organizations in the watershed work. He pointed out the major challenges faced such as lack of human resources, lack of common vision and clarity, lack of communication, lack of process documentation and inappropriate meeting place in the village and unfavorable mindset of the local people. Dr Wani mentioned that if the NGO was not capable of implementing the project, foreclosure of the project could be considered. Dr Sachan mentioned that these issues were discussed and the NGO would have to overcome these problems interactively with ICRISAT. Dr Wani suggested about hiring a person who would be willing to work in the rural area and contribute to awareness building of tribals by in Adilabad watershed.

Dr Devilal Vyas presented the progress report of Dungarpur Model watershed in Rajasthan. He discussed the biophysical aspects of the watershed area and the achievements made with regard to formation of watershed institutions and productivity enhancement activities. Convergence with other organizations (SGSY, ITC, RRB and agricultural research institutes) were also highlighted. During the session, it was suggested that the watershed should strive for greater convergence with other departments, considering the good relations with the government.

Mr Milan Saxena of WOTR presented the progress of Model watershed (Sangamer village) in the Ahmednagar district of Maharashtra. This watershed came on board only two months back, therefore, there was not much to report.

Mr Shailendra Tewari of Seva Mandir (NGO) reported the progress of Dhala watershed situated in Udaipur district of Rajasthan. This watershed is in the tribal area. Mr Tewari elaborated the criteria for selection of watershed and the activities carried out till date. One of the participants questioned about effect the guidelines have on the watershed as it changes from time to time. It was explained that common guidelines are broad in nature, which are flexible and define the outer boundary parameters. These guidelines could be altered depending upon the existing situation in a given state. It was pointed out that the new guidelines strike a balance between scientific and the community knowledge.

At the end of the session, the chairman summarized the presentations and highlighted that active involvement of the community both at planning and execution stage is must. There is a need to develop common parameters for evaluation of watersheds. Soil salinity is a major problem in Gujarat and therefore, this needs to be addressed. He thanked the presenters for highlighting the difficulties in implementing the works of the watersheds. Among the lessons need to be learnt and improvements made are: vermicomposting should be used for enhancing nutrition of the community and it is not to be sold to buy other things; community knowledge must be validated before being applied or else, it may do more harm than good. The Chairman finally thanked the presenters and the participants for the useful discussion. Dr Wani reminded that we must be optimistic in our efforts to achieve the desired results that will benefit the rural communities.

4.5 Technical Session V

Work plan of year 2010-11 was prepared in three parallel sessions along with partners NGOs working under SDTT-ICRISAT-ICAR, SRTT-ICRISAT and Model watersheds projects. Work plan of each partners NGOs are presented in Appendix A.

5. Concluding Session

Chair : Mr Bhaskar Mitra and Kiran Petare

Rapporteur : Dr KL Sahrawat

Work plans of SRTT-ICRISAT-ICAR, SDTT-ICRISAT-ICAR, Model watershed for year 2010-11 are presented.

SRTT-ICRISAT-ICAR Project

The work plan for 2010-11 was presented by Dr KH Anantha. The following points emerged after presentation of the report:

1. The implementing agency (NGOs) will record detailed data in the nucleus trials and yield data in the satellite villages; for the demonstration trials only farmers' observation on yield will be recorded.
2. It was suggested that we include goatry, fisciculture and poultry as the sources of livelihoods in addition to productivity enhancement activities.
3. In response to a question on increasing the number of trials for out-scaling, it was suggested that it was too early or premature for the project (two years) to undertake out-scaling activities in a big way. It was appropriate at the present time to learn from the trials restricted to nucleus and satellite villages.
4. Use KVKs and SAUs for the supply of seeds, conduct of the demonstration trials and farmers' training. Connect with ATMA farmers' field schools for the cross learning process.

SDTT-ICRISAT-ICAR Project

Following the presentation of the plans for Rajasthan and Madhya Pradesh separately, the following salient points emerged during the discussion:

Rajasthan

1. Efforts should be made to increase the number of trials for out-scaling through demonstration trials in districts where the project has done sufficient number of nucleus and satellite trials in the past. It was pointed out that the number of trials (150) in the Bundi district were less than those desired after five years of work in the nucleus and satellite villages. There was need to increase the number of demonstrations.
2. Linkages with ATMA farmers' field schools should be made for learning.
3. There was need to document the completed stories during the project, successes or failures, as the learning from the field work conducted.
4. There was an obvious need to spread out the trials (demonstrations) to more numbers of farmers in our effort for scaling out the learning through demonstrations.

Madhya Pradesh

The following points were brought out during discussion following the presentation of the plan for Madhya Pradesh:

1. Increase the capacity of the selected farmers and use them as trainers to collect data from the trials along with active participation in the process by ICRISAT and NGO staff on ground.
2. It was suggested that farmers from the nucleus villages could be trained and used to collect field data, but the responsibility lies with the NGO staff on the ground for the recording of the data in the nucleus and satellite villages.
3. Effort should be made to increase the number of demonstration trials for reaching more number of farmers and out-scaling in the districts with enough accumulated learning.

Model Watersheds

A long discussion followed after presentation of plans for typical two Model watersheds. The following points capture the essence of the suggestions made.

1. The basic data collection has begun in earnest for most watersheds and would be soon completed.
2. Good progress has generally been made in linking partners for social and physical aspects of related activities/jobs.
3. Efforts should be made to raise nurseries of general plants to be used as the source of organic matter. The obvious example was that of *Glyricidia*.
4. We should ponder on questions such as - Are we looking for perfect watersheds? Why farmers' adoption of the technologies is not increasing to desired level? Some of the well known technologies are not getting adopted. What are the causes? Is the lack of resources and or extension the problems?
5. It was suggested that the disjoint between extension and research was the major cause for the non-adoption of technologies in the watershed projects. Success has been achieved where NGOs and researchers have worked together. Also, developmental agencies were weak in technical knowledge and were unable to harness the community's social strength. There was need to bridge the gap between technology developers and development agencies through the consortium approach. Bring government, development agencies and researchers together to help farmers. Lack of monitoring and evaluation of watershed programs to correct the deficiencies in the system was an important bottleneck in the success of a program.
6. Watersheds are community based and social and technical aspects need to be properly integrated and these aspects should be considered while designing of watersheds in low and rainfall regions.

7. The data related to social aspects are dynamic relative to the baseline reference and can only be interpreted with the baseline data.
8. Allow space for the technologies to fail, but we should understand the causes of failures.
9. We generally do not report failures and if do report, put blame on others. This has to do with attitude.
10. We do not work in a team and always think about personal gain/ benefit.
11. Free support of inputs in the projects does not succeed in achieving the final goals; and this principle is non-negotiable for us.
12. Documentation in general was poor in the projects by the partners. There is scope for improvement in this important aspect as this helps in learning.
13. No donor fund failures and it calls for change in donor attitudes to ensure proper learnings from failures.
14. Corporate philosophy generally does not work for agricultural development.

The meeting ended with a vote of thanks by Mr P Pathak.

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Appendix A

Table 1: List of implementing partners and other consortium partners working in ICRISAT-SDTT-ICAR, ICRISAT-SRTT and Model watershed projects at different states in India

Project	State	Implementing partners	Other partners
ICRISAT-SDTT-ICAR	Madhya Pradesh	BAIF, BYPASS, CARD	Dept of Rural Development, Government of MP Dept. of Agriculture, Government of MP College of Agriculture, Indore Indian Institute of Soil Science (IISS) Central Institute of Agricultural Engineering (CIAE) *Zilla Panchayat* *Krishi Vignana Kendra* (KVK) Dept of Watershed Management Dept of Agriculture and Extension Rajasthan Agricultural University (RAU) MPUAT Central Arid Zone Research Institute (CAZRI) Central Research Institute for Dryland Agriculture (CRIDA) *Zilla Parishads* *Krishi Vignana Kendras* National Bank for Agriculture and Rural Development (NABARD) NRCAF
	Rajasthan	BAIF, DEEP	
ICRISAT-SRTT-ICAR	Jharkhand	TSRDS, PRADAN	
	Madhya Pradesh	GVT, FES	
Model Watersheds	Karnataka-Dharwad	BIRDS	
	Maharashtra- Jalgaon	JalSRI	
	A.P.-Medak	READ	
	M.P.-Guna	BAIF	
	U.P.-Jhansi	DA	
	M.P.-Raisen	BYPASS	
	Gujarat-Jamnagar	BAIF	
	Orissa- Maurbhanj	Shristi	
	Rajasthan-Dungarpur	PEDO	
	Maharashtra-Ahmednagar	WOTR	
	Rajasthan Udaipur	Seva Mandir	

Work Plan of Year 2010-11: SDTT-ICRISAT-ICAR Project

Target Region

- Madhya Pradesh: Rajgarh, Sehore, Raisen, Vidisha, Indore, Shajapur, Barwani, and Guna
- Rajasthan: Alwar, Banswada, Bhilwara, Jhalwar, Bundi, Sawai Madhopur and Tonk

A. Work plan in Madhya Pradesh

Table 2: District/village selected:

SN	District name	Village names
1	Sehore	Vedpure and two other villages
2	Vidisha	Anandpur and two other villages
3	Raisen	Bahmori, Pahria, Bhainsra
4	Shajapur	Mahudia, Moyakhera, Barkhera
5	Indore	Ringnodia and two other villages

1. Integrated nutrient management (INM)

(a) Nucleus trials

Treatment:

Improved variety+ farmers' practice

Improved variety + balanced nutrition (100% chemical)

Improved variety+ balanced nutrition (50% chemical + 50% organic/FYM/VC)

(b) Satellite trials

Treatment:

Improved variety+ farmers' practice

Improved variety + balanced nutrition (100% chemical)

(c) Scaling up trial

Treatment:

Improved variety + balanced nutrition (100% chemical)

2. Fallow management

(a) Nucleus trial

Treatment:

Fallow-chickpea/wheat

Short duration soybean-chickpea/wheat (INM+CF)

Short duration soybean-chickpea/wheat (INM+BBF)

Total No of trials:

Nucleus trials: 5 districts x 3 villages x 5 trial/villages

Satellite trials: 5 districts x 3 villages x 25 trial/villages

Scaling up trials: 5 districts x 3 villages x 50 trial/villages

Diversification: SB/PP, MZ/PP, GN/PP, MZ/GN, groundnut, greengram, vegetables: all with INM

Livelihood improvements: Nursery raising, vermicomposting, livestock - livestock camps, micro-enterprises, fodder development, kitchen gardening, *Glyricidia* plantations, backyard poultry and goatry, seed bank/SHGs formation

Data recording:

- Nucleus trials: Sowing date, emergence, 50% flowering, physiological maturity, harvest date, date and amount of inputs, harvest data on yield and yield components, soil analysis, plant population, plant samples at harvest.
- Satellite trials: Crop yields-biomass and economic data
- Scaling up: Economic yields, farmers' perceptions

Responsibilities and data recording

- Concerned NGO in the respective district is responsible for implementing the trials and data recording.
- NGO and ICRISAT staff has to visit trial/experimental sites frequently.
- Technical support should be given by ICRISAT staff.
- Data collection by the NGO staff and to send to ICRISAT by earliest possible.
- Concerned ICRISAT scientist: Data compilation, analysis, documentation.

B. Work plan in Rajasthan

Table 1: District/village selected and No. of experimental trials

SN	District name	No. of villages	Nucleus trials	Satellite trials	Scale up trials
1	Bundi	3	-	-	150
2	Alwar	3	-	-	150
3	Bhilwara	3	15	75	150
4	Banswara	3	15	75	150
5	Jhalawar	3	15	75	150
6	Tonk	3	15	75	150
7	Sawai Madhopur	3	15	75	150

Residual assessment: Farmers' practices + NPK in existing crop

1. Integrated nutrient management (INM)

(a) Nucleus trials

Treatment:

Improved variety+ farmers' practice

Improved variety + balanced nutrition (100% chemical)

Improved variety+ balanced nutrition (50% chemical + 50% organic/FYM/VC)

- All three treatments: Plot size will be taken 1000 m^2 / treatment; plot size for one trial is 3000 m^2.

(b) Satellite trials

Treatment:

Improved variety + farmers' practice

Improved variety + balanced nutrition (100% chemical)

(c) Scaling up trial

Treatment:

Improved variety + farmers' practice

Improved variety + balanced nutrition (100% chemical)

Table 2: Other trials and activities for livelihood improvement

Trials	Bundi	Alwar	Bhilwara	Jhalawar	Banswara	Tonk	Sawai Madhopur
Crops diversification	10 -20	10 -20	10 -20	10 -20	10 -20	10 -20	10 -20
Establishment of model farm as learning site	1	1	1	1	1	1	1
Vegetable cultivation (No)	10	10	10	10	10	10	10
Forage prod. (family)	20	20	20	20	20	20	20
Breed improvement	1	1	1	1	1	1	1
IGA							
Goatry (male buck)	5	5	5	5	5	5	5
Poultry	2	2	2	2	2	2	2
Nursery	1	1	1	1	1	1	1
Vermicompost	5	5	5	5	5	5	5
Micro nutrient bank	1	1	1	1	1	1	1
Capacity building							

Continued

Continued from previous page

Trials	Bundi	Alwar	Bhilwara	Jhalawar	Banswara	Tonk	Sawai Madhopur
Relevant trainings to 25 farmers	4	4	4	4	4	4	4
Farmers' day	2	2	2	2	2	2	2
Exposure visit	10	10	10	10	10	10	10
FGD & FW (at least two in each village	2	2	2	2	2	2	2
Documentation of best practices (Nos.)	3	3	3	3	3	3	3

Selected crops in *Kharif* are pearl millet, greengram, blackgram, maize, soybean and *Rabi* is wheat, mustard, chickpea.

Work Plan of Year 2010-11: SRTT-ICRISAT-ICAR Project

Target region

- Madhya Pradesh: Mandla by FES, Jhabua by GVT
- Jharkhand: Gumla by PRADAN; Saraikela-Kharsaw by TSRDS

Experimental treatment:

Farmers' practice

Farmers' practice + improved variety

Improved variety + balanced nutrition

Table 3: Work plan for SRTT-ICRISAT-ICAR project.

	Kharif	No. of trials	*Rabi*	No. of trials
Madhya Pradesh				
Mandla district: 1+5 village	Maize	10	Chickpea	40
	Pigeonpea	10	Mustard	25
	Black gram	10	Wheat	30
	Groundnut	10	Vegetable	30
	Paddy	30		
	Total	70	Total	125
Jhabua: 1+4 village	Maize	45	Chickpea	50
	Soybean	45	Wheat/mustard intercrop	15
	Groundnut	10	Vegetable	20
	Black gram	10		
	Pigeonpea	10		
	Total	120	Total	85
Jharkhand				
Gumla: 1+9 villages	Paddy	75	Chickpea	75
	Maize	25	Vegetables	25
	Maize/pigeonpea intercrop	25	Wheat	10
	Pigeonpea/black gram intercrop	25		
	Pigeonpea/ groundnut intercrop	5		
	Groundnut	10		
	Total	165	Total	110

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	Kharif	No. of trials	*Rabi*	No. of trials
Saraikela-Kharsaw: 1+5 villages	Paddy	30	Chickpea	30
	Pigeonpea	5	Wheat	15
	Maize	5	Wheat/mustard intercrop	15
	Vegetable	10	Mustard	15
			Vegetable	35
	Total	50	Total	

Other activities

Mandla, Madhya Pradesh	Activities in *Kharif*	Activities in *Rabi*
	• Glyricidia nursery - 3 SHGs • Planting Glyricidia 5000 seedlings • Vermicompost one commercial + 30 surface Model pits • Vegetable cultivation - 5 farmers in Kharif • Low cost drip - 10 farmers in Rabi/summer • Seed bank for one village • Environmental education program in one village • Three farmers' field days • Exposure visit – one • Well water depth monitoring in 24 wells • BBF - 3 farmers • Poultry farm - farmers • Common rice nursery - five farmers	• Vegetable cultivation - 30 farmers • Low cost drip irrigation - 10 farmers • Common nursery for vegetables • One farmers' field day • One community seed bank • Environmental education program in one village • Well water depth monitoring in 24 wells • Fodder production - four farmers • Common rice nursery - five farmers
Jhabua, Madhya Pradesh.	Activities	
	• 25 vermicompost surface units • Low cost drip irrigation involving 10 farmers • Glyricidia nursery one	
	• Vegetable nursery - 1 • Planting 5000 Glyricidia seedlings • 10 backyard poultry farms • Four field days • Five exposure visits • Five night camps for farmers	
Gumla, Jharkhand	Activities	
	• Boron & Zn spraying for mango orchards - 50 farmers • Training of 50 farmers in Kharif rice production • Training of 25 farmers in Rabi for chickpea and vegetables production	

Saraikela-Kharsaw, Jharkhand	Activities
	• Planting 10000 Glyricidia seedlings • Drip irrigation - one farmer • 10 vermicompost surface units • Two villages with seed bank • Kisan clubs in three villages • Linkages of 3 SHGs with bank • Four field days • Four exposure visits • Training of 20 farmers in Kharif paddy production • Training of 30 farmers in Rabi chickpea, vegetable and wheat/mustard intercrop production

Work Plan of Year 2010-11: Model watersheds

Watershed name: Padmalaya, Jalgaon, MH; NGO: JalaSRI

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line	JalaSRI	Done		
Formation of WC	JalaSRI	Done		
Soil sampling	ICRISAT	Done		
SHGs and Ags formation	JalaSRI/WC	June 2010		
Physical interventions				
Runoff rainfall, and soil loss monitoring station		Done		
2 farm ponds is in progress	JalaSRI/WC	June 2010		
4 farm ponds proposed	JalaSRI/WC	Nov 2010		
1 KT weir repairs	JalaSRI/WC	June 2010		
10 gully plugs	JalaSRI/WC	June 2010		
10 recharge pits	JalaSRI/WC	July 2010		
Data collection				
Rainfall, runoff, groundwater table, soil loss, etc.	JalaSRI/WC			
Avenue plantation in 1 km road side	JalaSRI/Social Forestry dept			
Topographic survey 982 ha	JalaSRI/WC			
Productivity enhancement				
Scaling up of varieties in *Kharif* and *Rabi* 2009	JalaSRI/WC	Done	30 ha	Satellite
Scaling up of INM in *Kharif* and *Rabi* 2009	JalaSRI/Dept of Agri (DOA)	Done	25 ha	Satellite
Scaling up of Varieties in *Kharif* and *Rabi* 2010	JalaSRI/WC	Sept10-Feb11	25 ha	Nucleus/ satellite/
Scaling up of INM in *Kharif* and *Rabi* 2010	JalaSRI/ DOA	Sept10-Feb11	20 ha	Nucleus/ satellite
Waste land development	Social forestry, *panchayat*, WC	July 10	3 ha	

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Particulars	Responsibilities	Expected time of completion	Target area	Other info
Micro enterprises				
4 nursery: 2 *Glyricidia* and 2 others	Social forestry / JalaSRI/WC	Dec 10		
5 vermicomposting units	JalaSRI/WC	July 10		
Capacity building				
Land management training	JalaSRI/ICRISAT	Done		
Seed bank	DOA	Nov		
Leadership, book keeping, record maintaining	JalaSRI/DOA	Nov		
Biogas	ARTI/JalaSRI	Done		
Hydrological monitoring/ training	ICRISAT	Done		
Total station	ICRISAT	Done		

Watershed name: Garbhan Nala, MP; NGO: BYPASS

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line	BYPASS	July 10		
Formation of WC & UGs	BYPASS	May 10		
Soil sampling and testing	BYPASS-ICRISAT	May 10		
PRA	BYPASS	Done		
SHGs formation	BYPASS	August 10		
Physical interventions				
Runoff rainfall, and soil loss Monitoring station installation	ICRISAT/BYPASS	July 10		
2 check dam,15 gully plg, field bunding with trench (2000 m)	WC & BYPASS	June 10-Feb11		
Data collection				
Rainfall,	WC & BYPASS	Continuous		
Groundwater table	WC & BYPASS	Continuous		
Runoff and soil loss monitoring	WC & BYPASS	Continuous: Aug onwards		
Productivity enhancement				
Fallow management nucleus experiment	BYPASS	*Kharif* & *Rabi*	10 farmers	
Scaling up of varieties in *Kharif* and *Rabi* 2010 - Satellite trials	BYPASS	*Kharif* & *Rabi*	10 farmers	
INM trials in *Kharif* and *Rabi* nucleus trials	BYPASS	*Kharif* & *Rabi*	10 farmers	
Micro enterprises				
2 nursery: *Glyricidia* and others	BYPASS /WC	Dec 10		
2 vermicomposting units	BYPASS/WC	July 10		

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Particulars	Responsibilities	Expected time of completion	Target area	Other info
Feasibility study on available options of livelihood & skills of community: NTFP, dairy, poultry, trading, seed bank, vegetable cultivation, food products, etc	BYPASS/WC	Oct 10		
Capacity building				
Watershed management	BYPASS	June 10		
Seed bank	ICRISAT/BYPASS	Oct 10		
Leadership, book keeping, record maintaining	BYPASS	June 10		
Hydrological monitoring - training	ICRISAT	July 10		
Exposure visit to watershed area	BYPASS	June 10		
Training of SHGs	BYPASS	Aug 10- Sept10		
Exposure visit to watershed area	ICRISAT	Dec 10		
Thematic FGDs with WC & Ugs	BYPASS & ICRISAT	Continue every fortnight		
Farmers' day	BYPASS	Sept10 & Jan11		
Animal health camps	BYPASS, BAIF	Aug10 & Dec11		

Watershed name: Guna, MP; NGO: BAIF

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line	BAIF	Done		
Formation of WC	BAIF	Done		
Soil sampling	BAIF	Done		
SHGs and AGs formation	BAIF			
Physical interventions				
Rainfall station		Done		
Runoff and soil loss monitoring station	ICRISAT/BAIF	June 10		
5 check dam	BAIF/WC	May 10-Jan 11		
Staggered contour trenches	BAIF/WC	June10-Mar11		
Farm field bunds	BAIF/WC	June 10-Mar11		
20 gully plugs	BAIF/WC	June 10-Mar11		
Data collection				
Rainfall, runoff, groundwater table, soil loss, etc.	BAIF/WC	Continuous		
Productivity enhancement				
Fallow management	BAIF/WC	*Kharif-Rabi*	25 ha + 25 ha	Nucleus trial
Varietals trials in *Kharif* and *Rabi*	BAIF/WC	*Kharif-Rabi*	30 ha + 50 ha	Nucleus - satellite trial
Crop diversification	BAIF/WC	*Kharif-Rabi*	35 ha + 35 ha	Nucleus - satellite trial
Micro enterprises				
2 seed bank	BAIF/WC	*Kharif-Rabi*		
Live stock development program	BAIF/WC			
Goatry and poultry	BAIF/WC			
Nursery	BAIF/WC			
Vermicomposting	BAIF/WC			
Capacity building				
Field level training (6 times)	ICRISAT/BAIF/ AG dept.	*Kharif-Rabi*		
Farmers' day-2	KVK/ICRISAT/ BAIF	*Kharif-Rabi*		
Exposure visit	BAIF/ICRISAT	*Rabi*		

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Particulars	Responsibilities	Expected time of completion	Target area	Other info
Animal health camp-2	ICRISAT/BAIF/ AG dept.	Oct 2010 and March 2011		

Watershed name: Saram, Dungarpur, Rajasthan; NGO: PEDO

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line	PEDO	Done		
Formation of WC	PEDO	Done		
Soil sampling	PEDO	Done		
SHGs and AGs formation	PEDO	Done		
Physical interventions				
Runoff rainfall, and soil loss monitoring station	ICRISAT/PEDO	June2010		
2 farm ponds	PEDO/WC	June2010		
Gully plug: 1 village	PEDO/WC	June2010		
20 recharge pits	WC/PEDO	June2010		
Data collection				
Rainfall, groundwater table-monthly	WC/PEDO	Continuous		
Runoff and soil loss	WC/PEDO	June onwards		
Productivity enhancement				
Scaling up of varieties in *Kharif* and *Rabi* 2010	WC/PEDO	*Kharif-Rabi*	5 ha	Nucleus - satellite trial
Scaling up of INM in *Kharif* and *Rabi* 2010	WC/PEDO	*Kharif-Rabi*	2.5 ha	Nucleus -satellite trial
Micro enterprises				
Nursery: *Glyricidia*	WC/PEDO	July 2010		
Seed bank	WC/PEDO	Feb 2011		
Goatry	WC/PEDO	Feb 2011		
Capacity building				
INM training	WC/PEDO/ ICRISAT	*Kharif-Rabi*		
Soil and water conservation training	WC/PEDO	June 2010		
Artificial insemination	PEDO/Animal Husbandry	June 2010		
Vegetable and spice cultivation	PEDO/KVK	June 2010		
Farmers' day	WC/PEDO	*Kharif-Rabi*		

Watershed name: Uptyaka, Orissa; NGO: Shristi

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line	Shristi	Done		
Formation of WC	Shristi	Done		
Soil sampling	Shristi	Done		
SHGs and AGs formation	Shristi			
Physical interventions				
Runoff rainfall, and soil loss monitoring station	ICRISAT	June		
3 farm ponds	Shristi	June10-Feb11		
3 dug well	Shristi	June10-Feb11		
Field bunding: 20 ha area	Shristi	March 11		
6 water harvesting structures	Shristi/ICRISAT	January 2011		
Data collection				
Rainfall, groundwater table-monthly	Shristi	Continuous		
Runoff and soil loss	Shristi	July onwards		
Productivity enhancement				
Scaling up of paddy variety in *Kharif*	Shristi		16 ha	Nucleus
Upland cropping (maize in 5 ha and groundnut in 5 ha area)	Shristi	June-Oct		
Kitchen garden in 200 households	Shristi	June		
Horticulture plant: Cashewnut in 20 ha; mango in 5 ha; *Glyricidia* plantation in 8 ha	Shristi/National Horticulture Mission -NHM/ DCCD	July-Aug 2010		
INM: Paddy-chickpea/ greengram: 4 ha	Shristi	June-Feb		
Micro enterprises				
1 nursery: *Glyricidia*	Shristi/KVK	Aug-Sept 2010		
Backyard poultry	Shristi/KVK	Aug-Sept 2010		
20 vermicomposting units	Shristi/KVK	Dec-10		
1 goatry	Shristi/KVK	Jan-11		
Capacity building				
Seed bank	Shristi/DA	Nov 2010		

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Particulars	**Responsibilities**	**Expected time of completion**	**Target area**	**Other info**
Leadership, book keeping, record maintaining	Shristi	Aug-Sept 2010		
Goatry	Shristi/Veterinary	Dec 2010		
Backyard poultry	Shristi/Veterinary	June-July 2010		
Vegetable production	Shristi/KVK	June-July 2010		
Animal health camp	Shristi/Veterinary	June-July 2010		
2 farmers' day	Shristi/Govt of Orissia	Sept , Feb		

Watershed name: Nagula Palli, Andhra Pradesh; NGO: READ AP

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line	READ	Done		
Formation of CBOs (WC, SHGs, Ags)	READ	Done		
Soil sampling	READ/ ICRISAT	Done		
Physical interventions				
Field bunding (30 ha)	READ	30 May 2010		
Loose boulders / rock fill dam (24 Nos.)	READ	30 Jun 2010		
Mini percolation tank (01 No.)	READ	30 Oct 2010		
Check dam repairing (02 No.)	READ	30 Oct 2010		
Check dam new (01 No.)	READ	30 Dec 2010		
Field bund plantation (5000 No.)	READ	30 July 2010		
Data collection				
Rainfall, runoff, groundwater table, soil loss, etc.	READ	continuous		
Productivity enhancement				
INM -2ha	READ	*Kharif* season		
INM -2ha	READ	*Rabi*		
Scaling up of varieties (12 ha)	READ	Both season		
Vegetable promotion – 2 ha	READ	*Rabi*		
Kitchen garden 10 HH	READ	July to August		
Micro enterprises				
Nursery (01 No.)	READ	June 2010		
Vermicomposting (20 No.)	READ	30 Dec 2010		
Dairy (1No.)	READ	30 Nov 2010		
Capacity building				
Formation of WHS	READ	30 July 2010		
Leadership, record and book keeping	READ	30 Aug 2010		
LWH (BBF)	ICRISAT / READ	30 June 2010		
INM	ICRISAT / READ	30 July 2010		

Watershed name: Mota Vadala, Jamnagar,Gujarat; NGO: BAIF

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line	BAIF	Done		
Formation of WC, SHGs and Ags	BAIF	Done		
Soil sampling	BAIF	Done		
Physical interventions				
Runoff rainfall, and soil loss monitoring station installation	ICRISAT/BAIF	Aug		
5 farm ponds, 2 check dam, 2 gully plug, field bunding (2000 m),	BAIF	June-Dec		
Data collection				
Rainfall	BAIF	Continuous		
Groundwater table	BAIF	Continuous		
Runoff and soil loss monitoring	BAIF	Sept onwards continious		
Productivity enhancement				
Scaling up of varieties in *Kharif* and *Rabi* 2010	BAIF	Sept -Feb	20 ha area	Nucleus trial
Scaling up of INM in *Kharif* and *Rabi* 2010	BAIF	Sept -Feb	20 ha area	Nucleus trial
Land management BBF in *Kharif* and *Rabi*	BAIF	Sept -Feb	20 ha area	Nucleus trial
Micro enterprises				
10 pearl making m/c	BAIF	Dec 2010		
1 nursery: Forestry plants	BAIF	Dec 2010		
Capacity building				
Exposure visit to near by watershed village	BAIF	Nov 2010		
Training of WC, SHGs	BAIF	June 2010		
Collection of hydrological data	BAIF- ICRISAT	Sept 2010		
Land mgt (BBF) training	ICRISAT	June 2010		

Watershed name: Dob-nevaj, Udaipur, Rajasthan; NGO: Seva Mandir

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line and household survey	Seva Mandir	Sept		
Formation of WC	Seva Mandir	Done		
Formation and revitalization of SHGs	Seva Mandir	July 2010		
Soil sampling	ICRISAT/ Seva Mandir	May-June 2010		
DPR work plan	ICRISAT/ Seva Mandir	Sept 2010		
Physical interventions				
Installation of gauging Station	ICRISAT/ Seva Mandir	June 2010		
Forest land treatment in 31 ha land	Seva Mandir/ Forest dept	May-July 2010		
Forest land treatment in 50 ha land	Seva Mandir/ Forest dept	10 Oct-11 April		
Land treatment in private land 50 ha	Seva Mandir	10 Nov-April 11		
Glyricidia plantation and agro-forestry plantation in 50 ha area	Seva Mandir/ CAZRI	July 2010		
Low-cost drip irrigation vegetable cultivation - 30 farmers	Seva Mandir	Sept-10 Nov		
Data collection				
Rainfall, groundwater table-monthly	Seva Mandir	June onwards		
Runoff and soil loss monitoring	Seva Mandir	June onwards		

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Particulars	Responsibilities	Expected time of completion	Target area	Other info
Productivity enhancement				
Participatory trials with INM (1.5 ha) in 3 villages; 5 farmers per village in *Kharif* and *Rabi*	Seva Mandir	*Kharif* and *Rabi*		Nucleus trial
Crop intensification (9 ha land); 3 villages; 15 farmers per village = 45 farmers	Seva Mandir/ MPUAT	*Kharif* and *Rabi*		Nucleus trial
Vegetable cultivation - 30 farmers	Seva Mandir	*Kharif* and *Rabi*		
Micro enterprises				
Formation of seed bank in 3 villages	Seva Mandir	*Kharif* and *Rabi*		
1 nursery	Seva Mandir	May-June 2010		
60 vermicomposting units	Seva Mandir	10 July-10 Dec		
Capacity building				
Farmers' day	Seva Mandir	*Kharif* and *Rabi*		
Animal health camp in 3 villages-twice a year	Seva Mandir/ Dept. Of Animal husbandry	10 July-10 Dec		
Watershed committee orientation training	Seva Mandir	June 2010		
Exposure visit to local w/s	Seva Mandir	10 Aug-		

Watershed name: Dolasne watershed, Sangamner, MH; NGO: WOTR

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line and household survey	WOTR	10 May		
Formation of CBOs watershed committee (WC)	WOTR	10 August		
Soil sampling	WOTR/ICRISAT	10 May		
DPR	WOTR/ICRISAT	10 June		
Physical interventions				
Installation of rain gauge	WOTR/ICRISAT	May 2010		
Continuous contour trench (CCT) in 10 ha	WOTR/WC	March 2011		
Farm pond-1	WOTR/WC	March 2011		
10 gully plug	WOTR/WC	March 2011		
Field bunding in 15 ha area	WOTR/WC	March 2011		
Data collection				
Rainfall	WOTR/WC	Daily		
GW level of bore well and open wells	WOTR/WC	Continuous-monitoring		
Productivity enhancement				
Up scaling of varieties of sorghum	WOTR/WC	*Kharif* : 20 ha		Nucleus
Participatory/exploratory trials INM	WOTR/WC	*Kharif*: 2ha		Nucleus
Micro enterprises				
Vermicomposting 5 units	WOTR/WC	10 Sep		
Capacity building				
CBO: SHGs, AG, WC	WOTR/WC	June 2010		
Technical training for productivity enhancement: improved agronomy practices	ICRISAT/WOTR	10 Sep		
Two exposure visit	ICRISAT /WOTR	Aug-Sept 2010		
Field day	WOTR/WC	*Kharif -Rabi*		
Seed bank training	WOTR/WC	10 Sep		

Watershed name: Agasanahalla, Dharwad *taluka*, Karnataka; NGO: BIRDS

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line and household survey	BIRDS	Done		
Formation of CBOs watershed committee (WC)	BIRDS	Done		
Soil sampling	ICRISAT	Sample collected, need to send to ICRISAT		
Physical interventions				
Trench cum bunds, farm pond, recharge pits near bore wells,	BIRDS/AGs/ WC	May-June		
Installation of monitoring unit	BIRDS/ICRISAT	Mid June		
Data collection				
Rainfall	BIRDS	Daily		
GW level of bore well and open wells	BIRDS	Continuous-monitoring		
Productivity enhancement				
INM in *Kharif* and *Rabi*	BIRDS	*Kharif-Rabi*	4 villages, 4 farmers/ village	Nucleus
Varietal trial in *Kharif* and *Rabi*	BIRDS	*Kharif-Rabi*	4 villages, 4 farmers/ village	Nucleus
Land form treatment BBF/ CF-conservation furrow/FP-farmers' practice	BIRDS	*Kharif-Rabi*	4 villages, 3 farmers/ village	Nucleus
Micro enterprises				
Nursery: *Glyricidia*	BIRDS	June		
Nursery: Horticulture	BIRDS	August		
Vermicomposting		Before June	4 village and 4 unit/ village	

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Particulars	Responsibilities	Expected time of completion	Target area	Other info
Capacity building				
SHGs, AG, WC	BIRDS	August and continue		
Runoff, soil loss monitoring training	ICRISAT/BIRDS	August		
BBF	ICRISAT/BIRDS	August		
Field day	BIRDS	*Kharif* and *Rabi*		
Seed treatment	UAS, ICRISAT	May		
IPM	ICRISAT	August		
Animal health camp	GOK, BIRDS, UAS	June		
PG research (2 PhD and 2 Msc)	UAS, ICRISAT, BIRDS	10 Sep		

Watershed name: Domagor Pahuj, Jhansi, UP; NGO: DA and Other partners: NRCAF

Particulars	Responsibilities	Expected time of completion	Target area	Other info
Institutional information				
Base line	DA/NRCAF	Done		
Formation of CBOs (WC, SHGs,Ags)	DA	Done		
Soil sampling	ICRISAT	Done		
Physical interventions				
Gauging structure	NRCAF/DA	30 June		
WHS/bunding	DA/WC	30 Jun		
Installation of monitoring unit	ICRISAT	30 Jun		
Data collection				
Rainfall, runoff, Groundwater table, soil loss, etc.	NRCAF/WC	Continuous		
Productivity enhancement				
INM in *Kharif*	DA	*Kharif*	3 villages, 3 farmers/ village	Nucleus
Experimental varietal trials on groundnut	NRCAF		Plot level at NRCAF site	Exploratory trials
Varietal trial in *Rabi* (chickpea)	DA	*Rabi*	3 villages, 9 farmers / village	Nucleus
Agroforestry systems	DA/NRCAF	July to August	25-30 ha	
HH nutritional security	NRCAF/DA	July to August	350 wells	
Kharif and *Rabi*, land use, soil fertility map	NRCAF/ ICRISAT	Continuous	fertility map- 3 years interval	
Micro enterprises				
Nursery will be strengthen	DA	Throughout the year		
Vermicomposting: 15	DA	30 Sept	15	
Vegetable production	DA	Throughout the year	20 farmers	

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Particulars	Responsibilities	Expected time of completion	Target area	Other info
Capacity building				
Fabrication of Gabion	NRCAF/DA	30 Jun		
Farmers' day	DA	*Kharif* and *Rabi*		
Animal health camp	DA	2 June		
Record keeping, leadership development, INM	DA	30 Sept		
Weed management, pest management	DA	*Kharif* and *Rabi*		
Hydrological monitoring training	ICRISAT			

Appendix B

Tata-ICRISAT-ICAR and Model Watershed Projects' Review and Planning Meeting

Productivity Enhancement through Sustainable Management of Natural Resources

4-6 May 2010

Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, Rajasthan, India

Program

Tuesday, 4 May 2010

0800–0900	Registration	
Session 1	**Inaugural Session**	
	Chair *SS Chahal* *Rapporteur* *KH Anantha*	
0900–0910	Welcome and objectives of the workshop	SP Wani
0910–0925	SDTT's role in improving livelihoods through sustainable management of natural resources	Bhaskar Mitra
0925–0940	CInI initiative for sustainable management of natural resources and improved livelihoods	Kiran Petare
0940–1010	Increasing agricultural productivity through sustainable management of natural resources in rain-fed areas	SP Wani
1010–1020	Special invitee's address	SP Tewari
1020–1035	Opening address	SS Chahal
1035–1040	Vote of thanks	Girish Chander
1040–1100	*Photograph and Tea/coffee break*	

Session 2	**Technical Session 1**	
	Chair *Neelima Khetan* *Rapporteur* *Kaushal Garg*	
1100–1125	Enhancing agricultural productivity in the state of Rajasthan	Pratap Singh
1125–1150	Strategies to reduce rainy season fallows and improve livelihoods	P Pathak
1150–1215	Enhancing water use efficiency and productivity in rain-fed areas	Piara Singh
1215–1240	Soil test-based fertilizer management for improving productivity and livelihoods	Girish Chander/ KL Sahrawat
1240–1305	Strategies to improve livelihoods in arid areas through sustainable management of natural resources	MM Roy
1305–1330	Discussion	
1330–1430	*Lunch*	
Session 3	**Technical Session II**	
	Chair *MM Roy* *Rapporteur* *Girish Chander*	
1430–1510	BAIF's progress report on productivity enhancement in selected districts of Madhya Pradesh	Somnath Roy
1510–1540	BYPASS's progress report on productivity enhancement in Madhya Pradesh	Akhilesh Singh Yadav
1540–1600	*Tea/coffee break*	
1600–1630	CARD's progress report on productivity enhancement in Madhya Pradesh	Vivek Sharma
1630–1700	DEEP's progress report on productivity enhancement in districts of Rajasthan	Bachchu Singh Choudhary

1700–1730	BAIF's progress report on productivity enhancement in districts of Rajasthan	AK Chourasia
1830	*Workshop dinner at Apani Dhani*	

Wednesday, 5 May 2010

Session 4 **Technical Session III**

Chair *Pratap Singh*
Rapporteur *S Raghavendra Rao*

0800–0830	GVT's progress report on productivity enhancement in Jhabua, Madhya Pradesh	Deepak Sharma
0830–0900	FES's progress report on productivity enhancement in Mandla, Madhya Pradesh	PK Maharana
0900–0930	PRADAN's progress report on productivity enhancement in Gumla, Jharkhand	SL Rahman
0930–1000	TSRDS's progress report on productivity enhancement in Sarai Kela, Jharkhad	Manoj Kumar
1000–1030	*Tea/coffee break*	
1030–1100	Progress report on Model watershed in Dharwad, Karnataka	MA Agasimundin
1100–1130	Progress report on Model watershed in Jalgaon, Maharashtra	Gauri Rane
1130–1200	Progress report on Model watershed in Medak, Andhra Pradesh	Naveen Kumar
1200–1230	Progress report on Model watershed in Guna, Madhya Pradesh	Sudhir Yadav
1230–1300	Progress report on Model watershed in Jhansi, Uttar Pradesh	SN Pandey
1300–1330	Discussion	
1330–1430	*Lunch*	

Session 5	**Technical Session IV**	
	Chair *Ajit Dhatt* *Rapporteur* *Piara Singh*	
1430–1455	Progress report on Model watershed in Raisen, Madhya Pradesh	Akhilesh Singh Yadav
1455–1520	Progress report on Model watershed in Jamnagar, Gujarat	Dasharath Thakor
1520–1545	Progress report on Model watershed in Nuagaon-Kunta, Orissa	Sisir K Sarangi
1545–1610	*Tea/coffee break*	
1620–1635	Progress report on Model watershed in Dungarpur, Rajasthan	Devilal Vyas
1635–1700	Progress report on Model watershed in Ahmednagar, Maharashtra	Milan Saxena
1700–1725	Progress report on Model watershed in Udaipur, Rajasthan	Shailendra Tiwari

Thursday, 6 May 2010

Session 6	**Technical Session V**	
0915–1300	Review of two days and working groups for preparing work plans	SP Wani
1000–1020	*Tea/coffee break*	
	Work Planning in Three Parallel Groups (i) SRTT - KL Sahrawat and KH Anantha (ii) SDTT - Piara Singh and Girish Chander (iii) Model watersheds - P Pathak and Kaushal K Garg	
1300–1400	*Lunch*	
1400–1500	Time for preparing work plans	
1500–1515	*Tea/coffee break*	

Session 7 Concluding Session

	Co-Chairs	*Bhaskar Mitra and Ganesh Neelam*
	Rapporteur	*KL Sahrawat*
1515–1530	Presentations of the work plans – SDTT-ICRISAT-ICAR project	
1530–1545	Presentations of the work plans – SRTT-ICRISAT-ICAR project	
1545–1600	Presentations of the work plans – Model Watersheds	
1600–1615	Concluding remarks	
1615–1625	Vote of thanks	P Pathak

Appendix C

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Glimpses of the Workshop

4–6 May 2009

Maharana Pratap University of Agriculture and Technology (MPUAT) Udaipur, Rajasthan, India


SUHAS P WANI
SS CHAHAL
CHAIR


CO-CHAIR
CO-CHAIR

PowerPoint Presentations

WELCOME TO MPUAT-UDAIPUR

Tata-ICRISAT-ICAR and Model Watershed Projects'

Review and Planning Meeting

Productivity Enhancement through Sustainable Management of Natural Resources

4–6 May 2010

Maharana Pratap University of Agriculture and Technology (MPUAT)

Udaipur, Rajasthan

Objectives

- To review the progress and synthesize the findings from the work done at different locations under SRTT, SDTT and Model Watershed projects in India
- To identify emerging issues, discuss up-scaling strategies, and prepare workplans for sustainable use of natural resources and increasing productivity in India
- To plan strategic participatory research and development trials for enhancing productivity

Collectives for Integrated Livelihood Initiatives (CInI)

CInI

Thematic areas CInI Focus

- Kharif Paddy Stabilization
- Kharif Maize Stabilization
- Diversion based Irrigation (Revival of traditional irrigation systems)
- Non Timber Forest Produce
- Microfinance and Livelihood
- Community Based Organizations

Kharif Paddy Stabilization Strategy

- Ensuring Food Security of Tribal Households through stabilization of paddy production
- An effort to enhance the livelihood of tribal population through intensification of rice cultivation with improved technology interventions, strong extension and assured irrigation support
- Assurance of good yield under improved practices, encourages farmers to get involved in other cash promoting livelihood interventions

Learnings of 2009-10

- Rainfall became a major problem this year (30% deficit)
- did fairly well in terms of good varieties, nursery raising, training for seed treatment, transplanting
- However, the crop management mainly in later stages when pest problem severed was not followed. Mainly through shoot borer and leaf virus
- Water harvesting played critical role in some areas, which helped for nursery saving
- In some areas, with no water harvesting resources have resulted in death of nursery and farmers had to go for nursery again, resulting in extra seeds

Diversion based Irrigation Management

- To establish DBI as a supporting tool for ensuring food security in tribal dominated Central Indian States
- Enables poor farmers living in difficult terrains to double their incomes by taking the second crop using diverted water flows
- Reduces their need for migrating in search of work
- Technically such schemes are feasible only in far flung, remote and tribal areas usually facing neglect by the State
- Investments is less compared to other source of irrigation
- O & M cost is less

- Pilots on Ahar-Pyne and Phad initiated towards revival process, agriculture promotion and institutional strengthening
- Study on Kattas – traditional irrigation system in South Orissa

Non Timber Forest Produce

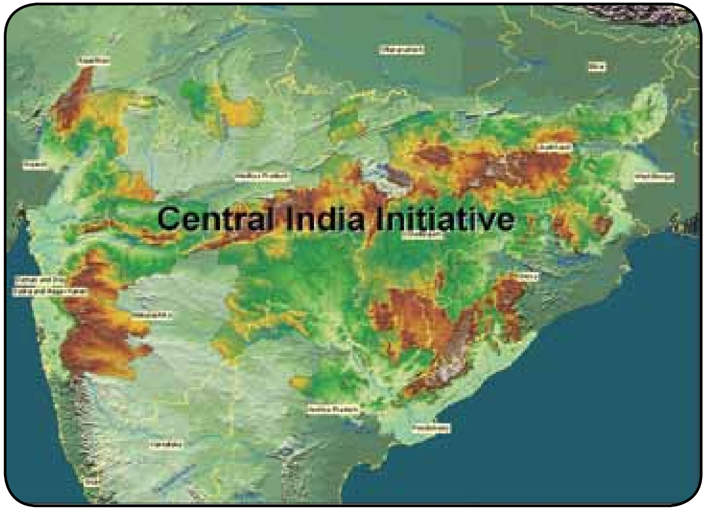
- NTFP as a sector (one product from harvest, value addition and marketing, e.g. Honey, Mahul Leaf)
- NTFP products at household level &/or sub cluster level in particular geography (aggregation, storage and local market, e.g. Mahua, Harra, Behara)
- Partnership pilot with NGOs and its institutions in NTFP trade has to be in business model
- Need to look at open market and partnership with other national agencies like key stone foundation

Status of NTFP in Madhya Pradesh

- Out of total Villages [illegible]% are in and around forest areas, 50% of HHs dependency is on forest
- NTFP total traded purchased volume is Rs. 5,815,799/-, sold volume is Rs. [illegible] and gross margin is Rs. [illegible], current market channel
- **NTFP dependency:**

Name of the Zones	Average income from different sources				Average NTFP Dependency
	NTFP	Agriculture	Labor	Total annual Income	
North West Part	Rs. 3,917 (12%)	Rs. [illegible] (41%)	Rs. 7,8[illegible] (38%)	Rs. 22,0[illegible]	27%
South East Part	Rs. 4,3[illegible] (11%)	Rs. [illegible] (50%)	Rs. 13,086 (39%)	Rs. 38,8[illegible]	11%
South West Part	Rs. 5,606 (20%)	Rs. 12,985 (46%)	Rs. 9,032 (32%)	Rs. 28,0[illegible]	20%
Average of all Zones	Rs. 5,286 (18%)	Rs. 14,127 (47%)	Rs. 10,412 (35%)	Rs. 29,825	18%

312 Household data analysis



Initiative Background

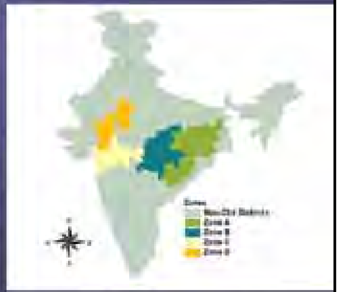
- 18 to 25 degrees belt stretching from Gujarat to West Bengal - hilly and undulating
- High Rainfall – high runoff; reasonable forest cover
- 50 million tribal population (70% of tribal population of India)
- Low literacy, high poverty, land and water productivity far below potential
- Low use of modern technology in agriculture

Central India Initiative (CInI) Objective

the CInI envisages a series of livelihood projects across the region, addressing core issues aimed at alleviating poverty amongst tribals in a sustainable manner

Central India Initiative: IWMI-Tata's Recommendations

- *The focus is on stabilizing Kharif crops, through the creation of decentralized water harvesting structures near farm lands.*
- *The focus is on promotion of 'Wadi' (orchards) and creation of water harvesting structures such as nallah and cement bag bunds.*
- *The focus is on promotion of 'Wadi' (orchards), developing and revival of irrigation systems to participatory approach and package of practices for crops like cotton , soyaben etc.*
- *The focus is on Community Managed Natural Resources; large check dams and lift irrigation systems.*



Strategy for 2010-11

- Define a systematic roll out plan
- a detailed study with each partner on the plans for Kharif 2010 along with the coming out with the gaps for implementation
- Working on pilot mode in Upland Paddy through partnership with Upland Rice Research Institute. Developing resource material for partners in form of pamphlets for PoP dissemination and one specific on IPM within paddy
- Cross field visits among partners for knowledge sharing and learning

Kharif Maize Stabilization

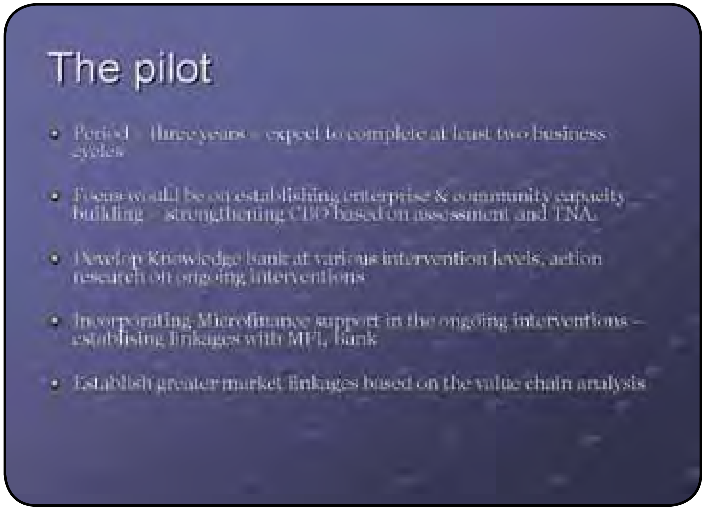
- Vision: One of the strategic thematic area to make heavy dents on tribal poverty in select pockets of Semi Arid Central Indian Tribal belt
- Mission 1: To demonstrate a high yielding user friendly (cost effective and easy to accept) PoP for Maize production in tribal areas of Central India
- Mission 2: To Highlight maize as lucrative multipurpose commercial crop at local level market initially and later at national and international level

Pilot Project

- High emphasis on seed replacement
- Trials of two to three best performed farmer preferred (Composite) seed varieties in clusters
- High emphasis on appropriate plant population by maintaining spacing row to row (50 to 60 cm) plant to plant (20 to 30 cm)
- Promoting N2 fixing and erosion resistant intercrop of pigeon pea, black gram etc
- focussed review and facilitation on field through service provider model equipped with specialised field tools of monitoring like maize cards
- Long term perspective of seed production in Rabi

Learnings of Pilot Project

- Importance of seed replacement and seed education of local community
- Wider spacing, but concern for fodder needs to be worked out
- Support irrigation is quintessential
- Soil health analysis play vital role in crop productivity
- N2 fixing intercrops need to be emphasized in higher degree
- Maize Cards found to be very comprehensive and can be used to make MIS
- Market Study emphasis on Scales of Production before exploring market
- Service Provider model is best in increasing outreach , Field demonstrations and discussions as most efficient method of extension


The pilot
Period – three years – expect to complete at least two business cycles
Focus would be on establishing enterprise & community capacity building – strengthening CBO based on assessment and TNA.
Develop Knowledge bank at various intervention levels, action research on ongoing interventions
Incorporating Microfinance support in the ongoing interventions – establising linkages with MFI, bank
Establish greater market linkages based on the value chain analysis


Financial services for supporting livelihood
Within Jharkhand focusing on strengthening of SHGs and ensuring quality
Timely Credit for Kharif Crops
Plan with paddy and vegetables for 25 SHGs – credit needs and bank linkages.
Livelihood planning – looking at livelihood interventions and credit needs of the family. Looking for options to meet the credit needs timely

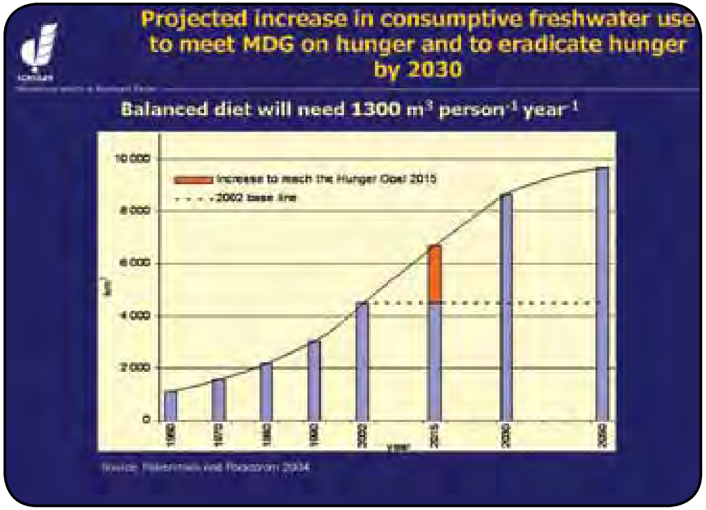

Community Based Organizations
Poverty Mitigation through strengthening Community-Based
Institutions promoted around the Diverse Sectoral Themes
of Tribal livelihoods-CInI

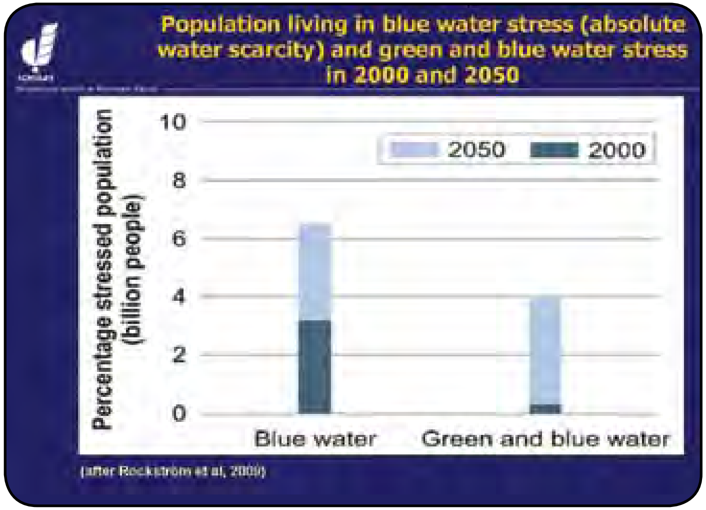

Thank You


Increasing Agricultural Productivity thru Sustainable
Management of Natural Resources in Rainfed Areas
Suhas P. Wani and Team

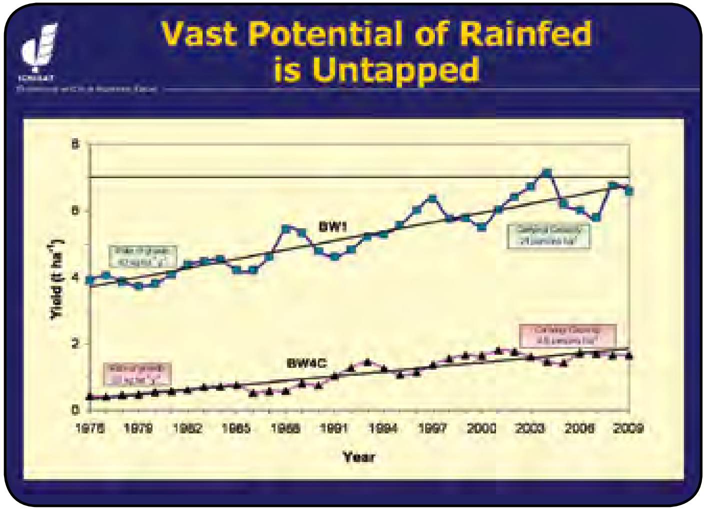

The big threat
A perfect storm:
Climate change
Land degradation
Loss of biodiversity
Food crisis
Energy crisis
Population explosion

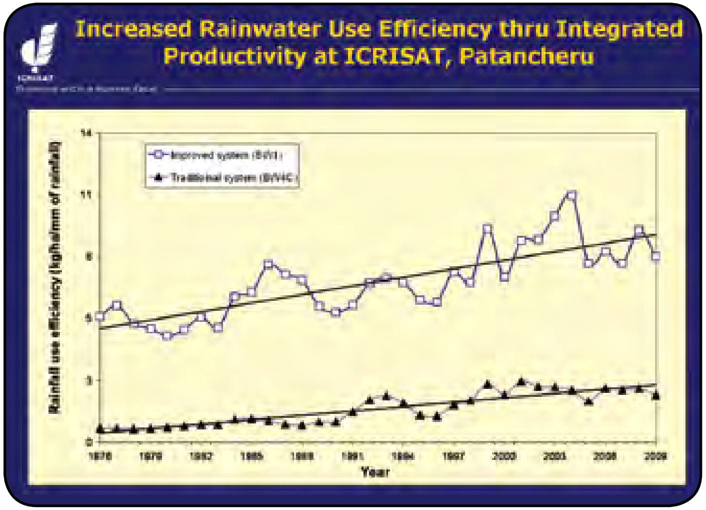

TIME
Khaleej Times
No Grain, Big Pain
UN issues warning over food crisis
Rice producers are struggling to keep pace with world demand ...
... and prices are still spiking
International Herald Tribune
Along Mekong, short on water and trust


Projected increase in consumptive freshwater use to meet MDG on hunger and to eradicate hunger by 2030
Balanced diet will need 1300 m³ person⁻¹ year⁻¹
10 000
8 000
6 000
4 000
2 000
0
Increase to reach the Hunger Goal 2015
2002 base line
2015
2030
year


Population living in blue water stress (absolute water scarcity) and green and blue water stress in 2000 and 2050
Percentage stressed population (billion people)
10
8
6
4
2
0
2050
2000
Blue water
Green and blue water
(after Rockström et al, 2009)


Main Message
Rainwater use efficiency can be substantially improved in drylands of the SAT to harness the potential of rainfed agriculture for achieving food security and inclusive growth in the dryl


Vast Potential of Rainfed is Untapped
Yield (t ha⁻¹)
8
6
4
2
0
BW1
BW4C
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
2006
2009
Year


Increased Rainwater Use Efficiency thru Integrated Productivity at ICRISAT, Patancheru
Rainfall use efficiency (kg/ha/mm of rainfall)
Improved system (BW1)
Traditional system (BW4C)
Year

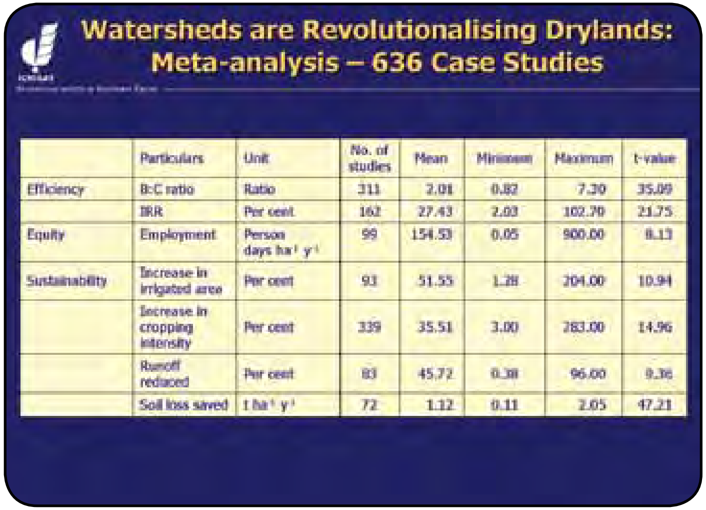
Tata-ICRISAT-ICAR Projects: Novel Initiative

- Targeting hot spots of poverty
- Science-based development initiative
- Linking scientists-development agencies, government line departments – farmers – A consortium approach
- Process for minimizing land degradation, increasing productivity and incomes while sustaining natural resources

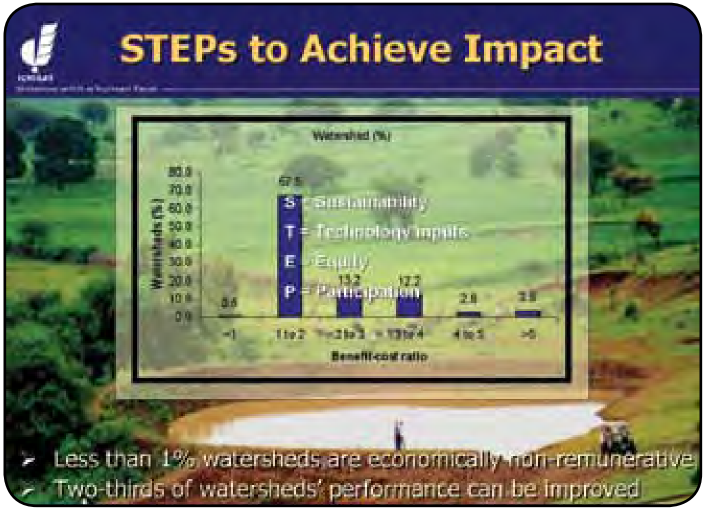
Community Watershed as a Growth Engine for Sustainable Development of Dryland Areas: Model Watersheds

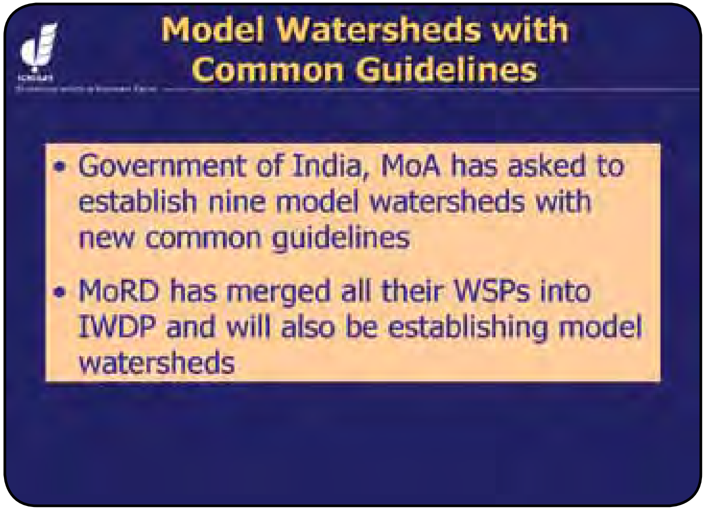
Main Emerging Messages

Way Forward



	Particulars	Unit	No. of studies	Mean	Minimum	Maximum	t-value
Efficiency	B:C ratio	Ratio	311	2.01	0.82	7.20	35.09
	IRR	Per cent	162	27.43	2.03	102.70	21.75
Equity	Employment	Person days ha^{-1} y^{-1}	99	154.53	0.05	900.00	8.13
Sustainability	Increase in irrigated area	Per cent	93	51.55	1.28	204.00	10.94
	Increase in cropping intensity	Per cent	339	35.51	3.00	283.00	14.96
	Runoff reduced	Per cent	83	45.72	0.38	96.00	9.36
	Soil loss saved	t ha^{-1} y^{-1}	72	1.12	0.11	2.05	47.21





Participants of the Annual Review and Planning Meeting 2009

Seeing is Believing: Sites of Learning

- Convergence
- Collective action
- Capacity building
- Consortium for technical backstopping

Convergence of Project Activities in CInI Areas

• Model watershed-IWMP (Rajasthan and MP + seven other states)	MOA-GoI
• Enhanced water use efficiency – FPARTs (Rajasthan, MP, Chattisgarh)	MoWR-GoI
• Facilitated project for partners in MP (BAIF), Rajasthan (CII) on enhanced water use efficiency	MoWR-GoI
• Model watersheds – IWMP (Rajasthan, MP and two other states)	MoRD-GoI
• Capacity building for state government officials – IWMP	MoRD-GoI
• Public private partnership (PPP)	Jain Irrigations

Linking with Policymakers

National Level Sensitization Workshop: Use of New Science Tools in IWMP

Comprehensive Assessment of Watershed Programs in India

Hungry Soils: Low WUE, Low Crop Yields

State	No. Of Farmers	% deficient OC	Av P	Av K	Av S	Av B	Av Zn		
Jharkhand	113	42	65	10	77	97	71		
Madhya Pradesh	341	22	74	1	74	75	80		
Rajasthan	421	38	45	13	71	56	46		
State	Farmers	pH	EC	OC	Av P	Av K	Av S	Av B	Av Zn
Jharkhand	113	5.6	0.13	0.33	3.3	63	7.8	0.17	0.68
Madhya Pradesh	341	7.8	0.25	0.65	5.0	100	9.6	0.43	0.72
Rajasthan	421	7.8	0.30	0.71	8.1	139	10.6	0.60	1.27
Jharkhand	113	4.5-7.4	[illegible]	[illegible]	[illegible]	8-247	[illegible]	[illegible]	[illegible]
Madhya Pradesh	341	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Rajasthan	421	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Intensification in High-Potential Agroecologies

- Rainy season fallow management
- Rice-fallow management
- IGNRM
- IPM
- Increased cropping intensity

Managing Rainy Season Fallows

- Two million ha Vertisols in MP are left fallow
- Integrated water resource management (IWRM) approach in Lalatora, Milli watershed increased cropping intensity by 30% and systems productivity by 34% (5.6 vs 4.18 t ha^{-1})

Good soybean crop on BBF in MP

Rice Fallow Management

Seed priming – low-cost delivery system for micro-nutrients and *Rhizobia* enhancing yield in rice-fallows

- 14 m ha rice fallows in India, Nepal, Bangladesh and Pakistan
- Out of 14 m ha rice fallows 12 m ha are in India
- Priming chickpea seeds with water sodium molybdate and Rhizobium before sowing improved crop establishment and yield by 40 to 65%
- Thousands of farmers in eastern India, Nepal and Bangladesh doubled their incomes thru seed priming

Various Improved Technologies Evaluated in the Field Trials During 2009-10 in Madhya Pradesh

S.No.	Description of Technology(ies)
1.	Double cropping or rainy season fallow management
2.	Broad-bed and furrow System (BBF) land form for moisture conservation and controlling water logging; and flat cultivation on grade
3.	Integrated nutrient management with micronutrients applications (borax, zinc sulfate and gypsum)
4.	Improved crop varieties soybean (JS 335, JS 9305) in the kharif and chickpea (ICCV 37 and ICCV 10) in the *rabi* season
5.	Improved implements viz. tractor mounted BBF maker cum seed drill; furrow openers attachment to existing seed drill

The Details of the Trials Conducted in Various Districts of Madhya Pradesh During the 2009 *Kharif* Season

S. No.	District	Villages (No.)	No. of Farmers	*Kharif* area Under demonstration trials (ha)	Treatment (improved varieties + INM with BBF/Flat system)
1	Vidisha	7	118	118 (63)*	BBF & Flat system
2	Guna	8	95	95 (45)	BBF & Flat system
3	Raisen	6	77	77 (52)	BBF & Flat system
4	Sehore	5	75	75 (55)	BBF & Flat system
5	Sagar	4	69	69 (19)	BBF & Flat system
6	Anandpur	12	122	122 (55)	BBF & Flat system
7	Rajgarh	6	29	29	Flat system
8	Indore	8	130	55	Flat system
9	Barwani	4	42	42	Flat system
10	Shajapur	5	64	64	Flat system
Grand total		65	821	746 (289)	

* *Figures in the parenthesis are the area under BBF system.*

Improved Crop Productivity Trials in Saraikela District of Jharkhand

Improved crop yield of paddy due to micronutrient application at Teleya village, Gumla district, Jharkand during the rainy season 2009-2010

Treatments	No of farmers	Area sown (ha)	Fertilizer applied	Yield (kg ha^{-1})	% of increase
Farmers input	14	8.00	FYM=1500 kg ha^{-1} and DAP 250 kg ha^{-1}	3150	-
Farmers input + Micronutrients	21	6.00	FYM=1500 kg ha^{-1} and DAP 250 kg ha^{-1}, 25 kg ha^{-1} Zinc Sulphate, 2.5 kg ha^{-1} Agribor	4600	46%
Due to late rainfall onset during the year planting was delayed					

Improved crop yield of Groundnut ICGV91114 with micronutrient application at Teleya village Gmla district, Jharkhand during the rainy season 2009-10

Treatments	No of farmers	Area sown (ha)	Fertilizer applied	Yield (kg ha^{-1})	% of increase
Farmers input	29	4.80	FYM=1500 kg ha^{-1} and SSP 250 kg ha^{-1}	1470	-
Farmers input + Micronutrients	35	3.90	FYM=1500 kg ha^{-1} and SSP 250 kg ha^{-1}, 25 kg ha^{-1} Zinc Sulphate, 2.5 kg ha^{-1} Agribor	1950	33%

Soybean Grain Yield during the *Kharif* 2009 Season in Five Districts of Madhya Pradesh

District	No. of farmers	Range in grain yield (kg ha^{-1})		Mean grain yield (kg ha^{-1})		Increase over FP
		FP*	IP**	FP	IP	
Guna	24	960-2460	1110-3350	1720	2080	21
Indore	30	1750-3820	2120-3490	2510	2900	16
Raisen	18	1420-2480	1700-3830	1930	2580	34
Sehor	25	1190-3700	1360-4620	2090	2500	20
Vidisha	43	990-4760	1410-5750	2170	3000	38
All districts	140	960-4760	1110-5750	2120	2680	26

* FP = Farmer practice
** IP = Improved practice

Improved crop yield of Maize due to micronutrient application at Teleya village Gmla district, Jharkhand during the rainy season 2009-10

Treatments	No of farmers	Area sown (ha)	Fertilizer applied	Yield (kg ha^{-1})	% of increase
Farmers input	14	2.20	FYM=1500 kg ha^{-1} and DAP 250 kg ha^{-1}, Urea 100 kg ha^{-1}	5500	-
Farmers input + Micronutrients	11	1.10	FYM=1500 kg ha^{-1} and DAP 125 kg ha^{-1}, Urea 100 kg ha^{-1}, 25 kg ha^{-1} Zinc Sulphate, 2.5 kg ha^{-1} Agribor	7000	27%

New BBF Maker cum Seed Drill used in the Field Trials in Madhya Pradesh


For inter crop sowing


For sole crop sowing


Furrow openers attached to farmers seed drill


Demo of seed drill cum BBF maker to farmers

Improved implement and BBF system that facilitates double cropping on Vertisols

Tractor drawn modular planter-cum-BBF maker

Good soybean crop established on BBF at Vidisha

Mean chickpea yields in water use efficiency trials in Madhya Pradesh during 2008-09 *rabi* season

District	Total no. of farmers	Total No. of villages	Total Area (ha)	Grain yield (t ha^{-1})		Increase in WUE (%)
				Improved system	Farmers Practice	
Vidisha	53	4	41	1.77	1.47	20
Raisen	20	1	1	1.45	1.08	34
Guna	32	2	12	1.77	1.39	27
Sagar	21	1	41	1.38	1.19	16
Mean	126	8	95	1.62	1.27	28

Chickpea Grain Yield During the *Rabi* 2008-2009 Season in Two Districts of Madhya Pradesh

District	Cultivar	Mean grain yield (kg ha^{-1})		Increase over FP
		FP	IP	
Sagar	ICCV37	1360	1600	18
	JKG1	1280	1510	18
Raisen	Jaki	1370	1580	15
	JG11	1260	1410	12

* FP = Farmer practice
** IP = Improved practice

Collective Action to Enhance Water Use Efficiency in Gumla

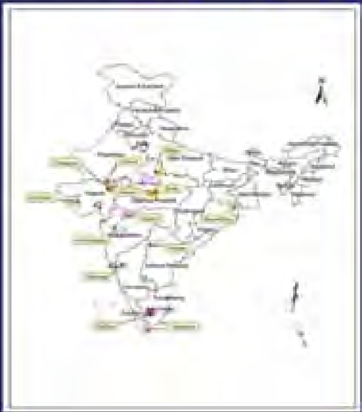
Micro-enterprises

Model Watersheds

Spread of Model Watersheds Across Different Rainfall and Agroecozones

Annual rainfall (mm)	Soil type	Agroecozone	Watershed
< 700	Alfisols and Inceptisols	4.2 Medium AWC and LGP 90-120 days	Dungarpur, Rajasthan
	Alfisols and associated soils	4.2 Same as above	Udaipur, Rajasthan
	Alfisols	2.4 Low AWC, LGP 60-90 days	Jamnagar, Gujarat
	Vertisols	6.1 Medium to high AWC and LGP 90-120 days	Saigaon, Maharashtra
	Vertisols and inceptisols	6.2 Same as above	Ahemednagar, Maharashtra
	Alfisols, Vertisols and Inceptisols	6.4 Medium to high AWC & LGP 150-180 days	Dharwad, Karnataka
	Alfisols	19.3 Low AWC and LGP 240-270 days	Tirunelveli, Tamil Nadu
700 – 1100	Vertisols	10.1 High AWC & LGP 150-180 days	Guna, Madhya Pradesh
	Vertisols	10.1 Same as above	Raisen, Madhya Pradesh
	Vertisols and Vertic Inceptisols	7.2 Medium to high AWC & LGP 120-150 days	Medak, Andhra Pradesh
	Alfisols	4.4 Medium to high AWC, LGP 120-150 days	Jhansi, Uttar Pradesh

Map Showing the Model Watershed Location in India



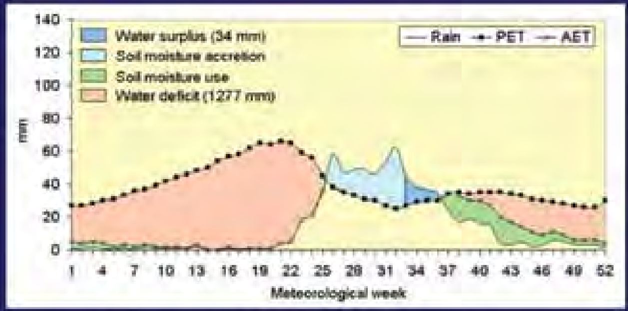
Jalgaon Model Watershed
Pathri – Samner Watershed

Process of Selection

Proposed locations for Model Watershed with the scorings based on priorities

Watershed (Villages)	Hydro-geology 30	Need based 20	Less irrigation area 20	Socio-economic status 20	Accessibility 10	Total Score 100
Pathri	25	16	13	14	7	75
Kasoda	22	16	16	0	7	74
Jamner	25	15	14	0	7	75
Kharchi	22	14	13	12	8	69

Jalgaon Model Watershed
Pathri – Samner Watershed



Water balance of Pathri-Samner watershed, Jalgaon

Grain yield in Pathri-Samner Watershed, 2009-10

Crops	Yield ($t\ ha^{-1}$): Farmers Practice	Improved variety	Improved variety + Micronutrient
Maize	3.6	4.2 (17)	5.1 (42)
Sorghum	1.7	2.1 (24)	-
Pearl millet	1.4	1.8 (29)	-

Values in parentheses are the % increase over Farmers practice

Capacity Building: An Important Pillar for Scaling-up


Women in the Forefront to Improve Productivity


Women Farmers' Meeting for Planning the Crop Production at the Teleya Village in Gumla District


Responsible Young Citizens: Environment Club Members


A View of the Farmers' Day During *Kharif* 2009 in Banswara District, Rajasthan


Field Day's in Jharkhand
Field day photographs of Sherbida village of Sarikela-Karshaw district of Jharkand


Field Day's in Jharkhand
Field day photographs of Teleya village of Gumla district of Jharkand


Thank you
We Gratefully Acknowledge the Support from:
Sir Dorabji Tata Trust
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Ministry of Agriculture
Ministry of Rural Development
Ministry of Water Resources
Government of India

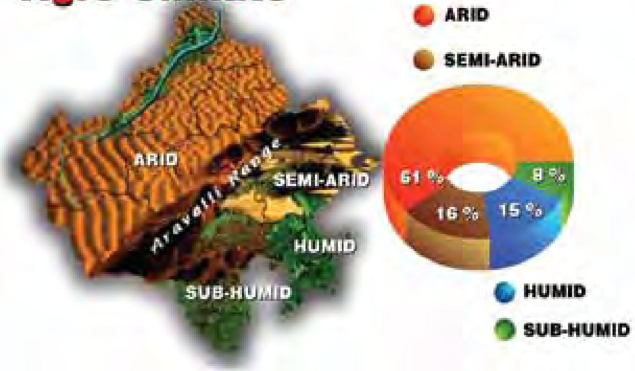
WELCOME

Enhancing Agricultural Productivity in State of Rajasthan

Dr. P. L. Maliwal
Zonal Director Research
Agricultural Research Station, Udaipur

RAJASTHAN

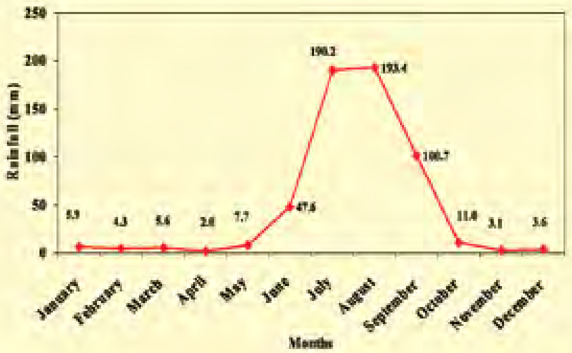
Agro-Climate



Main Features

- Largest state covering 10.5% of geographical area.
- 5.5% population of the country.
- 10% animal population of the country.
- 2/3 population depends on agriculture
- Average rainfall 557 mm
- Only 1% of water resources of the country.
- 70% crop area un-irrigated.
- 70% area irrigated through wells and tube-wells and 27% irrigated through canals.
- Continuous reduction in ground water and deterioration in water quality.
- 10.6 lakh ha saline sodic soils

Month Wise Normal Rainfall in Rajasthan



Soil deterioration problems lead to poor productivity

- Barren and unculturable land : 2.49 m ha
- Culturable waste land : 4.54 m ha
- Salt affected soil : 1.00 m ha


Soil Salinity


Water logging


Drought

Crop Production Scenario (2007-08)

S. No.	Crop	Area (m ha)			Production (m t)		
		Rajasthan	India	Share %	Rajasthan	India	Share %
1	Pearl Millet	5.10	9.50	53.7	4.22	9.79	43.1
2	Sorghum	0.63	7.93	7.94	0.39	7.78	5.01
3	Rice	0.13	43.77	0.29	0.26	96.43	0.27
4	Maize	1.06	8.26	12.8	1.95	19.30	10.10
5	Soybean	0.87	8.90	9.75	1.07	10.0	10.7
6	Groundnut	0.28	6.41	4.37	0.48	9.36	5.13
7	Wheat	2.62	28.15	9.30	7.12	78.40	9.08
8	Gram	1.23	7.58	16.22	0.57	6.91	8.25
9	Rapeseed	2.46	5.75	42.78	2.35	5.80	40.52

Strength of Rajasthan Agriculture

Contribution in Agricultural Production of the Country

Crop	Rank
Pearlmillet	1
Barley	2
Kidney bean	1
Rape and Mustard	1
Total oilseeds	2
Coriander	1
Garlic	2
Clusterbean	1

Potential and realized productivity for important crops in Rajasthan

Crop	Productivity q/ha	Potential
Bajra	8.27	25.00
Soybean	10.9	25.0
Wheat	27.9	55.0
Maize	14.5	35.0
Groundnut	12.2	25.0
Gram	7.6	25.0
Rapeseed and Mustard	9.49	30.00
Coriander	11.4	15.0

Constraints in Rajasthan Agricultural Development

Natural Constraints :

- Rainfall is highly inadequate and aberrant
- 61 per cent area lies in arid and semi-arid tracts where soils are having poor fertility, low water holding capacity, high infiltration rate and are shallow in depth in some areas
- One million ha area is under problematic soils (saline and alkali)
- Due to scarcity of rainfall, there is limited availability of ground water
- The crop suffers from high temperatures and wind velocity

Social Constraints:

- High growth rate of population (2.83 %)
- Increased fragmentation of land holdings (44.87 in 1980-81 to 53 lakhs in 1990-91)
- 30 per cent of population belongs to SC & ST category, most of which live below poverty line are unable to adopt new technology and risk capacity

Infrastructural Constraints :

- Inadequate spread of retail outlets for agriculture input
- Lack of post harvest marketing and processing infrastructure support like cold storage, grading, washing, cleaning, waxing, packing and container services
- Poor infrastructure support for horticulture and vegetable crops including marketing
- Farm mechanization is slow
- Inadequate supply of power

Strategy

To enhance agricultural productivity

Water Management

Need to develop water harvesting structures on farmers' fields.

JALKUND (Plastic lined)

Water Management

- Popularization of pipeline for irrigation and use of sprinkler and drip irrigation system in different crops for efficient use of water.

Popularization of efficient irrigation techniques

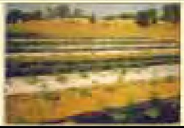
Drip Irrigation

Sprinkler Irrigation

Status of Micro Irrigation

Area in lac ha

State	Drip	Sprinkler	Total
Maharashtra	3.42	1.53	4.95
AP	1.55	1.24	2.79
Tamil Nadu	1.16	2.63	3.79
Karnatka	1.14	1.60	2.74
Gujarat	0.60	1.00	1.60
Rajasthan	0.10	5.54	5.64
India	8.29	19.27	27.56



Resource Conserving Technologies (RCTs)

- RCTs enhance use efficiency of water (30%), nutrients (20 %), energy (10-15%) .
  - Save on Fuel, irrigation water
  - Improve yields
  - Improve environmental quality (Reduced residue burning)

Zero-tillage wheat

Availability of Improved Seed

- Urgent need to make the seed of improved varieties of crop like maize, urd, moong, moth, groundnut, soybean during kharif and gram, barley, cumin, coriander available to the farmers as the SRR of these crops is very low compared to ideal.

Existing Seed Replacement Rate (2007-08)

Crop	Seed replacement rate (%)	
	Ideal	Present
Bajra	100	42.09
Sorghum	50	8.22
Maize	50	25.20
Paddy	25	6.23
Wheat	50	29.47
Blackgram	25	11.21
Gram	25	4.54
Soybean	50	12.18
Mustard	80	85.66
Groundnut	50	2.41
Moth	25	3.36

Integrated Nutrient Management

- Monitoring of soil status
- Judicious use of organic & inorganic sources of nutrients
- Use of low cost biofertilizers
- Soil test at the micro level
- Green manuring

Integrated Weed Management

- Need to increase use of herbicides in different crops and cropping systems
- Need to popularize and make available efficient weed control tools/machines
- Integrate methods of weed control

Integrated Pest and Disease Management

Farm Mechanization

- Need to popularize efficient farm implements like rotavator, seed-cum-fertilizer drill, hand weeder, reaper, etc. on subsidized basis.

Improved Implements

Whole Plant Maize Thresher

Sowing operation

Tillage operation

Rotavator

Suitable for primary and secondary tillage

Farm Mechanization

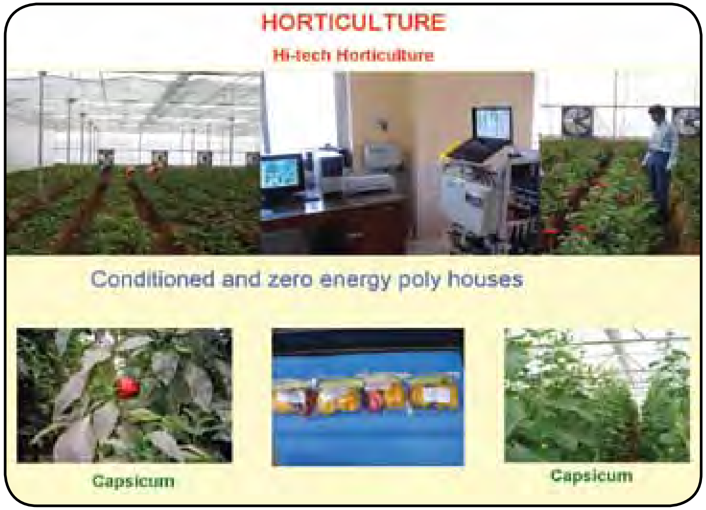
Tractor Mounted Vertical Reaper

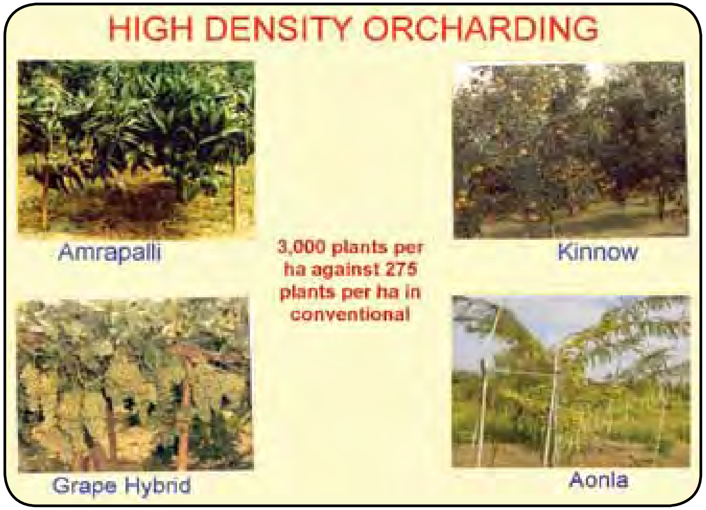
Self propelled vertical conveyor reaper

Multicrop thresher with maize dehusking shelling

Crop Diversification

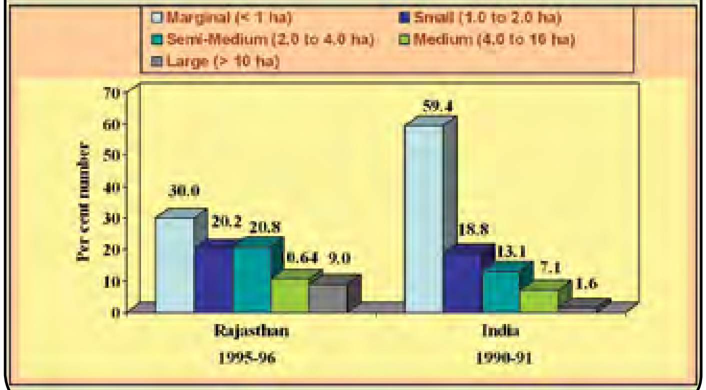
- Clusterbean , blackgram, greengram, sesamum, etc options for diversification for cereals.
- Prefer intercropping compared to sole cropping.
- Instead of foodgrains, medicinal and aromatic plants and spices.
- Diversification towards vegetables, fruit like aonla, ber, karonda, lasoda, pomegranate, orange, etc. as per suitability of the area.


HORTICULTURE
Hi-tech Horticulture
Conditioned and zero energy poly houses
Capsicum
Capsicum

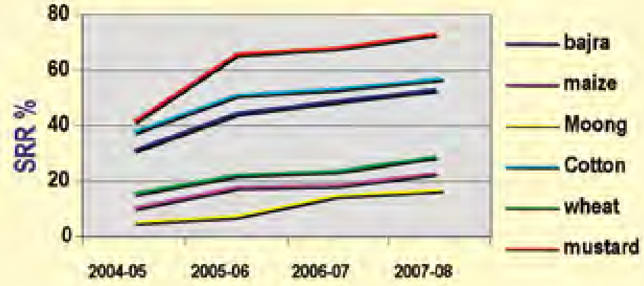

HIGH DENSITY ORCHARDING
Amrapalli
3,000 plants per ha against 275 plants per ha in conventional
Kinnow
Grape Hybrid
Aonla

Thanks

Number of Operational Holdings by Holding Type



Seed Replacement Rate (SRR)



Strategies to reduce rainy season fallow and improve productivity in SAT Vertisols

Prabhakar Pathak , R Sudi and S P Wani
International Crops Research Institute for the Semi Arid Tropics (ICRISAT)
Patancheru PO. Andhra Pradesh, 502 324, India

Collaborating Partners in the on-farm Trials in Madhya Pradesh

- BAIF, Bhopal (Vidisha, Guna, Indore, Sehore and Raisen)
- BYPASS Bhopal (Sagar)
- Others partners

Background

- Large areas of deep black soils (Vertisols) in several states are kept fallow during the rainy season and the crops are grown during the post-rainy season.
- The rainy season fallow area covers an estimated 2.02 million ha accounting 6.6%of total cropland in Madhya Pradesh.
- Four districts of Madhya Pradesh viz. Vidisha, Sagar, Guna and Raisen have the largest percent of area under rainy season fallow.

Rainy season fallow areas in Madhya Pradesh

Spatial distribution of fallow areas in Madhya Pradesh

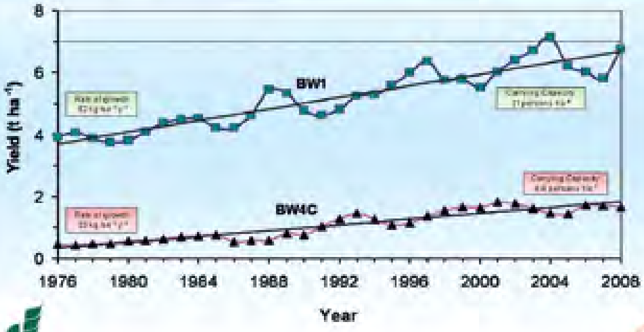
Some of the major reasons for rainy season fallow in Vertisols:

- Cultivation practices are affected by the sticky nature, poor infiltration, impeded internal drainage of the soils when wet,
- Excessive hardness and difficult workability when dry
- Risk of losing post-rainy season crops
- Risk associated with moisture stress or water logging during rainy season
- Lack of adequate resource

High runoff and soil erosion under monsoon fallow system

Long-term On-station Research at ICRISAT Center

Performance of improved Vs monsoon fallow system on Vertisols (1976-2008)



Mean runoff, peak runoff rate and soil loss from watersheds under improved and monsoon fallow systems

Parameters	Improved (BW1)	Monsoon fallow (BW4C)
Mean seasonal rainfall (mm)	780	780
Mean seasonal runoff (mm)	102	178
Mean runoff as % of rainfall	12	23
Peak runoff rate ($m^3\ s^{-1}\ ha^{-1}$)	0.18	0.22
Mean annual soil loss ($t\ ha^{-1}$)	1.51	6.46

Effect of improved and monsoon fallow systems

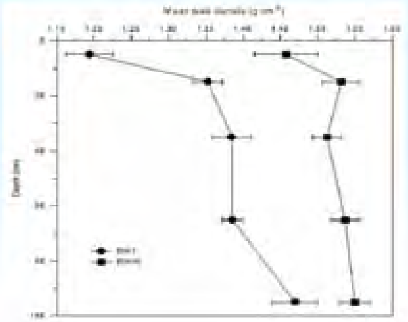
Parameters	Improved system (BW1)	Monsoon fallow system (BW4C)
Production per unit rainfall ($kg\ mm^{-1}$)	5.6	1.2
Rainfall used by crops (%)	71	38
Total soil lost ($t\ ha^{-1}$) during last 33 years	50	213
Carbon lost through soil loss ($kg\ ha^{-1}$) during last 33 years	198	853

Physical properties in watersheds under improved and monsoon fallow systems after 24 years

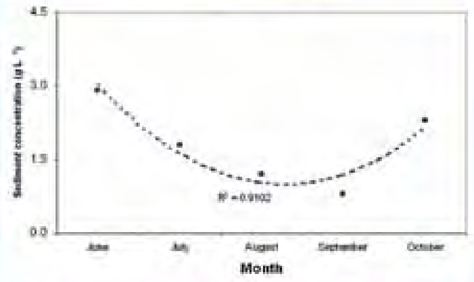
Soil properties	Improved system (BW-1)	Monsoon fallow system (BW-4C)
	Bed portion	Flat
Texture *		
Clay (%)	51	46
Gravel (%)	5	15
Bulk density ($g\ cm^{-3}$) *	1.2	1.5
Total Porosity (%) *	52.1	41.5
Air filled porosity (%) *	41.0	32.0
Penetration resistance (MPa) at 0-5 cm depth	1.1	8.5
Cum. Infiltration in 1 h (mm)	347	265

* 0- 10 cm layer

Bulk density in watersheds under improved (BW1) and monsoon fallow (BW4C) systems after 24 years

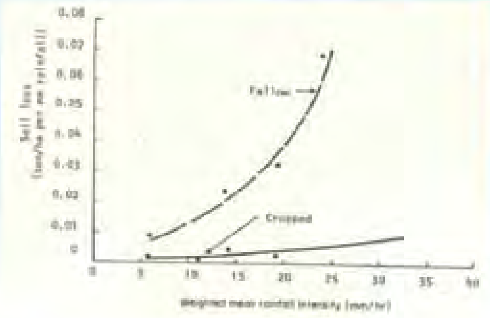


Rainy season cropping is essential for controlling soil loss



Effect of crop canopy on sediment concentration in runoff water on a Vertisol watershed

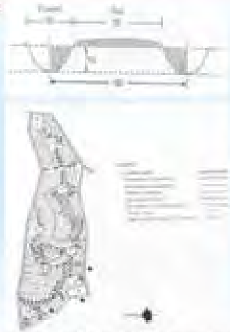
Effect of crop canopy on soil loss under different rainfall intensity in a Vertisol watershed



Broadbed and furrow system

Key requirements and design parameters:

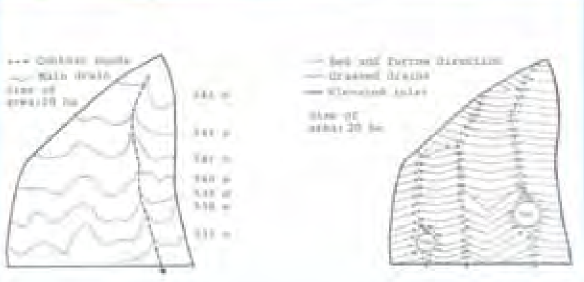
- Land smoothing
- Size and slope of furrows
- Size of bed
- Direction of BBF (adjustment with general topography)
- Field drain



Broadbed and furrow system dimension (cm) and field based on topographic map.

114

Topographic map for design of devolvement of land with Broadbed and furrow system



Broadbed and furrow system

Benefits:

- Improves *in-situ* 'soil and water conservation and the shallow furrows provides good surface drainage
- The BBF design is quite flexible for accommodating crops and cropping systems with widely differing row spacing requirements
- Dimensions of bed and furrows can be flexible based on soils, rainfall and topographic conditions
- Precision operations such as seed and fertilizer placement and mechanical weeding are facilitated by the defined traffic zone (furrows), which saves energy, time, cost of operation and inputs
- BBF system can be maintained on the long term (30 years or more)
- Reduces runoff and soil loss and improves soil properties over the years
- Facilitates double cropping and increases crop yields
- Favorable long-term changes in soil properties

Impact of monsoon season fallow system

- Low productivity due to single crop
- High runoff (25 –35% of rainfall)
- High soil loss (6-8 t/ha)
- Low rainfall use efficiency (30 – 35%)
- Downstream flooding and siltation

On-farm Trials
Madhya Pradesh

Development of BBF maker cum seed drill

A customized user friendly proto type tractor drawn modular inclined plate planter-cum-BBF maker has been designed and developed for the farmers to encourage the increased adoption of improved vertisols management system to increase water use efficiency of crops. This equipment was designed for easy and efficient planting with BBF making simultaneously, which saves the additional cost of operation for forming BBF. Further necessary modifications were done in the newly designed improved BBF maker cum planter based on the first year experiences.

Development of Modular type seed drill cum BBF maker at CIAE Bhopal

For inter crop sowing

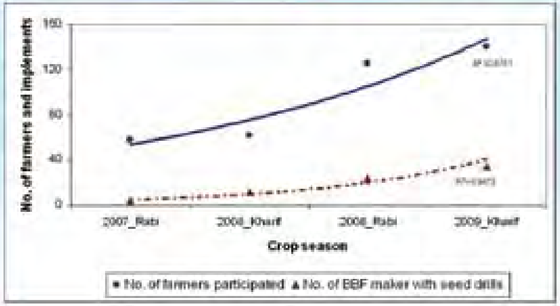
Sowing with new implement

Development of seed drill cum BBF maker at CIAE Bhopal

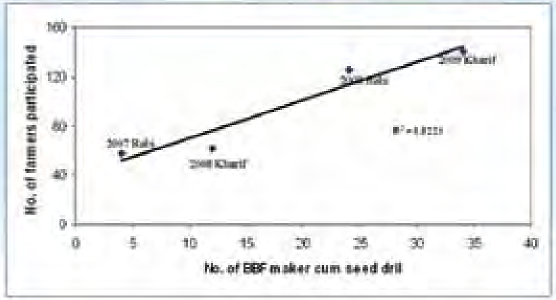
For sole crop sowing

Furrow openers attached to farmers seed drill

No. of farmers participated and the new implements provided in Madhya Pradesh during 2007-2009



No. of new implements provided Vs no. of farmers participated in Madhya Pradesh during 2007-2009



Supplemental irrigation is key for the success of sequential crops

Soybean crop yields in during kharif, 2008, Madhya Pradesh

District	No. of Farmers	Grain Yield (t ha^{-1})		Increase over farmers practice (%)
		Improved System @	Farmers Practice	
Vidisha	20	1.46	1.26	16
Raisen	14	1.97	1.19	66
Guna	19	1.31	1.20	9
Sagar	9	1.61	1.13	43
Mean	62*	1.59	1.20	33

*Total @ Improved practice includes BBF landform

Mean chickpea yields in Madhya Pradesh during 2008-09 rabi season

District	Total no. of farmers participated	Grain yield (t ha^{-1}) #		Increase over farmers practice (%)
		Improved system	Farmers Practice	
Vidisha	53	1.77	1.47	20
Raisen	20	1.45	1.08	34
Guna	32	1.77	1.39	27
Sagar	21	1.38	1.19	16
Mean	126*	1.62	1.27	28

* Total of two seasons; # mean of 2007/08 and 2008/09

Soybean grain yield in different districts of Madhya Pradesh during kharif 2009

District	Total no. of farmers	Soybean grain yield (t ha^{-1})		Increase over farmers practice (%)
		Improved System *	Farmers Practice	
Guna	24	1.72	2.08	21
Raisen	18	1.93	2.58	34
Vidisha	43	2.17	3.00	38
Indore	30	2.51	2.90	16
Sehore	25	2.09	2.50	20
All district	140	2.12	2.68	26

Capacity building activities

Trainings

Several trainings on making BBF using new implement were given to the farmers and project staff at the watersheds in the four districts.

Key approach/strategies for reducing monsoon fallow system in SAT Vertisols

- Land smoothing
- Construction of field drains and establishment of drainage networks
- Improved land and and water management system viz. BBF landform for in-situ soil and water conservation and safe disposal of excess runoff
- Proper implement for BBF system
- System that improves the workability of soils
- Land preparation before monsoon
- Runoff collection and supplemental irrigation (essential for some regions)
- Appropriate crops and cropping systems and other improved practices
- Capacity building of farmers

Impact of reduced monsoon fallow

- Substantial increase in crop yields
- Higher economic returns
- Substantial saving of irrigation water due to higher application efficiency in BBF system
- Reduced runoff and soil loss
- Reduced downstream flooding and siltation

Proposed activities

- Required number of user-friendly implements for BBF system will be made available
- Capacity building of farmers and other stakeholders will be given high priority
- Up-scaling the technology in wider areas of similar agro eco regions

Thank you

ICRISAT

Enhancing Water Use Efficiency and Productivity in Rainfed Areas

Piara Singh, P Pathak and S P Wani

ICRISAT

Major Constraints

- Rainfall uncertainty - droughts and wet spells
- Land degradation- poor soil fertility/nutrient imbalances
- Low rainfall use efficiency, groundwater depletion and poor water quality
- Small land holdings (<2 ha) and low investments by farmers in crop production

Further increase in food production has to come from higher productivity per unit of water and land to meet future food needs

ICRISAT

Strategies for Enhancing WUE

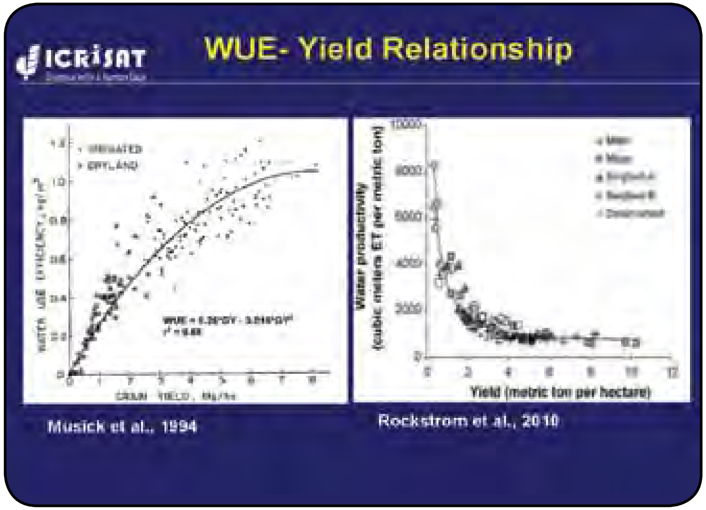
- Increasing water availability- *in-situ* and *ex-situ* rainfall conservation (water stored/rainfall)
- Enhancing use of stored water thru crop intensification, bringing more area under irrigation and other uses (water use/stored water)
- Enhancing water use efficiency (crop yield/water use as evapotranspiration)
- Enhancing transpiration efficiency (crop yield/water use as transpiration)
- Addressing capacity building, Institutional, policy issues for enhancing WUE

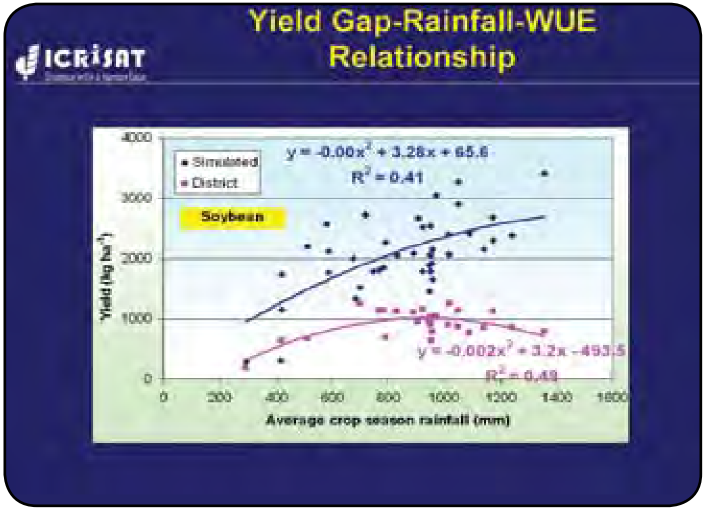
ICRISAT

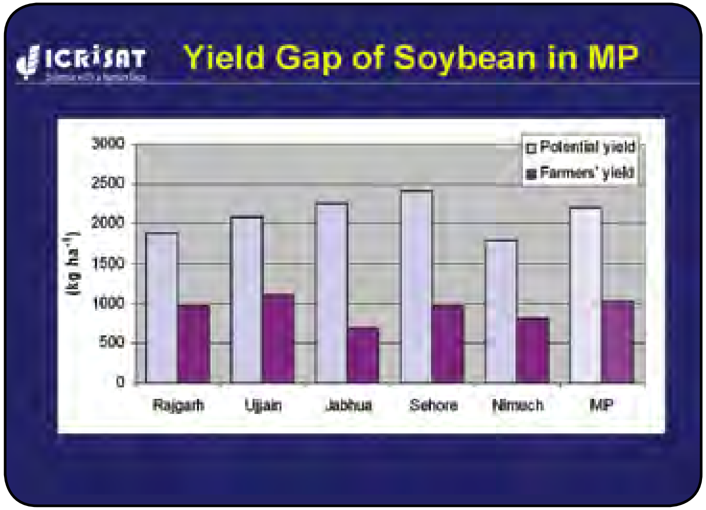
What is WUE?

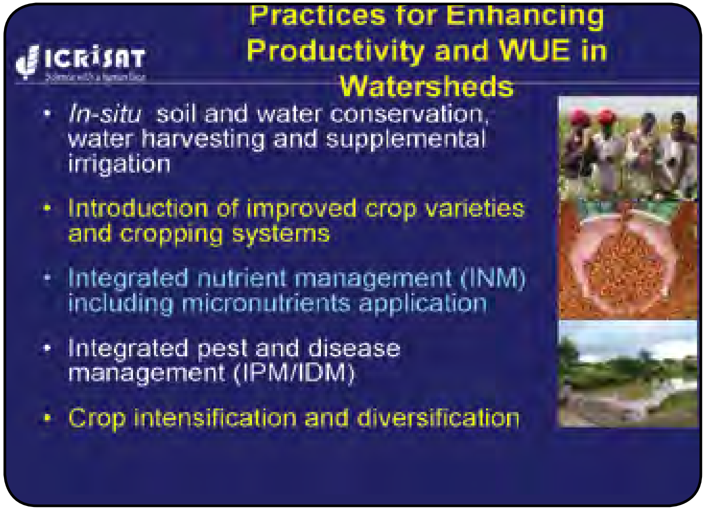
WUE is crop production (or net income) per unit area per unit of water used. Various expressions of WUE are:

- Rainfall use efficiency – production/rainfall (blue water)
- Water use efficiency—production/evapotranspiration of crop (green water)
- Transpiration efficiency – production/water transpired by the crop (green water)
- Irrigation efficiency—production/supplemental irrigation applied (blue water)


ICRISAT
WUE- Yield Relationship
IRRIGATED
DRYLAND
GRAIN YIELD, Mg/ha
Water productivity (cubic meters ET per metric ton)
Yield (metric ton per hectare)
Musick et al., 1994
Rockstrom et al., 2010


ICRISAT
Yield Gap-Rainfall-WUE Relationship
Simulated
District
Soybean
y = -0.00x² + 3.28x + 65.6
R² = 0.41
y = -0.002x² + 3.2x - 493.5
R² = 0.49
Yield (kg ha⁻¹)
Average crop season rainfall (mm)


ICRISAT
Yield Gap of Soybean in MP
Potential yield
Farmers' yield
(kg ha⁻¹)
Rajgarh
Ujjain
Jabhua
Sehore
Nimach
MP


ICRISAT
Practices for Enhancing Productivity and WUE in Watersheds
• In-situ soil and water conservation, water harvesting and supplemental irrigation
• Introduction of improved crop varieties and cropping systems
• Integrated nutrient management (INM) including micronutrients application
• Integrated pest and disease management (IPM/IDM)
• Crop intensification and diversification

In-Situ Water Conservation

- Contour cultivation
- Broadbed and furrow
- Flat-on-grade
- Conservation furrow
- Border strips
- Field bunds
- Vegetative bunds (*Gliricidia* & vetiver plants)

Groundnut on BBF, Kurnool, A.P.

Contour cultivation, Xiaoxingcun, China

Conservation furrow system, Mahabubnagar,

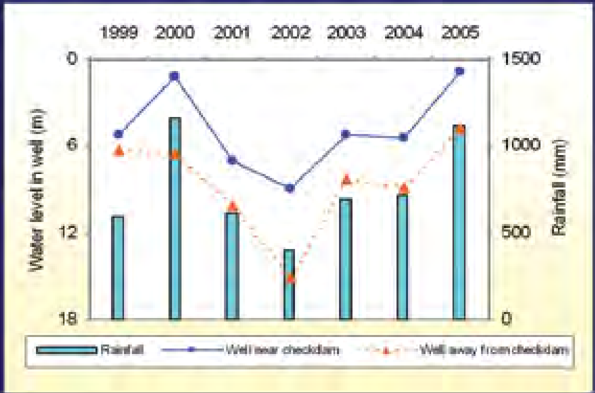
Ex-Situ Water Conservation

- To mitigate dry spells, recharge groundwater, enable off-season irrigation and permit multiple uses of water

Water harvesting structure in northeast Thailand

Low-cost mini percolation tank at Kothapally, A.P.

Impact of water harvesting structures on groundwater levels at Adarsha watershed, Kothapally



S & W Conservation Increased Crop yields (M.P.,2001-2005)

Watershed location	Crop	Grain yield (t ha^{-1})		
		Broad-bed and furrow system	Farmer's practice	Increase in yield (%)
Vidisha and Guna	Soybean Chickpea	1.72 1.01	1.27 0.80	35 21
Bhopal	Maize Wheat	3.65 3.25	2.81 3.30	30 16

RUE under different land management practices at Bhopal, M.P., India

Cropping system	Rainfall use efficiency (kg mm^{-1} ha^{-1})	
	Flat-on-grade	Broadbed and furrow
Soybean + chickpea	8.2	11.6
Maize + chickpea	8.9	11.6
Soybean / maize intercropping + Chickpea	8.9	10.9

Crop Yields Improved With Land and Water Management, Sujala Watershed, 2006-07.

Watershed	Crop	Farmers' practice	Conservation furrows	% increase
Haven	Maize	3.57	4.10	15
Dharwad	Soybean	1.50	1.80	20
Kolar	Groundnut	1.05	1.22	16
Tumkur	Groundnut	1.29	1.49	15

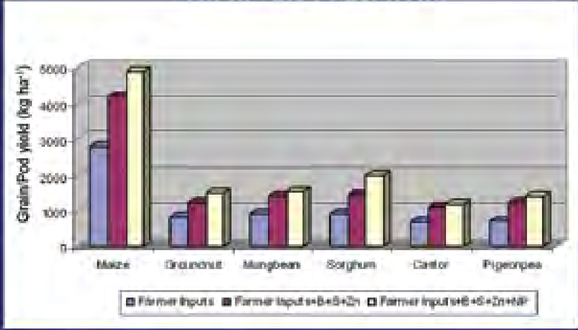
Evaporation Management for Higher WUE

Purpose: to reduce non-productive evaporation

- Dry planting, mulching, conservation agriculture, intercropping, early plant vigour, agroforestory and vegetative bunds.

Significant Response of Rainfed Crops to Micronutrients

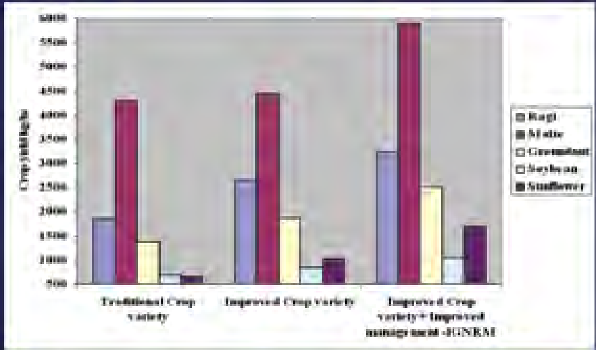
Increased crop yields by 30 to 120 percent in AP, MP, Rajasthan and Gujarat in India



Rainwater Use Efficiency Increased With Micronutrients

Crop	Rainwater use efficiency (kg mm^{-1} ha^{-1})	
	Farmers' practice	Farmers' practice + micro nutrients
Andhra Pradesh (Kurnool, Mahabubnagar and Nalgonda districts)		
Maize	5.2	9.2
Groundnut	1.6	2.8
Mungbean	1.7	2.9
Sorghum	1.7	3.7
Madhya Pradesh (Vidisha district)		
Soybean	1.4	2.7

Improved Varieties and Management Enhance Productivity in Karnataka



Effect of Integrated Pest Management on Crop Yield and Income

Water-shed	Crop	Parameter	With Chemical use (kg ha^{-1})	IPM (kg ha^{-1})	% increase
Bundi	Green peas	Yield	3530	4160	18
		Net returns (Rupees/ha)	10873	15069	39


Enhancing WUE of Supplemental Irrigation

- Methods of irrigation application
- Scheduling of irrigation
- Growing high value crops
- Improved agronomic management- balanced nutrition, plant population, IPM


Supplemental irrigation and RUE in northeast Thailand

Crops	Rainfall use efficiency (kg mm^{-1} ha^{-1}) Control	With supplemental irrigation of 75 mm
Soybean	1.0	3.1
Groundnut	0.9	4.6

High Income from Vegetables in Ringnodia Watershed, MP

High Value Crops	Area covered (ha)	Yield (t ha^{-1})	Net income (Rs ha^{-1})
Potato	8.25	17.5	29133
Onion	1.0	25.2	42000
Garlic	1.5	7.6	15750
Hybrid Tomato	1.5	66.8	55000
Coriander	2.9	6.1	12700

Double cropping improved rainfall use in a Vertisol watersheds, ICRISAT, 1976-84

Farming systems	Water balance component (mm) Annual rainfall	Water use	Surface runoff	Evaporation and deep percolation
	Improved technology			
Double cropping on BBF	904	602 (67) *	130 (14)	172 (19)
	Traditional technology			
Single crop in post-rainy season on flat	904	271 (30)	227 (25)	406 (45)

Growing of chickpea in rice fallows increased WUE of the system in Chhatisgarh

District	Rain + irrigation (mm)	WUE (kg ha^{-1} mm^{-1}) Rice	Rice + Chickpea	WUE (Rs ha^{-1} mm^{-1}) Rice	Rice + Chickpea
		Farmers' management			
Kanker	349	17.4	19.0	134	196
Bastar	351	11.1	11.1	83	110
		Improved management			
Kanker	349	21.1	22.0	158	214
Bastar	351	14.4	14.0	106	127

Factors Enhancing Rainfall Use Efficiency

- *In-situ* water conservation practice
- Improved crop agronomy- better crop establishment, plant population, Integrated nutrient management or balanced nutrition of crops
- Improved crop varieties and cropping system

Factors enhancing supplemental irrigation efficiency

- Improved methods of irrigation application and better irrigation scheduling
- Improved crop agronomy- better crop establishment, plant population, Integrated nutrient management or balanced nutrition of crops
- Improved crop varieties and high value crops

Suggested trials for the rainy season

a) Nucleus trials– in nucleus/model watersheds with intensive observations

1) In-situ water conservation (land management)
   - Traditional
   - Improved
2) Crop varieties
   - Local
   - Improved
3) Nutrient management
   - Traditional
   - Balanced nutrition

b) Satellite trials–in satellite watersheds or farmers fields

Trials with two important factors that could enhance productivity

Suggested trials for enhancing supplemental irrigation efficiency

a) Nucleus trials– in nucleus/model watersheds with intensive observations

1) Method of irrigation
   - Traditional
   - Improved
2) High value crop/vegetable
   - Local
   - Improved
3) Nutrient management
   - Traditional
   - Balanced nutrition

b) Satellite trials–in satellite watersheds or farmers fields

Trials with two important factors that could enhance productivity


Thank You

Benefits from soil and water conservation measures

- Increased surface and groundwater availability during all the seasons
- Runoff reduced by 15-55 %
- Soil loss reduced by 12-73 %
- Peak runoff rate reduced by 18-38 %
- Crop yields increased due to *in-situ* soil and moisture conservation practices ranged from 10-32 %
- Crop yield increased due to supplemental irrigation ranged from 25-85%
- The area under irrigation increased in the post-rainy season (1.15-1.3 times) and in summer (2-12 times)
- During summer the area under vegetables and horticulture increased several folds
- Reduced downstream flooding and sedimentation

Percent increase in grain yield of ragi due to cultivars and management

Tumkur district			
Cultivar	54	21	28-37
Management	35	72	57-69
Total	108	108	116
Kolar district			
Cultivar	11	9	-15
Management	81	21	55
Total	100	32	32

Integrated watershed management interventions

- Increasing water availability
  - Field-based *in-situ* soil and water conservation practices
  - Community-based water harvesting and groundwater recharging structures
- Improving rainfall use efficiency
  - Improved crop varieties and cropping systems
  - Integrated nutrient management
  - Crop intensification and diversification
  - Supplemental irrigation and efficient irrigation systems
  - Integrated pest management

Field-based soil and water conservation

Vegetative bunds with fruit trees and annual crop at Tad Fa Watershed, Thailand

This system gave 35% higher profit and reduced soil loss to [illegible] ($3.3\ t\ ha^{-1}$) than of sole annual crop of maize

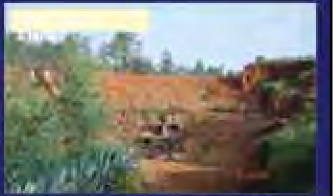
Plastic mulch system at Lucheba watershed, China

Plastic mulch to conserve moisture and improve soil temperature gave 31% higher yield ($22.5\ t\ ha^{-1}$) over no mulch in Chinese cabbage

Community-based rainwater harvesting / groundwater recharging

Small measures go a long way

- Check dams
- Percolation tanks
- Gabion structures
- Grassed waterways
- Diversion drains



Sulfur and micronutrient amendments increased crop productivity

Crop	Average grain yield (kg ha^{-1}) Control	Average grain yield (kg ha^{-1}) MN treatment	% increase over control
Maize	2800	4860	75
Greengram	770	1110	51
Castor	470	760	61
Groundnut pod	1430	1825	28

* Micronutrients applied: Boron (0.5 kg ha^{-1}), Sulfur (30 kg ha^{-1}) and Zinc (10 kg ha^{-1})

IGNRM Enhanced Farmers' Crop Yields (t ha^{-1}) in India

Crop	Yield with farmer's practice	Yield with IGNRM	% increase in yield
Groundnut	0.7-0.97	1-3.7	34-87
Soybean	1.3	1-3.1	83
Pigeonpea*	0.97	1.5	50
Sorghum	2.0	3.8	27
Sunflower	0.5-0.8	1.75	170
Maize	0.3-4.2	5.8	55
Ragi	1.3-3.0	3.5-5.8	134

* Improved cultivars

Diversification with High Value Crops Increased Family Incomes

High Yielding Crop Varieties and Cropping Systems

Improved varieties of groundnut (ICGV 91114 and ICGS 44), chickpea (KAK 2), pigeonpea (ICPL 87119), sorghum (CSV 15) increased yields by 20 to 43 %

Unlocking the potential of rainfed agriculture

Livelihoods of rural poor in SAT Asia could be improved sustainably through doubling of productivity and increased incomes by adopting Integrated Watershed Management approach

Small is more economical

Water storage structures	Storage capacity (m^3)	Cost of harvesting / recharging of water (Rs m^{-3})
Small Structures (earthen check dams, mini percolation tanks,…)	10-2000	6-42
Large structures (masonry check dams, big gabions,…)	2000-16000	16-70

Seasonal rainfall, runoff and soil loss from benchmark watersheds in India and Thailand

Watershed	Seasonal rainfall (mm)	Runoff (mm)		Peak runoff rate (m^3 s^{-1} ha^{-1})		Soil loss (t ha^{-1})	
		T*	UT*	T	UT	T	UT
Tad Fa Thailand	1284	169	354	0.029	0.048	4.21	31.2
Ringnodia M.P.	764	21	66	0.001	0.005	0.75	2.2
Lalatora M.P.	1046	70	273	0.065	0.052	0.63	3.2

* T= Treated UT= Untreated

Improved Practices Reduced Yield Gap of Soybean at Watershed Sites in M. P.

	Soybean grain yield (kg ha^{-1})		
	Guna	Vidisha	Indore
Max. rainfed potential	3600	3640	3410
Mean rainfed potential	2150	2540	2520
District yield	790	950	1150
Yield gap	1360	1590	1370
Yields in watersheds	1300-1980	1235-2070	1500
% yield gap abridged	38-88	37-70	26

Chickpea Productivity in Rice Fallows

States	Chickpea yield (kg ha^{-1})		Yield advantage (%)
	Control	Seed priming with Mo	
MP	814	917	12.7
UP	2053	2207	7.5
Orissa	284	323	13.7
Jharkhand	664	663	-
West Bengal	309	317	2.6

Sulfur and micronutrient deficiency widespread in the SAT regions

Location	Percentage deficient fields with extractable		
	Zinc	Boron	Sulfur
Andhra Pradesh (Nalgonda, Mahabubnagar and Kurnool)	86	96	89
Madhya Pradesh (Vidisha, Guna and Dewas)	90	35	96
Rajasthan (Bundi)	67	72	72
Gujarat (Bharuch and Kutch)	85	100	40
Haryana (Gurgoan)	89	93	60

Water harvesting/groundwater recharging (*ex-situ*)

Rejuvenating of open well, Kothapally, A.P.

Diversion of water, China

Tank bed cultivation, Bundi, Rajasthan

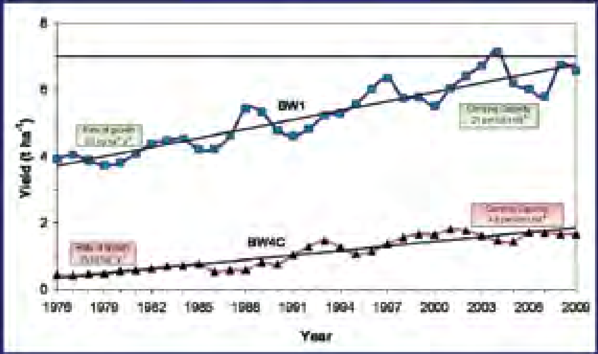
Integrated Nutrient Management Increased Crop Yields

Water-shed	Crop	Year	Trad. mgmt. (kg ha^{-1})	Imp. mgmt. (kg ha^{-1})	% increase
Dewas	Soybean	2005	760	1350	78
	Sorghum	2005	2100	3360	60
Bundi	Maize	2005	2470	3570	45
	Blackgram	2005	580	850	47
	Chickpea	2005	1140	1630	43
	Wheat	2005	4370	5070	16

Effect of Management Practices on Yield Increase in On-Farm Watersheds

Crop	INM + Variety	Land management	Supplemental irrigation	IPM/IDM
	% yield increase with improved management			
Soybean	14-79	8-35	–	–
Groundnut	32-105	9-17	–	–
Pigeonpea	34-68	10-17	–	–
Chickpea	32-70	10-37	18	17
Pearl millet	72-242	–	–	–
Kharif sorghum	35-217	–	–	–
Rabi sorghum	27	–	–	–

Improved Management of a Vertisol (BW1) supported sustainable double cropping for higher productivity and higher WUE at ICRISAT (1976-2006)



Intensification in High-Potential Agroecologies

- Rainy season fallow management (2 million ha)
- Rice-fallow management
- Increased cropping intensity

Soil test based fertilizer management for improving productivity and livelihoods

Girish Chander, SP Wani And KL Sahrawat

ICRISAT
Science with a human face

International Crop Research Institute for the Semi-Arid Tropics (ICRISAT)
Patancheru-502324, Andhra Pradesh, India

ICRISAT

Issues

- Increased productivity required to produce 320 Mt by 2025 to feed the burgeoning population
- Out of the 852 million poor worldwide, 221 million are in India.
- A large number of them depend on agriculture and any increase in agricultural productivity translates to a decrease in the absolute poor.
- Current productivity of the rainfed agriculture is quite low (1-1.5 t ha^{-1}) as against a potential of 2.5 to 7.0 t ha^{-1}.
- Apart from water shortage, the productivity in rainfed system is constrained by low soil fertility

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Essential Elements for better Soil Fertility

- Seventeen plant nutrients in adequate amounts and specific ratios are essential for best crop growth and realizing potential productivity. The 17 are:
- Basic nutrients absorbed from the air and water (3): Oxygen, carbon, and hydrogen.
- Macronutrients absorbed from the soil (6): Nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur.
- Micronutrients from the soil (8): Zinc, copper, boron, iron, manganese, chlorine, molybdenum, and nickel.

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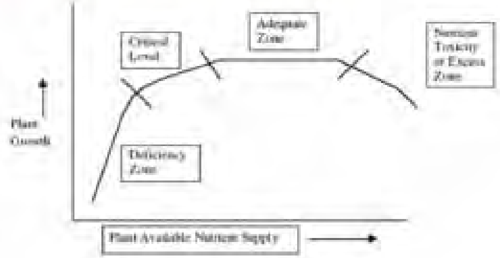
Relationship between plant growth/production and available nutrient supply



Rationale for Soil Testing

- Without a fertilizer recommendation based upon a soil test, a farmer may be applying too much of a little needed plant food element and too little or not at all of another element which is actually the principal factor limiting plant growth.
- This not only means an uneconomical use of fertilizers, but in some cases crop yields actually may be reduced because of use of the wrong kinds or amounts, or improper use of fertilizers.
- Efficient use of fertilizers is a major factor in any programme designed to bring about an economic increase in agricultural production.
- Soil testing is the base for management decisions about fertilizer requirements.

Soil Testing Process

- 3 critical phases - sampling, chemical analysis & interpreting the results
- Sampling: One of the weakest links, because soils are highly variable. So it is essential to carefully follow sampling instructions.
- The small amount of soil sample must represent thousands of metric tons of soil in the field.

Stratified Soil Sampling

- ICRISAT has developed & adopted Stratified Soil Sampling method
- A technique to represent different soils/different farmers fields in an area
- The targeted area is divided into different parts based on the differences like topography, soil colour, management practices etc.
- 12-15 sub samples are thoroughly mixed to get a composite soil sample.

Soil Sampling Instructions

- Do not collect soil samples from side of roads, under trees and places where FYM etc have been heaped
- For micronutrient analysis, use staineless steel augors to avoid contamination
- Moist soil should be air dried without sun or heat
- Take separate sample for problematic soils
- To track nutrient levels over the years, sample at the same time of year to avoid seasonal changes

GIS interpolation of results

- Portable GPS systems receivers can plot one's exact location as one moves across a large field, therefore if one is taking soil samples, the location of each sample can be georeferenced with N-S and E-W coordinates
- The information helps to develop digital maps which can be used by policy makers, extension workers & advanced farmers
- An interactive web based query/search enabled spatially referenced soil nutrient information particularly w.r.t. S, B & Zn and advisory with advanced visualization for selected districts of Karnataka are also facilitated at www.akmindia.in as a joint initiative with ICRISAT and the work is underway to feed the information for different

Soil test results of farmers fields in different states of India during 2008 & 2009

State	No. of farmers fields	Available-S ($mg\ kg^{-1}$)			Available-B ($mg\ kg^{-1}$)			Available-Zn ($mg\ kg^{-1}$)		
		Min	Max	% Def	Min	Max	% Def	Min	Max	% Def
Rajasthan	299	1.9	78.0	**69**	0.08	2.46	**70**	0.16	28.60	**65**
M.P.	268	1.8	134.4	**68**	0.06	1.3	**82**	0.3	3.8	**57**
Jharkhand	138	1.3	79.0	**57**	0.1	1.1	**69**	0.2	5.7	**40**
A.P.	827	1.1	287.3	**78**	0.04	1.46	**89**	0.22	8.0	**53**

Soil test results of Rajasthan farmers (2008)

District	No. of farmers fields	Available-S ($mg\ kg^{-1}$)			Available-B ($mg\ kg^{-1}$)			Available-Zn ($mg\ kg^{-1}$)		
		Min	Max	% Def	Min	Max	% Def	Min	Max	% Def
Bundi	36	3.2	50.9	**72**	0.10	0.98	**72**	0.20	1.80	**67**
Tonk	78	2.3	29.8	**79**	0.08	2.46	**64**	0.18	14.00	**58**
Sawai Madhopur	44	3.1	26.6	**86**	0.20	2.18	**52**	0.34	28.60	**41**
Jhalawar	30	1.9	78.0	**87**	0.22	1.36	**77**	0.40	3.40	**60**
Bhilwara	30	4.0	44.9	**43**	0.32	1.30	**47**	0.16	2.30	**37**
Dungarpur	21	4.0	17.6	**3**	0.28	0.90	**81**	1.20	14.1	**0**
Alwar	30	4.5	17.2	**63**	0.20	0.69	**87**	0.20	2.00	**83**
Banswara	30	2.4	22.0	**70**	0.10	0.54	**100**	0.26	2.60	**80**
Rajasthan	**299**	**1.9**	**78.0**	**69**	**0.08**	**2.46**	**70**	**0.16**	**28.60**	**65**

S, B and Zn deficiency symptoms in Crops

Sulphur Deficiency

Crop Yield in Tonk district of Rajasthan (Rabi, 2009-10)

Crop	No. of trials	Yield (kg ha^{-1})			% increase	
		T1	T2	T3	T2 over T1	T3 over Ti
Chickpea	7	1495	1647	1836	10	23
Wheat	8	3343	4248	4756	27	42
Mustard	10	1431	1576	1746	10	22

T1=Farmers practice; T3=Improved cultivar+Farmers practice; T3=Improved cultivar+Balanced Nutrition

Crop yield in Swai Madhopur district of Rajasthan (Rabi 2009-10)

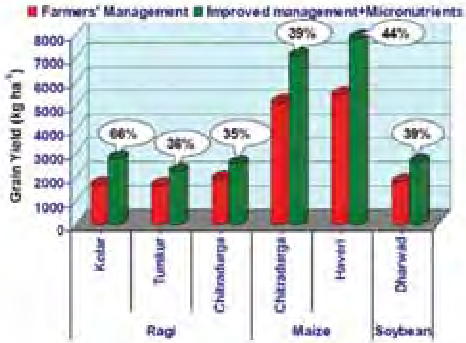
Crop	No. of trials	Yield (kg ha^{-1})			% increase	
		T1	T2	T3	T2 over T1	T3 over Ti
Chickpea	7	1270	1465	1670	**15**	**31**
Wheat	9	3952	4361	4799	**10**	**21**
Mustard	9	1242	1364	1508	**10**	**21**

T1=Farmers practice; T2=Improved cultivar+Farmers practice; T3=Improved cultivar+Balanced Nutrition

Crop yield in Andhra Pradesh (Rabi 2009-10)

District	Crop	No. of Farmers	Yield (kg ha^{-1})		% increase
			FM	BN	
Adilabad	Chickpea	8	2130	2947	38
	Wheat	1	4089	7183	76
Nalgonda	Groundnut	4	1473	2271	54
	Tomato	7	28167	38278	36
Khammam	Grondnut	1	1133	1855	64
	Tomato	1	700	800	14

Crop yields in Karnataka (Kharif, 2009) under Bhoo Chetna mission mode project



Maize yield in Rajasthan (Kharif, 2009)

District	No. of trials	Yield (kg ha^{-1})			% increase	
		T1	T2	T3	T2 over T1	T3 over Ti
Dungarpur	44	1447	2303	-	**59**	**-**
Tonk	19	1147	1932	3158	**68**	**175**
Sawai Madhopur	11	1427	2027	3000	**42**	**110**
Bundi	20	1378	2178	4236	**58**	**207**
Bhilwara	20	2991	4338	6511	**45**	**118**
Jhalawar	9	2412	3334	4632	**38**	**92**
Udaipur	8	2533	3095	6325	**22**	**150**

T1=Farmers practice; T2=Improved cultivar+Farmers practice; T3=improved cultivar+Balanced Nutrition

Yield of pearl millet in Rajasthan (Kharif, 2009)

District	No. of trials	Yield (kg ha^{-1})			% increase	
		T1	T2	T3	T2 over T1	T3 over Ti
Tonk	14	750	1179	2164	**57**	**189**
Sawai Madhopur	13	1008	1562	2169	**55**	**115**

T1=Farmers practice; T2=Improved cultivar+Farmers practice; T3=improved cultivar+Balanced Nutrition

Yield of crops in Rajasthan (Kharif, 2009)

District	Crop	No. of trials	Yield (kg ha^{-1})			% increase	
			T1	T2	T3	T2 over T1	T3 over Ti
Tonk	Groundnut	6	300	550	750	**83**	**150**
Jhalawar	Soybean	10	720	952	1316	**32**	**83**

T1=Farmers practice; T2=Improved cultivar+Farmers practice; T3=improved cultivar+Balanced Nutrition

Effect on WUE of crops in Bundi district (Raj) during rabi 2007-08

Crop	WUE (kg mm^{-1} ha^{-1})		% Increase
	FP	BN	
Wheat	6.2	7.8	26
Mustard	4.6	7.3	59
Chickpea	8.3	12.3	48

BN=Balanced nutrition; FP= Farmers practice

Effect on WUE of maize in Rajasthan during kharif, 2009

District	WUE (kg mm^{-1} ha^{-1})			% increase	
	T1	T2	T3	T2 over T1	T3 over Ti
Dungarpur	2.07	3.30	-	59	-
Tonk	3.36	5.52	9.13	64	172
Sawai Madhopur	4.09	5.77	8.59	41	110
Bundi	3.59	5.68	10.9	58	204
Bhilwara	7.39	10.8	16.2	46	118
Jhalawar	3.99	5.51	7.66	38	92
Udaipur	4.44	5.43	11.1	22	150

T1=Farmers practice; T2=Improved cultivar+Farmers practice; T3=improved cultivar+Balanced Nutrition

Benefit:Cost Ratio

S. No.	Crop	Benefit: Cost Ratio
1	Wheat	2.4:1
2	Mustard	2.3:1
3	Chickpea	7.8:1

Need for inclusion of organics

- Sulphur is mostly present in soil as organic matter
- Boron is present as neutral boric acid which is not retained by negatively charged clay particles and is so leached fairly rapidly from the soil. Diol complexes on clays & organic matter (OM) mostly hold it
- OM increases the efficiency of applied fertilizers in addition to physical, chemical & biological improvements in soil health
- Two good options are-(i) Vermicompost (1-1.5% N, 0.8% P, 0.7% K & micronutrients) (ii) Green manuring through nutrient rich *Gliricidia*

Gliricidia in improving productivity

Gliricidia is a fast growing N-fixing green leaf manure crop

Grown on 700 m long bunds provide ~30 kg N ha-1

Leaves are rich in nutrients (2.4% N, 0.1% P, 1.8% K & micronutrients) and have insecticidal properties

Roots stabilizes lands & reduce soil erosion

Propagated thru stem cutting (2-6 cm dia & 30-100 cm length) or seedlings raised from seeds

Planted on bunds at 50 cm spacing. For steep slopes, closer plant spacing of <20 cm

Pruning-Thrice a year-June, November, March

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Conclusions

- Soil testing is an important tool for rational fertilizer management decisions and productivity enhancement
- Majority of the farmers fields across the SAT regions in India are deficient in available S, B and Zn
- Deficient S, B and Zn are holding back the yield of field crops
- All crops across different regions responded beneficially to applied S, B and Zn in terms of increased yield, WUE and B:C ratio.
- Sulphur, B and Zn need to be included in balanced nutrition of plants for better productivity on sustainable basis.

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Future Studies to be undertaken

- **Residual effects** of applied S, B and Zn (Applied during rabi 2009-10) during kharif, 2010
- Studies on **foliar application of micronutrients**
- Studies on inclusion of **Vermicompost & Gliricidia** in nutrient management (On 50% N requirement basis)
- Studies on inclusion of **VAM, PSB & Rhizobia** with a view to target chemical fertilizer economy
- Studies on **varietal response** to balanced nutrition

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Thanks to All Partners & Donors

We Gratefully Acknowledge the Support from:

Sir Dorabji Tata Trust
Sir Ratan Tata Trust
Ministry of Agriculture
Ministry of Rural Development
Ministry of Water Resources
Government of India

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Thank you

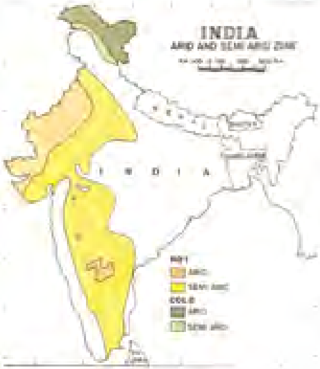
Strategies to Improve Livelihoods in Arid Areas through Sustainable Management of Natural Resources

M.M. ROY & T.K. BHATI

Central Arid Zone Research Institute
Jodhpur-342003 (Rajasthan)

Presentation in Annual Review & Planning Meeting of SRTT & SDT Projects at MPUA&T, Udaipur from May 4-6, 2010

Arid Zone Domains



Hot Arid :	**31.7 m ha**
Rajasthan:	19.60 m ha
Gujarat:	6.22 m ha
Haryana & Punjab:	2.75 m ha
South Peninsula:	3.13 m ha
Cold Arid :	**7.0 m ha**
Jammu & Kashmir:	7.0 m ha

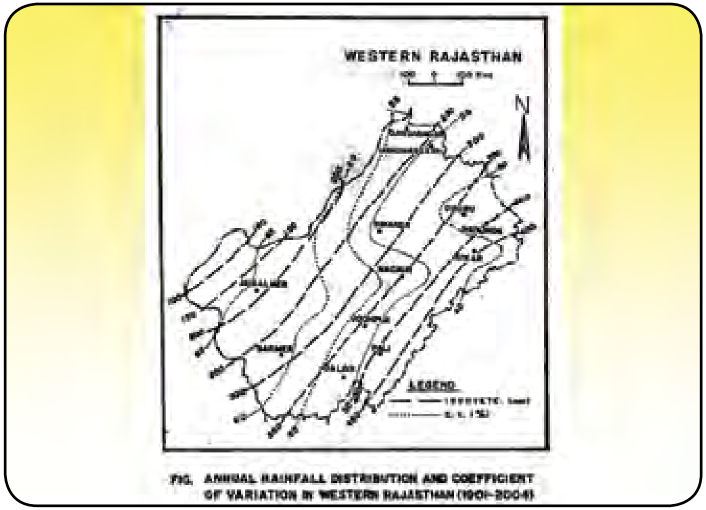
Emerging Challenges

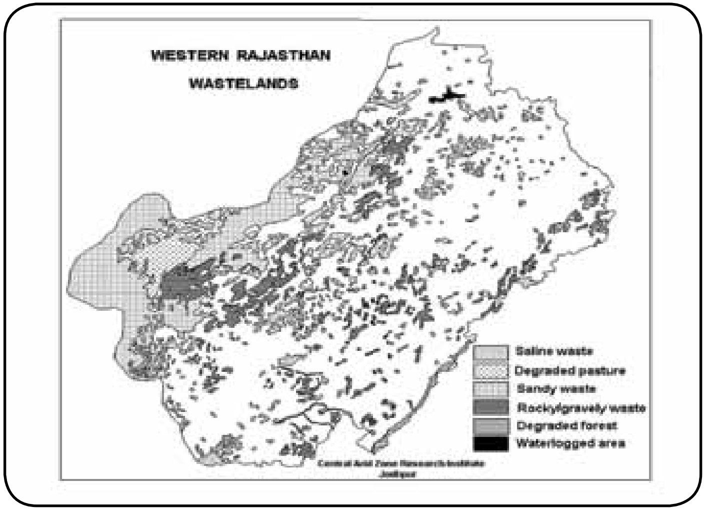
Constraints:

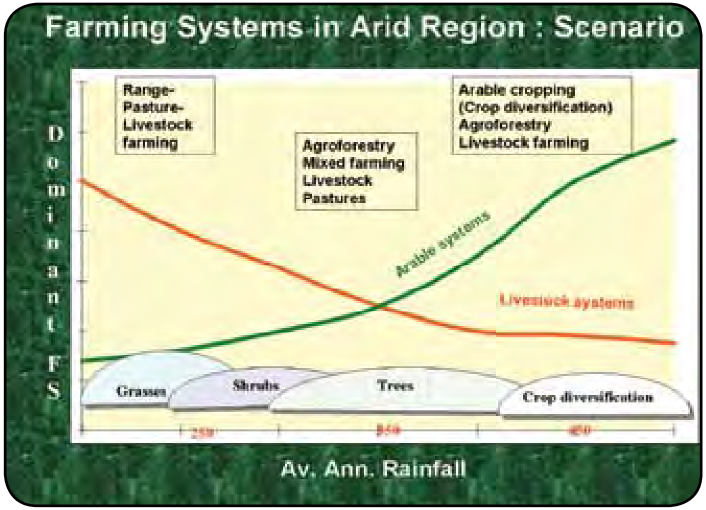
- Harsh climate
- Poor soils
- Poor water resources
- Slow plant growth
- Unplanned livestock breeding
- Subsistence farming
- Population Pressures

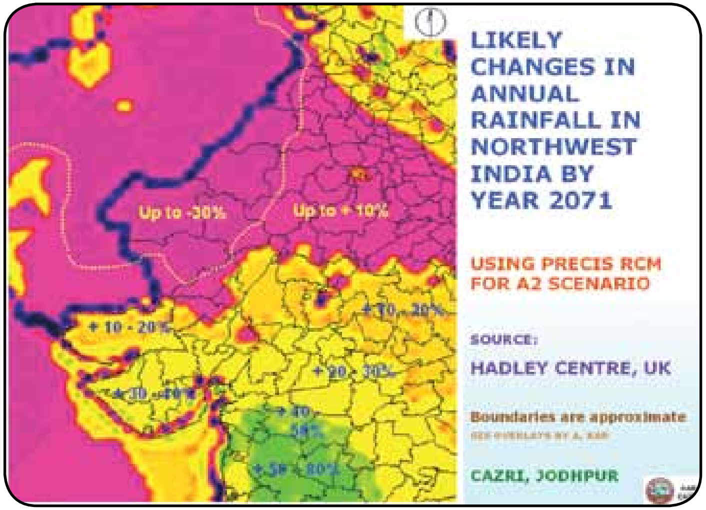
Will get hotter and drier:

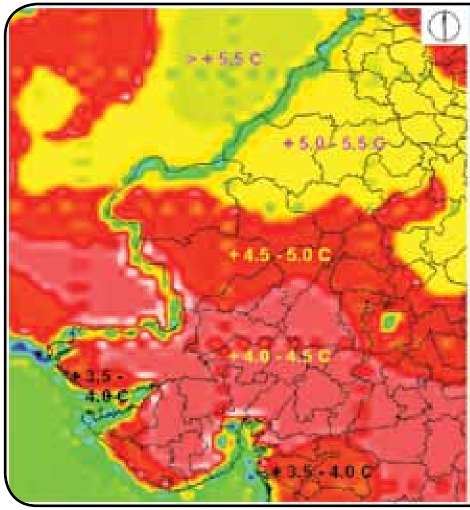
- Increased drought frequency
- Increased extreme climatic events
- Distress migration
- Desertification


WESTERN RAJASTHAN
N
LEGEND
FIG. ANNUAL RAINFALL DISTRIBUTION AND COEFFICIENT OF VARIATION IN WESTERN RAJASTHAN (1901-2004)


WESTERN RAJASTHAN
WASTELANDS
Saline waste
Degraded pasture
Sandy waste
Rocky/gravelly waste
Degraded forest
Waterlogged area
Central Arid Zone Research Institute
Jodhpur


Farming Systems in Arid Region : Scenario
Range-Pasture-Livestock farming
Agroforestry
Mixed farming
Livestock
Pastures
Arable cropping
(Crop diversification)
Agroforestry
Livestock farming
Arable systems
Livestock systems
Dominant FS
Grasses
Shrubs
Trees
Crop diversification
250
350
450
Av. Ann. Rainfall


Up to -30%
Up to + 10%
+ 10 - 20%
+ 10 - 20%
+ 20 - 30%
+ 30 - 40%
+ 40 - 50%
+ 50 - 80%
LIKELY CHANGES IN ANNUAL RAINFALL IN NORTHWEST INDIA BY YEAR 2071
USING PRECIS RCM FOR A2 SCENARIO
SOURCE:
HADLEY CENTRE, UK
Boundaries are approximate
CAZRI, JODHPUR



LIKELY CHANGES IN ANNUAL TEMPERATURE IN NORTHWEST INDIA BY YEAR 2071

USING PRECIS RCM FOR A2 SCENARIO

SOURCE:
HADLEY CENTRE, UK

Boundaries are approximate
GIS OVERLAYS BY A. KAR

CAZRI, JODHPUR

HIGHLIGHTS OF MAJOR CHANGES EXPECTED

- WESTERN INDIA TO EXPERIENCE 2-5°C HIGHER TEMPERATURE
- WINTER TEMPERATURE & NIGHT TEMPERATURE TO INCREASE
- MONSOON RAINFALL MAY DECLINE BY 10-30% IN NW OF DESERT
- WINTER RAIN MAY GRADUALLY INCRESE BY 20-40% FROM THE PRESENT
- NE FRINGE OF DESERT MAY EXPECT ~10% INCREASE IN RAINFALL
- SW & S RAJASTHAN MAY GET 15-30% HIGHER MONSOON RAINS, BUT
  VERY HIGH INTENSITY RAIN AND LESSER RAINY DAYS EXPECTED

THREE BROAD ZONES CAN BE DELINEATED IN ARID WESTERN INDIA:

1. HOTTER & VERY DRY NW RAJASTHAN & ADJOINING PUNJAB
2. WARMER & WETTER ARID GUJARAT & SOUTH RAJASTHAN
3. HOTTER & SLIGHTLY WETTER EASTERN RAJASTHAN

Livestock population trends in Rajasthan

Livestock	2003 Census	2007 Census	% in Arid Areas
Cattle	10.85	12.41	37.88
Buffalo	10.41	11.51	30.74
Sheep	10.05	11.28	73.13
Goat	16.80	21.88	49.76
Camel	49.80	43.04	80.00

Fodder Deficits In Rajasthan

Commodity	Requirement (mt/yr)	Availability (mt/yr)	Gap (%)	
			Rajasthan	Arid Rajasthan
Dry fodder	41.3	20.8	49.5	79.9
Green forage	77.8	32.1	58.8	93.5
Concentrate	24.7	2.3	90.6	94.0

Livelihood issues

- Out of 28 m labour force 20 m are working poor and 2 m are unemployed.
- Growth rate of unemployed people is 2.2% p.a whereas employment generation rate is 1.1 %.
- A decade plan to control the situation will require creation of extra employment for 8 lack people/yrs.
- Although agriculture sector provides employment to 66% of the population but large part of this falls in the category of working poor.
- To control rural poverty NRM and RNFS based livelihood systems need to be developed
- Jaisalmer, Barmer and Jodhpur district of arid Rajasthan covers more than 50 percent area of AGOs and have about 30% population below poverty line (BPL).

Gross State Domestic Product (%)vs. Workforce (%) in Rajasthan State

Sector	GSDP(%)	WF(%)	GSDP/WF
Primary	32.1	68.2	0.47
Secondary	27.0	15.8	1.71
Tertiary	40.9	16.0	2.56
Total	100.0	100.0	

Livelihood promotion approaches

Natural resources based
Rural non-farm sector based
Urban informal sector based
Out of state migration

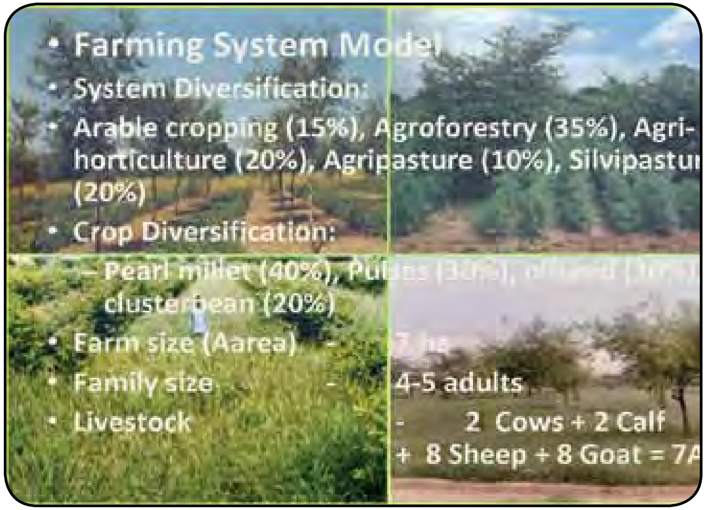
Opportunities for sustainable Development

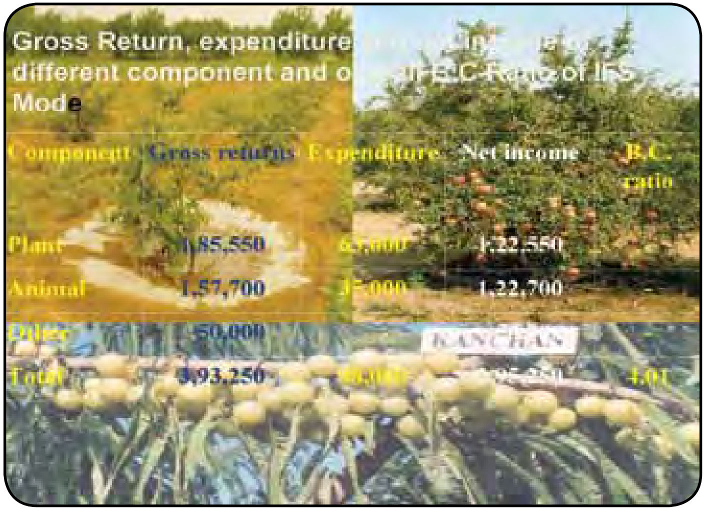
Rain water harvesting and its utilization through watershed/ index catchment/ cluster village, dune-interdune complex

Development and management of CPR's

Development of arid land farming systems

- Crops and cropping system diversification
- Alternate land use systems





Economic evaluation of farming system components of arid region with and without livestock components

Farming system components	Rainfall			
	<250 mm	250-350mm	350-450mm	450-600mm
Crop alone	2000-3000	3000-5000	5000-8000	8000-11000
Crop + Livestock	3000-4000	4000-6000	6000-9000	9000-12000
Agroforestry	4000-5000	5000-7000	7000-10000	10000-15000
Agroforestry + Livestock	5000-7000	7000-9000	9000-15000	15000-18000
Agro-horticulture	-	7000-10000	10000-15000	15000-20000
Agro-horticulture+livestock	-	8000-15000	15000-22000	22000-30000
Silvipasture + Livestock	3000-6000	6000-10000	10000-15000	15000-25000

Natural Resource Management : Shelterbelts & Roadside Plantations

Azadirachta indica – Acacia tortilis

(Roadside plantation by CAZRI : ~ 400 km length; then followed up by State)

Natural Resource Management : Promotion of Stress Tolerant Plants

Pearl Millet: CZP-9802 (Dual purpose; 14% higher grain yield ; grown in more than 25000 ha, suitable for extremely arid regions having annual rainfall less than 400mm; seed cost Rs. 150 ha^{-1})

Grasses: *Cenchrus ciliaris* CAZRI-75, *C. setigerus* CAZRI-76 (GFY 54-87 q ha^{-1}; DMY 33-42q ha^{-1}; days to flowering 55 days, seed cost Rs. 1000 ha^{-1}; variety has spread to Punjab)

Natural Resource Management : Promotion of Stress Tolerant Plants

Horse gram: Maru Kulthi –1(15-20% higher yielder than contemporary var.; widely accepted in western as well as central region). Released in 1989. Maturity : 90-115 days. Productivity : 4-6 q/ha. Drought resistant and suitable for late sown conditions.

Arid Horticulture: Ber varieties (Sev, Gola, Umran). CAZRI BER varieties have now spread throughout India and have also gone to Africa. Technique for propagation through budding of improved varieties on local root stock has made major impact in the arid and semi-arid regions. Can be successfully grown on marginal lands with certain conservation measures.

Natural Resource Management : Promotion of Stress Tolerant Plants

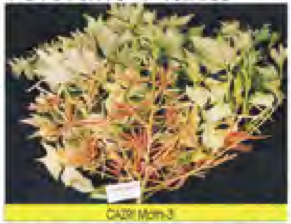
Moth been (CZM-1,2,3)

CZM-2 good for late planting upto July end.
CZM-3 good for dry zones, poor soils).
Can be grown as sole crop and intercrop with pearl millet.

CAZRI Moth (CZM -3)

Conditions : Rainfall 140 mm, Ambient temperature 40-42°C

Inputs : Pure seed, improved planting method



Crop/Var.	Inter-row spacing (cm)	Maturity (days)	Total grain yield (kg ha^{-1})	Benefit/ha (Rs.)	C:B ratio
Moth (CZM-3)	40	60	435	+ 11450	1 : 2.92
Moth (RMO-435)	25	65	100	- 1950	1 : 0.67
Guar (RGC-1066)	25	90	150	- 3250	1 : 0.45
Bajra (CZP-9802)	25	75	175	- 4000	1 : 0.03

Natural Resource management : Water Conservation and Use Efficiency

- Improved designs for traditional water harvesting structures i.e. tanka (cistern; 10,000 to 600,000 litres capacity), nadi (pond with LDPE lining) and khadins (crop cultivation on conserved soil moisture): provided assured crop production and generated additional income, popularized under various Institute and Govt. programmes, including Rajiv Gandhi Drinking Water Mission.
- Water conservation and utilization: Using paired row of crop on a single drip lateral and irrigating the crops based on canopy area basis. The technology saves water and lateral cost up to 40% and fertilizer up to 25%.

Natural Resource management : Supplementary and Complete Feed Block

Multi-nutrient Feed block:
Provides critical nutrients to desert livestock maintained on rangeland grasses and crop residues. Prepared from locally available feed resources and simple gadgets, fabricated locally.. The B/C ratio of block supplementation in cow & buffalo was estimated to be 1:4 & 1:4.5, respectively.

Complete Feed Blocks:
Area specific complete feed blocks as per needs of arid region for various production functions of arid livestock The technology has been adopted in 4 villages in Pali and 3 villages in Jodhpur district under FPARP programme. and B/C ratio in cow & buffalo was estimated to be 1:1.17 & 1:1.67, respectively.

Bio-formulations

Maru Sena 1, 2, 3 : Formulated from native strain of *Trichoderma harzianum*, *Aspergillus versicolor* and *Bacillus firmus* effective against soil borne plant pathogens

Biophos prepared from culture of *Chaetomium globosum*, mobilizes plant inorganic and organic phosphorus from soil

Neem pellets prepared from depulped whole seeds and *Eucalyptus* oil. Protects kaharif legumes from soil borne pests especially termites, white grubs and *Prosopis* root grubs

MEASURES OF INVESTMENT WORTH (Perennial crops)

Enterprise/ criteria	Pay back period (Yrs)	NPW (Rs)	IRR (%)
Ber	6	381310	46.97
Silvi-pasture	12	79519	23.90
Pasture (LS)	5	14308	47.73
Pasture (CC)	5	6424	43.24
Henna	9	34410	22.68

Note:
- Analysis is based on 10.5 % interest rate and per ha basis
- Henna analysis is based on farmers practice while others analysis is based on production system followed at institutes research farm

MEASURES OF INVESTMENT WORTH (Livestock)

Enterprise/ criteria	Pay back period (Yrs)	NPW (Rs)	IRR (%)
Goat	6	91811	40.91
Sheep	6	40455	25.98

Note:
- Analysis is based on farmers practice and at 10.5 percent interest rate
- Goat and sheep analysis is based on 25 animals each while buffalo with 5 milch animals

Value Addition ---- Products

- Post harvest value addition of plant (crops, trees, grasses, shrub etc.) based produces
- Value addition in animal produces viz. milk, wool, hair, skin, meat, leather, bones, etc.
- Value addition in plant and animal byproducts like plant residues, animal urine and excreta.
- Unconventional rural based value added products mushrooms, poultry, gum and resins, plant dyes, herbal medicines, etc.

Value Additions

Gum production from
Acacia senegal in rocky wastelands

Ca. 500 g gum yield per tree possible through ethophen

50 trees per ha yield 25 kg gum/year, valuing Rs 10000 & reducing import

Opportunities are high; risk negligible

Aloe vera

Net Income: Rs. 17000/ha in 2nd year; increases gradually to Rs. 40000/ha in 5th-10th year

.

Value-added products can generate employment for >1000 man-days; high benefits

NEW *ALOE* PRODUCTS

Aloe Shampoo makes the hair silky shiny, and free from dandruff.

Aloe Hair Cream, which also contains olive oil, castor oil, mustard oil and aonla, prevents hair fall and makes hair stronger.

Aloe Moisturizer is suitable for normal/oily skin, and makes the skin smooth, shiny and glowing; also removes black spots from skin due to cold

Aloe Crack Cream is highly effective for cracked feet, dry/ dehydrated skin. It moisturizes and softens the skin and helps in healing of skin lesions and skin cracks.

Peelu Squash

Peelu Jam

Dehydrated Fruits

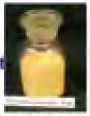
Seed-Meal

Products from *Salvadora oleoides* (Peelu)

Peelu Seed

Peelu grows abundantly in parts of our Desert, and has several uses that are yet to be fully exploited

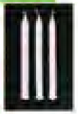
Candle from Peelu fat mixed with wax(1:1)



Peelu fat

Soap from Peelu fat

Bleached Peelu fat



Candle from bleached Peelu fat mixed with wax(1:1)

Solar candle making system

Capital requirement, Rs ≈ 12,000/-
income (supplementary), Rs ≈ 3000 pm.
Capacity : 10 – 16 kg candles per day.
Commercialized by NRDC, New Delhi.
Licenses granted to 4 firms by NRDC.
An avenue for employment generation

Solar dryer

Environment friendly, maintains original colour of material. Cost, Rs ≈ 50000/-. Capacity : 80 – 100 kg. 2 entrepreneurs have installed the dryer each of 1000 kg capacity in Jodhpur dist. Farmers of village Osian and Newra Road are using these dryers for dehydration of vegetables

PASSIVE COOL CHAMBER

Good for short term storage of food materials in rural areas. Prolonged shelf-life of food materials. Temperature reduction by 15 °C. High humidity in cool chamber > 90%. Cost: Rs ≈ 5000/-. Loading capacity 20 –40 kg depending upon the material. 14 units already installed at farmers fields / vegetables growers / vendors premises.

ANIMAL FEED SOLAR COOKER

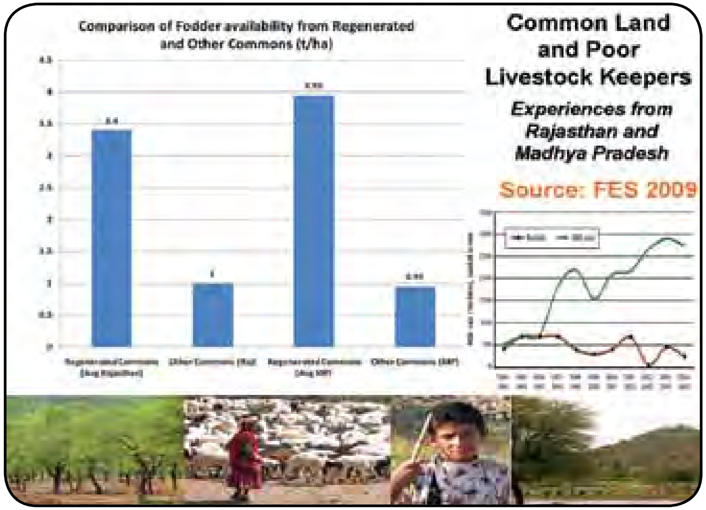
Developed for boiling of animal feed. Can be made locally. Saves conventional fuel / time of house wife. Environment friendly. Capacity : 10 kg. Cost, Rs ≈ 3500/- . State Govt. has sanctioned Rs 1 lakh for construction of these animal feed cookers in other villages.

IMPROVED KASSI

For weeding of crop and inter-culture operations. Low pull requirement (3.5-5.5 kgf) against 8.5 kgf in traditional Kassi. Minimizes human drudgery weeder is suitable for women & younger family members and for crop sown by broadcasting method
Per unit cost Rs 200 – 220
It has already been included in Package of Practices (POP) of State.

IMPROVED SEED DRILL

For sowing of crops on furrow slants. Harvests runoff water in specifically created furrows. High moisture concentration in plant root zone. Minimizes crust formation & early germination. Deep and wide furrows check wind erosion. Facilitates use of drip irrigation
Unit cost, Rs 35000/



CONCLUSION

Our thrusts need be:

Water: Most important in arid context ...NRM based water centred programmes

Livelihood Security: To sustain natural calamities like drought and disasters

Community Pasture Management: Ownership and community harmony

Wasteland Rehabilitation: Environmental gains, Carbon trading, employment generation

Crop Diversification: Arid legumes, Medicinal plants, Aromatic plants, Vegetables, Fruits. Link the products with the market

Soil Health: Soil biology

Investments: Public . Private

PRODUCTIVITY ENHANCEMENT THROUGH SUSTAINABLE USE OF NATURAL RESOURCES

TATA –ICRISAT PROJECT

BAIF (MADHYA PRADESH)

PROJECT OBJECTIVES

- Improving Rural Livelihoods and Minimizing Land Degradation
  - » through
  - The Community Watershed Approach for Sustainable Development of Dry land Areas
- To minimize land degradation and increase productivity and income
  - » through
  - Sustainable management of natural resources in the watershed by adopting farmer participatory integrated watershed management and livelihood options

PROJECT DETAILS

- Sponsorer – Sir Dorabji Tata Trust
- Project Initiation
  - Testing phase – Kharif 2008
- Current year of project-Third(2010-11)
- Districts/ Locations
  - Vidisha
  - Anandpur
  - Rajgarh
  - Indore
  - Badwani
  - Sehore
  - Guna

Inputs in INM Plots

INM (Dose per Hac.)

• DAP –	70 Kg
• UREA –	107 Kg (Wheat)
	7 Kg (Pulses)
• Zn So4 –	50 Kg
• Gypsum –	100 Kg
• Boron –	2.5 Kg

Season Wise Crops & Varieties

Season	Crops & Varieties
Kharif	o Soyabean (JS-335,JS-9305, Samrat, NRC-12), oMaize (Ganga kaveri) oPigeon pea (ICPL- 89117), o Black gram (T-9)
Rabi	o Wheat (Malvakirti,HI-8627,Lok-1,HI-1500 (Amrita) o Chickpea (JG-426, JG-11)

YIELD ANALYSIS UNDER INM

S. No.	INDICATOR	CROP - SOYBEAN	
		T	C
01	RANGE OF GRAIN YIELD (in qtl./plot)	1.8 – 7.2	1.30 - 3.80
02	AVG. GRAIN YIELD PER PLOT (in qtl.)	4.5	2.55
03	ADDITIONAL INPUT COST (Rs.) INCLUDING ADDITIONAL MANDAYS	1040	-
04	ADDITIONAL YIELD (in qtl.)	1.95	-
05	VALUE OF YIELD (Rs.)1700 per quintal	3315	-
06	BENIFITS THROUGH INM INTERM OF Rs.	2275	-

VARIETAL PERFORMANCE

S. No.	Crop	Variety	Yield (Qtl./ha.)	Farmers Perceptions
1	Soybean	JS 335	17.23	Yield is same but 9305 is the early variety & matured before 15 days
		JS 9305	22.00	
2	Maize	Local	16.00	Participants used hybrid variety in first time
		Hybrid	25.00	
3	Chickpea	ICCV 37	11.43	In case of ICCV 37 insect infestation is high as comparative to JG 11
		JG 11	10.60	
		Local	10.00	

PROGRESS (2009-10)

S NO	ACTIVITY	UNIT	Target	Achievement
1	CROP DIVERFICATION WITH VEGETABLE	Ha	175	142
2	INM,BBF,FALLOW Mgmt.	Ha	1400	1092
3	GLIRICIDIA PLANTING	No	22000	9100
4	ARTIFICIAL INSEMINATION	No	1900	1005
5	FARMERS TRAINING	No	32	26
6	GLIRICIDIA NURSERY RAISING	No	7	5

Continued...........

S.NO.	ACTIVITY	UNIT	Target	Achievement
7	SHG FORMATION	No	21	16
8	VILLAGE LEVEL ENVIRONMENTAL CLUBS	No	7	5
9	FODDER	Ha.	175	32
10	FARMER DAY	NO.	14	14
11	VERMICOMPOST	NO	70	25
12	EXPOSURE VISIT	Farmers	35	35
13	BBF	Ha.	100	174

CASE STUDY ON

"KITCHEN GARDEN"

ICRISAT- VILLAGE – RINGNODIYA

INDORE -MP

NAME OF FARMER :
MAHENDRA SINGH S/O
JORAWAR SINGH

Expenditure On Seeds And Manure: 230/-

Type of Vegetables -Lady Finger -20 Gms, Brinjal-20 Gms , Turai-20 Gms , Tamato - 10 Gms , Lauki-20 Gms

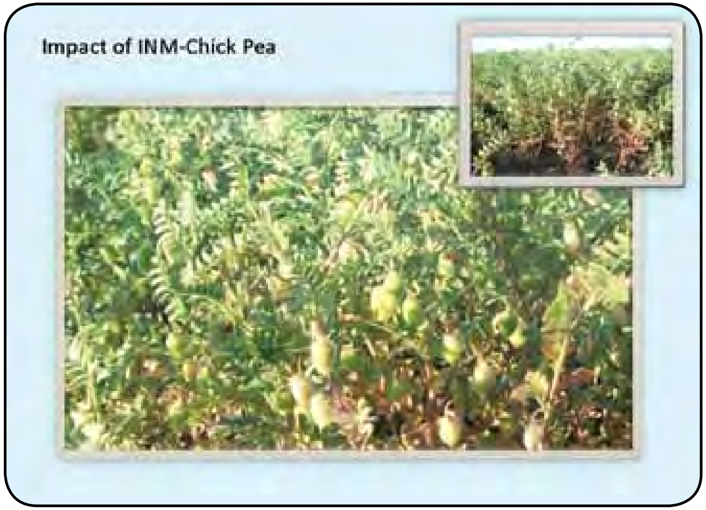
Vegetables Used at Home: 1 Kg Per Day @ Rs 20/-
Amount Saved In 60 Days= 60 daysX Rs 20/Day =1200/-

Vegetables Sold In the Market:
5 Kg Per Day@20/-per Kg 5 X 20 =100/- Per Day

Vegetables Sold In 30 Days:
150 Kg x Rs 20/Kg = 3000/-

Total Gross Income =4200/-

Impact of INM-Chick Pea


Impact of INM-Chick Pea


Vermi Compost Demonstration


BBF Practice in Soyabean Crop
Intercropping Soyabean with Maize


Kitchen Garden plot in Okhlikheda ,Farmer Kamal Chipa


BBF plot In Anandpur


Plant Observation of BBF plot Anandpur


Farmer Hari Om


Fodder Demonstration Of Sorghum In Village Sunkher


THANKS

Sustainable Livelihoods through Community Watershed approach in Raisen & Sagar district of MP State

Implemented by -
SDTT – ICRISAT- ICAR Consortium

Consortium partner -

Bhopal Yuwa Paryavaran Shikshan & Samajik Sansthan (BYPASS)

83, Paraspar Colony, Chuna Bhatti,
Bhopal 462016. Madhya Pradesh
Ph: 0755 – 2428244; 4281638
Email: bypassindia@yahoo.com

Presentation by
Akhilesh Singh Yadav

VILLAGES SELECTED FOR PRODUCTIVITY ENHANCEMENT

District RAISEN

VILLAGE	BLOCK
Sehora jagir	Begumgunj
Khamariya	Begumgunj
Saajkheda	Begumgunj
Pahariya	Silwani
Bhainsra	Silwani
Bamhori	Silwani
Gundrai	Silwani
Tulsipar	Silwani
Samnapur	Silwani
Nimnapur	Silwani
Dilhari	Silwani

Intervention in Kharif 2009

- INM – 77 ha
- Foundation/ Breeder seed -
- Variety JS 9305 – 77 ha
- BBF – 42 ha
- IPM – 10 ha
- Intercropping
  Soybean + Jwar – 5 ha
  Soybean + Tuar – 49 ha
- Beneficiary HH - 104 Farmers
- Micro Nutrient Supplement (Boron, Zinc, Zypsum)
- Ground Nut – 2 ha
- Kitchen gardens – 35 farmers/ Women
- Commercial vegetable cultivation – 4 ha

Intervention in Rabi 2009

- Residual INM – 77 ha/ INM 12 ha
- Foundation/ Breeder seed – 40 ha
- Variety – Chickpea - ICCV 37, JG 11
  Wheat – C 306
- BBF – 39 ha
- IPM – 8 ha
- Beneficiary HH - 104 Farmers
- Kitchen gardens – 35 farmers/ Women
- Commercial vegetable cultivation – 8 ha
- Fodder Development (Barseem) – 12 ha
- Sprinkler system – 1 No
- Vermi compost/ Nadep unit – 10 No
- Gliricidia plants – 3000 no
- Summer Vegetable Cultivation – 6 ha

Other activities

- Training of 08 SHGs on Group Functioning & management
- Income generation activities started by SHGs –
  - Commercial vegetable cultivation-Samnapur & Pahariya
  - Gliricidia Nursery by SHG in Pahariya
  - Midday meal in schools by 2 SHGs – Khamariya & Pahariya
- Training of SHG women on Nutrition – 4 villages
- Sensatisation of male community on Gender & development – 4 villages
- Training of SHG women on Menstrual hygiene – 2 villages
- Drawing competition on Children's day – focusing on Environment & Sanitation – 2 villages

Farmers Capacity Building

- 2 days training of 30 farmers on Soil, Water & Vegetation conservation
- Village level FGDs – 62 No.
- Exposure visit of 5 farmers to ICRISAT Patancheru
- EDP on Food processing to 20 Youths from these villages
- Integrated development plan for Pahariya village
- Cattle vaccination camp – 4 villages
- Farmers club in 5 villages
- 1 Village Seed bank

Yield data Kharif 2009- Raisen

SOYBEAN	Treatment Plot (JS 9305)	Control Plot (Local Variety)
Yield (Q/Ha)	15.6 to 25.2	12.5 to 23.3
Average Yield (Q/ha)	19.9 (Avg.)	17.5 (Avg.)
Plant population/ SqM	34 to 47	28 to 51
No of Nodules/ Plant	17 to 32	12 to 25
Plant height	54 to 63	46 to 57
Branching/ Plant	12 to 20	11 to 18

Yield Data Rabi Raisen

Variety in Treated plot CHICKPEA	Yield in Treated Plot	Yield in Control Plot with local variety
ICCV 37	12.5 to 18.6	12.2 to 16.6
JG 11	12.6 to 17.3	12.3 to 16.5
WHEAT		
C 306	13.2 to 18.8	13.00 to 18.2
Yield in Quintals per Hectare.		

Farmers Days

Village Khamariya - District Raisen

Date 16th September 2009

Participants 196

Issues – Soil health, Application of Micro Nutrients, Challenges in Agriculture development, Integrated Pest management, Organic farming

Resource persons

Dr S Reddy (IISS), Mr P Singh (CIAE), Mr Ram Niwas (PCI), Mr Ramkrishna (Icrisat), Agriculture dept representatives & Bypass team

VILLAGES SELECTED FOR PRODUCTIVITY ENHANCEMENT

District SAGAR

VILLAGE	BLOCK
Chitoura	Sagar
Bannad	Sagar
Berkhedi	Sagar
Shobhapur	Jaisinagar
Chandoni	Jaisinagar
Bichhuwa	Jaisinagar
Khamariya	Jasinagar
Bichhua	Jasinagar

Intervention in Kharif 2009-Sagar

- INM – 55 ha
- Foundation/ Breeder seed -
- Variety JS 9305 – 45 ha
- BBF – 20 ha
- IPM – 10 ha
- Intercropping
  Soybean + Jwar – 10 ha
  Soybean + Tuar – 35 ha
- No of beneficiaries - 65 Farmers
- Micro Nutrient Supplement (Boron, Zinc, Zypsum)
- Ground Nut – 2 ha
- Kitchen garden 28 farmers/ women
- Commercial Vegetable cultivation – 6 ha

Intervention in Rabi 2009_Sagar

- Residual INM – 55 ha & INM 10 ha
- Foundation/ Breeder seed – 25 ha
- Variety- Chickpea - ICCV 37
  Wheat - LokOne
- BBF – 10 ha
- IPM – 5 ha
- No of beneficiaries - 68 Farmers
- Kitchen gardens – 25 farmers/ Women
- Commercial vegetable cultivation – 8 ha
- Fodder Development (Barseem) – 8 ha
- Sprinkler system – 1 no
- Gliricidia plants – 2000 no
- Summer Vegetable cultivation – 4 ha

Other activities

- Training of 3 SHGs on Group Functioning & management
- Income generation activities started by SHGs –
  - Commercial vegetable cultivation- Chandoni
  - Gliricedia Nursery by SHG in Chandoni
  - Midday meal in schools by 2 SHGs – Chitora & Shobhapur
- Training of SHG women on Nutrition – 2 village
- Sensatisation of male community on Gender & development – 2 villages
- Training of SHG women on Menstrual hygiene – 1villages
- School sanitation campaign – 1 village

Farmers Capacity building

- 2 days training of 20 farmers on Soil, Water & Vegetation conservation
- Village level FGDs – 36 No.
- Exposure visit of farmers to ICRISAT Patancheru - 5 farmers
- Integrated development plan in process for Shobhapur village
- Cattle vaccination camp- 3 villages
- Farmers club in 3 villages & Youth broup in 1 village

Yield data Kharif 2009- Sagar

SOYBEAN	Treatment Plot (JS 9305)	Control Plot (Local Variety)
Yield (Q/Ha)	14.6 to 24.2	12.5 to 22.3
Average Yield (Q/ha)	19.2 (Avg.)	16.8 (Avg.)
Plant population/ SqM	36 to 48	38 to 50
No of Nodules/ Plant	18 to 32	12 to 24
Plant height	55 to 63	48 to 56
Branching/ Plant	12 to 22	11 to 19

Yield data Rabi Sagar

CHICKPEA Variety in Treated plot	Yield in Treated Plot	Yield in Control Plot with local variety
ICCV 37	13.59 to 15.86	09.98 to 13.08
WHEAT		
LOKONE	17.4 (Avg.)	14.4 (Avg.)
Yield in Quintals per Hectare		

Farmers Days

Village Chitora - District Sagar

Date 20th September 2009

Participants 190

Issues – Suitable Crop variety for the area, Pest management, High yield variety & crop diversification, Seed treatment, Organic farming,

Resource persons –Mr R D Yadav (CIAE), Mr Ram Niwas (PCI), Mr Ramkrishna (Icrisat), Agriculture dept representatives & Bypass team

Farmer's day Khamariya 2009

Information sharing during farmer's day

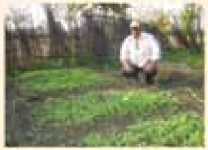
FARMERS DAY – CHITORA 2009

Training of Women on Health, Hygiene & Nutrition – Pahariya, Bamhori & Samnapur

Training of Women on Health, Hygiene & Nutrition – Pahariya, Bamhori, Samnapur, Khamariya




Crop diversification






Capacity Building of Farmers




Achievements – 2009-10

Activity	Target	Achievement
Productivity enhancement trials	100 ha / season / District	340 ha
Efficient irrigation management	2 units	2 units
Diversification with high-value vegetables	25 ha	20 ha
Enhancing soil fertility - Gliricidia	10000 plants	5000 plants
Human resource development activity for skill enhancement	50 farmers	50 farmers

Achievements – 2009-10

S no	Activity	Target	Achievement
6	Fodder development	25 ha	20 ha
7	Kitchen garden	50 no	63 no
8	Vermi compost units	-	12 units
9	Farmers club	5 no	8 no
10	Seed bank	1 no	1 no
11	Exposure visit	10 farmers	10 farmers
12	Farmers day	2 No	2 No
13	Field day	2 No	2 no

Proposed plan 2010-11

Activity	RAISEN	SAGAR
INM	**120 ha**	**80 ha**
IPM	**20 ha**	**10 ha**
BBF	**60 ha**	**40 ha**
Efficient irrigation systems	**2 units**	**2 units**
Vegetables Cultivation	**20 ha**	**10ha**
Gliricidia	**5000 plants**	**3000 plants**

Proposed plan 2010-11

Activity	RAISEN	SAGAR
Organic farming	20 ha	10ha
Fodder development	10 ha	10 ha
Kitchen garden	50 each season	25 each season
Equipments needed	**Bullock driven tropicultors**	
	BBF maker	

Center for Advanced Research And Development (CARD), Bhopal

Improving Rural Livelihoods and Minimizing Land Degradation through the Community Watershed Approach for Sustainable Development of Dry Land Area

A Tata –ICRISAT Initiative

CARD : The Organization

CARD is a non-government agency established, in India, in Bhopal under the MP Societies Registration Act, 1973

VISION: *We strive for a prosperous dawn with the promise of empowered communities and self- sustained habitats.*

MISSION: Development with Commitment & Professionalism

CORE VALUES: Participation, Empowerment, Institution Building, Transparency, Team Spirit

CARD Initiatives in Field

CARD: Studies & Evaluations

CARD Presence in Field

District	Region	Professional Strength	Coverage
Bhopal	Vindhya Plateau	20	Madhya Pradesh & CG
Mandla	Eastern Region	15 + 70	225 villages (Mandla)
Dindori	Eastern Region	07 + 20	130 villages in Shahpura
Shajapur	Malwa Region	03 + 8	33 villages of Agar
Ujjain	Malwa Region	03 + 15	40 villages, Ujjain
Jhabua	Western Region	05 + 10	19 villages, Thanla
Dhar	Western Region	18 + 50	28 villages in Tirla
Raipur	Chhattisgarh	06	Chhattisgarh Region
Korba	Chhattisgarh	15 + 50	121 villages
Dhamtari	Chhattisgarh	6 + 20	35 villages in Magarlod

CARD primarily works on Livelihood promotion in Tribal dominated region and with SC and OBC communities in Plateau region

Project at a glance

Duration of Project
Five Years (Sept 2008 to Aug 2013)

Total Annual Budget - 2,43,500/

Dr. Yaseen Khan	Associate fallow
Mr Amol Gawande	Coordinator Agriculture
Mr Balram Jamre	Project Officer
Mr Nirajan Gour	Research Assistant

Project Objectives

- To reduce intensity of Soil erosion on hilly tracks of the area
- To conserve the available surface water of the area
- To increase agricultural production and productivity.
- To reduce the level surface runoff by land treatment.
- To improve ground water resources in the region.
- To conserve available vegetation and plantation of economically viable plants.

Geographical Area Coverage Under Project in District Shajapur

Five Villages of three blocks of Shajapur district

Name of Block	Name of Village	Area (Hact)	Total HH
Barod	1. Barda	943	162
" "	2. Barkheda	675	196
Susner	1. Khanota	1045	199
Agar	1. Mahudiya	1305	164
" "	2. Moyakheda	1182	100
	Total	5150	821

Caste wise Distribution of Households in Project Area

Caste	Barda	Barkheda	Khanota	Mahudiya	Moyakheda	Total	% to total
General	30	44	49	1	0	124	15.10
OBC	75	109	95	114	62	455	55.42
SC	57	43	55	49	38	242	29.48
Total	162	196	199	164	100	821	100.00
% to total	19.73	23.87	24.24	19.98	12.18	100	

Activities of Project

- PRA and Baseline Survey of Five Villages
- Distribution of HYV Seeds (Gram)
- Income Generating Activities
- Formation of Seed Bank in Each Village
- Demonstration and Introduction of Vermi-compost
- Increasing Forage Production.
- Human Development Activities (Capacity Building of Farmers)
- Dissemination of Information and Technology
- Documentation and Photography

Past Activities

- **Baseline Survey of Five Villages**
- **Participatory Rural Appraisal of five villages**
- **Formation of Natural Resource Management Committees in all five villages**
- **Preparation of GIS Maps of all five villages**

Distribution of HYV Seeds for Rabi Crop-Gram (2008-09)

Village	No of Beneficiaries	Total Area (Bigha)	Quantity of Seeds (Kg)	Total Production (Qt)	Productivity (Qt/Bigha)
Berda	4	8	160	13.00	1.63
Berkheda	2	4	80	7.50	1.88
Khanota	0	0	0	0.00	0.00
Mahudiya	10	20	400	31.75	1.59
Moyakheda	9	18	360	29.50	1.64
Total	25	50	1000	81.75	1.64

Present Status of project

SN	Activity	Target	Achieved
1	Vermicompost(No of units)	25	15
2	NADEP(No of units)	10	0
3	Trial Plots (No of Beneficiaries/ hactares Covered))	KHARIF 75	KHARIF 66.5
	(INM, Residual etc)	Rabi 25	Rabi 25
4	Gliracedia Plantations(No of Saplings)	350	300
5	Kitchen Garden (No of Beneficiaries)	50	40
6	Drip Irrigation (No of Plots)	5	5
7	Animal Inseminations (No.)	facility is not available with the organisation	
8	Farmer's Day	Kharif 1	Kharif 1
		Rabi 1	Rabi 1
9	Farmers Training programme (With Subect and Visit)	8	8
10	Animal health Camps	2	2
11	Seed bank Status (Name of Seed bank)	2	2
12	Forage production(In Hectares)	15	10
13	Exposure visit	1vermi,1kvk,1horti,1icrisat,1Iiss	1vermi,1kvk,1horti,1icrisat
14	village level environmental clubs	5	5
15	farmers clubs	5	5
16	Soil testing	100	100

Seeds & Inputs Distribution Details- Kharif-09

N o	Seeds & Fertilizer	Stock	Distribution (Kg)	Cost	Farmers	Unit
1	Zink Sulphate	80	43	43000	30	Bag
2	Agribor	23.5	14.1	2115	47	Gram
3	Soybean 9305	51	51	89250	43	Qt
4	Red Gram /Tuwar	50	49	980	22	
5	Black Gram (Urad)	52	52	1040	14	
6	Green Gram (Mung)	50	48	1200	29	
7	Jowar	50	49	735	14	
8	Groundnut	30	29	580	8	
9	Yellow Maize	100	50	3000	10	Kg
	Total			141900	217	
	Amount Received (Farmrs' contribution)			94965		
	Amount Due			46935		

Seeds & Inputs Distribution Details- Rabi- 09

Seeds &Input	Stock	Distribution	Cost	Farmers	Unit
Zink Sulphate	37	13	9750	11	
Agribor	47.3	19.2	1152		Gram
Gram	10			11	Qt
JG226	520	360	9000	6	
Vishal	480	240	6000	5	
Wheat	5			11	Qt
JW 3020	240	240	4200	5	
M1418				6	
Total			30102		
Amount (Receipt)			9782		
Amount Due			26720		

Seed Distribution (soybean)-Kharif ATMA

Sr. No	Village	No. of Farmers	Quantity of Seeds (Kg)
1	Khanota	10	1000
2	Barkheda	05	500
3	Mahudiya	02	150
4	Barda	02	150

Seed Distribution – Rabi (gram) ATMA

Sr. No	Village	No. of Farmers	Quantity of Seeds (Kg)
1	Khanota	11	1000
2	Mahudiya	06	475
3	Barda	02	200

Fodder Development

Sr. No	Village	No. of Participant farmers	Area (Bigha)
1	Barkheda	5	3.5
2	Mahudiya	4	2
3	Khanota	6	4
4	Moyakheda	1	.5

Kitchen Garden

Sr. No	Village	No. of Participant farmers	Area (Bigha)	Crops
1	Moyakheda	7	5.5	Tomato, Brinjal
2	Mahudiya	14	13.25	Okra, Tomato, Brinjal
3.	Barkheda	11	10.5	Cabbage, Pea, Tomato, Cauliflower, Brinjal, Okra
4	Khanota	02	3	Okra, Tomato, Brinjal

Kitchen Garden

Glericidia Plantation

Name of Farmer	Village	Plants
Sardarsingh / pursingh	Barkheda	250
Pawatsingh / Ratanlal	Mahudiya	50

Animal Health Camps

Farmers	Animal	Village
84	575	Barkheda
76	1073	Mahudiya

Drip irrigation system

Sr. No	Name of Farmer	Village
1	*Sardarsingh / Pursingh*	Barkheda
2	*Sivlal / Amraji*	Barkheda
3	*Kailash / Sardarsingh*	Barkheda
4	*Sajansingh / Nansingh*	Barkheda
5	*Sivlal / Daryawsingh*	Mahudiya
6	*Parwatsingh / Ratanlal*	Mahudiya

Drip irrigation system

Income Generating Activities

(A) Details of Self Help Groups in the ICRISAT Project Villages

SN	Name of Village	Name of Self Help Group	Date of Formation	Total Members		Monthly Saving (Rs)	Total Saving (Rs)
				Male	Female		
1	Barkheda	Radha Swami	29.01.2009	0	11	20	660
2	Barkheda	Jai Maa Annpurna	29.01.2009	0	11	20	660
3	Mahudiya	Jai Dev Narayan	30.01.2009	0	11	50	1650
4	Barda	Ram Rahim	01.04.2009	0	11	20	220
	Total	4		0	44		3190

(B) Development of Nursery

SN	Name of Farmer	Village	Total Area (Bigha)
1.	Nain Singh s/o Inder Singh	Barkheda	1.0
2.	Sardar/ Pur Singh	Barkheda	0.5

Formation of Seed Banks

SN	Village	Name of Person	Quantity of Seeds (Qt)
1	Berda	Rajendra Singh	3.00
2	Berkheda	Sardar Singh	3.00
3	Khanota	-	-
4	Mahudiya	Ramesh Kumar -3.00 Parwat Singh -5.00 Karan Singh -1.00	9.00
5	Moyakheda	Bapu Lal	1.50
	Total		15.00

Introduction of Vermi compost

Name of Farmer	Village	Janpad	No.
Shiv Lal Dereyav Singh	Mahudiya	Agar	1
Rana Vikram Singh	Khannota	Susner	5
Sardhar Singh	Barkheda	Barod	4
Nen Singh Inder Singh	Barkheda	Barod	4
Shiv Lal Ram Singh	Moyakheda	Agar	1
Ramesh Kishan lal	Khannota	Agar	1

Human Development Activities

(Capacity Building of Farmers)

(A) Farmers Training Programs.

SN	Village	No of Trainings	No. of Participants
1	Berda	1	15
2	Berkheda	7	247
3	Khanota	4	122
4	Mahudiya	6	187
5	Moyakheda	1	41
	Total	19	612

Dissemination of Information and Technology

1. Arranging Village Level Meetings - 60
2. Farmers Training Programs- 19
3. Consultation with Research Organisations.
   1. KVK, Shajapur
   2. Agricultural Collage, Sihore
   3. Agricultural University, Jabalpur
   4. IDE (India), Bhopal
   5. District Horticulture Department, Shajapur

Farmers from Dhar, Ujjain, Dewas and other Janpads of Shajapur visited our project area to witness different interventions

Linkages developed with Other Departments

1. Agricultural Department, Agar.
2. Horticulture Department, Agar
3. Krishi Vigyan Kendra, Shajapur.
4. Suzlon Foundation, Indore.
5. International Development Enterprises (India), Bhopal.
6 Agriculture Technology Management Agency (ATMA)
7 IWMI/ FAO

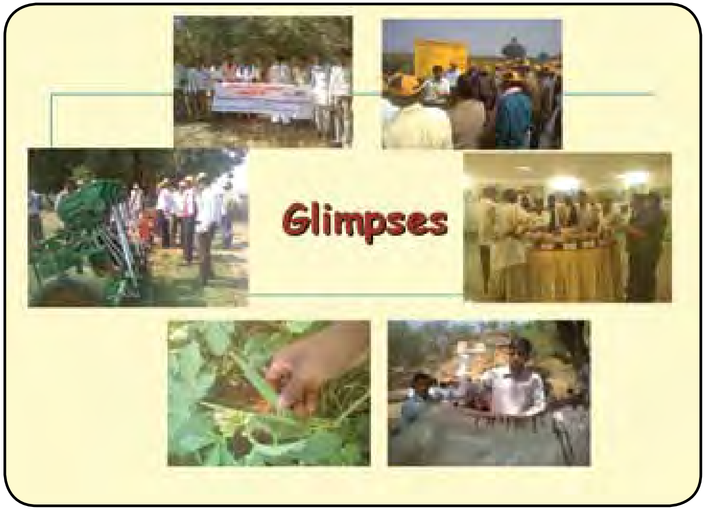
Problems in the Project Execution

1. Delay in Required Inputs i.e. Seeds, Fertilizer, Nutrients etc.
2 . Unavailability of Soil Testing Reports

Future Plan

- Regular meetings with villagers.
- Dissemination of vermin pits in the Villages.
- Identification of Beneficiaries and Estimation of their Seed Requirements for Kharif Season.
- Introduction of Artificial Insemination technique
- Detail Analysis of Integrated Nutrient Management.
- Dissemination of Drip Irrigation.
- Establishment of Kitchen Gardens among Farmers
- Monitoring of Agricultural Research Activities under the ICRISAT guidance.
- Formulation of New Project According to Peoples Needs.


Glimpses


Glimpses


Glimpses


Thank You
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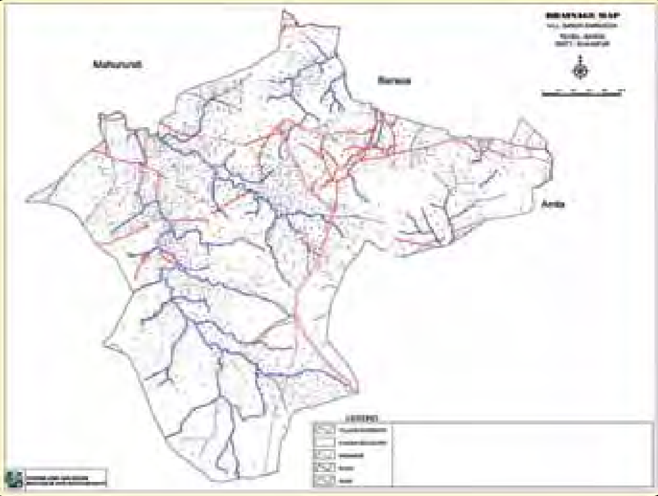
Application of Advanced Technology

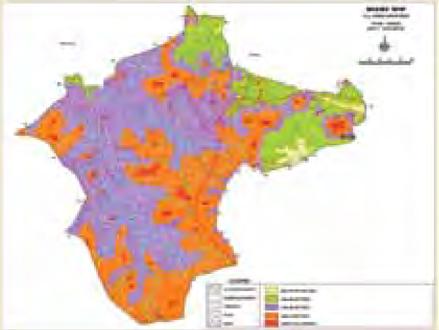
GIS Based Planning and Mapping of Project Area

(Suzlon Support)



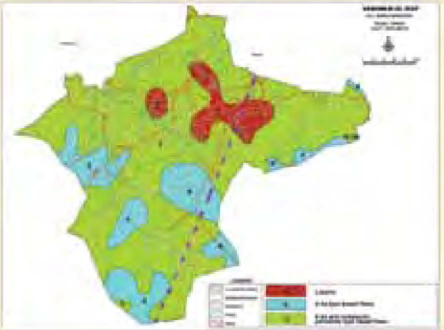
Barda Barkheda

Relief Map



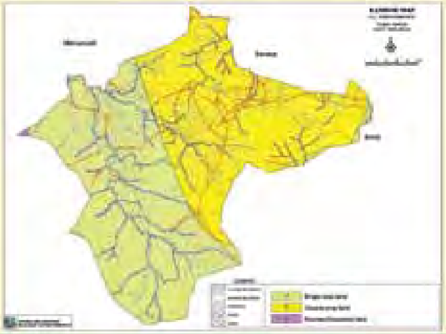
Barda Barkheda

Geological Map



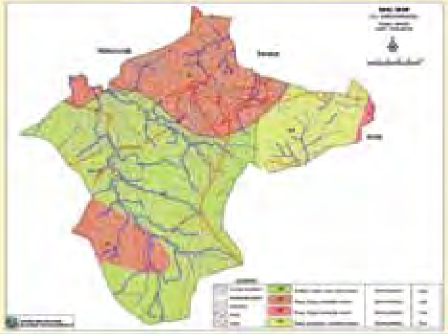
Barda Barkheda

Land use Map



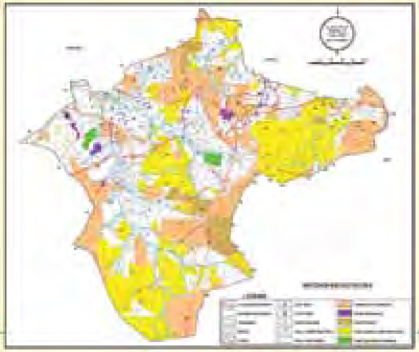
Barda Barkhed

Soil Map



Barda Barkheda

Watershed Activities



Thank You

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TATA-ICRISAT-ICAR PROJECT

Improving Rural Livelihoods and Minimizing Land degradation through the Community Watershed Approach for Sustainable development of dry land Areas

Presented by

DEEP Development Research Foundation Institute

District Tonk & Sawai Mathopur (Raj)

Project Location

Bio physical characteristics of the watershed village

Village Name	HH	Land use pattern (ha)					
		Forest	Irrigated	Un irrigated	Cultivable waste land	Uncultivable Waste land	Total
Dharola & Bairwa ki Dhani (Tonk)	106	623	84	296	117	122	1242
Juwar (Sawai Madhopur)	157	83	312	585	71	78	1129
Total	263	706	396	881	188	200	2371

Challenges in Semi arid regions

- Land degradation
- Water scarcity
- Low Productivity
- Poverty
- Population explosion

Objectives

- Community watershed approach at nucleus benchmark watersheds for enhancing productivity and reducing land degradation in two districts and to use these sites as centers of learning for scaling-out the benefits across the two districts.
- To scale-out the benefits of productivity enhancement and community watershed management with technical backstopping in the target agro-eco-region of Rajasthan
- Capacity building of lead farmers, development workers, and consortium partners in the target region, and provide technical support to the development agency in the area of community watersheds through establishment of a National Support Group for community watershed development.

Goal

To improve livelihoods through sustainable use of natural resources by undertaking science-led development in consortium mode with equity and inclusion in Semi arid agro eco regions

Project Activities

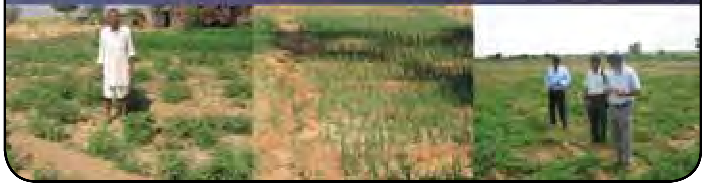
- Baseline survey
- Constraint identification
- Farmers' participatory evaluation & Selection of varieties
- Micronutrient amendment balanced nutrient mgmt trials
- Village level seed banks
- Vermi composting
- Capacity building
- Water saving technology
- Convergence of on going Government activities
- Breed improvement in small ruminant

Crop diversification

District	Village	Season	Before project	After project
Tonk	Dharola & Bairva ki Dhani	Kharif	Maize, Pearl Millet, Sesamum, Groundnut, Black/Green Gram, Sorghum	Use the HYV of GN and increased the area of Maize crop
		Rabi	Mustard, Wheat Gram, Barley	Mustard, Wheat Gram, Barley
		Zaid	Lucerne crop for fodder	Sorghum, Vegetables (Onion, Okra, Chilly & Cucumbers, Bitter gourd

Continue

District	Village	Season	Before project	After project
S.Madhopur	Juwar	Kharif	Bajra,Sorghum, Sesame,	Maize, G.Nut, Bajra,Sorghum, Sesame
		Rabi	Wheat, Mustard, Gram	Wheat, Mustard, Gram
		Zaid	Lucerne for Fodder	Sorghum & Vegetables



Convergence of the programs

- Farmer's Participatory Action Research Project ICRISAT
- Water saving technology with Department of Agriculture Extension
- Cleft lip & Palate with Chirantana trust Bangalore & smile train America

Crop demonstration in Kharif 2009

Inter crop trail with Maize in Dharola

Different between INM & Farmers practice on G Nut crop in Dharola

Fodder crops in Dharola village

Maize crop with INM Practice (Kaveri 235)

Crop Demonstration in Rabi 2009-10

Gram (JG 11) with INM

LOK-1 with INM

GoR officers visited the Mustard crop trails in Dharola

Gram (JG 11) with INM

Water saving technologies

Sr. No.	Technology	Village	Crop	Area (ha.)
1	BBF thru Tropicultor	Dharola	Groundnut	1.65
2	Furrow system	Dharola & Juwar	Vegetables	32.0
3	Sprinkler irrigation	Dharola & Juwar	G.Nut, Bajra.	14.0
4	Ridge & furrow system	Dharola & Juwar	Maize	7.0
5	Farm pond	Juwar	Wheat, Mustard, Gram	4*
				58.65

Ave. Crop yields from Tonk & Sawai Mathopur watersheds with best-bet nutrient management in TATA –ICRISAT project

Crop	Farmer's Practice		Best bet Practice	
	Tonk	S. Mathopur	Tonk	S. Mathopur
[illegible]	3.0	0	7.5 (150)*	0(0)*
[illegible]	9.0	12.4	25.8(186)*	24(93)*
[illegible]	11	16.5	34 (209)*	34.8 (110)*
Wheat	23	25.0	40 (74) *	40.5(62)*
Gram	11.3	11.2	16.7(39) *	16.3 (45)*
Mustard	12.2	11.2	16.4(34)*	16.6 (48)*

Capacity building in project Area

Training
- Integrated Nutrient Management
- Integrated Pest management
- Water Harvesting & management
- Organic farming
- Seed treatment
- Soil testing and their management

Exposure visit
- ICRISAT
- ICAR New Delhi

Farmers day
- One in Kharif & second in Rabi

Vermi composting

Objectives

1. Proper utilization of Animal dung's and maintain the maximum nutrients.
2. Reduce the dependency of chemical fertilizers and promoted to organic farming.
3. Improve the Soil as well as human health.

Work Achieved

S.No	Target	Unit Target	Achievement
1.	Baseline surveys in five villages of each the two districts using detailed household surveys and PRA methods.	2 district	Completed
2.	Productivity enhancement trials 100 ha season for two seasons (seed and fertilizer inputs @ 50% cost will be provided)	50 ha X 2 seasons X 2 district	30 ha area and 68 families have been covered under kharif season 50 ha area and 77 families have been covered under Rabi season
3	Efficient irrigation management for enhancing water use efficiency	Revolving fund X 2 districts Operational expenses X 2 districts	14 ha. Area covered under the Sprinkler irrigation in two district
4	Increasing forage production (to cover seed + fertilizer cost subsidy for the farmers)	25 ha. X 2 district	25 ha area & 50 families have been covered under forage production. 50 families have been covered under area treatment.

Continue...

5	Diversification with high-value vegetables with micronutrient and land form/irrigation treatments	25 ha X 2 districts	33 ha. area & 40 families have been covered in two district
6.	Revolving fund for income generating activity for Vermicompost	10 Nos	Completed (5 in Dharola village Tonk distt. & 5 in Juwar village Sawaimadhopur distt.)
	Goat Rearing	10 Nos	Farmers not ready to take the flock thru revolving fund
7.	Enhancing soil fertility	2 villages in 2 districts i.e. 2500 running meters	Gliricidia plants nursery raising in village – Dharola, distt. Tonk (2500 plant) & in village-Juwar, distt. Sawaimadhopur(2500plant)
8.	Strengthening environment Club	3 Nos	Completed

Continue...

9.	Human resources development activity for skill enhancement	15 progressive farmers X 2 districts 25 farmers per course X 3 courses	As per direction of ICRISAT we have conducted the exposure visit with 11 progressive farmers in ICRISAT and Three training course completed
10.	Documentation, photography and videography	—	Farmers' Video Documentation have been sent to ICRISAT
11.	Dissemination (Farmers' Day)	2 districts (2 in each district)	Completed one in Rabi (S. Madhopur) & Kharif (Toka). The two district farmers day celebrated jointly.

Other Achievement


Continue....


Continue...


Thank you

Objectives

- To consolidate the science-led farmer-centric community watershed approach at nucleus benchmark watersheds for enhancing productivity and reducing land degradation in 5 districts and to use these sites as sites of learning for scaling-out benefits in the 5 target districts.
- To scale-out the benefits of productivity enhancement and community watershed management with technical backstopping in the target agro-eco region of Rajasthan.
- Capacity building of lead farmers, development workers and consortium partners in the target regions and provide technical support to development agencies in the area of Community Watershed.

PROJECT LOCATIONS

CRITERIA OF SELECTION

- At least four years old treated watershed area
- Low Productivity & Low level of micro nutrients in the area

Scale up Of Programme

S.N.	DISTRICT	2008-09 (Villages)	2009-10 (Villages)
1	Bundi	03	05
2	Banswara	03	05
3	Bhilwara	03	05
4	Alwar	03	05
5	Jhalawar	03	05
TOTAL		15	25

STATUS OF PRODUCTIVITY

Crop	District Wise Productivity (2002-2003) Kg. per (Ha.)				
	Alwar	Bhilwara	Bundi	Banswara	Jhalawara
Maize	193	266	433	1363	1250
Soybean	1000	587	342	1765	498
Chickpea	489	633	664	624	588
Wheat	3149	2080	2453	1481	2333

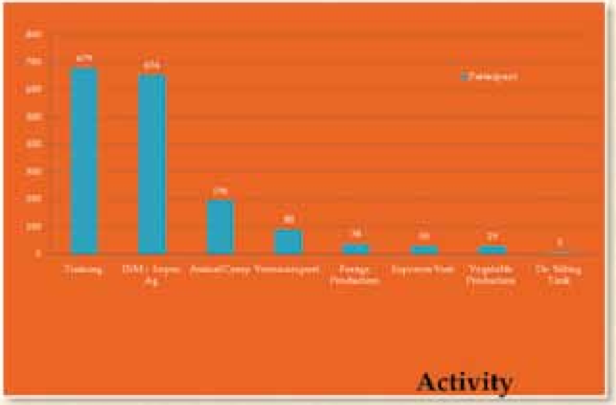
Information Source:-Krishi Vikas Diary Dept. of Ag. Raj.

Status of Soil Health

Indicator	Districts									
	Alwar		Bhilwara		Banswara		Bundi		Jhalawar	
	O.V.	Remark	O.V.	Remark	O.V.	Remark	O.V.	Remark	O.V.	Remark
Soil pH (1:2)	8.5	Normal	8.5	Normal	7.0	Normal	8.5	Normal	8.6	Alkaline
Electrical Conductivity (dSm-1)	0.24	Normal	0.21	Normal	0.17	Normal	0.21	Normal	0.23	Normal
Organic Carbon (%)	0.41	Low	0.74	Normal	0.38	Low	.59	Normal	0.55	Medium
Available Phosphorous (mg Kg-1)	40	High	3.80	Low	2.60	Low	6.2	Normal	14	High
Available Potassium (mg kg-1)	91	Medium	38	Low	52	Medium	91	Medium	67	Medium
Available Sulfur (mg kg-1)	15.2	High	5.0	Low	9.3	Low	9.25	Low	5.5	Low
Available Zink (mg kg -1)	0.26	Low	0.54	Low	0.26	Low	.65	Low	0.60	Low
Available Boron (mg kg-1)	0.46	Low	0.56	Low	0.16	Low	.45	Low	0.46	Low

Note- Zinc & Boron Deficiency is observed in the area (base year -2008)

Trend of Activities



Physical & Financial Coverage

Particular	Remarks
No. Of Distt. / Block / Villages	05 /05/ 25
Family covered	1276
Area covered (Ha.) INM + Forage + Improved Agri.	500
Granted Amount Against the Expenditure (up to march 2010)	9,28,497

Mirror of Year 2009-2010

S.N.	Activity	Unit	Trg.	Achi.	Variance	Reason of Variance
1	Trials	Ha.	500	500	Nil	
2	Vermi composting	No.	110	90	20	Participants have been selected & activity in progress
3	Forage Production	Ha	75	38	37	Lack of resources (Drought condition)
4	Vegetable Production	Ha.	75	6	69	Lack of resources (Drought condition)
5	De-silting Of tanks	No.	5	5	0	
6	Gliricidia Plants	No.	20000	5000	15000	Availability of seed is limited
7	Live stock Dev. Centre	No.	5	5	Nil	
	Animal Camp	No	0	3	+3	
8	Dissemination through Farmers day	No	10	10	nil	
9	Exposure Visit	No	1	1	Nil	
10	Training	No	15	15	nil	

Performance At A Glance

A. Soil fertility Enhancement Activity

1.1 Moisture improvement through deep plowing

- No of Participant - 115
- Area Covered - 23
- Impact –Effective for Weed & pest control and Average Yield is observed higher Then Other Plot

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1.2 INM Trial

Treatment plot	Control plot
• Size -2000sq.mt. • Seed- Rec. Seed Rat • Ryzobium & PSB / Trichoderma • DAP - 11 Kg. • Urea – 21 Kg. (Wheat & Maize) • Gypsum -32 Kg. • Zinc – 5 Kg. • Agribore - 400 gm.	• Size - 2000sq.mt. • Farmer Practices

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Economic Trend of INM (Maize Crop)

Plot size	2000 Sq.Mt
Given Additional inputs (A)	Zinc (Rs.150) Agribor (Rs.100) DAP(Rs.119) Gypsum (Rs.32.) Urea (Rs.105) Total(Rs.577)
Additional man days (B)	Rs.200
Value of Additional input (A+B) per plot	Rs.777
Value of Additional input per Ha.	Rs. 3885
Additional Grain yield per plot (a)	4.95 Qt.
Value of (a) @ 700 per Qt. 4.95x700=3465	Rs. 3465
Additional Straw yield per plot (b)	2.5 Qt.
Value of (b) @ 150per Qt. 2.5x150=	Rs.375
Value of (a+b) per plot	Rs. 3840
Value of Additional return per Ha.	Rs. 19200
Ratio of Additional of input - output	1:4

Increasing Consumption of Micro Nutrients

Name of Shop	Available Micro nutrients	Annual Consumption	Remark
Naruka Seed & Fertilizer Bhandar Shankar Seeds& Fertilizer Bhandar Charbhuja Seeds and Fertilizer Village - Devji Ka Thana	Zn,B.S.	5.50 To 6.0 Qt.	I didn't keep any micro nutrient before 2006.But demand is gradually increasing in the area . Shopkeeper :- Sohan Singh Naruka

Local fertilizers at shop in Thana

Local fertilizers of shop in Thana village

B. Varietal trials

Session	Crops	Varieties
Kharif	Maize	Mukta , Kaveri 235, Rupa-2266, Rana-2201 ,Star-1, All Raund
	Black Gram	T-9
	Soya been	JS-335
	Pearl Millet	Co(Cu-9)
Rabi	Wheat	Lok-1, Raj-3765
	Mustard	Madhuri ,Boi-902
	Chick Pea	ICVVV-37, ICVV-10

Due to varietal trials seed replacement rate is increased in project area

Major Observations

Crops	Indicator	Control Plot		Treatment Plot		Variance
		Range	Mean	Range	Mean	
Maize	Grain yield per plot (in Qt.)	1.60-7.44	4.52	3.84-15.10	9.47	**+4.95** (Yield of treatment plot will be 47.35 Qt. per ha. . It is nearly three and half time higher than average productivity (13.63Qt.)of Banswara Distt. Of base year) .It is also 100%higher as compare to control plot.
Soybean	Grain yield per plot (in Qt.)	1.28-2.28	1.78	1.80-3.84	2.64	**+0.86** (Yield of treatment plot will be 13.2 Qt. per ha .It is nearly four time higher than distt. Productivity (3.42Qt.)of Bunch of base year .It is 49 % higher than control
	Straw yield per plot (in Qt.)	2.74-3.62	3.18	4.77-6.96	5.86	**+2.68** (yield is 84%higher then control plot)
Wheat	Grain yield per plot (in Qt.)	2.44-5.55	3.99	3.77-7.33	5.55	**+1.56** (Yield of treatment plot will be 27.75 Qt. per ha. .It is near to distt. Productivity (31.49 Qt.) Alwar of Base year)
	Straw yield per plot (in Qt.)	4.52-7.4	5.96	5.0-9.40	7.2	**+1.24** (yield is 20.80%higher then control plot)
Chickpea	No. of nodules per plant (in Qt.)	25-45	35.0	35-78	56.0	**+21.0** (nodule formation is 60 % higher then control plot)
	Grain yield per plot	0.88-2.0	1.44	1.33-3.44	2.38	**+0.44** (yield is 20 % higher than control plot)

C. रोड़ी की बजाय केंचुए की खाद तैयार करे , उत्पादन भरपुर प्राप्त करें ।

- Participants 110
- No. of Villages 12

D. Fodder Demonstration

- Participants 190
- No. of Villages 10

2.Dissemination Tools

Farmers day - 10

Participants -1276

Interventions	Ben.	No. of Animals
AI	1290	885
Confirm Pregnancies	1290	885
Deverming & Vaccinations	196	631

Trend of Adoption

Technology	Previous Status	Present Status
Use of Improved Seed	3 to 4 %	40 to 50 %
Use of Micro Nutrients	Nil	35 to 40 %
In case of vegetable	Nil	60 to 70 % (Alwar)& 15to20% (other)
Use of Tropicultor	Nil	Limited (Bullock drawn should be modified as a tractor drawn)
Inter Cropping	5 to 10%	35 to 40 %
Crop Diversification	Maize – Wheat / Gram (more then 60%)	Maize +soybean – onion – wheat – Ladies finger / onion/chari (10 to

Eco-Club - 4

Exposure – 14 Member

Subject	No. of Participants
Master Trainers Training	98
Water shed Management	230
Improved Agriculture	196
Improved Small Animal Rearing (Goat)	237
Training Cum Exposures ICRISAT, Hyderabad	30

"Children are cheepast mean of extension of best practices"

"Different trainings are help full to change the mind set of communities & increased the rate of adoption"

Farmers Perception

- Compulsory contribution is the constraint for marginal farmers
- Farmers are getting improved seed and they stored for next generation
- Farmers realized low infection & infestation of pest and diseases in case of micro nutrients.
- Participants show the interest about Exposure & training during FGD.

	Project Team Level	Community Level
Learning's	Capacity building of project team due to •Development with Research attitude •High level scientific interaction and participation in qualitative seminar •Participatory research •Technical knowledge bank •Clarity about climatic & weather measurement •Replication of technologies in other areas	Increased community participation due to •Live extension through research (treatment plot) •Technical support on field •High level training & exposure •Need based rain fed interventions •Experience sharing through meeting & farmers day •Environmental awareness & varietal awareness
Constraints	•Technical data collection & monitoring is difficult due to standing crops. •There is no provision of higher studies /short term courses to groom resource persons/ competent local youth to enhance the productivity after post project period as withdrawal policy ..	•Participations of marginal farmers is limited due to cash contribution •Irregular climatic changes •Lack of crop insurance facility

Sirohi is the key of success

A meeting was attended by Ramesh s/o Shri Ratan lal in village Govrdhanpura.he got information about sirohi buck. Which is fast growing breed.

He decided & bought the one buck by the assistance of KVS in three thousand rupees.

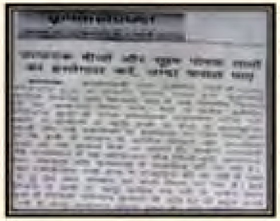
After two years he had got 55 new kids in herd .

After , 3 years

Ramesh earned Rs.75000 from sell of kids & also maintained 70 He & She goat. At present 15 Sirohi bucks are available in herd.

Ramesh / Ratan Lal

Sirohi is the key of my goat unit . Today I am happy due to this business .



M e d i a

Action Plan Year 2010-11

S.N.	Activity	Unit	Target	Unit cost	Q-1	Q-2	Q-3	Q-4
1	Improved Agri. Trials INM Trail Varietals , Inter cropping	Ha.	500	100	-	250	250	-
2	Vermi composting	No.	50	3000	20	15	15	
3	Forage Production	Ha	100	500	-	50	30	20
4	Vegetable Production	Ha.	80	1000	-	40	40	
5	Seed bank through SHG	No.	15	10000	-	-	15	-
6	Gliricidia/Sasbenia Plantation on bunds	No. of participants	200	200	-	20000	-	20000
7	Livestock support (Large ruminants) through Insemination	No. family	400	200	25	25	50	100
8	Dissemination through Farmers day	No	10	15000	-	-	5	5
9	Exposure Visit	No	75	2500	-	1	-	-

Action Plan Year 2010-11 Cont ....

S.N.	Activity	Unit	Target	Unit cost	Q-1	Q-2	Q-3	Q-4
10	One day Tanning Programme	200Rs per day per participants	25farmers perseason	10000 per district		25	25	-
11	Focus Group Discussion on Trials	No.	30	500		15	15	
12	SHG	No.	15	7200				
13	IGA through Revolving fund	No.	5	10000				
14	Support to Eco club	No.	10	5000	-	10	-	-
15	Travel cost 1.Field level 2. Monitoring level	Distt. 2000x12x5	5	20000 24000	-	-	-	-
16	Field Level Man Power for data collection & extension activities	Hac	500	200	-	50000	50000	-
17	Documentation	No	5	15000	-		-	
	Contingency	Distt.	5	40000	-	-	-	-
	TOTAL							

Strategies for Forage Production in Rainfed Areas and Feeding Livestock during Drought

Dr. Suresh C. Alagundagi
Professor of Agronomy
University of Agricultural Sciences,
Dharwad – 580 005, Karnataka

Some facts

India is the largest livestock holding country in the world and its present livestock inventories exceed 520 million.

India supports

55% of the world's buffaloes
16% of the world's cattle
20% of the world's goats
4% of the world's sheep

India is a house to 16% of the human population to be sustained on approximately 2% of total geographical areas.

(Source : winter school notes on "Strategies for sustainable livestock production in Arid zone, 29th Oct. to 27th Nov. 2003, CAZRI, Jodhpur)

Land use pattern in India

Particulars	Area
Total geographical area	328 m.ha (2%)
Total cultivated land	150 m ha (46%)
Rainfed cultivated area	100 m ha (67%)
Irrigated cultivated area	50 m ha (33%)
Cultivated area under fodder crops	6.6 m ha (4.4%)
Forests, grasslands and other uses	75 m ha

Source : Watershed development in Karnataka state – UAS Bangalore

Scenario of fodder availability in India till 2025

(In million tonnes)

Year	Supply			Demand			Deficit as % of actual demands		
	Green	Dry	Total	Green	Dry	Total	Green	Dry	Total
1995	379.3	421	800.30	947	526	1473	59.85 (568)	19.85 (105)	(673)
2000	384.5	428	**812.5 (53%)**	988	549	**1537**	61.10 (604)	21.93 (121)	**47.00 (725)**
2005	389.9	443	**832.9 (52%)**	1025	569	**1594**	61.96 (635)	22.08 (126)	**48.00 (761)**
2010	395.2	451	846.2	1061	589	1650	62.76 (666)	23.48 (138)	(804)
2015	400.6	466	866.6	1097	609	1706	63.50 (698)	23.58 (143)	(839)
2020	405.9	473	878.9	1134	630	1764	64.21 (728)	24.81 (157)	(885)
2025	411.3	488	899.3	1170	650	1820	64.87 (759)	24.92 (162)	(921)

Source: Draft report of the working group on animal husbandry and dairying for five-year plan (2002-2007, Govt. of India, Planning Commission, August 2001).

Resource constraints for fodder production

- Increased pressure due to human and livestock population
- Low economy of farmers
- Misuse/over use of resources
- Non scientific cultivation practices
- Aberrent weather situations

Important Forage, Pasture crops and Top feed trees

Irrigated	Rainfed	On field bunds
A) Grasses / Cereals Hybrid Napier Guinea Para Green panic Rhodes Signal Deenanath Sorghum (multicut) Maize Oat	Anjan Signal Rhodes Green panic Blue panic Deenanath Dicanthium (Marvel) Chrysopogon (Dhavalu, Gonji) Sehima (pavan) Nandi Setaria Paspalum, Bajra & Sorghum	Signal Blue panic Paspalum Panicum coloratum Vetiver (Khus)
B) Legumes Lucerne Berseem Stylosanthes Siratro Centrosema Calopogonium Cowpea Field bean	Stylosanthes Atylosia Siratro Centrosema Kudzu (Pueraria tuberosa) Desmodium Horsegram Local legumes Cluster bean	Stylosanthes Dashrath grass (Desmanthus)

c) Fodder shrubs Calliandra Glyricidia Mulberry Desmanthus (Dashrath) Erythrina Sesbania sesban (Shevari) Sesbania grandiflora (Agati)	Calliandra Glyricidia Mulberry Erythrina Prosopis juliflora	Calliandra Glyricidia Mulberry
D) Fodder trees Subabul Drumstick Erythrina Sesbania sesban (Shevari) Sesbania grandiflora Bauhinia purpurea	Hardwickia binata (Anjan) Albizia lebbec (Bagi, Siris) Dalbergia sissoo Babul (Acacia sp.) Subabul Bauhinia purpurea Gmelina arborea (Shivani) Prosopis cineraria (Khejri) Azadirakta indica (Neem) Melia azadirakta Fig Ficus religiosa F. bengalensis Wild almond	Ailanthus excelsa, Ardu Agati Erythrina Subabul Drumstick

In view of the profitability and complementarity of **crop-livestock production system**, successful integration of forage crops in existing cropping systems in rainfed areas is imperative to utilize the resources efficiently and to improve the forage resources

Food-fodder production system for dryland areas (sequential cropping system)

In Dryland areas with black soils

* Forage sorghum – lentil
* Sorghum for fodder – gram
* Sorghum for fodder – safflower
* Cowpea as cover crop during *Kharif*

After harvesting grain crops, *Rabi* forages such as senji, vicia, fodder type safflower and barley on residual moisture

Some of the other approaches

In traditionally monocropped red soils

a) Intercropping of forages in

* Grain : sorghum + cowpea/sunhemp/mothbean / *S. sesban*
* Grain pigeonpea + forage sorghum / teosinte / maize / bajra
  sudangrass / deenanath grass / cowpea / cluster bean / sunhamp

b) Ratooning pearl millet for fodder and grain production

c) Over seeding of *Stylosanthes* in cereal crops like maize, sorghum and pearl millet

d) Ley farming (food-fodder production system)
ex: Grain sorghum after 3 years of continuous crop of *S. hamata* / *Cenchrus ciliaris* + *S. hamata*

Alley cropping (Avenue / Hedge row cropping / Agri –Silvicultural System)

It is an important land use option to stabilize the productivity of arable crops and meet the multiple needs of the farmers in risk prone dry land areas.

The promising examples are:

Acacia albida alleys + Nandi grass
Acacia albida alleys + Signal grasses
Acacia albida alleys + Anjan grass
Sesbania sesban alley (4m apart) + sorghum
S.sesban alley (4m apart) + Intercropping of gram in forage Sorghum-gram sequence.

As a result of thrust given for increasing food production, more and more of the marginal and sub-marginal lands and other wastelands not suitable for farming are put to cultivation for increasing crop production which is doing more harm to soil health through enhanced soil erosion, increased siltation of waterways and desertification of the arid and semi-arid land.

Silvipasture System

Integrated silvi-pastoral system of farming has been recognised as low input technology for the utilization of marginal, sub-marginal and other wastelands which compose of about 50 per cent of the total land for meeting the shortage of forage besides fuel wood and timber.

Vegetative Barriers

These include rows of perennial grass, hedges, wind brakes and shelter belts etc., on contours. Barriers across the gully in rows with different species, consisting of close growing grasses, shrubs and fast growing trees that may have some value as fuel, fodder etc., are preferred.

Soil and Moisture Conservation

An experiment on the effect of vegetation cover on run off and soil erosion was conducted at Central Research Farm Jodhpur for 3 years from 1993-95. The data revealed that the average run off as percentage of total rainfall was maximum from bare plot (16.03%) followed by plots under *A. tortilis* (14.23%) and *C. mopane* (12.63%) and least (5.69%) in sown pasture of *C.ciliaris*. The loss of soil from bare field was 6 times higher than sown pasture of *C. ciliaris* and 2 to 4 times higher than tree plantation and it was about 1.5 times higher than the plot of cluster bean. *C. ciliaris* produced average dry forage 2 t/ha. The average grain yield of cluster bean was 600 kg/ha. The average annual rainfall received during 1993, 1994 and 1995 was 322, 572 and 337 mm,

Feeding strategies and Management of Livestock during Drought

Feeding strategies

* Harvest the grain crops like maize, jowar, bajra and minor millets for fodder purpose at flowering stage
* Kharif sorghum can be harvested for fodder and ratoon should be allowed for grain production.
* Forest tree leaves [lower branches with foliage (40%)] can be pruned and used to feed the livestock.
* Chaffing of dry roughages to 1-2 inches length is essential to minimize the wastage by 30-40 per cent.
* Karda / Kadda can be collected from cultivated and non cultivated lands and can be used for feeding.
* Leftover dry roughages after feeding should be stored separately and re-fed after enrichment.

Enrichment of dry roughages

Crop residues such as wheat straw, paddy straw, maize / sorghum stovers, sugarcane bagasse and matured dry grasses are poor source of nutrients. Several treatments have been suggested to enhance their utilization.

* Salt water treatment
* Urea treatment
* Urea + jaggery / molasses treatment

Feeding of non-conventional fodder

* Grasses from forest, agro industrial by-products and damaged grains can be utilized for feeding.
* Chopped banana leaf and stem can be fed to the **livestock** to the extent of 1/3rd of its daily requirement.
* Sugarcane tops and bagasse can also be fed.
* By-products of fruits and vegetable industries *viz.*, mango, tomato, grapes and citrus fruit industry by-products can be used for feeding.
* Starch industry by-products may be used for feeding.
* Mango seed kernel, Babul pods, tamarind seeds, rain-tree pods, tapioca waste, cashew cake, palm extraction, groundnut shells, paddy husk, maize cobs, sunflower heads etc. can be used as feed during scarcity period.

Livestock management strategies

* Priority feeding : First priority should be given to milking, pregnant, draft animals and young calves. Then left over fodder should be fed to other animals.
* Feed / graze the animals during cool hours of the day (morning and evening).
* Water should be provided frequently.
* Showering the animals during mid-day.

Administrative suggestions

* Large quantity of dry fodder like jowar kadabi, wheat bhusa etc. available with farmers can be procured and distributed in the scarcity areas.
* Establishment of fodder banks near forest areas to procure and store the available forage.
* Government seed agencies be advised to keep stock of fodder crop seeds.
* If seeds of specific varieties cannot be procured in time, in sufficient quantities, dual / grain types or even F2's of hybrids can be used for sowing.
* Fodder tree species can be encouraged for planting along the road sides and in social forestry as against the species like *Eucalyptus* and *Acacia auriculiformis*.
* Growing of range grasses and legumes in waste lands and forest areas.

Conclusion

With the integration of livestock and crop production not only local resources can be effectively utilized but also management of waste of animal and crop can be done for improving the productivity of both i.e. crop and animals. This integration promotes concept of organic farming in which synergy of nature and components of production systems e.g. crop, animal etc. is utilized for sustainable production.

Guinea grass along irrigation channel

Para grass for water logged areas

Lucerne – Queen of forage crops

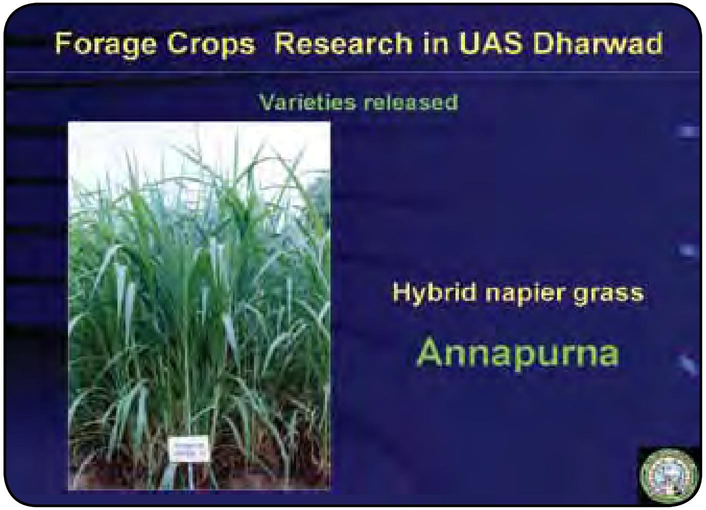
Stylosanthes legume fodder crop

Napier hybrid grass + siratro mixed cropping

Dalbergia sissoo with *Chrysopogon fulvus* + Stylosanthes

Teak + Guinea grass + Groundnut


Teak with Wheat in Agri-silviculture
Teak + subabul
Albizia procera with wheat in agrisilviculture


Forage Crops Research in UAS Dharwad
Varieties released
Hybrid napier grass
Annapurna


Guinea grass - Samruddhi


Guinea grass - Nandini


Fodder maize
Ksheeramrut


Fodder Sorghum
SSV-74


Fodder Bajra
Deenabandhu
DRSB-2

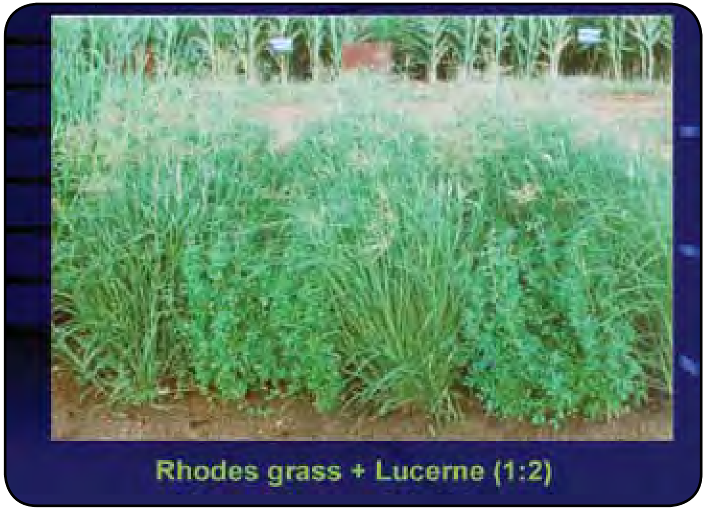

Fodder Cowpea : Swad

Fodder Horsegram : Deenanath

Fodder Sorghum + Cowpea mixed cropping system

Sorghum + Cowpea (2:1)

Fodder Sorghum + Fieldbean (2:1)


Rhodes grass + Lucerne (1:2)


Grasses for field bund stabilization and fodder


Thank you

TATA-ICRISAT-ICAR Project Review and Planning Meeting
(4th to 6th May 2010, at MPUAT, Udaipur, Raj.)

GRAMIN VIKAS TRUST – JHABUA (M.P.)

Biophysical and social constraints

1. Degraded soils with poor fertility.
2. Acute fodder scarcity for the livestock.
3. Poor socio economic base of the farmers.
4. One - two heads of cattle, several goats and some poultry birds.
5. Combined average income just - below poverty line.
6. Lack of suitable and early crop varieties.
7. Non-adoption of package of practices.
8. Non-use of recommended plant protection measures.
9. Lack of marketing and credit facilities.

Bio-physical and social constraints, Cont.

1. **Gender: Women** are involved in almost all the activities including agriculture, livestock grazing, firewood collection, marketing etc.
2. **Livestock:** Animal draught power is the main means of ploughing throughout this region. Animal manure is widely used.
3. **Tree and Forest:** Common species in these area are; Neem, Mahua, Sal, Tendu, Palas, Karanj, Tamarind, Ber etc. Mango, Sapota, Custard apple, Guava, Drumstick, Papaya, Lemon etc. are the main horticultural plants generally found in the homestead area of few household.
4. **Food Security Position:** Migration is 50-60% and seasonal migration is much more higher i.e. > 50%. After kharif harvesting poor people leave their houses in search of job.

Rainfall (in mm)

	2003	2004	2005	2006	2007	2008	2009
Jhabua District	1112	1113	734	1503	1450	637	690

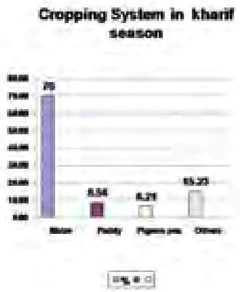
Topography

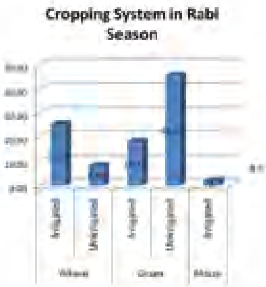
% of Cultivable Land	% of Slope
20 to 25%	2 to 3%
30 to 35%	3 to 20%
40 to 45%	>20%

Soil Type

Type of Soil	Area Occupied in %	Depth in cm	Clay %	Silt%	Sand%	pH	Remarks
Deep Black Cotton Soils	20	45	40-60	25	15	7-8	Occurs in low land area, suitable for maize, cotton, and soybean crops
Mix Red and yellow Soils	35	20-25	15	25	60	-	Occurs on slopes and sandy to sandy loam, suitable for black gram, green gram, maize, jowar, and red gram.
Skeletal Soils	38	7-15	8	12	80	6-7	Composition of stones of 50 to 250 grams.

Major Cropping Systems





Opportunities for doubling the Agricultural productivity

1. **Opportunities for Crop Improvements:** Improved Seeds
2. **Opportunities for Agronomic Interventions:**
   - Land preparation:
   - Use of improved varieties:
   - Seed treatment:
   - Seed treatment with bacterial culture:
   - Sowing method, seed rate and spacing:
   - Composting and Green Manuring
   - Fertilizer Application:
   - Weed management:
   - Plant protection against insect pests:
   - Rouging of disease infected plants:
   - Agriculture tools and implements:
3. **Opportunities for Soil Health Improvements: Vermi Composting, Composting, Green Manuring, Deep Ploughing, etc.**
4. **Opportunities for Capacity Improvements: PoP, IPM, INM, PIM, Low Cost Techniques**
5. **Scope for ITK Documentations and Dissemination:**

TATA-ICRISAT-GVT Project Progress

1. Programme Area

Project villages

# Block	Meghnagar block	House holds	Area, ha
1 Jhabua	Gundipada	180	375
2 Jhabua	Manpura	136	210
3 Jhabua	Jhayada	186	565
4 Meghnagar	Hatyadeli	565	853
5 Meghnagar	Garwara	185	333

Input under INM trials

S N	Season	Crop	Urea	DAP	Gypsum	Sulphur	ZnS	Agribor
	Kharif	----------> Fertilizer Kg /Ha <----------						
1		Soya	7	70	100	Application of Gypsum provides all the Sulphur required	50	2.5
2		Maize	102	70	100		50	2.5
3		Jowar	102	70	100		50	2.5
4		Arhar	7	70	100		50	2.5
5		G.nut	7	70	100		50	2.5
6		B/G.gram	7	70	100		50	2.5
	Rabi							
7		Chickpea	7	70	100		50	2.5
8		Wheat	102	70	100		50	2.5

Progress at glance

- Total 54 INM trials have been taken for Kharif 2009 in 04 villages of project area. Out of which 10 trials are Maize JVM-421, 4 of black gram JU-86, 10 trials of green gram MGG-285, 12 trials of Soyabean JS-9305, 12 trials of pigeon pea ICPL-7035 and 6 trials of Ashoka 200F variety of Paddy.
- Under Rabi season of 2009, 61 trials of INM have been taken out of which 31 trials are JG-226 and 30 trials of GJ-412 variety in five villages i.e. Gundipada, Manpura, Hatyadeli, Garwara and Jhayada of the project area.
- Total 22 INM trials were taken in *kharif* 2008, and 50 INM trials were taken in *robi* 2008-09 under TATA-ICRISAT Project.

Contd.

•Total 39 vermi composting units have been constructed in the project villages for soil health improvements programme. All the units are in operation and the vermi compost will be used before kharif season for INM trails.

•Soil testing cards has been received of 22 farmers from ICRISAT, soil analysis results shows that soils are deficient in Boron and Zink micro nutrients and in all the trials Zink sulphate and Gypsum has been given to beneficiaries to fulfil the micro nutrients requirements.

•Under TATA-ICRISAT Project a rain gauge has been installed in Garwada Villages for the day to day rainfall data collection and the total rainfall received at Garwara village till the date is 690 mm.

•Agriculture implements i.e. Tropicultor received from ICRISAT for the tillage activities of the INM trials.

Kharif 2009 Trials Results

INM Trials Results Yield data (q/ha) in cluster

Crop	Variety	Total Trials	Control (q/ha)	INM (q/ha)
Soybean	JS 9305	12	15.30	17.50
Paddy	Ashoka 200F	6	28.00	35.50
Maize	JVM 421	10	16.50	18.55
Green Gram	MGG-295	10	7.25	8.75
Black Gram	JU-86	4	5.50	6.95

Rabi 2009-10 Trials Results

INM Trials Results Yield data (q/ha)

Crop	Variety	Total Villages	Total Trial No	Control (q/ha)	INM (q/ha)
Gram	Vijay	5	30	10.00	11.30
	Vishal		30	10.30	11.50

Soil health improvement

Detail of vermi composting units

S.N.	Village	No. of vermi unit constructed	Production, qtls
1	Gundipada	06	4.2
2	Manpura	10	7.0
3	Garwara	16	11.2
4	Hatyadeli	07	4.9
Grand total		**39**	**27.3**

Capacity building programme

- Faliya & Village meetings
- Night camps
- Two farmers field Day
- One in Sept.
- Second in Feb.
- Focus Group Discussion
- Trainigs through convergence
- Harnessing linkages

Convergence

- SRTT-Cinl
- NABARD
- NREGS
- ICAR
- LINE DEPARTMENTS
- ON GOING SCHEMES

Seed Producer Coop. Society-Garwada

SRTT (CInI)

SRTT (CInI)

SRTT (CInI)

SRTT (CInI)







NABARD Wadi


NABARD Wadi


NABARD Wadi

NABARD Wadi

NREGS W/s

NREGS W/s

THANK YOU

Title of the Project - **Increasing Agricultural Productivity of Farming Systems in Parts of Central India through Participatory Research-cum-Demonstrations and Knowledge Sharing Innovations.**

FES

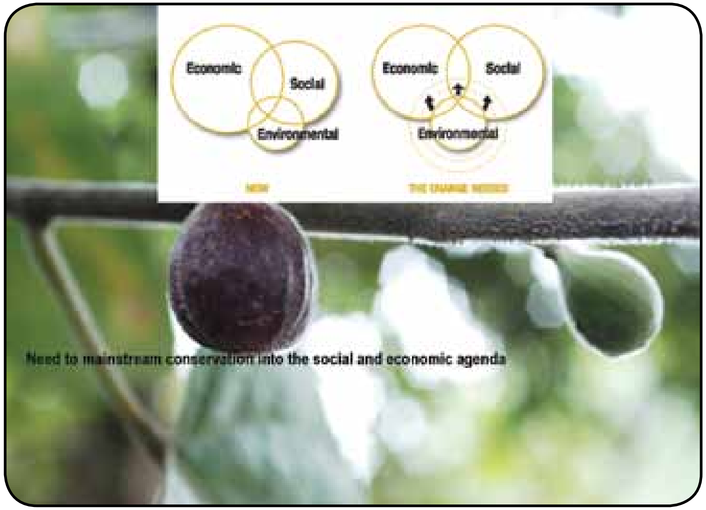
FOUNDATION FOR ECOLOGICAL SECURITY

We work towards the ecological restoration and conservation of land and water resources and setting in place the processes of coordinated human effort and governance towards that end.

FES

We are

- In five eco-regions of the country
- with 1200 village institutions with hundred thousand rural families
- on 80 thousand hectares of forest and common lands
- In 24 districts of six states
- About 200 staff members



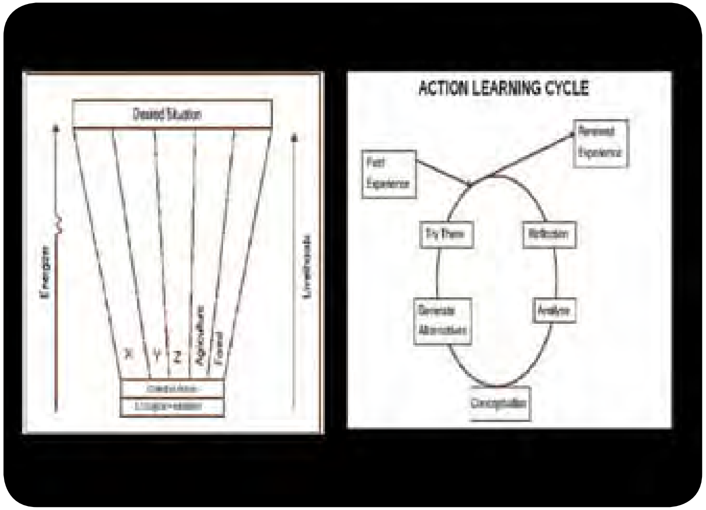
Need to mainstream conservation into the social and economic agenda

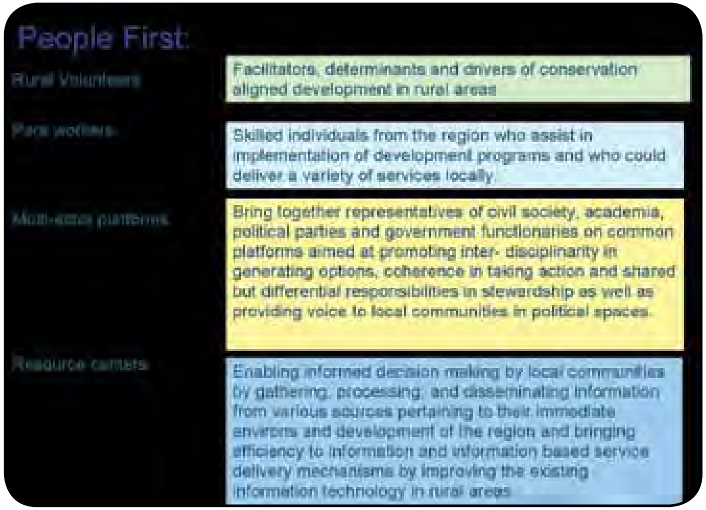
Landscape approach- Ecological and Social boundaries transgress administrative boundaries

Commons provide a unique opportunity to work through a singular platform on issues concerning poverty reduction, reducing inequalities and improving the ecological health

Community institutions enable a code of locally agreed behaviour that both encourage collective steps and keeps undesirable individual action in check.


Engaging local visions


Desired Situation
X
Y
Z
Agriculture
Forest
ACTION LEARNING CYCLE
Past Experience
Renewed Experience
Try Them
Reflection
Generate Alternatives
Analyse

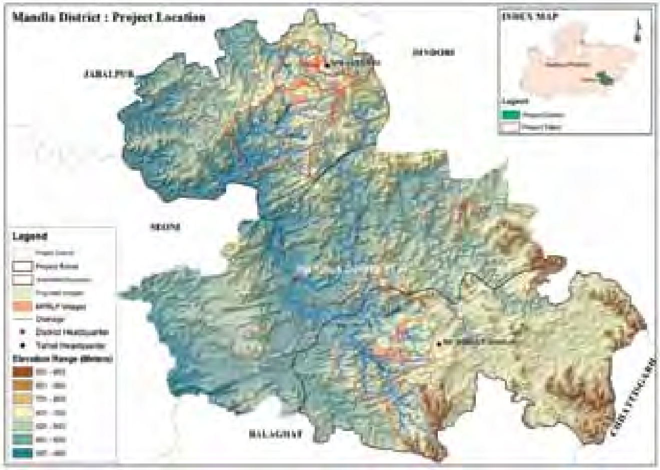

People First:
Rural Volunteers
Facilitators, determinants and drivers of conservation aligned development in rural areas
Para workers
Skilled individuals from the region who assist in implementation of development programs and who could deliver a variety of services locally
Multi-actor platforms
Bring together representatives of civil society, academia, political parties and government functionaries on common platforms aimed at promoting inter- disciplinarity in generating options, coherence in taking action and shared but differential responsibilities in stewardship as well as providing voice to local communities in political spaces.
Resource centers
Enabling informed decision making by local communities by gathering, processing, and disseminating information from various sources pertaining to their immediate environs and development of the region and bringing efficiency to information and information based service delivery mechanisms by improving the existing information technology in rural areas


Synergy between strategies
Rural Volunteers
Grassroots leaders driving the agenda of the network; Provide window for adoption of best practices at grassroots
A forum for different actors of development arena for collaborating, negotiating, setting agenda and guidelines, advocacy for ecologically sensitive development policies
Multi-Actor Platform
the HR backbone for implementing best practices and provide local skill base to different actors
Support informed decision making and collaborative learning among community and other development actors
Para workers
Resource Centers

SPEAR HEAD TEAM- MANDLA

MANDLA DISTRICT PROFILE

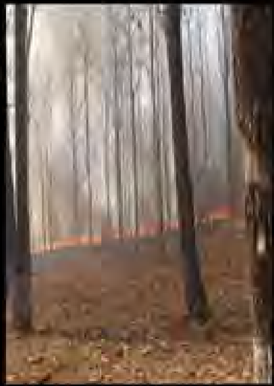
- Total Geographical area – 8771 Sqkm.
- Lies between Latitude 22°12' and 23°22' N and Longitude 80°18' and 81°51' E
- Total 4 Tehsils and 9 Blocks
- Total 493 Gram Panchyats
- Total Villages – 1241



THE PROJECT AREA:

KEY ISSUES

- Degradation of forest & other natural resources
- Increasing pressure on biodiversity rich areas
- Low agriculture productivity
- Migration
- Limited livelihood portfolio leading to unsustainable means of income generation
- Weak institution
- Vicious cycle of exploitation & degradation



Strategies

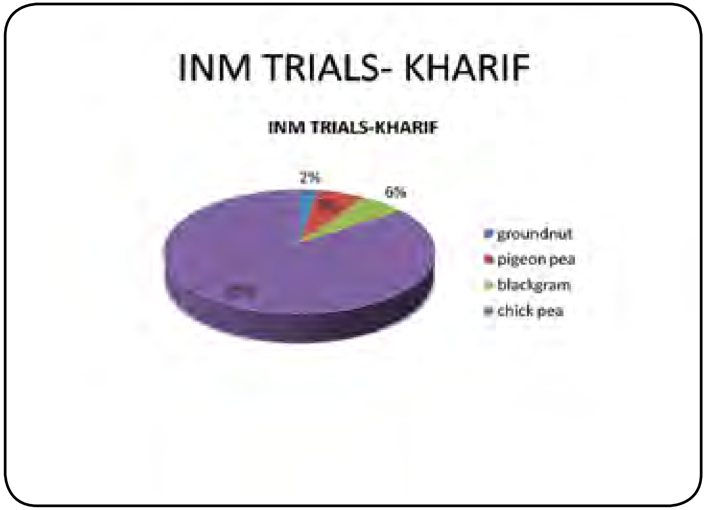
- Strengthening village level institutions
- Capacity Building of community and PRIs for better management and governance of Natural Resources.
- Technical support to Panchayats in design, estimate, budgeting and implementation
- Using NREGS for improving natural resources and working towards strengthening livelihood portfolios
- Developing local leadership- RVs
- Agriculture (Paddy enhancement, vegetable promotion) and horticulture interventions

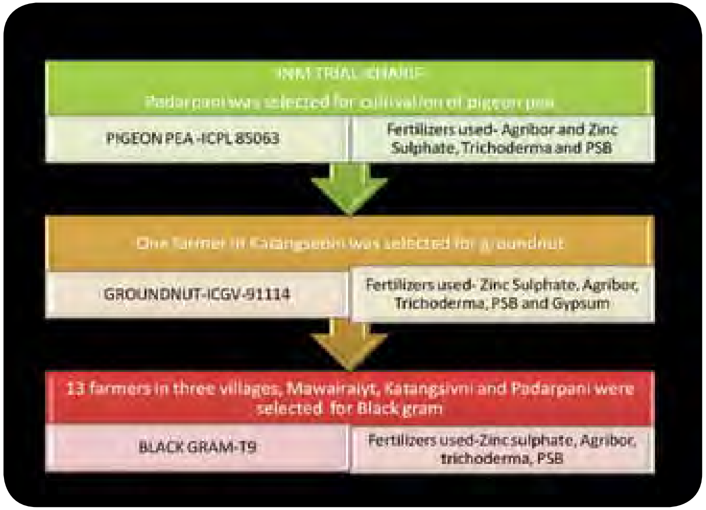
Strategies cont…

- Varietal trial cum demonstration.
- Sustainable agricultural backward support – Vermicompost, Glaricidia, community seed bank.
- Developing service providers- Para workers
- Work on efficient irrigation systems
- Energy conservation
- Awareness generation programmes


Katangsivni
Mavaimaal
Mavairaiyat
Padarpani
Bhardwara raiyat
Bhardwara maal


INTERVENTIONS:


INM TRIALS- KHARIF
INM TRIALS-KHARIF
2%
6%
groundnut
pigeon pea
blackgram
chick pea


PIGEON PEA -ICPL 85063
Fertilizers used- Agribor and Zinc Sulphate, Trichoderma and PSB
GROUNDNUT-ICGV-91114
Fertilizers used- Zinc Sulphate, Agribor, Trichoderma, PSB and Gypsum
13 farmers in three villages, Mawairaiyt, Katangsivni and Padarpani were selected for Black gram
BLACK GRAM-T9
Fertilizers used-Zincsulphate, Agribor, trichoderma, PSB

Vegetable Promotion

The team has facilitated vegetable cultivation with nine farmers in three villages through Gram Sabha

The plots are developed organically with Vermicompost, trichoderma, azatobacter as inputs. Tricho cards are used for pest management

The marketing prospects in mind, tomato and brinjal are the main varieties that are being given

Organically prepared manure with locally available ingredients like neem, juggery, curd, Ipomoea leaves, lantana leaves, cow urine and cow dung is used

VERMICOMPOSTING

Why?

To promote organic farming with sustainability

How:

Masters trainers were identified and trained who are providing technical assistance villagers in the preparation of vermicompost pits. The master trainers are being developed as Para-workers.

Sustainability:

A surface model pit is made with a input cost of Rs.750 + Rs.300 towards material cost

Linkage with institution:

Only 3 kgs of earthworms (isenea poetida) were made available to the villagers and after that the earthworms has been used as a revolving resource within the village.

GLYRISCIDIA

Nursery promoted with 4 farmers in 2009

Nursery promoted with 3 SHG's in 2010 to encourage participation of women within the village and reduce the use of urea.

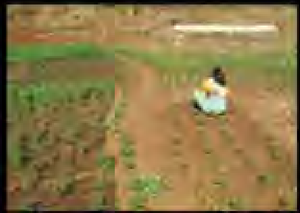
Twenty farmers took this up and propagated the concepts of farm forestry and organic farming by planting 2537 plants along the field bunds the last rainy season

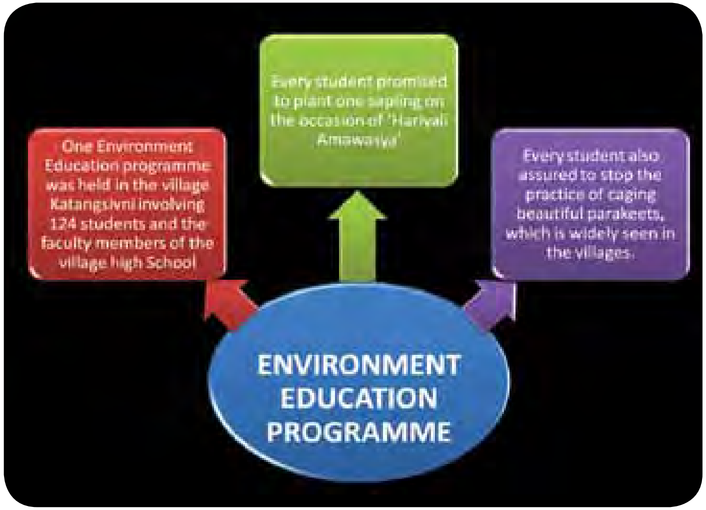
Glyriscidia plants have achieved a desired shoot length 2 ft.

Plantation will be done this year by cutting of shoot.

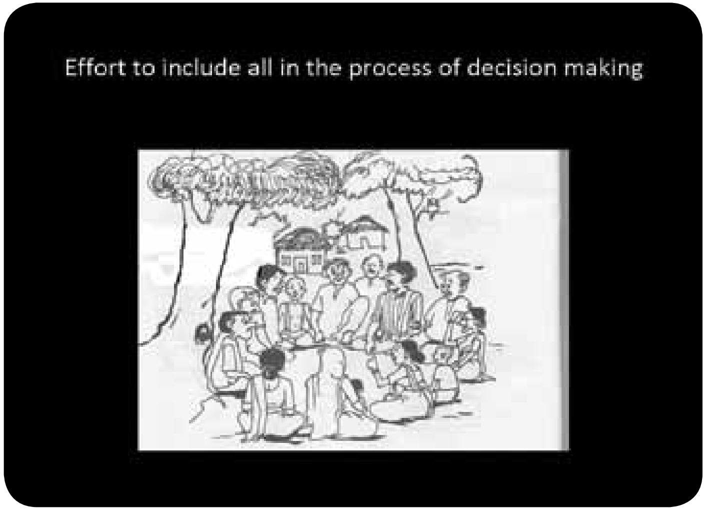
Seed bank

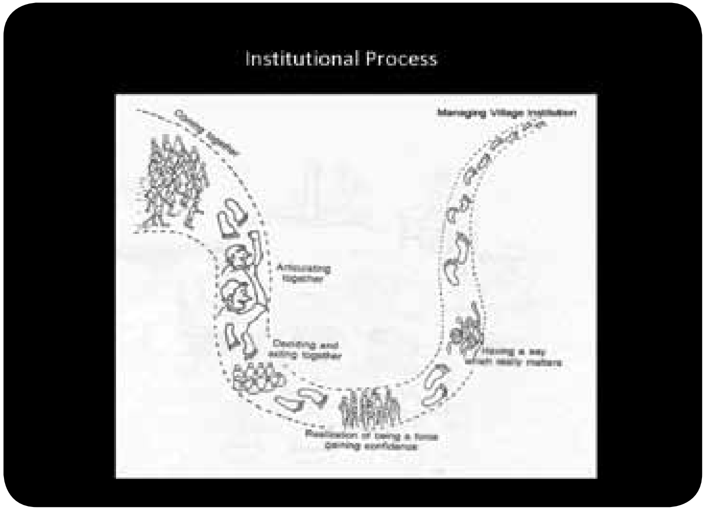
- One seed bank has been initiated in padarpani village
- The seed bank is being managed by PSPS(prakritik sansadhan and pravandan samity)
- Seeds like chick pea, pigeon pea are being kept in the bank

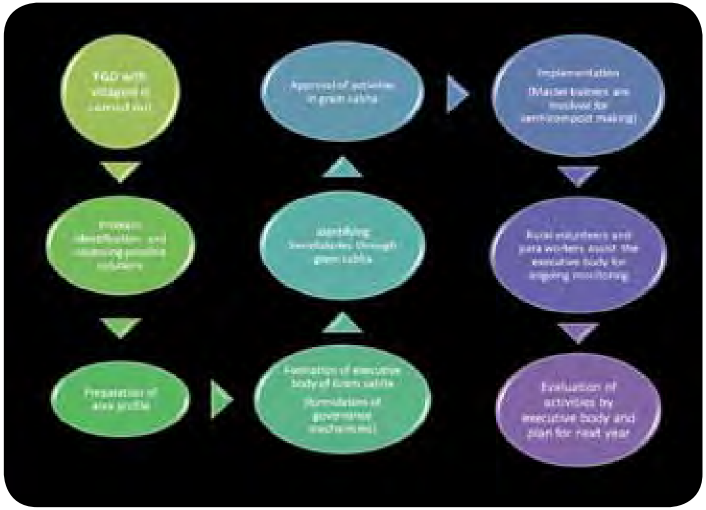



Every student promised to plant one sapling on the occasion of 'Harivali Amawasya'
One Environment Education programme was held in the village Katangsivni involving 124 students and the faculty members of the village high School
Every student also assured to stop the practice of caging beautiful parakeets, which is widely seen in the villages.
ENVIRONMENT EDUCATION PROGRAMME


EXECUTION PLAN OF DIFFERENT ACTIVITIES:


Effort to include all in the process of decision making


Institutional Process
Managing Village Institution
Articulating together
Having a say which really matters
Realization of being a force gaining confidence



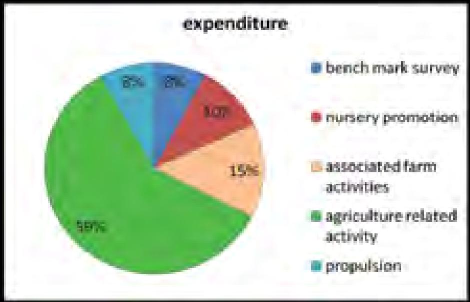
Target achieved status against SRTT- ICRISAT Work Plan for Kharif Season (2009-10)

S.N	Activities	Crop	Area/No	No. of Farmers	June	July	August	Sept	Oct	Achievements
1	Common Rice Nursery		2 Ha	1						will be done in 2011
2	Varietal Trials with INM	Maize, Pigeon Pea, Black Gram, Ground nut	15 Ha	[illegible]						[illegible]
3	INM	Paddy	8 Ha	12						
4	[illegible]		[illegible]							[illegible]
5	Vermi Compost		Commercial model - 4	4		[illegible]	[illegible]			Commercial Model [illegible]
			Surface Model - [illegible]	[illegible]		[illegible]	[illegible]			Surface Model [illegible]
6	Vegetable cultivation		[illegible]	1		[illegible]				[illegible]
7	Farmers' Field Day		1						1	[illegible]
8	Exposure visit		1	[illegible]					1	visit to ICRISAT hyderabad, with [illegible] farmers
9	Community Seed Bank	Chick Pea	1							done
10	Environment Education Programme		2				1		1	

Target achieved against SRTT- ICRISAT Work Plan for Rabi Season (2009-10)

S.N	Activities	Crop	Area/No	No. of Farmers	Nov	Dec	Jan	Feb	March	Achievements
1	Varietal Trials	Chick Pea	13 Ha							farmers [illegible], seeds [illegible] kgs, Area [illegible] Acre
2	INM	Mustard	5 Ha							
		Wheat	13 Ha							
3	Vegetable cultivation		5 Acre	[illegible]	1					[illegible] farmers [illegible], Area [illegible] acre
4	Livestock Drip Irrigation		4			2				2 farmers [illegible]
5	Common Nursery for vegetable			1	1					
6	Farmers' Field Day		1							1
7	Community Seed Bank		1							Done
8	Environment Education Programme		2				1			[illegible] done

Financial progress of 2009-10



KEY ISSUES:

- Small land holding
- Subsistence farming practices
- There is a consistent caste conflict in the village which sometimes does not results in co-ordinated decision making.
- When there is a question of 50% contribution of farmers then big farmers come in whereas small and marginal farmers move apart. So the target group is shifting from poor to rich. Whom should we target?
- Certify locally available seeds for better acceptance by the farmers of the area.

LEARNINGS:

- INDEGENOUS PRACTICES ON WATER EFFECIENCY SYSTEMS MUST BE ENHANCED.
- SERVICE PROVIDER MODEL IS AN EEFECTIVE MODEL FOR TRANSFORMATION OF TECHNOLOGY.
- EFFECTIVE INSTITUTION MECHANISM ENSURES SUSTAINABILITY.
- MULTI ACTOR PLATFORM PROVIDES OPPRUTUNITY FOR WIDER APPLICATIONS.
- GIVEN CHANCE TO THE WOMEN CADRE CONTRIBUTES TO DECENTRALISED DECISION MAKING PROCESSES.
- CERTIFICATION OF INDEGENOUS SEEDS CAN POOL IN MORE PEOPLE TO TAKE THE INITIATIVE FURTHER.

WORK PLAN OF 2010-11

SRTT- ICRISAT WorkPlan for Kharif Season (2010-11)

S.N	Activities	Crop	Area/No	No. of Farmers	June	July	August	Sept	Oct
1	Common Rice Nursery		2 Ha	5					
2	Varietal Trials with INM	Maize, Pegion Pea, Black Gram, Ground nut,soyabean	20 Ha	20					
3	INM	Paddy	8 Ha	24					
4	Glyrecidia nursery		3	3 SHG's					
5	Glyricidia plantation		5000 RMt						
			Commercial model - 1	1	1				
6	Vermi Compost		Surface Model - 30	30	10			10	10
7	Vegetable cultivation		5000sq mts	3	3				
8	Farmers' Field Day		3		1			1	1
9	Exposure visit		1	5				1	
10	Community Seed bank	Chick Pea,pegion pea,black gram, ground nut	1						
11	Environment Education Programme		1		1				
12	well reading/monitoring		24	24	24				
13	broad bed & furrow		1 acre	3	3				
14	poultry farm			10			10		

SRTT- ICRISAT WorkPlan for Rabi Season (2010-11)

S. N	Activities	Crop	Area/No	No. of Farmers	Nov	Dec	Jan	Feb	March
1	Varietal Trials	Chick Pea	20 Ha	40					
2	INM	Mustard	10 Ha	25					
		Wheat	20 Ha	30					
3	Vegetable cultivation		10 Acre	30	30				
4	Low cost Drip Irrigation		10	10	2	6			
5	Common Nursery for vegetable		6	6	6				
6	Farmers' Field Day		1					1	
7	Community Seed Bank	Chick Pea,pegion pea,black gram, ground nut	1						
8	Environment Education Programme		1			1			
9	well reading/monitoring		24	24	24				
10	fodder production		1 acre	4	4				

THANK YOU

FES

FOUNDATION FOR ECOLOGICAL SECURITY

ICRISAT PROJECT ON PRODUCTIVTY ENHANCEMENT

PRADAN, Gumla

Plan for 2009-10

- Glyricidia cultivation.
- Paddy(SRI), Tomato, Black gram, Bean, Finger Millet, Chilly, Cabbage, Groundnut in Kharif with all the families of Teleya during Kharif.
- Focus on growing cash crops to give additional income.
- Wire-staking in tomato.
- Include another 100 families from the neighboring villages also during Kharif.
- Use of Macro & micronutrients in all crops. (B & Na)
- In Rabi and summer also each farmer will do two crops.
- Expansion of area coverage.
- Seed storage.
- Involving youth club of the village in this programme.
- Exposure of villagers to ICRISAT Centre, Hyderabad

Programmes 2010

1. Kharif Agriculture
   - Cereals : Paddy, Maize
   - Vegetables : Tomato, French-bean, Chilly, Sem
   - Pulses, Pigeon-pea, Black gram
   - Oilseeds: Ground nut
2. Seed Bank
3. Glyricidia plantation
4. Drip Irrigation
5. Vermicompost
6. Rabi Agriculture
   - Chick-pea.
   - cabbage & cauliflower.

..programme 2010 continues

7. Summer Agriculture
   - Green gram
8. Rainfall data Measurement
9. Area expansion
10. Grooming SHG members towards Seed bank, Seed production programme, Glyricidia Nursery.

Micro-nutrient Trials in Paddy

- Total 100 families participated with avg. area 0.25 Ha.
- Total area 25 Ha
- Practices:
  - Seed treatment with fungicide.
  - Vermicompost application in nursery.
  - Proper nursery management.
  - Early transplanting in 12-20 days.
  - Zn Sulphate and Boron applied @ 25 Kg/ha and 2.5 Kg /ha along with DAP & Potash.
  - Insecticide application to control hispa & gall midge
  - Timely weeding.
  - Control plots with no Zinc & Boron.

Sample Data of Paddy Zn and boron application increased yield from 3500kg- 5000kg

Sl No	Farmer	Area(Ha)	Zn(Kg)	B(Kg)	Yield(Kg)	Productivity(Kg/Ha)
1	Ramesh Munda	0.40	10	1	2228	5500
2	Bandhan Rautia	0.40	10	1	1620	4001
3	Jageshwar Oraon	0.20	5	0.500	1012.5	5000
4	Sanjay Oraon	0.40	10	1	2531	6250

Maize is a successful crop in gumla

SL. No	Treatments	No of farmers	Area sown (Ha)	Fertilizer applied	Yield kg ha-1	% of increase
1	Farmers input	14	2.20	FYM=1500kg ha-1 and DAP 250kg ha-1, Urea 100kg ha-1	7000	-
2	Farmers input + Micronutrients	11	1.10	FYM=1500kg ha-1 and DAP 125kg ha-1, Urea 100kg ha-1, 25 kg ha-1 Zinc Sulphate, 2.5 kg ha-1 Agribor	5500	27%

Kharif Vegetables

Key Interventions are:

- Application of Zn and Boron.
- Use of Hybrids
- Optimum fertilizer dose
- Technical trainings at field

Success:

- 118 families participated in 5 Ha upland.
- Huge flowering in Tomato.
- Increase production & yield.
- Farmer earned Avg. Rs 6000.

Vegetable Data
Zn and boron application increased per family income by 50%

Sl No	Farmer	Crop	Area(Ha)	Zn(Kg)	B(Kg)	Yield(Kg) & Income
1	Ramesh Munda	Tomato	0.04	1	0.1	3600 Rs 18000
2	Shankar Oraon	Cabbage	0.04	1	0.1	1500 Rs 9000
3	Jagdev Oraon	Tomato	0.04	1	0.1	4000 Rs 16000
4	Durga Devi	Tomato	0.04	1	0.1	2200 Rs 11000
5	Sunny Oraon	Tomato	0.04	1	0.1	3200 Rs 16000

Pulse Production

Participation:

- 82 families participated with 4 Ha upland.

Key Interventions:

- Use of improved varieties.
- Zn, B application
- Timely sowing.
- Seed treatment with Rhizobium & Sodium Molibdate.
- Insect & pest control.

Pulse Yield Data

Sl	Farmer	Area (Ha)	Production (Kg)	Yield (Kg/Ha)
1	Bhaiyaram Oraon	0.20	60	300
2	Ramesh Munda	0.10	40	400
3	Rupeshwar Oraon	0.10	20	200
4	Balmohan Oraon	0.10	60	600
5	Chohrai Oraon	0.10	70	700
6	Jagdev Oraon	0.10	60	600

Sample Data of Ground Nut
Proper POP including application of micro nutrient increased yield by 33%

Sl No	Farmer	Area(Ha)	Zn(Kg)	B(Kg)	Yield(Kg)	Productivity (Kg/Ha)
1	Agustin Ekka	0.1	2.5	0.250	405	4000
2	Angnu Oraon	0.2	5	0.500	1012	5000
3	Anil Oraon	0.2	5	0.500	607	3000
4	Arjun Singh	0.02	1	0.100	73	3500

SEED BANK

- Started with SHG, Jeewan Mahila Mandal, Teleya.
- Members of seed bank committee 16.
- Committee provided fund Rs 15,000 for chick pea growers on buy-back system basis.
- 3 quintal of Chick pea KAK-2, ICCV-2 Seeds collected & stored.
- Seed storage house for storing seeds is made.
- Seed Drums purchased.

Glyricidia Nursery

- Nehru Yuva Club, Teleya participated in Glyricidia nursery.
- Nursery prepared.
- Seeds placed in 10,000 poly packets.
- Farmers will purchase seedlings from yuva club.

Drip Irrigation

- Drip system is installed in 1 Ha of land with 10 Farmers.
- Farmers contributed 25% cost for installation.
- Only one farmer is able to use drip water as wells are dry in summer.
- Training & exposure organized for Farmers.

Vermicompost

- Total 44 sheds are constructed with 44 families.
- Trainings conducted for transferring production technology.
- 44 sheds are in production phase.
- Vermicompost from 30 sheds are harvested and yield is 400Kg to 500 Kg per shed.
- Stored for use in vegetables mainly.
- Faster decomposition in summer months.

Chick -pea

- 350 farmers from 5 villages participated.
- The trials are chick-pea improved variety with micro-nutrient application. (Zn, B)
- Seed treatment with Rhyzobium & Sodium Molibdate.
- Early sowing gives higher production till Dec 1st week.
- Farmers earned on an avg. Rs 2000-3000 from 0.40 ha of land.
- KAK-2 (1700kg/ha) & ICCV-2 (1600kg/ha)are found good varieties for the Gumla area.

Sample Data

Sl No	Farmer	Area(Ha)	Zn(Kg)	B(Kg)	Yield(Kg)	Productivity (Kg/Ha)
1	Ramesh Munda	0.040	1	0.100	60	1500
2	Bhagwat Singh	0.040	1	0.100	72	1800
3	Timbu Oraon	0.020	1	0.100	40	2000
4	Robert Ekka	0.080	2	0.200	140	1750

Area Expansion

- Total 350 farmers from 5 villages are included in this project.
- Motivational & Technical trainings arranged in all this 5 villages.
- Farmers are participating in all trials particularly micronutrient trials from all 5 villages.
- Chick- pea demand of seed is high in all 5 villages.

Rain fall Data, Soil Test

- Rainfall data collected daily.
- Total rainfall till date 954mm from June 2009 onwards.
- Maximum rainfall received this year in month of July , 468mm.
- Highest rainfall receive on 20th August, It is 71mm.
- Soil testing results are given to farmers.
- B, Zn is deficit in soil, soil mostly acidic.
- Nutrient management is in practice according to soil status now.

Green Gram

- Total 50 farmers participated from 5 villages.
- Area per family 0.04 Ha.
- Good standing crop at field, high vegetative growth.
- Boron spray is completed in fields.

Trainings

- Technical training provided to 250 Farmers.
- Planning exercise carried out in all 5 villages for Kharif agriculture programme.
- SHGs trained for management of Seed Bank.
- Exposure to ICRISAT with 20 Farmers.

Overall Success

- Productivity increase in food crops. 3-4 months of additional food security.
- Chick-pea is a success with minimum investment and less irrigation.
- Vermicompost production is in practice of farmer.
- Drip installed with 10 farmers.
- Green gram with vigorous vegetative growth.

....overall success continued

- Yield increase in vegetables due to Zn & B application.
- Seed bank is a key success, 3quintol seeds of chick-pea stored with proper management.
- Glyricidia nursery properly completed.
- Proper documentation, data collection & communication.
- Area expansion plan achieved.

Failure

- Late rainfall and erratic nature led to failure of Groundnut crop.
- Late planting of Pigeon pea, yield is quite low.
- Farmers belief about drip system is still not up to the mark. Low participation.
- Late sowing of chick-pea, low yield for 20% farmers.
- Less participation in summer green gram due to water scarcity.

Issues

- Huge work in documentation hence requires additional manpower.
- Land & water treatment in project villages to increase crop intensity.

Some Snapshots

Some Snapshots


Some Snapshots


Some Snapshots


Some Snapshots

Some Snapshots

Some Snapshots

Thank You

ICRISAT
Science with a human face

Pradan

Annual Review and Planning Meeting

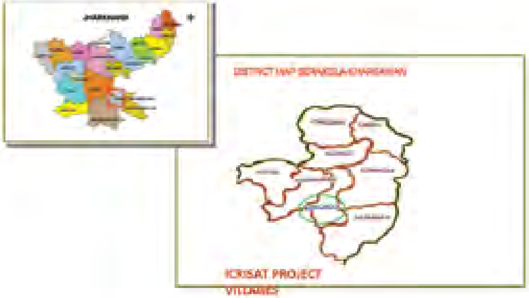
4th - 6th May, 2010

TATA – ICRISAT Project
Seraikela - Kharswan, Jharkhand

By: TSRDS, Jamshedpur

Area of Operation

Ten (10) Villages under ICRISAT. Twenty Three (23) villages under CInI



Demography Details

• Total House hold	– 1916 HH (ST-74%)
• Total Population	– 12851Nos (23 Villages).
• Average Rainfall	- 1200 to 1500 mm
• Total Treatable area	– 5140.64 Acres
• Total Cultivable land	– 2438 Acres
• Cropping Pattern	– Kharif (Paddy) & Rabi
• Yield rate – a)Paddy	– 1.5 to 1.8 ton/acre
	- 0.6 to 0.8 ton/acre
b)Rabi	- Wheat, Mustard, Vegetables & Chickpea

Project Details - ICRISAT

GOAL

Increasing Agricultural Productivity of Farming System in Central India through Participatory Research cum Demonstration and Knowledge sharing innovation under CInI.

Objectives:

•Conservation and optimum utilization of natural resources

•Productivity enhancement of Kharif paddy through proper nutrient management

•Change from mono-crop to multi-crop in Kharif season.

•Introduction of Chickpea in Rice fallow upland area & other oilseeds crops.

•Institution building to ensure sustainability of project intervention (Seed Bank & Vermicompost Unit)

•Introduction of third crop after harvesting of Chickpea.

Background - Kharif

- *Primitive agriculture practices, unstable kharif crop Primarily rain fed.*
- *Food security due to use of HYV paddy variety in Low and middle land.*
- *Productivity is 1.5-1.8 ton/acre*
- *Almost 30% of the land is upland, not suitable for HYV variety (MTU-7029,IR-36, IR-64).*
- *Low productivity of paddy in the upland area. People of the area are keen on paddy in the upland.*
- *Initiation of Maize & Groundnut crop in Kharif season in very small area.*
- *Less use of fertilizer & Micronutrients.*
- *Spoilage and damage to crop during harvest on account of Elephant menace.*

Background - Rabi

- *During the CInI Project period 650 acres of Irrigation potential was created.*
- *Less utilization of Water Resources - approximate 450 acres coverage in 2009-10.*
- *Productivity is very Less.*
- *Wheat, Mustard & vegetable are the main crops.*
- *Open grazing by the cattle is the major problem.*
- *40% house hold have adopted Rabi crop.*
- *Chickpea has been adopted, coverage is less.*

Process Flow Chart

Village level Planning through community participation

↓

Institutional Building VDC/ User Group

↓

Capacity Building of community members and project staff

↓

Utilization of Assets created and benefits derived

↓

Interface with modern Technological know-how

↓

Capacity Enhanced & Strengthened to Enable them to adopt crop diversification.

ICRISAT Project Intervention

Kharif -

- *Enhancement of productivity by using micro nutrients*
- *Introduction of upland crop – Green Gram, Ground Nut, Pigeon Pea, Maize*

Rabi -

- *Introduction of Chick Pea*

Summer -

- *Vegetable Cropping after harvesting of chick pea*

Green Manure -

- *Glacidia plantation on the bund of field*

Vermicompost Unit

Storage tank for Seeds

TATA STEEL

Kharif Process Cycle - Paddy

TATA STEEL

Steps Taken

Technical

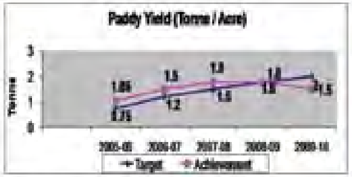
- On field advice to the farmers
- Distribution of high quality seeds and inputs
- Exposure visit / Agricultural Meeting at village level
- On field Result Demonstration
- Introduction of improved agriculture equipments

Social

- Village level institution formed – VDCs, SHGs
- Collective farming

TATA STEEL

Improve Yield of Paddy Crop



Using Transplantation method – HYV variety (MTU-7029, IR-36, IR-64)

Note : Less production in 2009-10 due to less rainfall (approx. 1300 mm against 1500 mm)

TATA STEEL

Improve Yield of Paddy Crop

ICRISAT Method - by additional use of micro nutrient

	Area (in acres)	Yield (in Kg)	Yield / acre
General Method by using DAP & Urea	36.75	53200	1447.62
ICRISAT Method by using DAP , Urea & Micro nutrient	42.5	68750	1617.65

Upland Crop - Kharif

(Green Gran, Ground Nut, Pigeon Pea & Maize)

2008-09 -

Trial Plot

- Area coverage : 10 acres
- No. of Farmers adopted : 11 nos.

2009-10

- Area coverage : 48 acres
- No. of Farmers adopted : 69 nos.

Yield Record (Maize) – 900 Kg/acre

Constraints – Upland Kharif Crop

(Other than Paddy)

- Less land holding size Area approx. 2.5-3 acres per HH
- Eager to do Paddy crop in upland for their food sufficiency
- Unusual rainfall
- Less productivity
- Lack of technical know how
- Reluctant to adopt new crop

Area under 2nd Crop

Major Crop : Wheat, Mustard & Vegetables

2009-10

- Resource created for Irrigation : 650 acres
- Area coverage : 450 acres
- No. of Farmers adopted : 620 nos. (35% of total HH)
- Cropping Intensity : 118%

Chick Pea Cultivation

	No. of Farmers	Area (in acres)
2008-09	17	21.5
2009-10	69	32

Variety	Avg. production per acre
JG – 11	222
KAK -2	262
ICCV -II	163

Summer Crops

Major Crop : Tomato, Bottle gourd, Pumpkin

Coverage in same land after harvesting of Chick pea

2009-10

Area coverage (Saharbera) : 8 acres

No. of Farmers adopted : 12 nos.

Outcome / Impact

Agriculture Extension

- Use of Micro nutrient in Kharif Paddy crop
- Increase in area under HYV Kharif paddy
- Increase the yield of HYV Paddy from 1.5 to 1.8 tonne/acre
- Increase in area of Upland crop
- Acceptance of chick pea cultivation
- Start summer crop after harvesting of chick pea
- From Mono crop to cropping intensity to 118%
- Around 650 acre irrigation capacity created
- Additional income Rs. 12000 – Rs. 15000 per HH

Issues

Technical

- Less productive soil
- Uplands – less fertile land
- Upper lowland – moderately fertile
- Lowlands – completely inundated during rainy season, high inflow of water damages crops
- Low technical knowledge and lack of capital inputs
- Banking institutions reluctant to provide financial support

Social

- Migration of people to nearby industries as daily wage earner like brick kiln, crushers etc.
- Delay in second cropping – after paddy harvest, tribal community involved in festive seasons
- Fenced satisfaction and alcoholism
- Open grazing and elephant menace
- Dependency on forest for easy and early income

Plan for Kharif

- HYV Paddy coverage in low land & middle land – 1000 acres
- Use of Micro nutrients in paddy crop
- Introduction of HYV upland paddy – 200 acres
- Area expansion for maize crop
- Glicidea plantation on bund of field
- Installation of Drip Irrigation system for Kharif vegetable

"We sometimes feel that what we do is just a drop in the ocean, but the ocean would be less because of that missing drop"

Mother Teresa

THANK YOU!

SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES AND IMPROVED LIVELIHOODS AGASINAHALLA MODEL WATERSHED PROJECT

Mahantesh Agasimundin
Managing Director
Bijapur Integrated Rural Development Society ® (BIRDS)
"ATMASAXI" HRD Training Center
Nagaling Nagar, N.H. 13
HUNGUND-587 118 Dist: Bagalkot

Model watersheds established in India

Model watersheds established in Dharwad Taluk of Dharwad Dist Karnataka State

Collaborating Organizations

Lead Implementing Agency
International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Andhra Pradesh

Implementing Agency
BIJAPUR INTEGRATED RURAL DEVELOPMENT SOCIETY ® (BIRDS) HUNGUND Dist: Bagalkot Karnataka State

Collaborating partners
University of Agriculture Science, Dharwad
District Administration, Dharwad
Department of Agriculture, Dharwad
Watershed Department, Dharwad
Department of Forestry, Dharwad

Key features of New common guidelines for watershed projects

- Delegating powers to states
- Financial assistance to dedicated institutes
- Duration of program
- Livelihood oriented
- Cluster approach
- Scientific planning
- Capacity building
- Multi tier approach

Need for Establishing Model Watershed

- The land resources of Karnataka especially its dry drought prone lands, which comprises more than 79 % of the total arable area, have been poorly managed by the resource poor farmers of the state. Soil loss due to erosion coupled with reduced water resources has led to a situation of rapid soil fertility deterioration, declining/stagnating crop yields, depletion of underground water sources, deforestation, denudation, destruction of natural pasture and diminishing biomass production.
- Exploring the full potential of rain fed agriculture to meet the food , fodder and fuel requirement of the state population, is the only alternative, however, this will require investing in suitable soil and water conservation technologies, crop breeding targeted to rain fed environments, agricultural extension services, and access to markets, credit and input supplies in rain fed areas.
- The potential for increasing the irrigable area and enhancing productivity from irrigated lands has its limitations. The total irrigation potential from all sources, including inter basin transfers, is estimated at around 50 % of the total cropped area of 104.89 lakh hectares by the Karnataka state land use board. The remaining land has to depend on rain fed farming forever. Therefore if the state has to conserve and develop natural resources in rain fed areas to improve their production and productivity, their development on watershed basis is inevitable. Development of rain fed areas is important because more than 44 % of its agricultural production comes from dry lands.
- Karnataka has the highest proportion (79 %) of drought prone area among all major states in the country and in absolute terms it has the second largest area of dry land in the country after Rajasthan. In addition, Karnataka also has the second lowest (154.2 M ha M/Yr) replenish able ground water resources among major states after Rajasthan.

Objectives

- To improve rural livelihood through participatory watershed development program with consortium approach through application of new science tools and cost-effective integrated genetic and natural resource management practices appropriate to socio-economic conditions of farmers and natural resources of the ecosystems;
- To establish nine Model Sites of *Learning in different agro eco zones for demonstrating the potential* of rainfed areas for increasing productivity;
- To build capacity of different stakeholders in the areas of integrated watershed management.
- Sustainable alleviation of Poverty. Develop and strengthen community based institutional arrangements for sustainable natural resource management
- Improved skills and employment opportunities for non-farm sectors
- Involvement of village communities in participatory planning, implementation, social and environmental management, maintenance of assets and to operate in a more socially inclusive manner.
- Improve the productive potentials of selected watersheds and their associated natural resource base.

Innovative methods and new science tools Used in Model Watershed

- Consortium approach
- Integrated water resource development approach
- Emphasize increased water and other NR use efficiency
- Integrated management of soil health
- Use of GIS and Remote Sensing, Simulation modeling tools
- Innovative institutional mechanisms for harnessing synergies

Agasinahalli Model Watershed

- Location:
  Neeralakatti, Kotur,
  Agasinahalli, Singanahalli

Total Area Ha: 1555 ha

- Neeralakatti : 414.69 ha
- Kotur : 482.31
- Agasinahalli : 393.00
- Singanahalli : 265.00
- Soil Depth : 6 to 9 Inches
- Soils: Black, Red, Brown

Selection of watershed

Agasinahalla Model Watershed

Agasinahalla Model Watershed

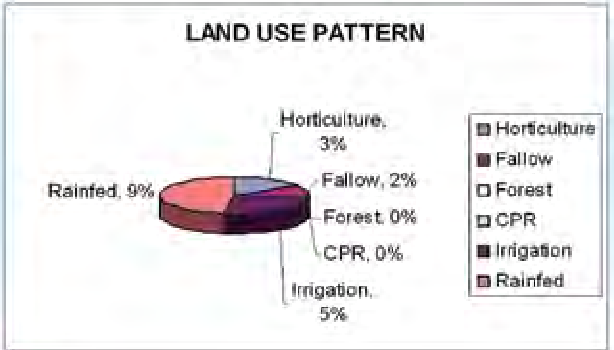
Total Households & Population

Name of the Village	No of House Holds				Total Population		
	SC	Backward Class	Others	Total	Male	Female	Total
Neeralakatti	128	66	24	218	654	597	1251
Kotur	62	82	577	721	1972	1947	3919
Agasanahalli	0	29	4	33	76	73	149
Singanahalli	78	19	397	494	1471	1501	2972
Total	**268**	**196**	**1002**	**1466**	**4173**	**4118**	**8291**

Land use pattern (ha)
Agasinahalla Model Watershed

Name of the Village	Irrigated	Rainfed	Fallow Land	Horticulture	Forest	Common Property Resource	Total
Neeralakatti	25.00	356.00	08.31	15.40	2.25	07.73	414.69
Kotur	35.00	421.42	13.70	17.84	2.85	0.0	492.31
Agasinahalla	8.00	382.00	-	3.00	-	0.0	393.00
Singanahalli	7.00	245.00	0.0	04.50	-	0.0	256.65
Total	**75.00**	**1404.42**	**22.01**	**40.74**	**5.10**	**07.73**	**1555.00**

Agaisnahalla Model Watershed



Agasinahalla Model Watershed

Water Sources for Irrigation

Name of the Village	Open Well Irrigation		Tube Well Irrigation		Drinking water-tube wells		Ground water level (m)
	Functioning	Completely Defunct	Functioning	Completely Defunct	Functioning	Completely Defunct	
Neeralakatti	01	0	45	48	1	0	75-80
Kotur	04	04	78	83	2	2	67-91
Agasinahalla	02	02	65	48	0	0	68-75
Singanahalli	03	02	25	35	1	1	61-75
Total	**10**	**08**	**213**	**214**	**4**	**3**	

Agasinahalla Model Watershed

Livestock Population

Village	Cow	Buffalo	Bullock	Other (goat, sheep, etc.)	Total
Neeralakatti	318	208	172	176	874
Kotur	503	526	456	180	1665
Agasinahalli	24	42	32	5	103
Singanahalli	524	562	472	230	1788
Total	1369	1338	1132	591	4430

Soil & Water Conservation activities

Sl No	Details of Structure's & Activity	Units	No of Structures					Unit cost of the Structure	Cost of the Activity
			Neeralakatti	Kotur	Agasanahalli	Singanahalli	Total		
1	Gully Plugs	Nos	30	25	25	30	110	2000	220000
2	Open well recharging pits	Nos	30	75	70	35	230	10000	2300000
3	Fied bund plantation/avenue plantation	KMT	500	500	500	900	2000	35	70000
4	Field Bunds	RMT	30000	25000	20000	45000	120000	36	4320000
5	Water Way	Mt	2000	2500	2500	2000	9000	40	360000
6	Horticulture	Ha	40	40	40	40	160	12000	192000
7	Forestry	Ha	10	12	12	10	44	2000	880000
8	Vermi Compost	Nos	20	20	20	20	80	3500	280000
9	Live Stock								350000
	Total								10700000

Water Harvesting structures

Sl No	Details of structure's and activity	Units	No of Structures					Unit cost of the structure	Cost of the Activity
			Neeralakatti	Kotur	Agasanahalli	Singanahalli	Total		
1	Farm ponds	No	6	6	6	6	24	40000	960000
2	R.R.S/S.R.S	Nos	6	2	4		19	40000	400000
3	Silt Deflection Sulter	No	5	5	5	5	20	10000	200000
4	Nala Cleaning	Mt	300	200	200	300	1000	500	500000
5	Mini Percolation Tank	Nos	3	3	3	3	12	30000	360000
6	Check Dam	Nos	3	–	–	5	8	150000	1200000
7	Roof water harvesting Structure	No	2	4	3	2	11	30000	330000
8	Soakon pits	No	20	30	30	30	110	2500	275000
	Total								4225000

Major crops grown and productivity level-2007-08

Crop	Area (ha)				Productivity-q ha1			
	Neeralakatti	Kotur	Agasanahalli	Singanahalli	Neeralakatti	Kotur	Agasanahalli	Singanahalli
Rabi season	74	53	24	188				
Wheat					5-6-q/ha	5-6-q/ha	6-7-q/ha	6-7-q/ha
Jowar					6-7-q/ha	6-7-q/ha	7-8-q/ha	7-8-q/ha

Details of Farmers

Name of the Village	Marginal	No of House holds				Total
		Big	Medium	Small	Land Less	
Neeralakatti	119	114	73	39	276	621
Kotur	146	131	107	64	705	1057
Agasanahalli	62	63	42	9	46	222
Singanahalli	67	33	52	40	805	1027
Total	**394**	**341**	**274**	**152**	**1831**	**2927**

Conducted PRA in all the four villages

Detailed soil sampling was collected and analyzed

Stratified soils sampling farmers field were colleted

Farmer Participatory Trial For Kharif 2009

Gram sabha conducted

Street Meeting

Revenue Map

CBOs information

- 18 SHGs formed, Total Members 268
- 16 AGs formed. Total members 320
- Sri Madivaleshwar ICRISAT Model Watershed committee Neeralakatti
- Name of the Bank Indian Overseas Bank Garag
- A/c No 030801000012453

Agasanahalla Model Watershed SHG Progress report

S N	Name of the SHG	Village	Date of Formation	Members F	Members M	Members Tot	Bank A/C No	Name of the Bank	Saving Last Month Saving	Saving This Month	Saving Total
1	Shri Nanrula Model Watershed SHG	Agasanahalli	20/1/2009	12		12	91510	Indian Overseas Bank Garag	10240	960	11200
2	Shri Sankavva Model Watershed SHG	Agasanahalli	20/1/2009	10		10	30553	"	9000	800	9800
3	Shri Allamaprabhu Model Watershed	Neeralakatti	22/3/2009	15		15	12060	"	3700	600	4300
4	Shri Maruthi Model Watershed SHG	Neeralakatti	30/3/2009	11		11	12073	"	4070	440	4510
5	Shri Kalmeshwara Model watershed	Neeralakatti	16/6/2009	12		12	12107	"	4080	480	4560
6	Shri Renukadevi Model watershed	Neeralakatti	26/6/2009	10		10	12130	"	4600	400	5000
7	Shri Jai Hanuman Model Watershed	Neeralakatti	8/7/2009		17	17	12140	"	5780	680	6460
	Sub Total			70	17	87			42550	4360	46910

8	Shri Bhagirathi Model Watershed	Kotur	26/5/2009	20		20	253	Vijaya Bank Kotur	8000	800	8800
9	Shri Vidyashree Model Watershed	Kotur	4/6/2009	20		20	275	Vijaya Bank Kotur	7770	760	8530
10	Shri Akkamahadevi Model Watershed	Kotur	5/6/2009	12		12	234	Vijaya Bank Kotur	4640	480	5120
11	Shri Sangameshwara Model Watershed	Kotur	1/6/2009	12		12	216	Vijaya Bank Kotur	4640	480	5120
12	Shri Bhagyalaxmi Model Watershed	Kotur	19/6/2009	15		15	262	Vijaya Bank Kotur	6500	680	7180
13	Shri Karaganti Model Watershed SHG	Kotur	22/6/2009	12		12	268	Vijaya Bank Kotur	3900	360	4260
14	Shri Makkamadevi Model Watershed SHG	Kotur	16/4/2009	16		16	208	Vijaya Bank Kotur	17600	1280	18880
15	Shri Mahalaxmi Model Watershed	Shiganahalli	2/6/2009	20		20	245	Vijaya Bank Kotur	7600	800	8400
16	Shri Mallikarjuna Model Watershed	Shiganahalli	16/6/2009	17		17	195	Vijaya Bank Kotur	6530	646	7176
17	Shri Durdundi Model Watershed	Shiganahalli	9/6/2009	20		20	237	Vijaya Bank Kotur	7500	800	8300
18	Shri Takediir Model Watershed SHG	Shiganahalli	9/6/2009	17		17	196	Vijaya Bank Kotur	6460	680	7140
	Sub Total			181	0	181			81140	7769	88909
	Grand Total			251	17	268			123609	12129	135818

BIRDS Hungund
(ICRISAT Model Watershed Development Project)
Internal evaluation of SHGs formed in the ICRISAT Model Watershed Development Project

Name of the SHG: **Date of Formation**
Name of the Bank : **A/c No: :**
Total Members:
Name of the Village : **Name of the Community Organizer:**

Sl No	Particulars	Yes	No	Verifiable
1	Whether minimum 10 to maximum 20 members in Group			How many
2	Whether all the members of save every week			Which week & How much savings
3	Whether they opened Group Bank Account			Which Bank
4	Whether after saving in 2 or 3 days put into the Bank			Bank Counter slip
5	Whether the savings amount written in the Personal Pass book			Xerox copy
6	Whether the minutes book is written?			Xerox copy of Minutes
7	Whether all the books of documents written in properly?			"
8	Whether they appointed Book writer to write the documents			Name
9	Whether all the members Land Less or had BPL Number			BPL No
10	Does the SHG meet every week?			Minutes
11	Whether all members of the group had concept of the ICRISAT Model Watershed Development Project			Minutes
12	Does the members had the concept of the SHG			Minutes

13	Does the Representative-I & II got Area			Minutes
14	Whether the Community Organizers of BIRDS given information about ICRISAT Model watershed Development project			Minutes
15	Whether literate members in the Group? If yes, How many			Signature in Minute book.
16	Whether sanction Internal loan & disbursements (If yes Percentage)			Check Ledger, Cash book,
17	Whether Sanction Bank Linkage & disbursements (%)			"
18	Whether sanction Revolving Fund (Govt)			"
19	Others 1 2 3			

Date:
Place:

Supervisors
Name & Address

Evaluators
Name & Signature

Distribution of Revolving Fund Cheque

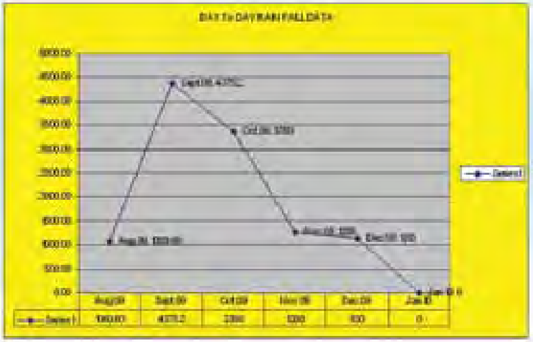
- On 14-2-2010 at Neeralakatti Project Office
- Distributed Rs. 10000/- Revolving Fund to each SHG.
- 18 SHGs got Revolving Fund

Representative-I & II of all the 18 SHGs

Activities done during 2009-10

- Formation of watershed committee and Self Help Groups, Area Groups & Executive Committee
- Baseline Survey.
- Water & Soil Conservation Activity
- Detailed soil sampling
- Installation of Rain water measuring system
- Improved Crop cultivation

DAY BY DAY RAINFALL DATA



Groundwater monitoring in watersheds

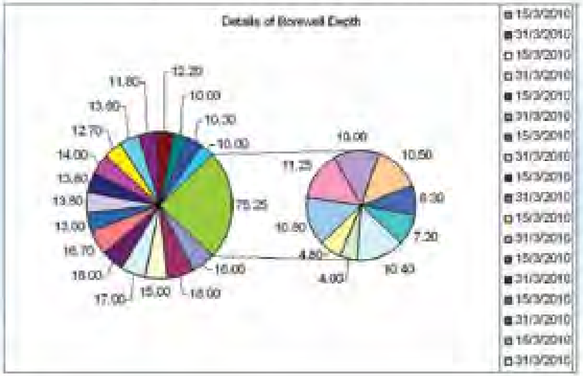
Farmer measuring groundwater level

Agasanahalla Model Watershed Bore Well Depth Information

S. No	Farmer Name	Village Name	Survey No	Date	Months	Bore well Depth
1	Shri Ramappa R.Dandin	Neeralakatti	276/1	15/3/2010	March	16.00 Meter
				31/3/2010		18.00 Meter
2	Shri Iswarappa B.Ambannavar	Neeralakatti	341	15/3/2010	March	15.00 Meter
				31/3/2010		17.00Meter
3	Shri Fakirappa L.Dandin	Neeralakatti	234	15/3/2010	March	16.00 Meter
				31/3/2010		19.70 Meter
4	Shri Rudragouda.S.Patil	Neeralakatti	81	15/3/2010	March	13.00 Meter
				31/3/2010		13.80 Meter
5	Shri Irappa Ambannavar	Neeralakatti	318	15/3/2010	March	13.80 Meter
				31/3/2010		14.00 Meter
6	Shri Gulappa Ambannavar	Neeralakatti	240	15/3/2010	March	12.70 Meter
				31/3/2010		13.60 Meter
7	Shri Devappa Ambannavar	Neeralakatti	87	15/3/2010	March	11.80 Meter
				31/3/2010		12.20 Meter
8	Shri Dhavalsab Nanasabanavar	Kotur	342	15/3/2010	March	10.00 Meter
				31/3/2010		10.30 Meter

S. No	Farmer Name	Village Name	Survey No	Date	Months	Bore well Depth
9	Shri Basappa Rudrappa Angadi	Kotur	193	15/3/2010	March	10.00 Meter
				31/3/2010		10.40 Meter
10	Shri Vijaykumar Appannavar	Kotur	272	15/3/2010	March	04.00 Meter
				31/3/2010		04.80 Meter
11	Shri Chanappa Nigappa Bannakki	Kotur	237	15/3/2010	March	10.80 Meter
				31/3/2010		11.20 Meter
12	Shri Satappa Mallappa Galli	Kotur	318	15/3/2010	March	10.00 Meter
				31/3/2010		10.50 Meter
13	Shri Suresh Koudannavar	Kotur		15/3/2010	March	08.30 Meter
				31/3/2010		07.20 Meter

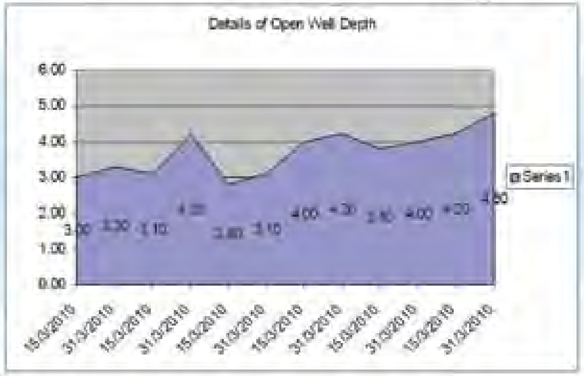
Details of Bore well Depth



Agasanahalla Model Watershed Open Well Depth Information

S. No	Farmer Name	Village Name	Survey No	Date	Months	Depth
1	Shri Masabhi Maside	Kotur		15/3/2010	March	03.00 Meter
				31/3/2010		03.30 Meter
2	Shri Durgadevi Temple	Kotur		15/3/2010	March	03.10 Meter
				31/3/2010		04.20 Meter
3	Shri Pundakka Bhimarayappa Parihal	Kotur		15/3/2010	March	02.80 Meter
				31/3/2010		03.10 Meter
4	Shri Yoga Basappa Kotabagi	Kotur		15/3/2010	March	04.00 Meter
				31/3/2010		04.20 Meter
5	Village well Near Water tank	Heeralakatti		15/3/2010	March	03.80 Meter
				31/3/2010		04.00 Meter
6	Agasinahalli	Heeralakatti		15/3/2010	March	04.20 Meter
				31/3/2010		04.80 Meter

Details of Open Well Depth



Improved seeds and micro nutrients were provided

Inputs		Quantity provided (kg)
Improved cultivar seeds		
Maize	Kaveri,	50
	Prabhat	255
Sorghum		84
Safflower		84
Chickpea	ICPL-37	945
	JG-11	*877*
Micro and secondary nutrients		
Agribor		24
Zinc sulphate		98
Gypsum		-

Demonstration of Improved implement Tropicultor

Agasinahalla Model Watershed Khariff Harvesting Yield Data

Name of the Farmer	Crop Variety	Survey No	Date of sowing	Date of Harvesting	Harvesting area	Fresh Weight Total Stalk	Fresh Weight Total Cob	Fresh Weight Total Sample Stalk	Fresh Weight Total Sample Cob	Treatment	Dry weight of sub sample stalk	Dry weight of cob	Sub sample of dry Grain
[illegible]	Maize Kaveri	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.00	1Kg	1Kg	T1	[illegible]	[illegible]	[illegible]
					[illegible]	[illegible]	7.80						
					[illegible]	[illegible]	7.00						
[illegible]	Maize Kaveri	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.00	1Kg	1Kg	T1	[illegible]	[illegible]	[illegible]
					[illegible]	[illegible]	2.75						
					[illegible]	[illegible]	3.00						
[illegible]	Maize Kaveri	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.00	1Kg	1Kg	T1	[illegible]	[illegible]	[illegible]
					[illegible]	[illegible]	2.25						
					[illegible]	[illegible]	3.25						
[illegible]	Maize Kaveri	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.60	1Kg	1Kg	T1	[illegible]	[illegible]	[illegible]
					[illegible]	[illegible]	4.50						
					[illegible]	[illegible]	4.75						

Name of the Farmer	Crop Variety	Survey No	Date of sowing	Date of Harvesting	Harvesting area	Fresh Weight Total Stalk	Free h Weig ht Total Cob	Fresh Weight Total Sample Stalk	Fresh Weight Total Sample Cob	Treatment	Dry weight of sub sample stalk	Dry weight of cob	Sub sample of dry Grain
[illegible]	Maize Kaveri	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.00	1Kg	1Kg	T2	[illegible]	[illegible]	[illegible]
					[illegible]	[illegible]	[illegible]						
					[illegible]	[illegible]	[illegible]						
[illegible]	Maize [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.00	1Kg	1Kg	T3	[illegible]	[illegible]	[illegible]
					[illegible]	[illegible]	[illegible]						
					[illegible]	[illegible]	[illegible]						
[illegible]	Maize [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.00	1Kg	1Kg	T3	[illegible]	[illegible]	[illegible]
					[illegible]	[illegible]	[illegible]						
					[illegible]	[illegible]	2.75						

Agasinahalla Model Watershed Khariff Harvesting Yield Data

Name of the Farmer	Crop Variety	Survey No	Date of sowing	Date of Harvesting	Harvesting Area	Fresh Weight Total Stalk (kg)	Treat Ment	Fresh Weight Sub Sample	Sub-Sample Dry Weight Stalk	Sub Sample of Drie Grain Yield
Shri Erappa [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T2	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Shri Mahadevappa A.Ambannavar	[illegible]	12	[illegible]	[illegible]	[illegible]	[illegible]	T2	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Shri Devappa Ambannavar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T2	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Shri Tirtasha Kalmat(Kotur)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T2	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Shri Ibrahimshab R. Hanumanal (Kotur)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T2	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				

Shri Erappa Ambannavar	Soyabean JS-335	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T1	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Shri R.S.Patil	Soyabean JS-335	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T1	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Shri R.S.Patil	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T2	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Shri Fakeerappa Dandin	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T2	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Shri Madivappa Ambannavar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T2	[illegible]	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				

Shri Rayappa Budappannavar	[illegible]	24	[illegible]	[illegible]	[illegible]	[illegible]	T1	1 K.G.	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Shri Rayappa Budappannavar	[illegible]	34	[illegible]	[illegible]	[illegible]	[illegible]	T2	1 K.G.	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Tirtaiha s Kalmath	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T1	1 K.G.	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				
Tirtaiha s Kalmath	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T2	1 K.G.	[illegible] gram	[illegible] gram
					[illegible]	[illegible]				
					[illegible]	[illegible]				

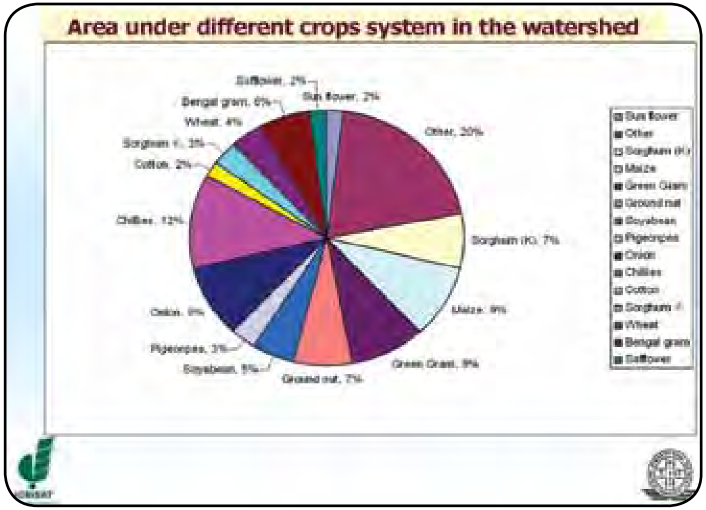
Agasinahalla Model Watershed Rabi Harvesting Yield Data

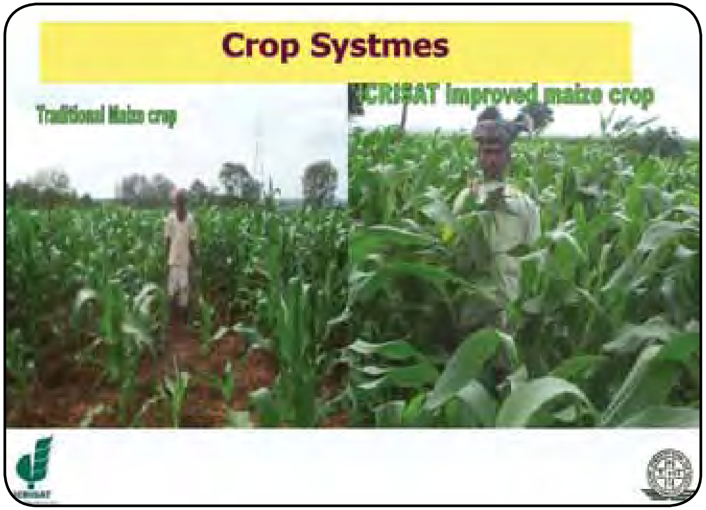
Farmer Name	Crop Variety	Survey No	Date of Sowing	Date of Harvesting	Harvesting Area	Fresh Weight Total Stalk (K.G)	Treatment	Fresh Weight Sub Sample Stalk	Sub Sample Dry Weight Stalk	Sub Sample of Dry Grain Yield
Shri Siappa Budappannavar	Chick pea JG-11	1	[illegible]	[illegible]	[illegible]	[illegible]	T1	[illegible]	[illegible] gram	[illegible] gram
Shri Siappa Budappannavar	Chick pea JG-11	1	[illegible]	[illegible]	[illegible]	[illegible]	T2	[illegible]	[illegible] gram	[illegible] gram
Shri Shankarappa Ambanavar	Chick pea JG-11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T1	1 K.G	[illegible] gram	[illegible] gram
Shri Shankarappa Ambanavar	Chick pea JG-11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	T2	1 K.G	[illegible] gram	[illegible] gram
Shri Irapp Ambanavar	Chick Pea JG-11	275	[illegible]	[illegible]	[illegible]	[illegible]	T1	1 K.G	[illegible] gram	[illegible] gram
Shri Irappa Ambanavar	Chick Pea JG-11	275	[illegible]	[illegible]	[illegible]	[illegible]	T2	1 K.G	[illegible] gram	[illegible] gram
Shri Devappa Ambanavar	Chick Pea JG-11	17	[illegible]	[illegible]	[illegible]	[illegible]	T1	1 K.G	[illegible] gram	[illegible] gram

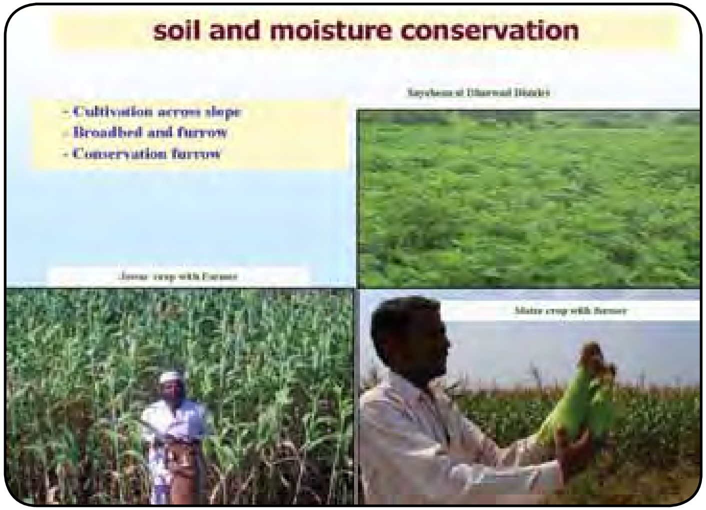
Agasinahalla Model Watershed Rabi Harvesting Yield Data

Name of the Farmer	Crop Variety	Survey No	Date of Sowing	Date of Harvesting	Harvesting area	Fresh Weight of Total Stalk (kg)	Fresh Weight Total Cob (kg)	Fresh Weight Sub sample stalk	Fresh weight sub sample cob	Treatment	Dry weight of sub sample stalk	Dry weight of Cob	Sub sample of Dry Grain
Sri Hovappa Kallolavi	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1Kg	1Kg	T1	[illegible]	[illegible]	[illegible]
Sri Shankrappa Karaoisavara	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1Kg	1Kg	T1	[illegible]	[illegible]	[illegible]
Sri Shankarappa Karaoisavara	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1Kg	1Kg	T2	[illegible]	[illegible]	[illegible]
Sri Paresh L Dandin	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1Kg	1Kg	T1	[illegible]	[illegible]	[illegible]
Sri Paresh L Dandin	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1Kg	1Kg	T2	[illegible]	[illegible]	[illegible]
Sri Kallappa Dandin	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1Kg	1Kg	T2	[illegible]	[illegible]	[illegible]

Farmer measuring the crop. Crop measuring machine provided by ICRISAT


Area under different crops system in the watershed
Safflower, 2%
Sun flower, 2%
Bengal gram, 6%
Wheat, 4%
Cotton, 2%
Chillies, 12%
Other, 20%
Sorghum (K), 7%
Ground nut, 7%
Pigeonpea, 3%
Sun flower
Other
Sorghum (K)
Maize
Green Gram
Ground nut
Soyabean
Pigeonpea
Onion
Chillies
Cotton
Sorghum
Wheat
Bengal gram
Safflower


Crop Systmes
Traditional Maize crop
ICRISAT improved maize crop


soil and moisture conservation
- Cultivation across slope
- Broadbed and furrow
- Conservation furrow


Conducted Training on Vermi Compost pits. Total 20 members participated
Constructed Vermi Compost pits

Conducted SHG Training to all the SHG members. Total 264 members were participated

Conducted Exposure Training at Hyderabad

Women Farmer Sharing her feelings about the Exposure at Hyderabad

Filed Bund Work is in progress under Water & soil Conservation Programme (Trench cum bund)

Work Plan of Agasinahalla Model Watershed

Sl No	Name of the Activity	Unit	Total cost for five years				
			Unit cost (Rs)	Physical Unit (Ha)	Project Contribution (Rs)	Farmers Contribution (Rs)	Cost of each activity (Rs)
1	[illegible]						
2	[illegible]	[illegible]					
3	[illegible]						
4	[illegible]						
5	Soil and water conservation						
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Horticulture	Ha	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Forestry	Ha	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Vermi compost	Nos	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Live Stock			[illegible]	[illegible]	[illegible]	[illegible]
	Sub Total		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

6	**Water harvesting structure**						
	a) Farm ponds	No.	40000	24	792000	163000	960000
	RRT/RTS	Nos	40000	10	360000	40000	400000
	Silt Detention Tank	Nos	10000	36	480000	30000	300000
	Nala Cleaning	Mt	300	1060	450000	30000	300000
	Mini Percolation Tank	Nos	30000	12	240000	45000	360000
	Check Dam	Nos	150000	8	1000000	120000	1020000
	Roof Water harvesting Structure	Nos	30000	11	287000	31000	300000
	Sunken Pit	No.	2500	116	231000	55000	275000
	Sub Total		**302000**	**1195**	**3843000**	**365000**	**4225000**
7	Productivity enhancement						
	a) Improved varieties	ha					
	b) Micronutrients	ha					
	c) Integrated weed management	ha					
	d) Improved land and water management	ha					
	e) Improved irrigation system (e.g., micro irrigation, improved surface irrigation)	ha					
	f) Improved surface irrigation	ha					
	g) Improved implement	Nos					
	h) Other farm machinery	set					
	Sub Total		0	0	0	0	0
8	Afforestation & Pasture Development						
	a) Afforestation	ha					
	Pasture development/...	ha					
	c) Bio-fence plantation	ha					
	Sub Total		0	0	0	0	0

9	Crop diversification and horticulture development						
	a) Private land	ha	0	0	0	0	0
10	**Livestock development**	No.					
	a) AI unit etc	No.					
	b) Animal health camps	No.			270000	90000	360000
	Sub Total				270000	90000	360000
11	Income generating activities (SHG & micro enterprises etc. for landless/marginal farmers)						
	a) Vermi composting	Nos					
	b) Mushroom cultivation	Nos					
	c) Nursery	No					
	d) Revolving fund to SHG groups	Nos	40000	36	1440000		1440000
	e) Value addition units	Nos					
	f) Village information center	Nos					
	Sub Total		40000	36	1440000		1440000
12	Establishment of weather and hydrological monitoring units						
	a) Automatic weather station	Nos					0
	b) Runoff and soil loss monitoring unit	Nos					0
	Sub Total		0	0	0	0	0
13	Capacity building						
	a) Community mobilization	Nos			30000		30000
	b) Trainings	Persons			730000		730000
	c) Field days	Nos	10000	20	200000		200000
	d) Exposure visits	Persons			360000		360000
	e) Training materials	Nos			300000		300000
	f) Demonstration plots	Nos					
	Sub Total		10000	20	1620000	0	1620000

14	Monitoring and Evaluation						
	a) Participatory monitoring and evaluation						
	b) Baseline						
	c) Workshop and meetings						
	Sub Total	0	0	0	0	0	0
15	Impact assessment						
16	Remote sensing data	Nos					
	Total		0	0	0	0	0
17	Administrative Expenses (10%)						
	Total		**410811**	**132075**	**16470000**	**3000000**	**16475000**

Year wise Action Plan for Agasanahalla Model Watershed

Sl No	Particulars	1st year		2nd year		3rd year		4th year		5th year		Total		Total (Rs)
		Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	
1	Selection of Watershed	0	0	0	0	0	0	0	0	0	0	0	0	0
2	PRA/DPR (Soil sampling)	0	0	0	0	0	0	0	0	0	0	0	0	0
3	DPR Preparation	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Baseline survey													
5	Soil and water conservation	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]
6	Water Harvesting Structure	90	247700	303	311500	448	1120000	605	1140000	28	375000	1195	4225000	4225000
7	Productivity Enhancement	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Afforestation	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Crop Diversification Horticulture	0	0	0	0	0	0	0	0	0	0	0	0	0
10	SHG Aid	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	20	[illegible]	[illegible]
11	Seminar/Meeting	0	0	0	0	10	[illegible]	0	0	0	0	10	[illegible]	[illegible]
12	Weather & Hydrological Monitoring	0	0	0	0	0	0	0	0	0	0	0	0	0

S No	Particulars	1st year		2nd year		3rd year		4th year		5th year		Total		Total (Rs)
		Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	
[illegible]	Weather & Hydrological Monitoring	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Evaluation & Monitoring		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Impact Assessment		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Travel		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Workshop/ meeting		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Admin cost (10%)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	TOTAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CASE STUDY

Low Cost But High Yield, That is ICRISAT

Neeralakatti is a small village in Dharwad District and also Dharwad Taluk. Here is small farmer named Nagappa Bheemappa Devdapur having 2 acre and 14 Gunta land. He is a man with progressive ideas wants to be different from other small farmers. He wants to achieve and get maximum yield with his small 2 acre land. Hence he used to visit "**Raitha Samparka Kendra**" and Agriculture University often. The team of "**ICRISAT Model Watershed**" held the Gramasabha and he also participated and came to know the watershed model of ICRISAT. One day he asked the ICRISAT Team to visit his land. The team while going to Agasinahalli visited his land and told they will supply good quality seeds with low cost which were tested and processed. The yield is comparatively high than other conventional seeds. The Nagappa Convinced about this and became the ICRISAT Model Watershed Beneficiary.

Nagappa visited our ICRISAT Office. We gave him "**5 kg Prabhat maize**" quality seeds 100 kg Gypsum, 4 kg Zinc sulphate and 1 kg agriboron with subsidized rate.

He sowed these ICRISAT supplied Prabhat maize seeds in 1 acre land of Kelur territory with survey No 274. He put also 50 kg DAP and 50 kg Urea along with ICRISAT supplied Gypsum, Zinc sulphate & Agriboron. He spent 1100/- Rs while it was 3800/- Rs last year. The yield this year is 25 quintals while it was 21 quintals last year.

Thus with less cost more yield. Nagappa is smiling with ICRISAT help.

Naganna S Kerlholad
Community organizer
BIRDS ICRISAT
Project

Achievement of women belonging to poor family

My name is Smt Susheela Basappa Yettinagudda of Neeralakatti. I belong to poor family. Hence I wanted to have some programmes towards my sustainable development. I has listened to a number of SHG but I was not for SHG. We also met and formed Renukadevi ICRISAT Model Watershed SHG with 10 members. Every week we meet and save Rs 10/.- each. The savings up till now is 4080 Rs. ICRISAT people gave SUTTUNIDIHI to our sangha. In that I have availed Rs.5000/- as loan.

I have purchased two goats with my savings and loan from Bank. I am finding my livelihood and getting benefit out of SHG.

Smt Susheela as told to
Naganna Kerlholad
Community organizer

Small Step but big achievement towards sustainable development (IGP)

Success story of Sangavva Pujar

Agasinahalli is a small village of Dharwad Taluk of Dharwad District. It is a backward village where basic facilities are lacking. The ICRISAT model watershed team one day visited the Agasinahalli and made a Gramasabha and explained the importance of forming SHG and the formalities to be followed. Then all the women came together and formed SHG named "Namratha Women ICRISAT Model Watershed SHG. It consist of 11 members. Every week we are saving 20/- Rs and up till now I have saved 960/- Rs. The ICRISAT model Watershed Project people have given 10000/- Rs as suttunidhi for our sangha. We give loan to members. I have availed 5000/- Rs Loan and purchased one Buffalo with my other savings. Now this Buffalo give 4 liters of milk. I will sell milk to sweet mart at Rs 12 per liter. Monthly I will get Rs. 1500/-. I will repay Rs. 500/- to the SHG towards loan and I will make lively hood with rest of the money.

Thanks to ICRISAT for motivating and involving me in SHG and it is a small Step but big achievement towards sustainable development i.e. Income Generation Programme

Smt Sangavva Pujar as told to
Naganna Kerlholad
Community organizer

IMPACT

- Due to Traditional seeds formers faced problems every year, like inconvenient to timely, Traditional seed growth highly but less yields.
- ICRISAT Seeds helped to reduced expenditure on farming and got good yield.

ICRISAT

International Crop Research Institute for Semi-Arid Tropics, Hyderabad

JalaSRI

Watershed Surveillance and Research Institute, Jalgaon

Padmalaya Model Watershed Development Programme Pathri-Samner, Jalgaon District

GAURI RANE

Coordinator

JalaSRI

Funded by: Government of India

Partners:

- ICRISAT, International Crop Research Institute for Semi Arid Tropics, Hyderabad
- JalaSRI, Watershed Surveillance and Research Institute, Jalgaon
- Jalgaon District Agriculture Department

Duration: 2008-2013

JalaSRI

Watershed Surveillance and Research Institute, Jalgaon, India

A multidisciplinary Research Institute Sponsored By

Khandesh College Education, Society's

MOOLJI JAITHA COLLEGE, JALGAON

[NAAC Accredited "A" Grade, UGC Honoured "College with Potential for Excellence" and ISO 9001:2008 Certified]

A member of Digital Government International working group of a project of National Science Foundation, USA

And

A District level Research Initiative for

Digital Governance and Hotspot Geoinformatics

Padmalaya Model Watershed

Watershed area: 982 ha

Population: 5500

Total farmers:

Pathri : 623

Samner : 641

Soil depth: 15-150cm

Soils: Black loam

Villages	Cultivable land			Cultivable waste	Uncultivable waste	Total
	Irrigated	Un-irrigated	Total			
Pathri	45.4	620.3	665.7	42.4	54.4	762.5
Samner	109.0	552.2	661.2	15.1	101.9	[illegible]

Team

ICRISAT

Suhas P Wani
P.Pathak
Sudi Rao
And Others

JalaSRI

Gauri Rane
Chetan Mahajan
Bidhan Sardar
Vikrant Mahendran
Hemant Koli

Objective

The main objective of this project is to improve the food security and livelihood opportunities for rural people in rainfed area of Pathri-Samner through integrated watershed approach

Objectives

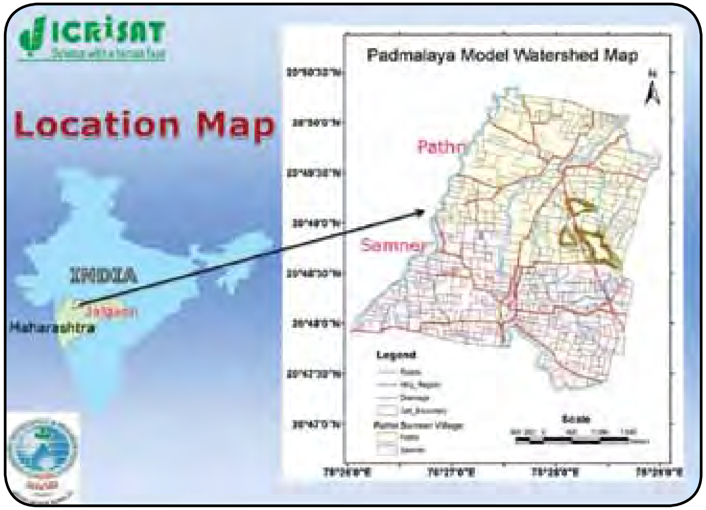
[illegible]

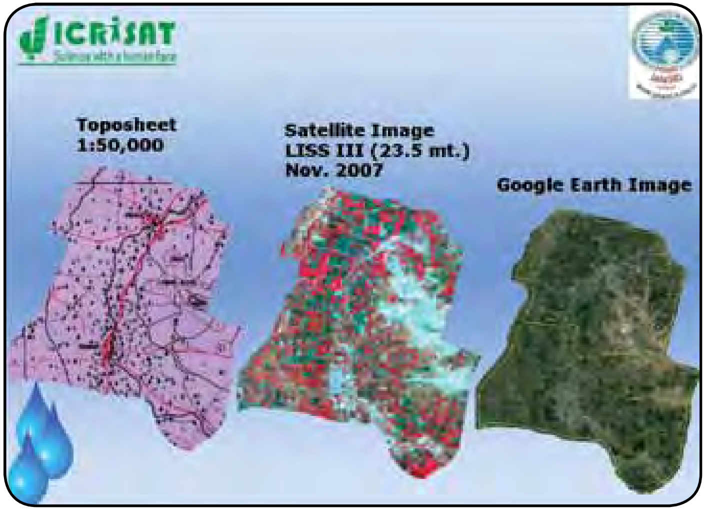
1. Integrated soil – water - nutrient management practices appropriate to farmers resources and ecosystem
2. Cost effective water harvesting and groundwater recharging structures (check dams, percolation tanks, etc.)
3. Drainage line treatment (gully plugs, loose boulder structures and gabions)
4. Improved agronomic practices (high yielding varieties, intercropping and introduction of new crops, nutrient management options, vermicompost, biofertilizers, improved implement, etc.)
5. Crop diversification with high value horticulture / vegetables
6. Cattle improvement programs (artificial insemination and animal health camp)
7. Afforestation
8. Income-generating micro-enterprises for improving livelihoods of women and landless farmers
9. Capacity building and institutional building for sustaining the impact of watershed program

Process of Selection

Proposed locations for Model Watershed with the scorings based on priorities

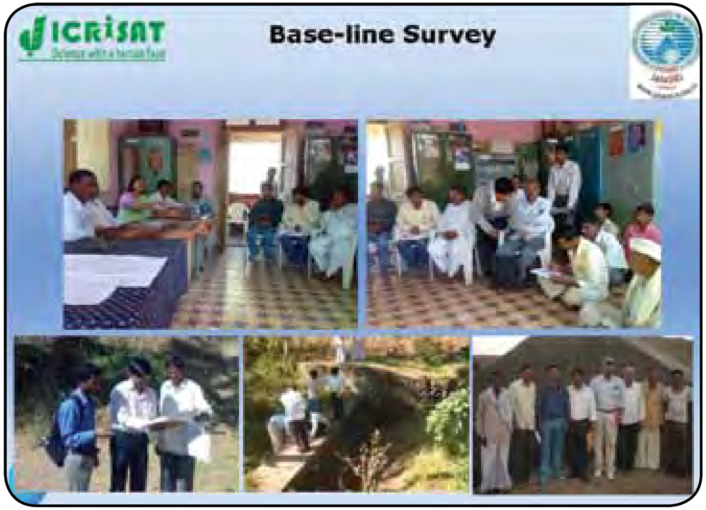
Watershed (Villages)	Hydro-geology	Need based	Less irrigation area	Socio-economic status	Accessibility	Total Score
	30	20	20	20	10	100
Pathri	25	16	13	14	7	75
Kasoda	22	16	16	13	7	74
Jamner	25	15	14	12	7	75
Kharchi	22	14	13	12	8	69


Location Map
Padmalaya Model Watershed Map
Pathri
Samner
INDIA
Jalgaon
Maharashtra
Legend
Scale


Toposheet
1:50,000
Satellite Image
LISS III (23.5 mt.)
Nov. 2007
Google Earth Image


Inauguration and Address
by ZP President


Work Done


ICRISAT
Base-line Survey


ICRISAT
Hydrological Monitoring Station
(Digital Runoff Recorder and Automatic
Soil Loss Monitoring Device)


ICRISAT
Installation of Automatic Weather Station


ICRISAT
Farmers Participatory
Soil Sample Collection:
Stratified Sampling

Use of Tropicultor for Better Crop Establishment

Seed and Fertilizer Distribution for Participatory PE Trials

Kharif Season

Rabi Season

Crop Observations in Participatory Trials

Exposure Visit by Watershed Committee to ICRISAT

Women Self Help Group Formation

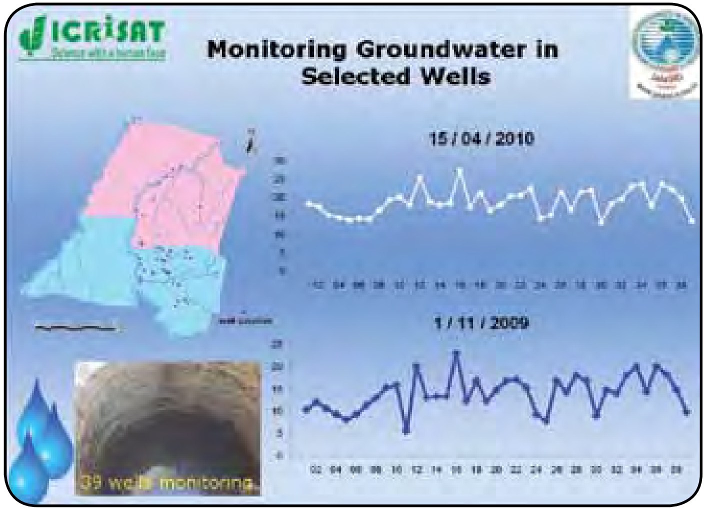
ARTI Technology Training, Phaltan

Training for Biogas by ARTI - Appropriate Rural Technology Institute, Pune

Site selection for Farm pond: Convergence with GoMS Program


ICRISAT
Discussion for Proposed Developmental Plan of Watershed


ICRISAT
Survey


ICRISAT
Monitoring Groundwater in Selected Wells
15 / 04 / 2010
1 / 11 / 2009
39 wells monitoring


ICRISAT
Students Involvement through NSS: Desiltation of Check Dam
CHANGE

Distinguished Visitors

Work To Be Done

SECOND YEAR PLAN

- **Soil and Water Conservation:** Gully plug (25 nos.), Well recharge pits (50 nos.), avenue plantation (3 ha), water storage structures (7 out of 23 proposed), Gully control structures(10 nos.)
- **Water harvesting structures:** Farm Pond construction (6), diversion canal (1 no), percolation tanks (1 no), Renovation of structures (3 nos.)
- **Productivity Enhancement:** Improve variety seeds (200 ha), Micronutrients (200 ha), Improved land management with Tropicultor (1 no.)
- **Income generating:** Vermicompost Production and Distribution (15 nos.)
- **Capacity building:** Trainings (10 persons), Exposure visits (10 persons), Demonstration plot (5 nos.)

Padmalaya Model Watershed Existing and Proposed Sites for Soil and Water Conservation Stuctures

FUTURE PLAN

Soil and Water Conservation: Gully plug (80 nos.), Well recharge pits (60 nos.), avenue plantation (2 ha), water storage structures (10 nos.), Gabion Structure (1 no), Gully control structures(12 nos.), field bunds

Water harvesting structures: Farm Pond construction (10 nos.), Masonry check dam (4 nos.), Underground bandhara (1 no), Bolder nala Bandhara (20 nos.), percolation tanks (2 nos.)

Productivity Enhancement: Improve variety seeds (350 ha), Micronutrients (350 ha), Farm machineries (1 no.), integrated pest management, improve land and water management

FUTURE PLAN

Income generating: Vermicompost Production and Distribution (25 nos.), Biopesticides and vermiwash (5 nos.), Nursery (2 nos.)

Capacity building: Trainings (50 persons), Exposure visits (50 persons), Demonstration plots (5 nos.)

Impact assessment

Future Remote sensing data acquisition

Acknowledgment

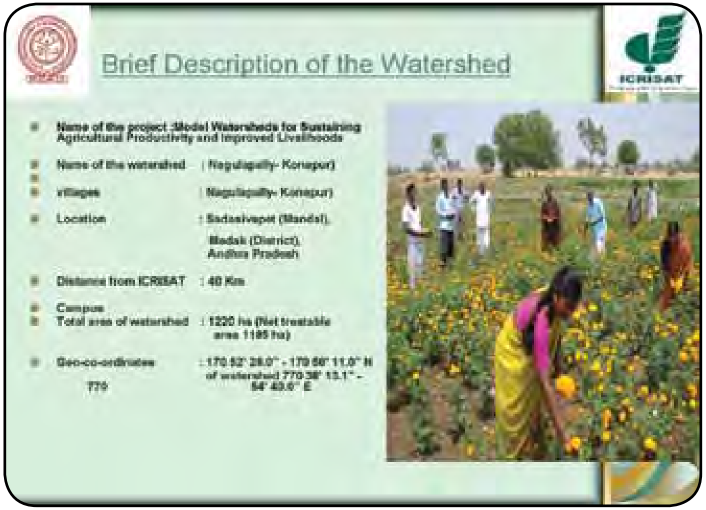
- **Nandkumar Bendale,** President, K.C.E society, Jalgaon
- **Anil Rao,** Principal, M. J. College, Jalgaon
- **Kunal Kumar,** District collector Jalgaon
- District Agriculture officer, Jalgaon
- District Irrigation Officer, Jalgaon
- Deputy Director, Social Forestry, Jalgaon

Thank You


WELCOME
TO
NAGULAPALLY-
KONAPUR Model
Watershed
MEDAK (Dist.)
ANDHRA PRADESH
PIA :- READ
ICRISAT


PROFILE OF PROJECT
IMPLEMENTING AGENCY
ICRISAT
Name of the NGO : Rural Education & Agriculture Development (READ)
Legal Status : Registered society under public societies registration Act,1350 Fasli
Whether Trust or Society : Society Society Registration Number : 6414/1997, Dated-12-12-1997
Aim of the Society :-
Main aim of the society is to rural education development and agriculture development i.e nothing but READ. READ act as agent to mobilize the people towards importance of education and alternately literacy rate increase. If literacy rate increased easy to reach all govt policies and programmes to people. And also act as agent to mobilize the people towards good agriculture outputs Alternately rural lively hoods increased and poverty decrease
To create awareness for good agriculture outputs
To create awareness for Education importance.
To facilitate process towards building of a civil society through collective action, participation and community based initiatives.


DETAILS OF PROJECT
IMPLEMENTING AGENCY
ICRISAT
The major intervention of the organization :-
Natural resource management, empowerment of women, livelihood enhancement and environment education
The thrust of the organization has been to function both as facilitating and a training Agency
The emphasis has been on building processes that strengthen community initiatives for collective action. Such process includes forming women's sangha's decision making. Through democratic processes, discussion and participatory lobbing and advocacy for gaining access to development programs
Field :-
Rangareddy (dist) and Medak (dist) Andhra Pradesh, India
Mission statement :-
Establish sustainable regenerative rural life styles, environment protection and create replicable models for villages
Overall objective of the organization :-
Establish sustainable regenerative rural life styles, environment protection and create replicable models for villages. The project envisions to mobilize, motivate and facilitate rural groups especially women to develop their degraded fallow or assigned land with relevant off form livelihood components in village waste lands to enable them to have secured sustainable livelihood and ensure biomass for agriculture, domestic and livestock benefit and biofouled for energy uses


Brief Description of the Watershed
ICRISAT
Name of the project :Model Watersheds for Sustaining Agricultural Productivity and Improved Livelihoods
Name of the watershed : Nagulapally- Konapur)
villages : Nagulapally- Konapur)
Location : Sadasivapet (Mandal), Medak (District), Andhra Pradesh
Distance from ICRISAT : 40 Km
Campus
Total area of watershed : 1220 ha (Net treatable area 1185 ha)
Geo-co-ordinates : 170 52' 28.0" - 170 56' 11.0" N of watershed 770 38' 13.1" - 770 54' 40.6" E

Consortium partners:

- Watershed committee and farmers
- NGO;-Rural Education & Agriculture Development (READ)
- International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
- DWMA, Govt., of Andhra Pradesh
- Central Government: CRIDA and NRSA

Watershed map

Population details

Name of the Village	No of house holds				Total population		
	Scheduled caste	Backward class	Others	Total	Male	Female	Total
Nagulapally	105(42)*	95(38)	47(19)	247	543(52)	496(48)	1038
Konapur	85(19)	242(54)	118	445	957(52)	842(48)	1905
Total	190(28)	337(49)	165(23)	692	1500(51)	1438(49)	2944

Objectives:-

- The overall objective of the project was to enhance and sustain productivity in soils of medium to high water holding capacity in the intermediate rainfall excoriation with emphasis on arresting soil degradation

Activities done

- Base line data collection
- Collection of soil samples
- PRA Exercise
- Transact walk
- Preparation of DPR
- Installation of Rain gauge
- Construction of Vermi compost units
- Ground water measures

Trainings

Sl.no	Name of the training	No of trainings	No of participants
1	Trapiculture training	2	160
2	Soil sample collection	1	66
3	Application of Micro nutrients	1	38
4	Vermi compost	2	52
5	Watershed Concept	2	48
6	Book Keeping	2	18
7	Exposure visit	2	32

ICRISAT OFFICIEALS VISIT TO MODEL WATERSHED

Institutional Arrangements

ACTION PLAN FOR THE YEAR 2010-11

Sl. NO	Activity proposed	No.of units	Unit	Rate/Unit	Amount in Rs
1	Farm Bunding	1800	Cum	64	1,15,200
2	Stone Outlets	38	No	600	22,800
3	MPT	2	No	20,000	40,000
4	Farm pond with Revetment	2	No	35,000	70,000
5	RFD	10	No	8,000	80,000
6	Loose Boulder	14	No	4,000	56,000
7	Check Dam Repair	2	No	25,000	50,000
8	Check Dam	1	No	1,50,000	1,50,000
9	Afforestation				20,000
				TOTAL Rs:	6,04,000

Progress for the year 2010 -11

Sl.NO	Activity proposed	Sanctioned		Achievements	
		Phy	Finance	Phy	Finance
1	Farm Bunding	1800	1,15,200	1086	69,500
2	Stone Outlets	38	22,800		
3	MPT	2	40,000		
4	Farm pond with Revetment	2	70,000		
5	RFD	10	80,000		
6	Loose Boulder	14	56,000		
7	Check Dam Repair	2	50,000		
8	Check Dam	1	1,50,000		
9	Afforestation		20,000		
	TOTAL		6,04,000		69,500

Work Progress

Contour Bunding Instructions of ICRISAT Officials

Distribution of improved seed

Khareef 2009-10		
1	Pigeon pea	200Kg
2	Maize	400Kg
3	Sorghum	20Kg
4	Greengram	52Kg
Rabi 2009-10		
5	Chickpea	400Kg

Sorgum

Pigeonpea

Chickpea

Application of Micronutrients

Zink Sulphate	240Kg
Agribor	12Kg
Gypsum	1400Kg

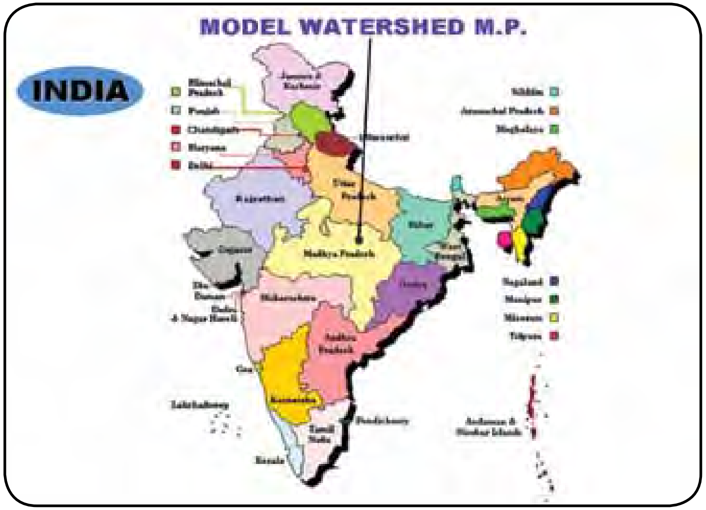

Mixing of micronutrients


Aplication of microneutrients

Impact Assessment of Rabi Cultivation 2009-10

Sl no	Name of the crop	Improved varieties with neutrients		Local Varieties		Net yelid increase
		Area	Yeild in Kg/ha	Area	Yeild in Kg/ha	Net yeild in Kg/ha
1	Chickpea	1.00	1280	1.00	1060	220

THANK YOU



INTRODUCTION

Guna gateway of Malwa & Chambal, is located on the northern - eastern part of Malwa Plateau between Parvati and the Betwa River. The western boundary of the District is well defined by the River. The Parvati is the main River flowing along the western boundary touching Rajgarh District of M.P. and Jhalawar and Kota District of Rajasthan. Shivpuri & Kota are located in north where as Vidisha, Bhopal, and Rajgarh lies to the South.

OBJECTIVES

- Sites of learning for different Eco-Zones.
- Capacity Building.
- Science based planning.
- To regenerate the Natural Resources through watershed development approach.
- To improve the socio-economic condition of rural poor.
- Empowerment of women .
- Inclusive Development of village through watershed.
- Change cropping pattern and increase cropping area.

BASIC INFORMATION

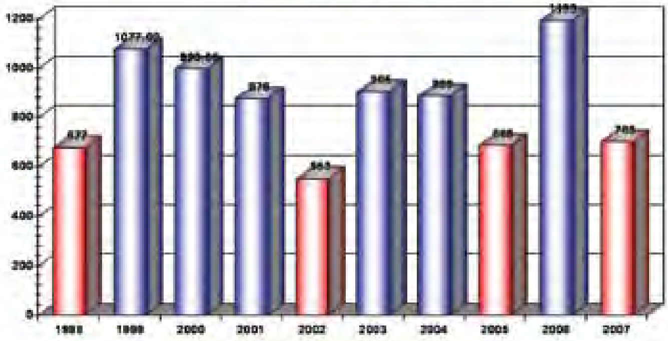
Name of watershed	Barkheda khurd
No. of Village	04
District / State	Guna/M.P.
Block	Chachoda
Distance from dist. HQ (km)	50
Total Households	415
Avg. land holding (ha./family)	3.5
Literacy (%)	65 to 70
Migration (%)	15
Total sanctioned area (ha.)	1367.00
Starting Date	Nov. 2008

BASIC INFORMATION .....

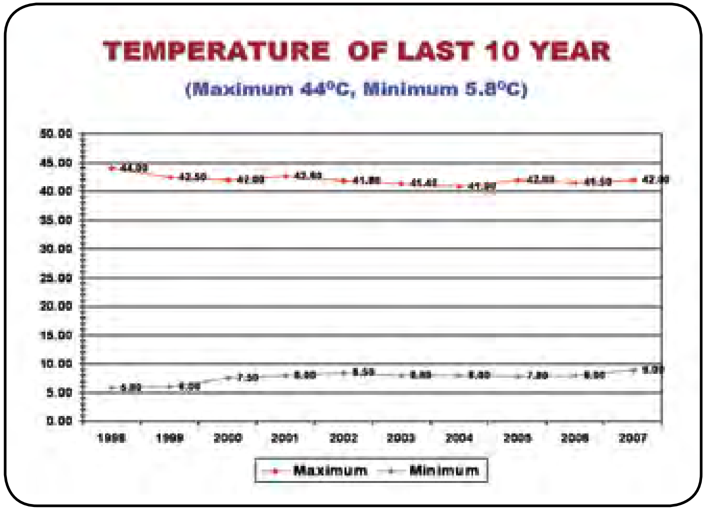
Cultivated land (ha.) Irrigated land (ha) Un irrigated (ha)	1226.00 321.00 905.00
Sources of Irrigation	Dug well, River, Nallah & Irrigation tank
Soil type	Black, Sandy loam and Red
Soil depth	2 to 10 fit.
Main crops	Soybean, Maize, Sorghum, Coriander, Wheat & Chickpea
Use of fertilizer	Chemical Fertilizer (DAP, Urea & SSP) , FYM
Average Rainfall	900 mm
Temperature	Maximum 44 C , Minimum 5.8 C

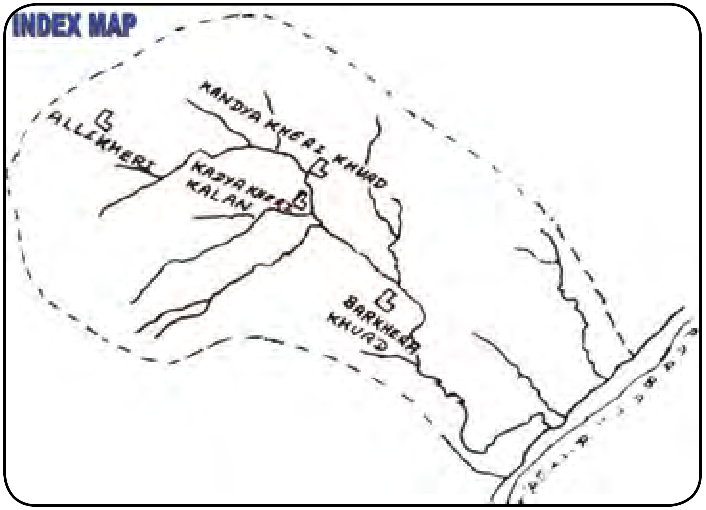
RAIN FALL OF LAST 10 YEAR

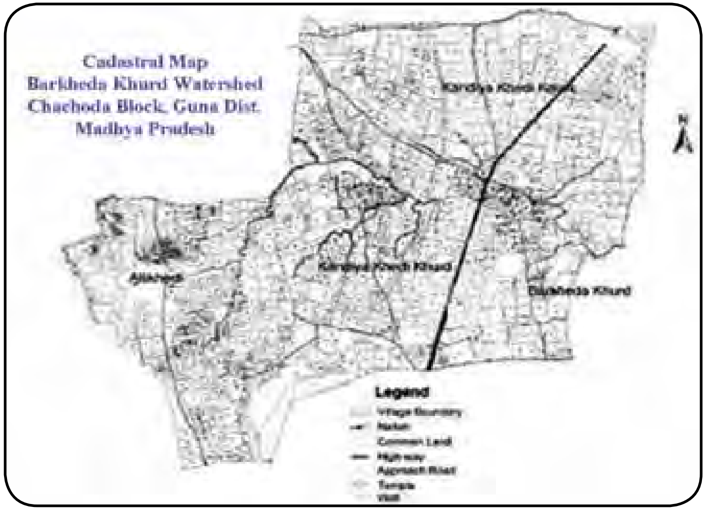
(Average 900 mm)



Average Rain Fall (mm.)







PROCESS ADOPTED

- Base Line Survey of selected villages
- Technical Survey through transit walk
- Focus Group Discussions & Village meetings
- Compilation of major technical gaps & assessment of quick need for environment building
- PRA & Group formation
- WDC formation
- Preparation of Participatory DPR
- Approval of DPR
- Capacity Building of Groups & WDC
- Implementation by WDC
- Participatory evaluation/ Social Audits
- Participatory Impact Assessment
- Preparation & Approval of Exit policy by Gram sabha
- Handling over the project as per policy
- Technical handholding to VOs/ POs

PHYSICAL PROGRESS
(Upto March 2010)

Sr.	Activity	Achievement
1	PRA	Complete (May 2009)
2	Committee Formation	Complete (27/06/2009)
3	Rain Gauge	Installation (Aug. 2009)
4	One Year Work Plan (2010-11)	Complete (Feb. 2010)
5	Rain Fall Measurement	Complete (Aug.09 to March 2010)
6	Selected Well for Ground Water level	15

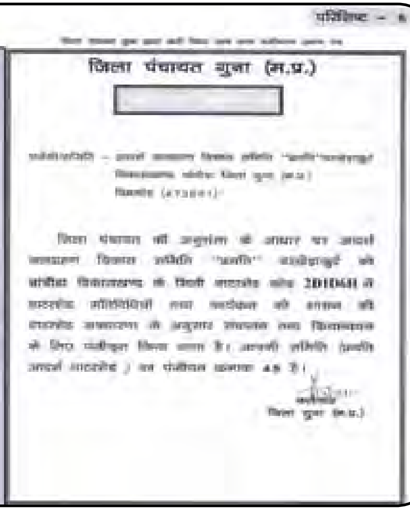
PHYSICAL PROGRESS.....

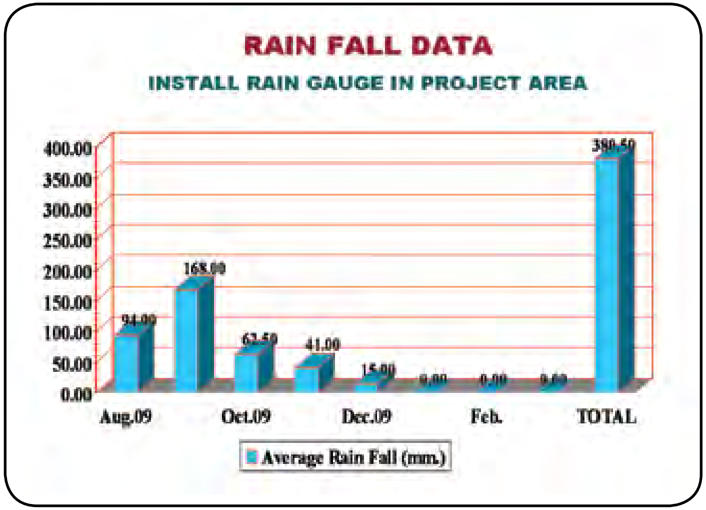
Sr.	Activity	Achievement
7	Ground Water Level Observation	Complete (Oct. 09 to Mar. 2010)
8	INM demo plot Kharif - 2009 Rabi - 2009-10 No. of Beneficiaries	23.75 ha. (Soybean JS-335) 6.25 ha. (Chickpea ICCV-37) 84
9	Baseline survey	Complete (83 Families)
10	Committee Registration	Complete (08/04/2010) by Collector-Guna

PHYSICAL PROGRESS.....

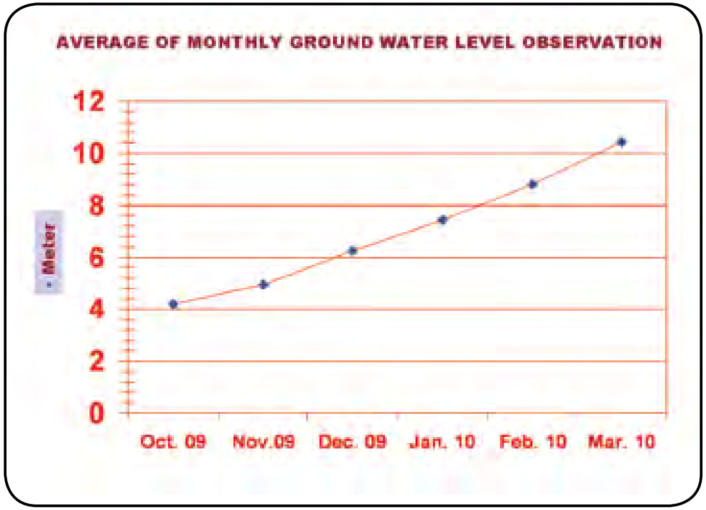
Sr.	Activity	Achievement
11	Soil Sample	70
12	Number of Village Meeting	28
13	Exposure visit	01 - ICRISAT Campus (07/04/10 to 9/04/10)
14	SHG's Formation	05 (Saving Rs. 15000/-)

COMMITTEE REGISTRATION CERTIFICATE ISSUE BY DISTRICT COLLECTOR GUNA - (M.P.)




RAIN FALL DATA
INSTALL RAIN GAUGE IN PROJECT AREA
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
94.00
168.00
62.50
41.00
15.00
0.00
0.00
380.50
Aug.09
Oct.09
Dec.09
Feb.
TOTAL
Average Rain Fall (mm.)


INSTALLATION OF RAIN GAUGE


AVERAGE OF MONTHLY GROUND WATER LEVEL OBSERVATION
12
10
8
6
4
2
0
Meter
Oct. 09
Nov.09
Dec. 09
Jan. 10
Feb. 10
Mar. 10


GROUND WATER OBSERVATION

Demo Plot of Soybean JS-335 Kharif crop – 2009-10

Demo Plot of Chickpea ICCV-37 Rabi crop – 2009-10

ON FARM RESEARCH TREATMANT

(Recommended for leguminous crop)

Fertilizer	@kg./ha.
Borax	2. 50
Gypsum	100
Zink Sulphate	50
DAP	70
UREA	07
Culture PSB Rhizobium	 0.40 0.40

IMPACT OF INM

Kharif & Rabi crop 2009 - 2010

Particular	Kharif		Rabi	
	Control	Treatment	Control	Treatment
Maximum yield/ha. Qt.	15.00	21.00	18.99	21.08
Minimum yield/ha. Qt.	10.00	12.00	10.49	11.99
Average yield/ha. Qt.	12.70	16.45	14.30	17.41

- Kharif Crop – Soybean JS - 335, * Rabi Crop – Chickpea ICCV- 37
- Net profit approximate Rs. / ha. - 5000/-

PRA

BARKHEDAKHURD

PRA

ALLIKHEDI


BASE
LINE
SURVEY


COMMITTEE
FORMATION
On
27/06/2009


PARTITICIPATORY
WALK
THROUGH


Some Photo Graph
of Project area
During PRA Period


Village Meeting
Taken by Our
CPC


VILLAGE AND
COMMITTEE
MEETING'S


SHG's
FORMATION
AND MEETING'S


SOIL SAMPLE FOR TESTING

WORK PLAN 2010 – 2011

❑ Soil & Moisture Conservation

Activity	Unit	Unit cost	Physical Unit	Total cost in Lac.
Staggered Contour Trench	No.	50	2000	1.000
Cattle protection trench (C.P.T.)	RMT	45	1000	0.450
Farm field bunds (Soil)	RMT	140	2000	2.800
Gabion structures	No.	50000	2	1.000
Gully Plugs/Nala Plugs	RMT	750	200	1.500
TOTAL				**6.750**

WORK PLAN 2010 – 2011.....

❑ Water Harvesting

Activity	Unit	Unit cost	Physical Unit	Total cost in Lac.
Farm ponds	No.	50000	4	2.000
Renovation of old water storage structures	No.	150000	2	3.000
Well Recharge	No.	4000	15	0.600
Percolation tank	No.	250000	1	2.500
TOTAL				**8.600**

WORK PLAN 2010 – 2011.....

❑ Afforstation / Plantation

Activity	Unit	Unit cost	Physical Unit	Total cost in Lac.
Afforestation	Ha.	5000	10	0.500
Gliricidia Plant	No.	2	10000	0.200
Horticulture Plant	No.	40	1000	0.400
Jetropha Plant	No.	2	5000	0.100
TOTAL				**1.200**

WORK PLAN 2010 – 2011.....

❑ Pasture Development

Activity	Unit	Unit cost	Physical Unit	Total cost in Lac.
Government Land Demo (Improved Grass)	Ha.	5000	10	0.500
Private Land Demo (Green Fodder)	Ha.	3000	25	0.750
TOTAL				**1.250**

WORK PLAN 2010 – 2011.....

❑ Agriculture Development

• On form Research

Activity	Unit	Kharif	Rabi	Total
INM + BBF	Ha.	25	25	50
Inter Cropping	Ha.	25	10	35
Varietal Trail	Ha.	40	40	80
TOTAL		**90**	**75**	**165**

WORK PLAN 2010 – 2011.....

❑ Composting

Activity	Unit	Total
Vermi Compost Pit	No.	20
NADEP	No.	20
Bio Gas	No.	10

* 50 % Farmer Contribution of Total Cost.

WORK PLAN 2010 – 2011.....

❑ Livelihood

Activity	Unit	Total
Nursery Raising	No.	01
Vegetable Cultivation	Ha.	20
Kitchen Garden	No.	100
SHG's	No.	10
Green Fodder Demo	Ha.	25
Seed Bank	No.	02

WORK PLAN 2010 – 2011.....

- Capacity Building

Activity	Unit	Total
Field Level Training	No.	06
Village Level Meeting / Campaign	No.	24
Farmer's Day	No.	02
Exposure Visit	No.	01
Animal health camp	No.	02
Awareness camp	No.	02

YOUR SUGGESTIONS SOLICITED

THANKS

MODEL WATERSHED FOR SUSTAINING AGRICULTURAL PRODUCTIVITY AND IMPROVED LIVELIHOODS- DOMAGOR PAHUJ WATERSHED, JHANSI

ICRISAT Science with a human face

NRCAF

Development Alternatives

Bundelkhand Region

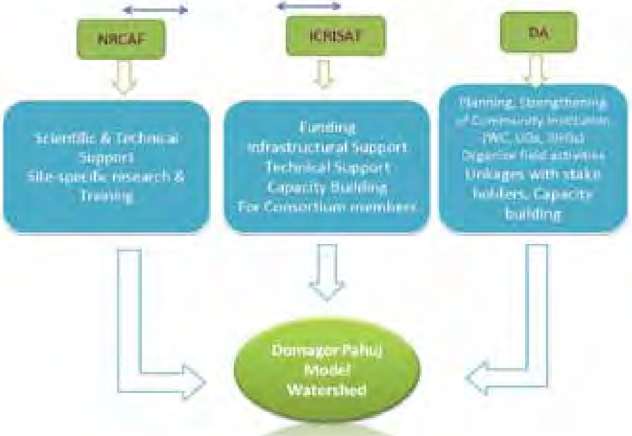
Issues of Concern…..

- Limitation of ground water availability for drinking and irrigation
- Shallow soil depth with exposed rocks and low productivity
- Degraded land with multi directional slopes prone to severe soil erosion
- Poor productivity of crops and livestocks
- Frequent Droughts
- Uncontrolled grazing
- Lack of awareness about technological know how.

GENESIS OF THE PROJECT

- In order to build the capacity of different stakeholders in the area of community watershed management, there is an urgent need to establish sites of learning for the rainfall zone of 700-1100 mm.
- On the basis of criteria mentioned in Common Guidelines (GOI, 2008) Domagor Pahuj watershed has been selected to improve rural livelihood activities through participatory watershed development programme with consortium approach.
- Date of Start : 11 Feb 2009

Consortium Partners



Objectives

Approach

- Participatory – not BENEFICIARIES but STAKEHOLDERS
- Inclusive – one and all
- Stakeholding – development partnerships

Strategy ....

- Providing appropriate technical inputs for transforming unproductive farming practices into economically viable venture
- Facilitating involvement of village level institutions and leverage resources through Convergence from Govt and others.

Domagor-Pahuj Watershed at a Glance..

Location

- Latitude: 25°28' to 25°31' N
- Longitude: 78°25' to 78°28' E
- Area: 1646ha

Land Use

- Cultivated Area: 960 ha
- Forest Area: 154 ha
- Drainage: 170 ha
- Degraded: 193 ha
- CPR: 107 ha
- Other: 62 ha

Activities in watershed area

Activities completed

- ❑ Selection of 1646 ha watershed site.
- ❑ Base line survey (Socio-economic) of 150 HH (20%)
- ❑ Participatory Rural Appraisal (PRA)
- ❑ CBOS (WC, UGs & WSHGs)
- ❑ WC is registered and two bank account opened
- ❑ Kharif and Rabi crop trials 2009-2010
- ❑ Soil sampling for fertility analysis
- ❑ Selection of sites for Nallah plugs, Gauging station

RESOURCES

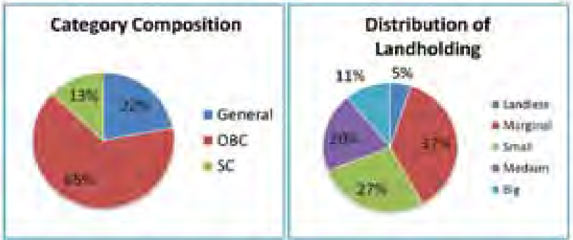
- Population: 3500
- Households: 778
- Livestock population: 3051
- Average Land Holding: 1-1.25 Ha

Vegetation:
Kardhai Palash, Neem, Mahua, Wild Zizyphus, Chiraul and Bamboo.
Grasses: Cenchrus and Aristida

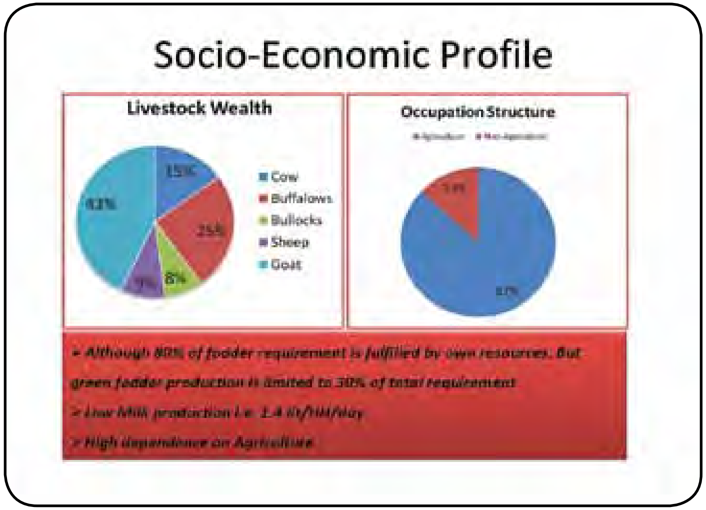
Main Crops
Kharif: Groundnut, Urd, Mung & Maize
Rabi: Wheat, Mustard & Chickpea

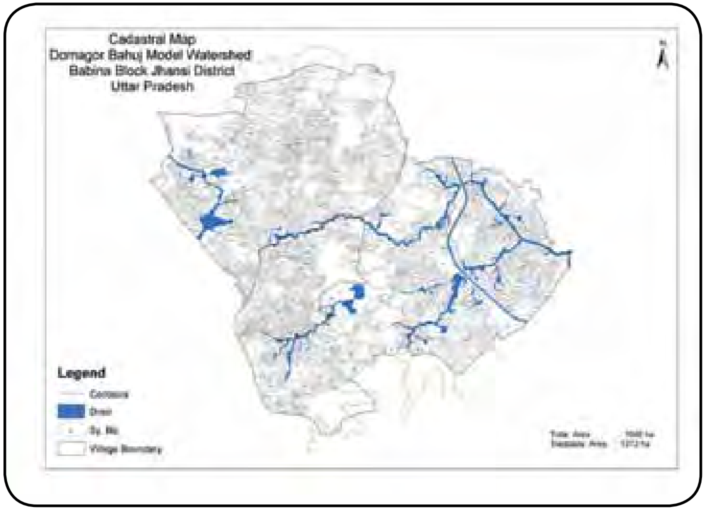
Soil
90% Red Laterite & 10% Black Soil.
Low in N,P, OC and medium in K
deficient in zinc, sulphur and boron

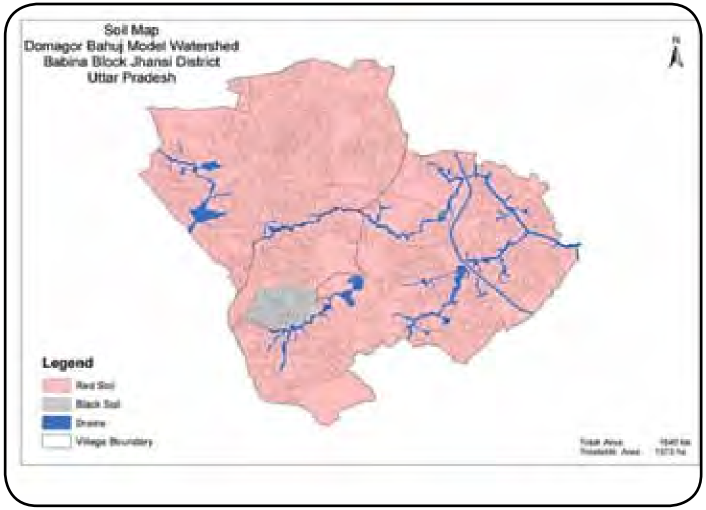
Socio-Economic Profile

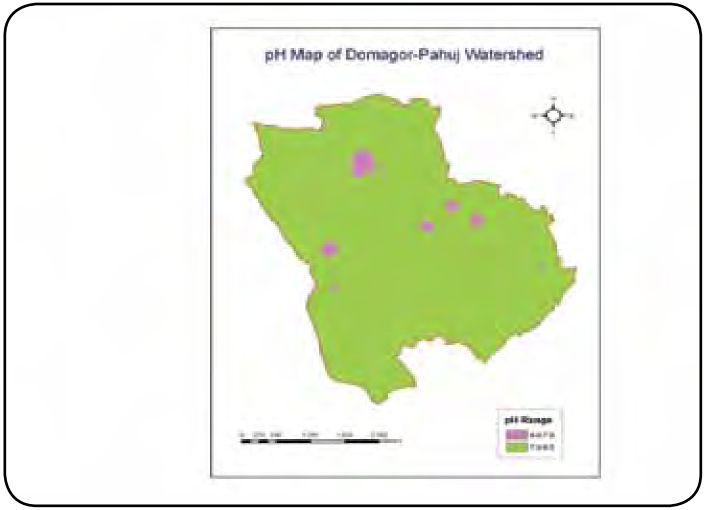


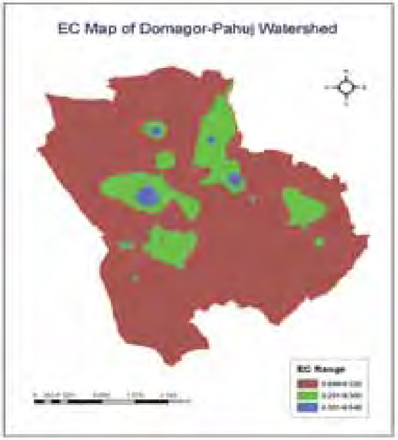
- ➢ *65% of total population belong to OBC category*
- ➢ *Around 70% of total farmers belong either to landless, or marginalized or small category*
- ➢ *66% of total land owned by OBC*


Socio-Economic Profile
Livestock Wealth
15%
25%
8%
9%
43%
Cow
Buffalows
Bullocks
Sheep
Goat
Occupation Structure
➢ Although 80% of fodder requirement is fulfilled by own resources. But green fodder production is limited to 30% of total requirement
➢ Low Milk production i.e. 1.4 lit/HH/day
➢ High dependence on Agriculture


Cadastral Map
Domagor Bahuj Model Watershed
Babina Block Jhansi District
Uttar Pradesh
Legend

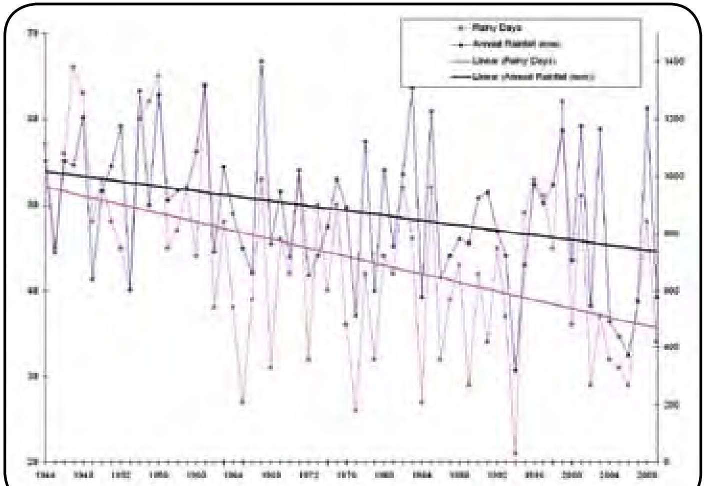

Soil Map
Domagor Bahuj Model Watershed
Babina Block Jhansi District
Uttar Pradesh
Legend

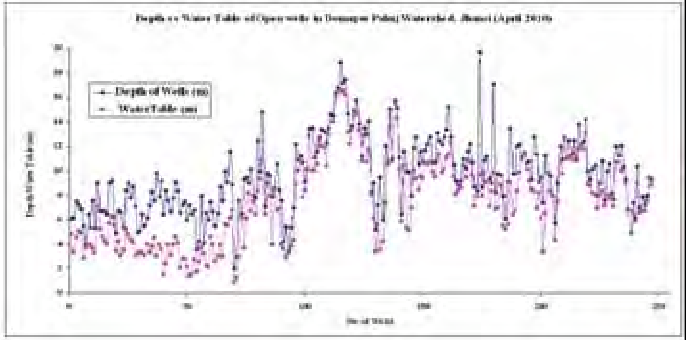

pH Map of Domagor-Pahuj Watershed

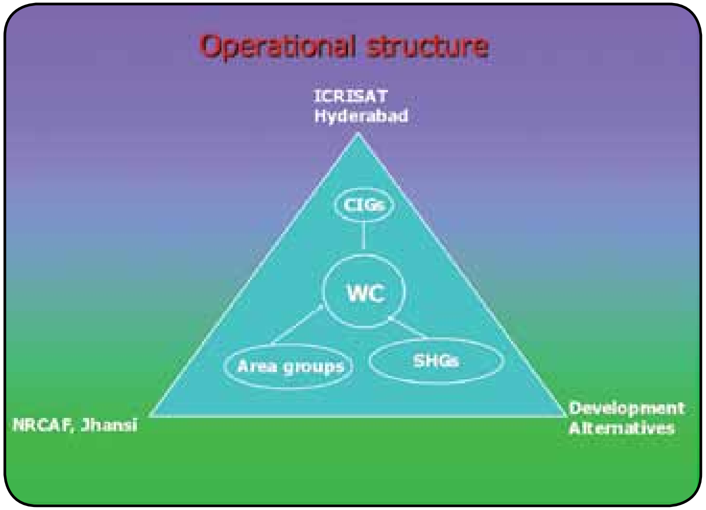


WATER RESOURCES

- Open wells: 351
- Mean depth of well: 9.62 m
- Mean ground water level (April 10): 7.53 m
- No. Dry wells (April 10): 101 (29 %)
- Ponds (silted): 3
- Hand pumps: 45
- Check Dams (breached): 6
- Check Dam : 01







Human Resource Development.........Creating a green Jobs

Capacity Building Trainings

- Zizyphus budding
- Nursery techniques
- Vermicomposting
- Nutritional Garden for HH Level

Exposure Visits

- Dabur WS, Garhkudar: 45 farmers
- Jain irrigation, Jalgaon: 10 farmers
- Kisan mela: 3 farmers
- ICRISAT Hyderabad: 5 WC memebers

HRD Continued..

Watershed committee (regd)

- 1 WC (2 *Gram Panchayats)*
- 23 members (10 Female & 13 Male)
- Representatives from UGs and WSHGs
- 1 member from each *Gram Panchayat*
- President & Secretary of WC elected by the people in open gram sabha

User Groups

- 14 area groups formed
- Each comprises of about 100 ha of land
- Managing water-harvesting structures

Self-Help Groups

- 22 Women SHGs, mainly homogenous groups
- Average membership- 10
- Revolving fund of Rs. 15000 from WC to nursery grop
- Activities- Vermi-composting, Nursery raising, vegetable growing etc

Crop Demonstration

PARTICIPATORY ON-FARM TRIALS – KHARIF 2009

Varietals Trials (Groundnut)		
ICGS 44	09 (03 in each villages, reach wise)	Selection Process: Village meeting was organised in each village with WC members and final approval of distribution of seeds was taken by WC
ICGV 91114	09 (03 in each villages, reach wise)	
Field size	0.4 acre each	
Micronutrient Trials		
ICGS 44	09 (03 in each villages, reach wise)	
ICGV 91114	09 (03 in each villages, reach wise)	
Field size	0.4 acre each	

PARTICIPATORY ON-FARM TRIALS – RABI-2009-10

Chickpea- JG130	09 (3 farmers in each village, 1 acre each)	Selection Process: Village meeting was organised in each village with WC members and final approval of distribution of seeds was taken by WC
Wheat (Swarna)	03 (1 farmer in each village, 1 acre each)	
Mustard (Rohini)	06 (2 farmers in each village, 1 acre each)	

Table: Performance of groundnut varieties with micronutrients in on-farm trials

Treatment	Pods/ plant	Seeds/ pod	1000-Seed weight (g)	Pod yield (kg/ha)	Haulm yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)	Shelling %
Variety								
ICGV-91114	10.2	1.81	330.5	969	2130	3099	31.3	67.2
ICGS-44	11.0	1.94	335.8	1010	2313	3323	30.4	68.3
Jhumka	12.4	2.10	345.2	1225	2793	4018	30.5	65.8
CD at 5 %	1.2	0.14	9.7	202	452	658	1.0	1.3
Micronutrient								
With	11.7	2.01	343.2	1005	2257	3262	30.8	67.7
Without	10.7	1.89	331.2	1132	2566	3698	30.6	66.5
CD at 5 %	0.9	0.10	10.2	119	289	414	NS	1.1

Plantation of trees in the watershed

Sl. No.	Name of plant	No.	Village	Remarks
1	Amaltas	300	Dhikauli	The WC members have decided to first cover Dhikauli followed by Nayakheda & Domagor
2	Gulmohar	300	Dhikauli	
3	Glyricidia	750	Domagor, Dhikauli & Nayakheda	
4	Teak	25	Dhikauli	

Budded ber plant

Capacity Building: - Trainings.......

Opportunities

- Income generating Micro-enterprises
  - Upgrading & rearing livestock
  - Village Seed bank
  - Fodder Bank
  - Poultry-based activities
  - Dairy
- Wasteland Development/ Afforestation
- Models for replication
- Improve basic facilities for securing livelihoods
- COCO (Community Owned community operated) instititutions for scaling the operation
- House hold nutritional security

Learning ....

- Attitude of the community towards Watershed programme has been fix for the charity only, require more interactive capacity building programme for community institution
- Cost-Benefits Knowledge sharing needed among user groups
- Entry point activities creates a confidence among stakeholders particularly farming community (willingness to pay)
- Consortium approach : A plate form for sharing flip and flop side of development interventions

Scope........

- Risk partitioning through agro-forestry system (Agri-horti based farms)
- Leverage resource from Bundelkhand package
- High possibilities of Scaling in Bundelkhand through existing partners strength
- Together we can demonstrate impacts in identified districts of Bundelkhand region, MP and UP both based in the learning model

Work plan 2010-11

- **Soil & Water Mnagement activity**
- Field bunding -50 ha
- Nallah Plug-5 nos.
- Field drainage structure-30 nos.
- Hydrological gauging station-1no.
- **Alternate land use system**
- Agri-horticultural system-25–30 ha
- Household nutritional security-At 351 wells

Crop trials

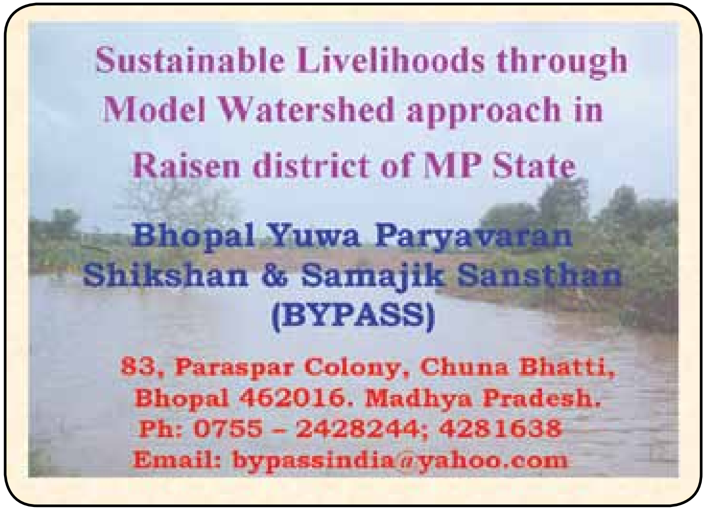
- Kharif (Groundnut, Sesame)
- Rabi (Chickpea, Wheat)

Capacity building training programmes

- Training on leadership development for CBO
- Fabrication of gabion
- Record keeping
- Construction of low cost water harvesting structure
- Livestock Based activities.

Basic facilities for the watershed village

- Drinking water
- Household energy security
- Fodder Bank
- Seed bank
- Farm Machinary service center


Sustainable Livelihoods through
Model Watershed approach in
Raisen district of MP State
Bhopal Yuwa Paryavaran
Shikshan & Samajik Sansthan
(BYPASS)
83, Paraspar Colony, Chuna Bhatti,
Bhopal 462016. Madhya Pradesh.
Ph: 0755 – 2428244; 4281638
Email: bypassindia@yahoo.com


BLOCK
DISTRICT
(ICRISAT), Patancheru
&
MoRD Government


MADHYA PRADESH
2001
Bhind
Gwalior
Datia
Shivpuri
Chhatarpur
Rewa
Neemuch
Guna
Satna
Sidhi
Panna
Sagar
Rajgarh
Vidisha
Damoh
Katni
Shajapur
Bhopal
Umaria
Ratlam
Ujjain
Raisen
Jabalpur
Shahdol
Dindori
Sehore
Narsimhapur
Indore
Dewas
Dhar
Hoshangabad
Seoni
Mandla
Harda
Chhindwara
West Nimar
East Nimar
Betul
Balaghat
D - Datia


GARBHAN NADI MODEL
WATERSHED
Chorpipariya
Siyalwada
Gaganwada
Rampura
Dungariya
Padariya Kalan

Social Profile

HH in project area	Population	ST HH	SC HH
511	2821	248	48
		48.5%	9.5 %

Area profile

Area of Watershed taken (ha.)	Villages covered	Agriculture Land (ha.)	Forest Land (ha.)	Waste Land (ha.)
1736	06	1237	422	51
		71.2%	24.3%	2.9%

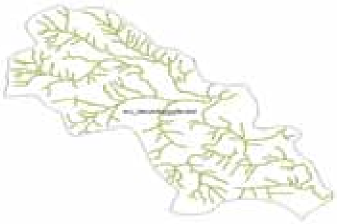
Average Annual Rainfall - 950 mm
Rain fall in year 2009 - 1100 mm

Farming Status

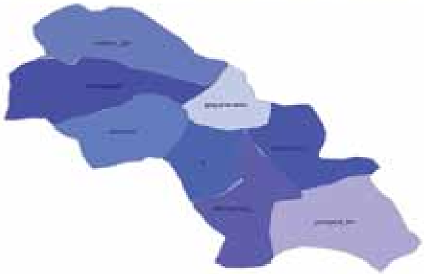
Category	Criterion	No of HH
Landless		73
Small/ Marginal Farmers	< 1 to 2 ha	228
Medium farmers	2 t0 4 ha	151
Big farmers	> 4 ha	59
		511

Milli Watershed Boundary

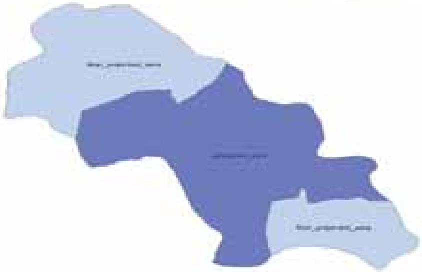
Drainage Map



Micro watersheds



Proposed area for treatment



SOIL PROFILE

Element	Depth
Black Cotton Soil	1 to 5 feet
Loamy soil	3 to 12 feet
Moorum	9 to 15 feet
Moorum with Gravel	10 to 35 feet
Hard Moorum	20 to 40 feet
Basalt	35 -70 feet and above

Agriculture profile

Agriculture Land	Irrigated	Fallow land	Forest
1237	212	186	422
71 %	17.2 %	15 %	24%

Agriculture Productivity

CROP	Area under crop (ha)	Average Production (q/ha)
Soyabean	455	12.6
Tuar	187	11.0
Paddy	35	20
Til	10	12
Maize	18	7.2
Wheat	234	16.2
Chickpea	533	16.4
Lentil	125	11.0

Water sources

	Functional	Non Functional
Open wells	32	47
Tube wells	124	44
Drinking water hand pumps	30	07
Depth of Tubewel 90-120 feet	In wells depth of water is at 15 to 35 feet	

PREVAILING SITUATION-1

- Lower per capita agriculture production
- Depletion of Ground Water Table
- Soil erosion
- Erratic monsoon
- Improper cattle management
- Low per capita income
- Information gap

PREVAILING SITUATION-2

- Kharif fellow area – 15 %
- Area under Rabi crop – 74 %
- Area having irrigation facilities – 17.2 %
- Sources of irrigation are – Wells , Tube wells, Nadi & Nala
- Depth of wells – 25 to 50 ft.
- Depth of tube wells – 90 to 165 ft.
- Availability of water in Nadi/ Nala up to December-January

CHALLANGES

- Improper management of Natural resources
- Inefficient use of water for irrigation
- Poor understanding of agricultural advancements and inappropriate skills
- Soils in the project area are critically deficient in micronutrients/macro-nutrients
- Improper measures to prepare & preserve seeds from harvest
- Inadequate institutional support
- Open grazing practices
- Lack of employment opportunity
- Poor functioning of CBOs
- Threat to crops due to wild animals

OPPORTUNITIES -1

- Adequate Rainfall
- Opportunities to create Surface & Sub Surface water bodies
- Soil profile in the area is very conducive for Water recharging purpose
- Area under cultivation could increase substantially by adopting soil conservation measures
- Scope for enhancing per capita production by improving soil nutrients

OPPORTUNITIES -2

- **Interest of farmers to grow lucrative cash crops**
- **Good potential for animal husbandry**
- **96% of Human resource is engaged in Agriculture**
- **On going functional collaboration of organisation with community**
- **Consortium approach of project**
- **Scope for introduction of improved and innovative agricultural implements**

Selection process of Model watershed

- Selection of 6 probable sites
- Secondary date collection for all sites
- Appraisal visit to all the sites (Bypass & Icrisat team) and discussions with community
- Selection criterion -
  - Community willingness towards participation
  - Rainfed agriculture
  - Poor Economic status/ Marginal section
  - Knowledge gap (Technical)
  - Great Potential to work on NRM

Time Line

- Habitations about 150 years old
- Earlier it was dense forest of Sagon
- Wild animals like Tiger, bear, deer were exists just till 15 years back in the area
- Electricity supply was started in 2003
- 10 years back the river was perennial
- Handpumps were installed after 1990 in the area, earlier people use to dug pits in river beds during summer
- Community faced drought 3 years back in the area

PRA Exercise

- Social/ Resource mapping
- Time line/ Context analysis
- Seasonality
- Services/ Problem analysis

Community Mobilisation

- IPC
- Group Meetings/ Discussions
- User Group Formation
- Member selection is going on for Watershed Committee formation

- Identification & fortnightly measurement of 12 benchmark wells across watershed area
- GPS reading at benchmarks and proposed sites for structures
- Field survey for proposed structure sites
- Baseline survey started
- Soil samples collection process started

THANKS

PROGRESS REPORT ON MODEL WATERSHED, MOTA VADALA OF JAMNAGAR DISTRICT,GUJARAT

PROJECT TEAM

PROJECT LOCATION

ABOUT WATERSHED VILLAGE

- DIST. FROM H.Q. : 62 km.
- DIST. FROM TALUKA H.Q. : 15 km.
- POPULATION : 4309
- NOs OF HOUSE HOLDS : 1047
- LITERACY % : 70 %
- AREA OF WS : 1200 Hactors.
- AVE.RAIN FALL : 600-800 mm
- MAX.- MIN TEMP : 44° c – 10 ° c
- TOPOGRAPHY : UNDULLATING
- AGROCLIMATIC ZONE : 05 (NORTH SAURASHTRA)
- SOIL TYPE : SHALLOW & MEDIUM BLACK TO SANDY

WATER RESOURCE

OPEN WELL IRRIGATION	TUBE WELL IRRIGATION	DRINKING WATER TUBE WELLS
585	20	03

LIVESTOCK POPULATION

COW	BUFFALO	BULLOCK	SHEEP & GOATS	TOTAL
725	335	920	730	2710

LAND USE PATTERN

IRRIGATED (Ha.)	RAINFED (Ha.)	FALLOW LAND (Ha.)	HORTICUL TURE (Ha.)	FOREST (Ha.)	COMMON PROPERTY RESOURCE (Ha.)	TOTAL
1001	1920	600	0	0	409	3930
25	49	15	0	0	10	% DISTRIB UTION

MAJOR CROPS GROWN & PRODUCTIVITY LEVEL

SR. No.	CROP	AREA (Ha.)	PRODUCTIVITY (Q/Ha.)
	KHARIF SEASON		
1	GROUND NUT – 30 %	900	20
2	COTTON – 50 %	1500	27
3	PULSES LIKE GRAM, BLACK GRAM, GREEN GRAM & ONION – 20 %	600	
	RABI SEASON		
1	WHEAT – 20 %	240	37
2	CUMIN – 50 %	600	6
3	GRAM, GARLIC, GRASSES – 30 %	360	
	SUMMER SEASON		
1	GROUND NUT	112	20

MAIN INCOME SOURCE.

- 80 % FARMERS DEPENDANT OF AGRICULTURE.
- 10 % ON ANIMAL HUSBANDRY
- 10 % AGRI. LABOURERS IN VILLAGE
- 40 % OF LABOUR WORK FROM OUT SIDE. (PARTIAL MIGRATIONS)

PROBLEMS OF VILLAGE....

- IRREGULAR RAINS.(600-800 MM)
- LOW CROP PRODUCTIVITY.
- HEAVY EROSION DUE TO UNDULLATING LAND TYPE.
- 25 % IRRIGATION FACILITIES.
- 20 % BACKWARD COMMUNITY.

SOCIAL PROBLEMS…..

- ILLITERACY . (30%) IN GENERAL
- YOUNG GENERATION GOING AWAY FROM AGRI. WORK
- SCHOOL UP TO 10 TH STD.
- TRADITIONAL SYSTEM OF A.H.
- DRINKING WATER PROBLEM
- NO OTHER GOVT. SCHEMES IN VILLAGE

SOLUTIONS FOR PROBLEMS..

- WATERSHED DEV. PROG. IN VILLAGE.
- INCOME GENERATION FOR YOUNG GENERATION IN VILLAGE.
- PROMOTIONAL PROG FOR IMPROVED AGRICULTURE.
- DEVELOPMENT OF IRRIGATION FACILITIES.
- FODDER PRODUCTION FOR DAIRY FARMERS.
- WASTE LAND DEVELOPMENT PROG.

CONTINUE….

- CONTROL OF EROSION BY DOING LAND TREATMENT.
- SILVI PASTURE PROGRAMME.
- BRINGING MORE LAND UNDER AGRICULTURE.
- GROUND WATER RECHARGING FOR WATER AVAILABILITY AND QUALITY OF WATER.
- COMMON LAND MUST BE COVERED BY DOING PLANTATION.

ACTION POINTS….

- POSTING OF THE WSD TEAM IN AREA.
- DECIDING THE PRIORITY FOR ACTIONS/ SOLUTIONS WITH VILLAGERS.
- SELECTION OF VILLAGE WSD COMMITTEE
- DEVELOPMNT OF ACTION PLAN FOR VILLAGE
- DISCUSSION OF THE PLAN WITH VILLAGERS(ALL SECTIONS OF SOCIETY.)
- PLANNING FOR THE ACTIVE PARTICIPATION OF FARMERS & CONTRIBUTION FROM BENEFICIARY.
- WORK PLAN FOR ACTIVITIES.
- TRAINING OF THE STAFF & VILLAGE COMMITTEE MEMEBERS FOR IMPLEMENTATION.
- ACTION FOR INDIVIDUAL WORK & COMMON PROPERTY DEV. MUST BE GIVEN EQUAL WEIGHTAGE .

IMPLEMENTATION....

- A TEAM OF 4 PERSONS...
  - TEAM LEADER..
  - CIVIL ENGINEER..
  - AGRICULTURE GRADUATE.
  - SOCIAL WORKER (WOMAN MEMBER).
- SUPPORT FROM H.O. FOR TECHNICAL/ FINANCIAL MATTERS

TRAINING TO WSD VILLAGE COMMITTEE

- AWARENESS TRAINING FOR WSD WORK.
- FORMATION OF USERS GROUPS.
- TRAINING OF USERS GROUPS MEMBERS
- 2 DAYS TRAINING FOR WSD VC FOR IMPLEMENTATION OF PROJECT.
- 2DAYS TRAINING FOR RECORDING & ACCOUNTING.
- 2 DAYS EXPOSURE VISIT OF MEMBERS TO WSD AREA
- 2 DAYS TRAINING FOR SHG WORKERS IN VILLAGE.
- 1DAY TRAINING FOR RECORD KEEPING OF PROJECT.
- AWARENESS TRAINING FOR THE DEVELOPMENT & USE OF COMMUNITY ASSETS.

MONITORING SYSTEM...

- A TEAM FROM H.O. WILL BE APPOINTED FOR THIS WORK
- A TEAM OF 4 PERSONS WILL VISIT EVERY 3 MONTHS TO ASSESS THE PROGRESS.
- A TEAM OF TWO PERSONS WILL VISIT MONTHLY TO ASSESS THE PROCESS AND QUALITY OF WORK & ACCOUNTS MATTERS.
- ALL VOUCHERS AND PROCEDURES WILL BE CRITICALLY REVIEWED.
- SENIOR EXECUTIVE WILL VISIT REGULARLY ALL SITES. HE WILL APPROVE THE WORK PLAN (MOSTLY CPC LEVEL)
- A TEAM WILL ALSO DISCUSS THE POINTS WITH WSD VIL. COM. & FARMERS.
- ALL WORKING SYSTEMS SHOULD BE FOLLOWED STRICTLY. A TEAM MUST SEE IT CRITICALLY.

ACTIVITIES COMPLETED

- BASE LINE SURVEY OF 100 HOUSE HOLDS

ACTIVITIES COMPLETED

- FORMATION OF VILLAGE WATERSHED COMMITTEE & ASSOCIATION

CONTINUE............

ACTIVITIES COMPLETED

- EXPOSURE VISIT OF FARMERS AND TEAM LEADER TO ICRISAT,PATANCHERU
- FORMATION OF 2 SHGs

ACTIVITIES COMPLETED

- 16 VERMI COMPOST UNITS

ACTIVITIES COMPLETED

➤ 100 SOIL SAMPLES COLLECTED

ACTIVITIES COMPLETED

➤ MEASURED WATER LEVEL OF 16 OPEN WELLS

OPEN WELL WATER LEVEL OBSERVATIONS

SR.NO	TOTAL DEPTH OF WELL (MT.)	WATER LEVEL (MT.)
01	24	23
2	18.25	17.25
3	19	17
4	21.5	20
5	10	8.5
6	21	17
7	18	15.35
8	19.25	18.25
9	16	9
10	23	22
11	21	19.5
12	19.75	18.75
13	21.5	19.75
14	22	20
15	18.25	17.25
16	22	18.25

Welcome To

UPATYAKA UNNAYAN MODEL WATERSHED

Nuagaon, Mayurbhanj, Odisha

SITE FOR LEARNING'S

Title of the Project

Model Watersheds for Sustaining Agricultural Productivity and Improved Livelihoods

Mayurbhanja District, Orissa

Specific Objectives

A: *To improve* rural livelihood activities through participatory WDP with consortium approach through application of cost- effective integrated genetic and NRM practices appropriate to socio economic conditions of farmers and natural resources of the ecosystem

B: To establish one Model Site of Learning at Mayurbhanj district, Orissa for high rainfall dry land areas (>1100 mm rainfall per annum) for demonstrating the potential of rainfed areas by adopting IWRM approach

C: To build capacity of different stakeholders in the areas of integrated watershed management for enhancing impact of watershed programs.

Location of model watershed...

Watershed Features

ORSAC Code	04 08 02 03 05 03 02 01
Villages	Dabak, Nuagan, Baniabasa, Dengam, Srirampur, Rangmatia, Chapaldihi, Mahuldihi
Gram Panchayats	Bholagadia, Dengam and Badapathara
Block	Khunta-1
Drainage	Catchment : Budhabalang; Subcatchment : Sunei Watershed : Naluanala
ACZ	North Central Plateau Zone
AER	12 (Red Soil Region of NBSSLUP)

Collaborating Organization...

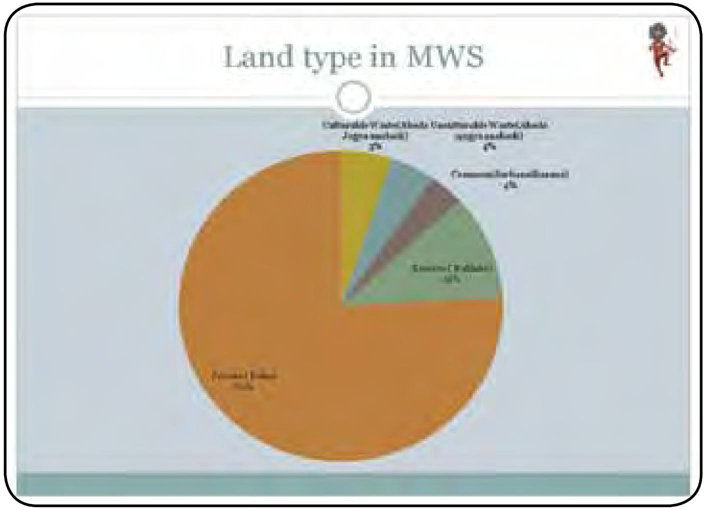
- ICRISAT (International Crop Research Institute for Semi-Arid Tropics), Hyderabad
- KVK (Krishi Vigyan Kendra), OUAT, Syamakhunta, Mayurbhanja
- SHRISTI (Society for Harmonious Renaissance Innovative of Simple Technological Initiatives), Bhubaneswar
- Model Watershed Committee, Nuagaon

Watershed Features

- Annual Rain fall: 1250mm(According to Block Data)
- Last year Rainfall: 1200mm(Block & Watershed data)
- No of Open well for irrigation: 8
- Acute water scarcity: March to July
- Major Crops: Paddy, Groundnut, Vegetable
- Soil Type: Red

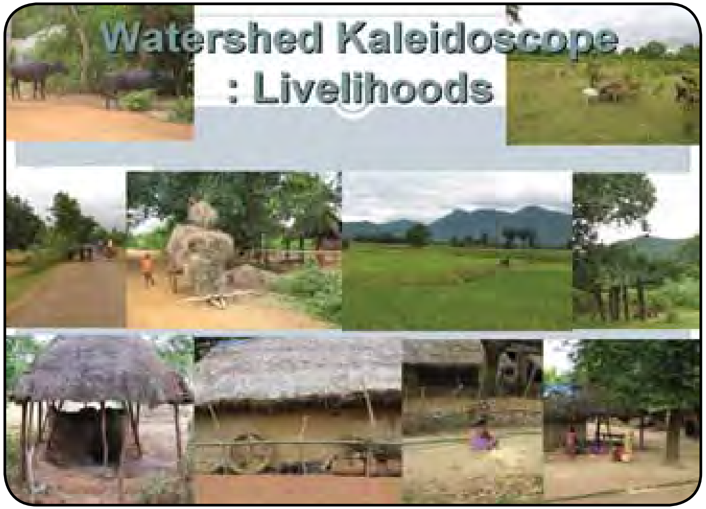
Basic facts...

- Total house holds :1035
- Total population : 4657
- ST population :4148 (89%)
- Total Area :1697 ha
- Treatable Area :1584.16 ha
- Literacy :29%


Land type in MWS


Paddy on Jami land
Bubei on Dahi land
Watershed : Land uses !
Vitex Live-fence


Status of soil water conservation structure


Watershed Kaleidoscope
: Livelihoods

Watershed Key Livelihoods

Biomass-based	Farm :Paddy, Bubai, Ground nut, Maize Forest :Siali, Fuel wood, Honey, Palua Off farm :Livestock (Goatery, poultry)
Skill/caste based	Bubai rope making, Potter, Bamboo artisan
Trade	Vegetable vending, petty business
Other	Wage labour, Migration

Project Interventions

November 2008 – April 2010

Progress So far...
Preparatory Works & Institution Building

- Regular Village and Watershed Committee Meetings
- Building a team of village youth volunteers
- Participatory Mapping : Resource Map, Social, Soil
- GPS readings of boundaries & structure & Map preparation
- Land ownership (RoR) data collection from Rev Dept
- WC formation & Registration under SRA, 1860
- Sub watershed committee formed in each village
- Bank a/c opened
- Watershed day Observation
- Formation of Watershed Advisory committee
- Completion of WSHG gradation
- Preparation of work plan for WC (Jan'10-July'10)

Progress so far ...
Collaboration & Convergence

- NABARD : 6 farmers club formed
- Executive Engineer (MI) : Site visit for LI point
- NHM : DDH agreed for fruit plantation
- MGNREGS : PD, DRDA has received our list of works
- DCCD, Cochi: 7 (1400plant) ha cashew plantation
- ATMA : Convergence with ATMA & SRI
- KVK : Adopted Village (Dabak), Research trials on Bubabi, IPM in pigeon pea

Progress So far… Capacity Building

- Exposure Visits : INRM work in Karanjia $ ICRISAT
- Developed one WSHG for nursery raising
- Initiated ground work for federation of WSHG
- Trainings : Vermicompost, Group cohesiveness-SHG, GPS reading, baseline survey

Progress so far.. Demonstration & Trials

- Tropiculture demonstration, but not use by villagers due to bullock are incapable and they arte not financial stable to hire tractor
- Demonstration of improved agril. implements
- Chick pea (lowland-introduction) trials
- Maize (Upland-introduction)
- Groundnut (Upland- introduction)
- Pigeon pea (Upland- Introduction)
- Paddy varietal trial

Progress So far… Documentation Work

- Baseline Survey
- 25% household survey completed
- 200 soil sample collected and analyzed at ICRISAT
- GW monitoring every month- 40 wells
- Rainfall data collection for rainfall analysis
- Stream-transact and analysis of structures

Chick pea Trial

30 days old chickpea in farmers field

Information

Indicator	Unit	Output
Farmers	No	29
Area	Acre	10
Input	Kg	300
Seed rate	Kg/acre	30
Recomended.seed rate	Kg/acre	30
Yield	Qtl/acre	3-4
Actual.yield	Qtl/acre	8-10
Failure	Acre	4

Maize and groundnut Trial

Farmers in their field

Information

Indicator	Unit	Output	
		Maize	G.Nut
Farmers	No	35	41
Area	Acre	8	6
Input	Kg	100	300
Seed rate	Kg/acre	12	50
Recomm. seed rate	Kg/acre	7-8	50 (seed)
Yield	Qtl/acre	10(seed)	5
Actual. yield	Qtl/acre	16-20(seed)	8-9

Pigeon pea (Field pea)

Farmers in their field

Information

Indicator	Unit	Output
Farmers	No	21
Area	Acre	9
Input	Kg	150
Seed rate	Kg/acre	16
Recomm seed rate	Kg/acre	25-30
Yield	Qtl/acre	4
Actual. Yield	Qtl/acre	8-10
Failure	Acre	3

New variety Rice trail

Manaswani

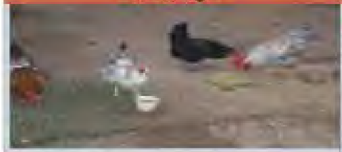
Indicator	Unit	Output
Farmers	No	18
Area	Acre	5
Input	Kg	90
Seed rate	Kg/acre	18
Recomended.seed rate	Kg/acre	25
Yield	Qtl/acre	10-15
Actual.yield	Qtl/acre	18-25
Failure	Acre	0

JGL-132

Indicator	Unit	Output
Farmers	No	8
Area	Acre	1
Input	Kg	25
Seed rate	Kg/acre	25
Recomended.seed rate	Kg/acre	25
Yield	Qtl/acre	12-18
Actual.yield	Qtl/acre	20-25
Failure	Acre	0

Backyard poultry

6 months/ 15 days old Banaraja



Information

Indicator	Unit	Output
Household	No	18
T.Bird	No	260
Purchase from	Institutions	KVK
Growth rate(gm)	Month	250-350
Cost/bird	INR	40
Selling price/kg	INR	120-150
Egg	months	Irregular
Survival	%	70

Vermicompost

Successful & failed pits

Information

Indicator	Unit	Output
Training	No	2
Vermin pit	No	16
Success	No	4
Input	Rs	Agriculture

Vegetable Nursery raising

Low cost nursery

Information

Indicator	Unit	Output
Farmers	No	6
Unit	No	12
Tomato	No	10000
Brinjal	No	12000
Chilly	No	6000

Plantation in dahi

Cashew and mango

Information

Indicator	Unit	Cashew	Mango
Farmer	No	5	4
Area	Acre	18	4
Plant	No	1400	240
Plant rate	acre	80	60
Convergence	Deptt.	DCCD	NHM
Survival (after 6 months)	%	80	85
Input/Ha	INR	20000	11250

Shramdan by villagers

Diversion drain

Information

- Villagers of Baniabasa and Dengam divert the river water through channel to their agriculture field
- Total villagers: 65
- Total day: 5

Capacity building

Village meeting

Information

Indicator	Unit	Progress	participant
Village meeting	Month	Regalar	40-50
Map preparation/ GPS reading	No	1	15
Chickpea	No	1	30
Base line survey	No	2	12
Exposure	No	2	12/5

Watershed day

Clips of day

Information

Indicator	Output
Total participant	554
Guest	BDO, DAO, AHO, GP
Objective	Awareness, sharing
Duration	4 hour
Session	Inaugural, Sharing,exhibition of stall, committee revive, feedback

Stall in watershed day

Stall cont...

Reasons of Failure (Trial)

- Land selection
- Irregular rainfall
- Non application of Fertilizer
- Less orientation
- Late plantation
- No interaction among farmers
- No follow up

Soil sample analysis

Soil report

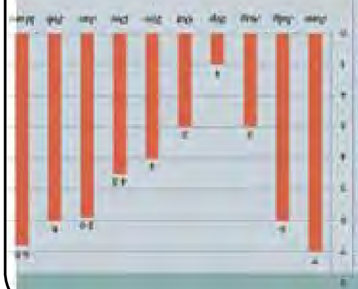
Indicator	Available	Critical limit		
	Average	Low	Med	High
PH	5.4	<6.5	6.5-8.5	>8.5
EC(ds/M)	0.1			
B (ppm)	0.2	0.58		
S(ppm)	3.6			
P (ppm)	4.7	<5	5-10	>10
Zn (ppm)	1.3	0.75		
Exch.-k	100.4	<50	50-125	>125
OC(%)	0.8	<0.5	0.5-0.75	>0.75

Process followed

Indicator	Unit	Output
Sample	No	162
Type	Where	L_M_H
	Farmer	S-M_B
When	Month	Dec
Taken by		Villagers

Well reading Monitoring

Depth of water label in Different month

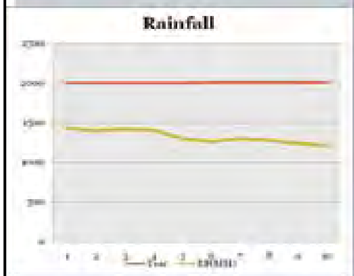


Information

Indicator	Figures
Starts from	June-2009
Total no well	40
Instrument used	ICRISAT type
Unit in	Meter
Data collection	10 & 11th of every month
Data collected by	Secretary W/s

Rainfall data

Line showing rainfall pattern



Description

Indicator	Report
Trend	Irregular but decreases
Peak month of Rainfall	July, Aug, Sep
Data taken	2001-2009
Source	Block s W/S
Data taken	Female member of W/S

Challenges

- Limited HR support vis-à-vis Higher Demand
  - Bigger size of Watersheds
  - More number of Village
  - Research, Implementation and Model Development
- Lack of common vision and clarity in comprehending the processes and provisions

Challenges

- Difficulty/inability of small NGOs to cross-subsidize
- Incomplete communication among partners : ICRISAT-Local partner-Community
- Process documentation
- Meeting place inside village

About Organisation

- Jan Shiksha Evam Vikas Sanghthan (PEDO) is a voluntary non-governmental organization working in south Rajasthan sience 1980.
- " PEDO's mission is "to strengthen value based people's institutions in order to utilize existing resources for poverty alleviation and environmental improvement."

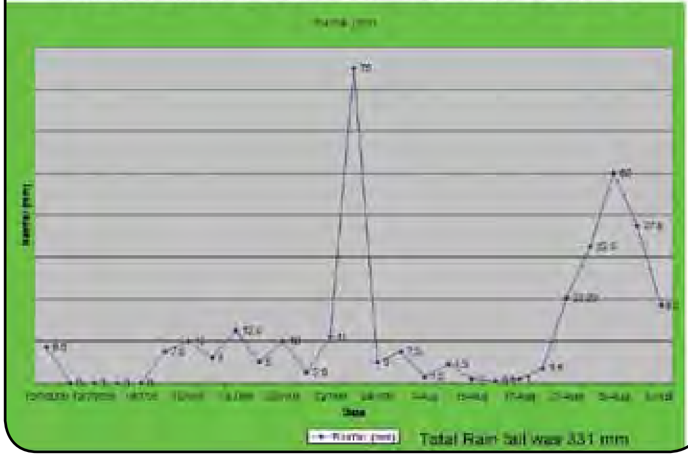
Bio-physical characteristics of the project area

Revenue Villages – (6 village) Saram, Virpur, Gesuon ka vaga, Baka khada,Sara and Himmatpur panchayat-Virpur

Total area of watershed	1353 ha.
Total irrigated area	128 ha.
Un Irrigated area	765 ha
Cultural waste	149 ha.
Area unavailable for Cultivation	310 ha.

Drainage and revenue maps of the watershed

Rainfall in Shram watershed 2009



Interventions

- Formation of watershed institution
  - -Gram Sabha
  - -Formation of water user group (Hamlet)16
  - -10 Member selected by gram sabha for village level committee(5 men + 5 women)
  - -Resource mapping by user groups.
  - -PRA exercise in all villages.

Cont..

- Structure of watershed management and development committee.
  - - 2 member selected from each WUG.
  - - 36 members in watershed committee.
    - - 11 members are Governing body
    - - 3 Sub committee
      - Planning and Monitoring
      - Finance
      - Conflict resolution
- SHG Cluster Formation(15 Groups)

Training - Management

- Training to WUG for resource mapping
- Training in PRA exercise.
- Training in Role/Responsibility
- Management and Maintenance of accounts and record and measurement book.
- Technical training on Soil / Water conservation and nursery raising.
- Monthly MIS system.

Training Skills

- Construction of Vermi-compost
- Vegetable Cultivation
- Seed Grading
- Soil Sampling
- Operating Milk Collection center
- Spice Cultivation
- Exposure

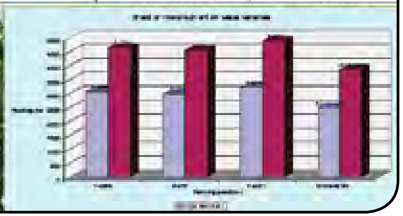
Constraint Identified

1. Rain water runoff very high
2. Silt , nutrient losses and Water scarcity is the major problems
3. Ground water lifting very high, therefore well recharging are very necessary.
4. Good scope of BBF, contour trenching and Earthen dam, sunken pond in the area
5. Good scope of crop productivity enhancement thru use of good quality seed & deficient nutrient.



Effect of micro nutrient on Maize crops in 2009

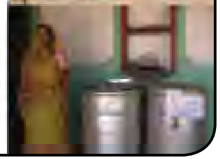
Crops	Ave. Farmer's practice with used the Improved seed (Kg/Ha)		Ave. Improved practice with used the Improved seed (Kg/Ha)	
	Grain	Fodder	Grain	Fodder
Maize (P-2266			3068 (23.5*)	4652 (20.5*)
Kavri -235	2484	3860	2995 (20.6*)	4560 (18.1*)
P-2201			3215 (29.4*)	4885 (26.8*)

Achievements

- Village & watershed level institution has been developed for achieve the goal thru participation mode.
- Achieved the maize crop productivities up to 25-30 percent with use of deficient nutrient in 2009.
- Prepared the 20th commercial vermi compost pit in village and farmers has sold the 150 kg vermi compost @ Rs 3 / kg
- Developed a village level seed bank for providing the quality seed timely and monitor by WSHGs.
- Preparing the gliricidia nursery thru woman SHGs
- Starting the soil & water conservation work in one village.
- Provided the revolving fund to WSHGs for procurement of good quality seed for demonstration trails.





Milk collection Center

- 140 liters per day collection
- 32 families are beneficiaries

Convergence

- SGSY
- ITC-Marketing and Technical support for Spice cultivation
- Bank-RRB
- Agriculture Research Station

Challenges

- Migration
- Poor Marketing linkages
- Low Literacy
- NREGA
- Unavailability of Inputs
- Undulating Terrain
- Poverty
- Low Productivity

Thank You

WOTR

water gives life

Our Vision and Identity

Our Vision…

"Communities, especially the poor within, are empowered to live in dignity and secure their livelihoods in sustainable ecosystems"

Our Mission

To provide committed development support, that motivates, energizes and empowers, communities, groups, other organizations and individuals, for self-help through integrated watershed development and enhancement of well-being on a sustainable basis

Area of Operation

Programme Management / Watershed Development & NRM

Capacity Building in Watershed Development / NRM

(vkbZ- th- MCyw- Mh- ih- egkjk"Vª ljdkj ,oa vU; nkunkrk) (IGWDP, GoM, Other Donors)

- No. of Projects (izdYiksa fd la[;k) :489
- Area Covered (ha) ({ks= ftls mipkfjr fd;k) :378,830
- No. of PIAs (fdz;kUo;u laLFkkvksa fd la[;k) :120
- No. of States (jkT; tgkWa fdz;kUo;u gqvk fd la[;k) : 4

Direct Implementation (included above)

- No. of Projects (izdYiksa fd la[;k) : 95
- Area covered (ha) : 71,215
- No. of States : 4

Dolassane-Bambalewadi Model Watershed

Location: **Sagamner taluka in Ahmednagar district**

Dolassane-Bambalewadi Model Watershed

Dolassane-Bambalewadi Model Watershed

Information of households and Population

Category	No of households	Total Population		
		Male	Female	Total
ST	117	309	279	588
SC	19	52	48	100
Others	189	539	500	1039
Total	325	900	827	1727

Dolassane-Bambalewadi Model Watershed

Land Use Pattern

Sr. No.	Component	Area (In ha)
1	Irrigated	50.00
2	Rainfed	768.18
3	Fallow Land	102.65
4	Horticulture	2.40
5	Forest	463.59
6	Common property resources	211.24
7	Total	1598.06

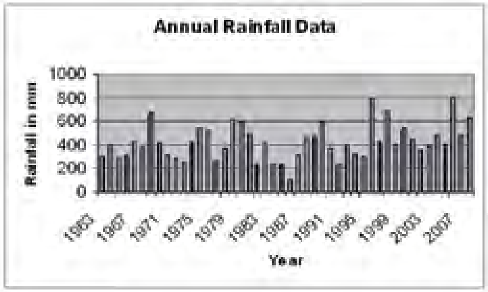
Dolassane-Bambalewadi Model Watershed

Detail of Agriculture

Sr.no	Crop	Production in Area (ha)	Productivity (Q/ha)
A	Khariff Season		
1	Black Millet	456.00	8
2	Soyabin	190.18	3.5
3	Ground Nut	32.00	10
4	Onion	59.00	150
5	Tomato	31.00	140
B	Rabi Season		
1	Wheat	6.00	10
2	Gram	15.00	8
3	Jawar	29.00	7

Dolassane-Bambalewadi Model Watershed

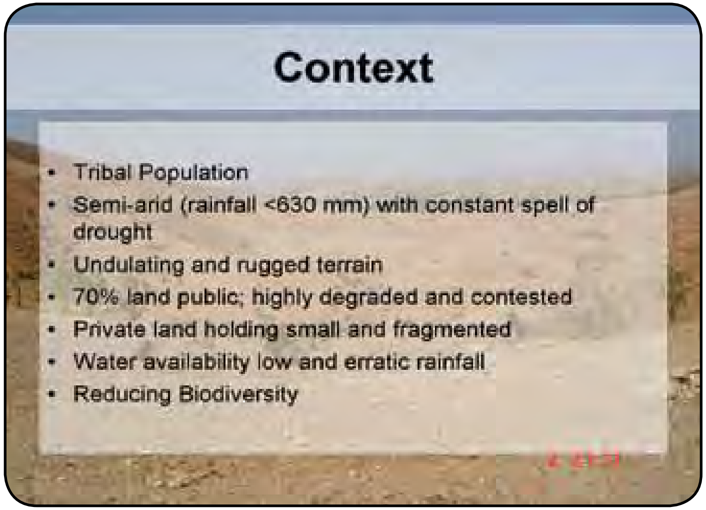
Rain fall data



Thanks

Watershed Organisation Trust
'Paryavaran', Behind Market Yard
Ahmednagar - 414 001
Maharashtra, India

Phone : 0091 241 2450188
Fax : 0091 241 2451134
email : info@wotr.org
Website : www.wotr.org


Context
• Tribal Population
• Semi-arid (rainfall <630 mm) with constant spell of drought
• Undulating and rugged terrain
• 70% land public; highly degraded and contested
• Private land holding small and fragmented
• Water availability low and erratic rainfall
• Reducing Biodiversity


Context.....
• 83% self-employed farmers
• Around 80% farming rain fed
• Small and fragmented farms
• >50% producers-consumers
• Mixed Package of Practices- increasing use of fertilisers and modern seeds
• Remoteness hindering access to support mechanism and market


Seva Mandir
• Four decades in tribal and rural development
• Focus on organising and preparing fragmented communities for self-development
• Works in 628 villages and 56 urban settlements (>70,000 HHs) in Udaipur and Rajsamand districts in South Rajasthan
• Institutions, livelihood and capabilities are core domains of intervention
• Work in the areas of local village institution strengthening, natural resource development, women and child development, education and health


Past experiences in watershed development
• Developed 10,000 ha of area under watershed development covering 34 villages
• Demand and process driven approach combining social preparedness and technical feasibility
• Engaging with already existing village institutuins.committee as Watershed Development Committees
• Longer engagement with the community, not just during watershed activity
• Incorporation of concerns of common lands in the watershed development
• Efforts to integrate diverse development solutions

Learning's of Dhala watershed

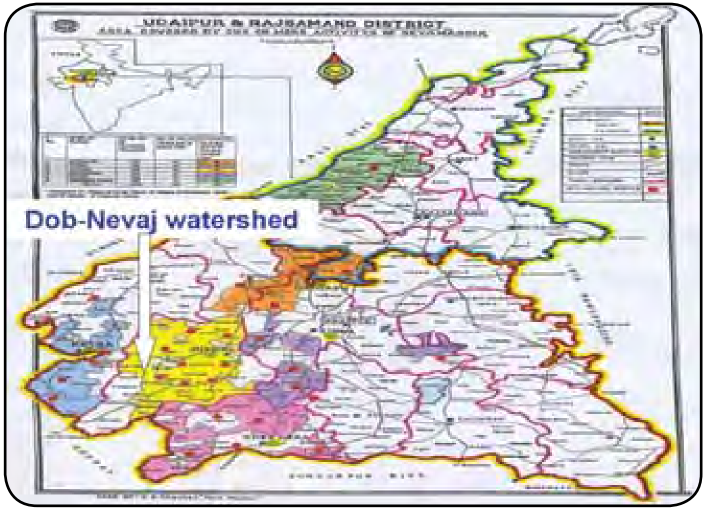
- Subsequent integration of soil & water conservation activities with agriculture and livestock development
- Regular and continuous planning and follow-up for productivity enhancement
- Diversification of cropping system with horticulture, vegetable cultivation, cash crops
- Integration of safe drinking water intervention with the approach decentralized solutions

Plausible impacts of Dhala watershed

- Increased availability of water for drinking and irrigation purpose
- Net increase in cropped area as result of land reclamation (with average 0.10 ha per family)
- Increase in the area under winter crop with increase in water for irrigation and residual moisture
- No of farmers involved in vegetable cultivation increased from zero to 25 farmers in rabi season
- Farmers in vermi composting activity and using in crops
- Gradual move towards the food and income security of the families
- Increased awareness on safe drinking water and water handling practices

Partnership of Seva Mandir and ICRISAT

- Seva Mandir and ICRISAT partnership- five years old
- Initial collaboration for trails of kharif crops like Maize, Bengal gram in 4 villages per year
  - Increase in maize production from 12.5q/ha to 18q/ha, with application of micro-nutrients and good package of practices
- Dob- Nevaj watershed partnership started from January 2010.



Criteria of watershed selection

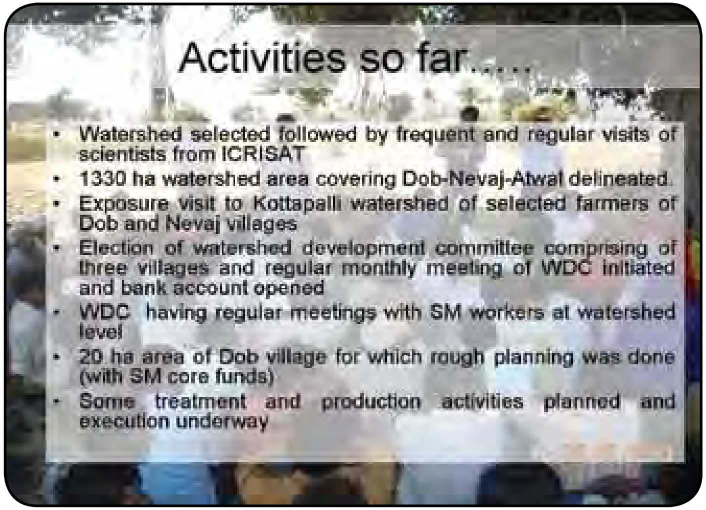
- Geographically representative of semi-arid western states
- High Percentage of common land (53 percent)
- Good connectivity and accessibility from Udaipur and Gujarat
- Vibrant and and enthusiastic community
- Existence of institutional set up
- Higher prospects of regeneration of bio-physical regeneration

Details of watershed Area

Macro watershed Name	:Gamari I
Macro watershed No	:17
Micro watershed No	:1,3 and 4
Total geographical area	:1330 ha
Cultivable land	:625 ha
Forest land	:555 ha
Non-arable land	:120 ha
Village pasture land	:30 ha
Villages and hamlets	:Dob (4), Nevaj(5) and Atwal (7)

Strategy for watershed Development

- Incorporating own learning and rich experience and expertise of ICRISAT and all other partners.
- Integrated net planning for NRM and production plan
- Productivity enhancement plan and activities to go hand in hand with S&W conservation
- Stress on empowerment of VIs-WDC,SHGs
- Convergence with mainstream develoment initiatives like NREGS and SGSY
- Collaborating with Government, MPUAT and PRIs


Activities so far.....
• Watershed selected followed by frequent and regular visits of scientists from ICRISAT
• 1330 ha watershed area covering Dob-Nevaj-Atwal delineated.
• Exposure visit to Kottapalli watershed of selected farmers of Dob and Nevaj villages
• Election of watershed development committee comprising of three villages and regular monthly meeting of WDC initiated and bank account opened
• WDC having regular meetings with SM workers at watershed level
• 20 ha area of Dob village for which rough planning was done (with SM core funds)
• Some treatment and production activities planned and execution underway


Thank you

Increasing Agricultural Productivity thru Sustainable Management of Natural Resources in Rainfed Areas

Review of Two Days Work

- Inaugural session
- Review of progress in SDTT,SRTT, and Model watersheds
  - Success of consortium
  - Good results of increased productivity
  - Need to build on the success
  - Specific locations need to address identified challenges

Planning: Work Plans 2010:Objectives

- To prepare the work plans and develop the strategy to achieve the project objectives of increasing the agricultural productivity in the target districts.
- Conduct demonstrations and collect data to build trust of the farmers and policy makers for scaling-up

Planning: Work Plans 2010

- Participatory Research & Development (PR&D) Trials
- Scaling-up of proven technologies
- Research gaps to be addressed

Three Groups

1. **SRTT-ICRISAT-ICAR Project**
   Facilitators: **KL Sahrawat and KH Anantha**
2. **SDTT-ICRISAT-ICAR Project**
   Facilitators: **Piara Singh and Girish Chander**
3. **Model Watersheds**
   Facilitators: **Pathak and Kaushal Garg**

PR&D Trials – Nucleus Trials

Purpose: Collect relevant data for assessment and policy brief development

- Which technologies? (INM, Water Management for rainy and postrainy season, cultivar selection, crop diversification with high-value crops, efficient irrigation, livelihood activities etc.
- Which district and villages?
- How many farmers?
- What data to be collected?
- Who is responsible to collect data?

Participatory R&D Nucleus Trials *(Contd..)*

Technologies/interventions

- Rice Fallow Management – *Piara Singh*
  - Seed priming – hardening + Micronutrient, *Rhizobium*
  - Application of micronutrients to paddy
  - Farmers' practice
  - Different crops during *rabi*

Demonstration Trials – Satellite Trials

Purpose: Assess and demonstrate benefits including economic to the farmers

Steps:

- How many satellite trials? (1:5 or ?)
- How to select the farmers?
- Which and how many villages?
- What data we need to collect?
- Who is responsible?

Scaling Out Trials

Purpose: Seeing is believing principle adopted to increase spread of technologies and benefits

- Which villages and how many?(1:5:10?)
- Selection of farmers – Criterion (small and marginal, new beneficiaries?)
- What data we collect?
- When and how many field days to monitor?
- How nucleus farmers can be used?
- Data collection and preparation of reports with all needed information

Timeliness

- Select villages and farmers for each trial
- Discuss with the farmers – Not contractual arrangement
- Collection of data
- Collection of samples and data processing
- Reporting and report preparation

Responsibilities of Partners

- NGO partners
- ICRISAT
- SAUs, KVKs, and Research Institutes

Participatory R&D Nucleus Trials

Technologies/interventions

- Rainy season fallow management - *P Pathak*
  - Short duration soybean + chickpea/wheat+ INM
  - BBF + soybean SD cv + chickpea/wheat +INM
  - Furrows – open ended + soybean + SD cv + chickpea/wheat + INM
  - Farmers management (fallow) + chickpea/ wheat (farmers' practice)

Participatory R&D
Nucleus Trials *(Contd..)*

Technologies/interventions

- Rainy season fallow management – *Girish/Sahrawat*
  - Taluk-wise recommendations
    - Soil application
    - Foliar spray
    - Residual effects
  - Crops: Soybean, chickpea, wheat, vegetables, maize, paddy etc.

Participatory R&D
Nucleus Trials *(Contd..)*

Technologies/interventions

- Crop diversification trials – *Sachan/Gajanan*
  - Possible upland crops in rice areas
  - SD cultivars of maize, groundnut, sunflower etc. in Madhya Pradesh
  - High value crops (Vegetables) and bund trees

Participatory R&D
Nucleus Trials *(Contd..)*

Technologies/interventions

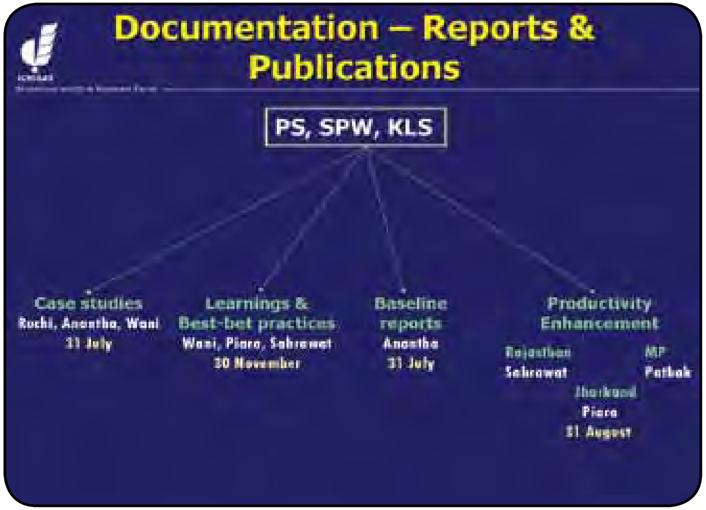
- Microenterprises for Livelihood – *Anantha/Ruchi*
  - What are possibilities?
  - What makes them successful?
  - What's impact?

Documentation

It's a weak linkage and we need to strengthen it

- Good quality data is must
- Good recording of notes by field staff (weekly basis)
- Collation, compilation, analysis and synthesis


Data Compilation
• Jhabua & Mandla
Anantha
• BAIF, MP
Pathak
• CARDS
• Raisen and Sagar
Sudi
• BAIF, Rajasthan
Girish
• DEEP
Mathur
• Gumla and Sarai
Jangawad
• Model Watersheds
Pathak, Sachan & Sudi


Documentation – Reports & Publications
PS, SPW, KLS
Case studies
Ruchi, Anantha, Wani
31 July
Learnings & Best-bet practices
Wani, Piara, Sahrawat
30 November
Baseline reports
Anantha
31 July
Productivity Enhancement
Rajasthan
Sahrawat
MP
Pathak
Jharkand
Piara
31 August


Thank You.

Work plan for SDTT- ICRISAT- ICAR initiatives on Productivity Enhancement for Sustainable Livelihood in MP State 2010-11

Nutrient management

1. Study of Residual effects (Last season expts)

Treatments
- Farmers practice
- Balanced nutrition

2. INM trials

(A) Nucleus trial

Treatments
- Imp variety + Farmer practice
- Imp variety + Balanced nutrition (Chemical)
- Imp variety + Balanced nutrition (50% Chemical) + 50% organic—FYM or VC

INM

3) Satellite trials

1) IV +FM

2) IV+INM (chem)

4) Scaling up trials

1) IV + INM (chem)

Fallow management

Nucleus trials

1) fallow-chickpea/wheat

2) SD soybean-chcikpea/wheat (INM+CF)

3) SD soybea-Ckickpea/wheat (INM+BBF)

Districts selected for strategic trials

- 1. Sehore (Vedpuri + 2 vill)
- 2 Vidisha (Anandpur + 2 vill)
- 3. Raisen (Bahmori, Pahria, Bhainsra)
- 4. Shajapur (Mahudia, Moyakhera, Barkhera)
- 5 Indore (Ringnodia + 2)

Number of trials

- Nucleus trials= 5D x 3V x 5T = 75
- Satellite trials = 5 x 3 x 25=375
- Scale up trials = 5 x 3 x 50=750

Diversification

Intercropping on shallow black soils
SB/PP
MZ/PP
GN/PP
MZ/GN—Bharwani distt.
Groundnut
Greengram
Vegetables
All with INM

Livelihoods Improvement

- Nursery raising
- Vermicomposting
- Livestock- livestock camps
- Micro-enterprises
- Fodder development
- Kitchen gardening
- Glyricidia plantations
- Backyard poultry and goatry
- Seed bank/SHGs formation

Data recording

1) Nucleus trials—sowing date, emergence, 50% flowering, physiological maturity, harvest date, date and amount of inputs, harvest data on yield and yield components, soil analysis, plant population, plant samples at harvest.
2) Satellite trials—crop yields-biomass and economic
3) Scaling up—economic yields, farmers perception

Responsibilities and data recording

- Concerned NGO in the respective district for implementing the trials and data recording
- Frequent visits to trial sites- NGO and ICRISAT staff
- Technical support—ICRISAT staff and data collection from the NGO staff and sent to ICRISAT
- Data compilation, analysis, documentation- concerned ICRISAT scientist

Thank you

SDTT ICRISAT ICAR PROJECT RAJASTHAN

WORK PLAN 2010- 11

AREA COVERED

Name of the District.	Implementing Agency
Bundi	
Alwar	BAIF
Bhilwara	
Banswara	
Jhalawar	
Tonk	DEEP
Sawai Madhopur	

PARTICIPARATORY RESEARCH & DEVELOPMENT

Sr. No.	District	No. Of Villages	Nucleus Trials	Satellite Trials	Scale up Trials
1	Bundi	3	-	-	150
2	Alwar	3	-	-	150
3	Bhilwara	3	15	75	150
4	Banswara	3	15	75	150
5	Jhalawar	3	15	75	150
6	Tonk	3	15	75	150
7	Sawai Madhopur	3	15	75	150

Selected crops , Kharif – Maize , PM , GN, BG, Soybean.
Rabi – Wheat, Mustard, Chickpea

TECHNOLOGIES

Component	Treatment	Description
Nucleus Trials	T1 Improved Variety + Farmers Practices. T2.Improved Variety + Balance Nutrients. T3, Improved Variety + 50 % Balance Nutrients + 50 % VC. / FYM	•All three treatments will be taken under NT with 1000 Sq. Mtr. Per treatment plot. Trial plot size of 3000 Sq. Mt • 3 Distt. * 3 Vill. * 5 Trials = 45 Trials in BAIF Location • 2 Distt. * 3Vill. * 5 Trials = 30 Trials in DEEP Location.
Residual Assessment	Farmers Practices + NPK in existing crop	Same plot will be considered in rabi season .
Satellite Trials	T1 Improved Variety + Farmers Practices. T2.Improved Variety + Balance Nutrients.	•3 Distt. * 3 Vill. *25 Trials = 225 Trials in BAIF Location • 2 Distt. * 3Vill. *25 Trials = 150 Trials in DEEP Location.
Scale up Trials	T1 Improved Variety + Farmers Practices. T2.Improved Variety + Balance Nutrients.	• 5 Distt. * 3 Vill. *50 Trials = 750 Trials in BAIF Location • 2 Distt. * 3Vill. *50 Trials = 300 Trials in DEEP Location.

Work Plan 2010-11

Component	Districts							
	Bundi	Alwar	Bhilwara	Banswara	Jhalawar	Tonk	S. Madhopur	Total
PR & D A.NT B. ST C.SC	 0 0 150	 0 0 150	 15 75 150	 15 75 150	 15 75 150	 15 75 150	 15 75 150	 75 375 1050
Crops Diversification A. High Value Crop With INM (Maize – PP , Maize – GN, Wheat – Mustard , / Chickpea 5 – 15 %	10-20	10-20	10-20	10-20	10-20	10-20	10-20	70-140

Continue...

Component	Bundi	Alwar	Bhilwara	Banswara	Jhalawar	Tonk	S. Madhopur	Total
B. Establishment of Model Farm as Learning Station.	1	1	1	1	1	1	1	7
C. Vegetable Cultivation Nos.	10	10	10	10	10	10	10	70
D. Forage Prod. (Family)	20	20	20	20	20	20	20	140
3. Livelihood. A. Breed Improvement B. IGA. B1. Goatry (Male Buck) B2. Poultry B3 Nursery B4 Vermicompost B5 Micro Nutrient Bank	1 5 2 1 5 1	1 5 2 1 5 1	1 5 2 1 5 1	1 5 2 1 5 1	1 5 2 1 5 1	- 5 2 1 5 1	- - 2 1 5 1	5 30 14 7 5 1

Continue...

Component	Bundi	Alwar	Bhilwara	Banswara	Jhalawar	Tonk	S. Madhopur	Total
4. Capacity Building A.Relevent Trainings (25 Farmers / Trg.	4	4	4	4	4	4	4	28
B. Farmers Day C. Exposure Visit. (NO. of farmers)	2 10	2 10	2 10	2 10	2 10	2 10	2 10	14 70
D. FGD & FW (At least two in each village.								
5. Documentation of best practices (Nos.)	3	3	3	3	3	3	3	21

Review and Planning Meeting of SRTT Project - 2010

Work Plan for 2010-11

Partner NGOs

- Madhya Pradesh
  - Mandla: Foundation for Ecological Security (FES)
  - Jhabua: Grameen Vikas Trust (GVT)
- Jharkhand
  - Gumla: Professional Assistance for Development Action (PRADAN)
  - Saraikela-Kharsaw: Tata Steel Rural Development Society (TSRDS)

Participants

- Dr KL Sahrawat - ICRISAT
- Dr KH Anantha - ICRISAT
- Mr Manoj Kumar – TSRDS
- Mr K Ramakrishna – ICRISAT
- Mr Deepak Kumar Sharma – GVT
- Mr Ramvilas Kalam – GVT
- Sourav Pahari – FES
- Pradeep Kumar Maharana – FES
- Abhishek Kumar - PRADAN
- LS Jangawad – ICRISAT
- G Pardhasaradhi – ICRISAT

Experimental Treatments

- Farmers' practice (FP)
- FP+ improved variety
- Improved variety +balanced nutrient management

Madhya Pradesh

Mandla District, Kharif 2010

1+5 villages

- Ten trials with maize
- Ten trials with pigeonpea
- Ten trails with black gram
- Ten trials with groundnut
- Thirty trials with paddy
- **Total trials = 70**

Rabi 2010-11

- Chickpea 40 trials
- Mustard 25 trials
- Wheat 30 trails
- Vegetable 30 trails
- **Total trials= 125**

Other Activities

Kharif 2010

- Glyricidia nursery with 3 SHGs
- Glyricidia planting 5000 running meters
- Vermicompost one commercial + 30 surface model pits
- Vegetable cultivation with 5 farmers in kharif
- Low cost drip with 10 farmers in Rabi-summer
- Seed bank one village
- Environmental Education Program in one village
- Farmers' field day 3
- Exposure visit one
- Well water depth monitoring 24 wells
- BBF 3 farmers
- Poultry farm 10 farmers
- Common rice nursery five farmers

Rabi 2010-11

- Vegetable cultivation with 30 farmers
- Low cost drip 10 farmers
- Common nursery for vegetables
- Farmers field day one
- Community seed bank one
- Environmental Education Program one
- Well water depth monitoring 24
- Fodder production 4 farmers
- Common rice nursery 5 farmers

Jhabua District, Kharif 2010

1+4 villages

- 45 trials with maize
- 45 trails with soybean
- 10 trials with groundnut
- 10 trials with black gram
- 10 trials with pigeonpea
- **Total trials = 120**

Rabi 2010-11

- Chickpea 50 trials
- Wheat/mustard intercrop 15 trials
- Vegetable 20 trials
- **Total trials = 85**

Other Activities

- Vermicompost 25 surface units
- Low cost drip irrigation 10 farmers
- *Glyricidia* nursery one
- Vegetable nursery one
- Planting of glyricidia 5000 seed wings
- Backyard poultry 10
- Field days 4
- Exposure visits 5
- Night camps for farmers 5

Jharkhand
Gumla District, Kharif 2010

1+9 villages

- **Paddy (hybrid rice) 75 trials**
- **Maize 25 trials**
- **Maize/pigeonpea intercrop 25 trials**
- **Pigeonpea/black gram intercrop 25 trials**
- **Pigeonpea/groundnut intercrop 5 trials**
- **Groundnut 10 trials**

Rabi 2010-11

- Chickpea 75 trials
- Vegetables 25 trials
- Wheat 10 trials
- **Total trials =110**

Other Activities

- Boron & Zn spraying for mango orchards 50 farmers
- Farmers training 50 in Kharif rice production
- Farmers training 25 in Rabi for chickpea and vegetables production

Saraikela-Kharsaw District, Kharif 2010

1+5 villages

- Paddy 30 trials
- Pigeonpea 5 trials
- Maize 5 trials
- Vegetable 10 trials
- **Total trials = 50**

Rabi 2010-11

- Chickpea 30 trials
- Wheat 15 trials
- Wheat/mustard intercrop 15 trials
- Mustard 15 trials
- Vegetable 35 trials
- **Total trials = 110**

Other Activities

- Glyricidia 10000 seedlings
- Drip irrigation one farmer
- Vermicompost surface units 10
- Seed bank two villages
- Kisan clubs three villages
- Linkages of 3 SHGs with bank
- Field days 4
- Exposure visits 4
- 20 nos of farmers' training in Kharif paddy production
- 30 no. of farmers' training in Rabi chickpea, vegetable and wheat/mustard intercrop production


Thank You.

About ICRISAT

The International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger and a degraded environment through better agriculture.

ICRISAT is headquartered in Hyderabad, Andhra Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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